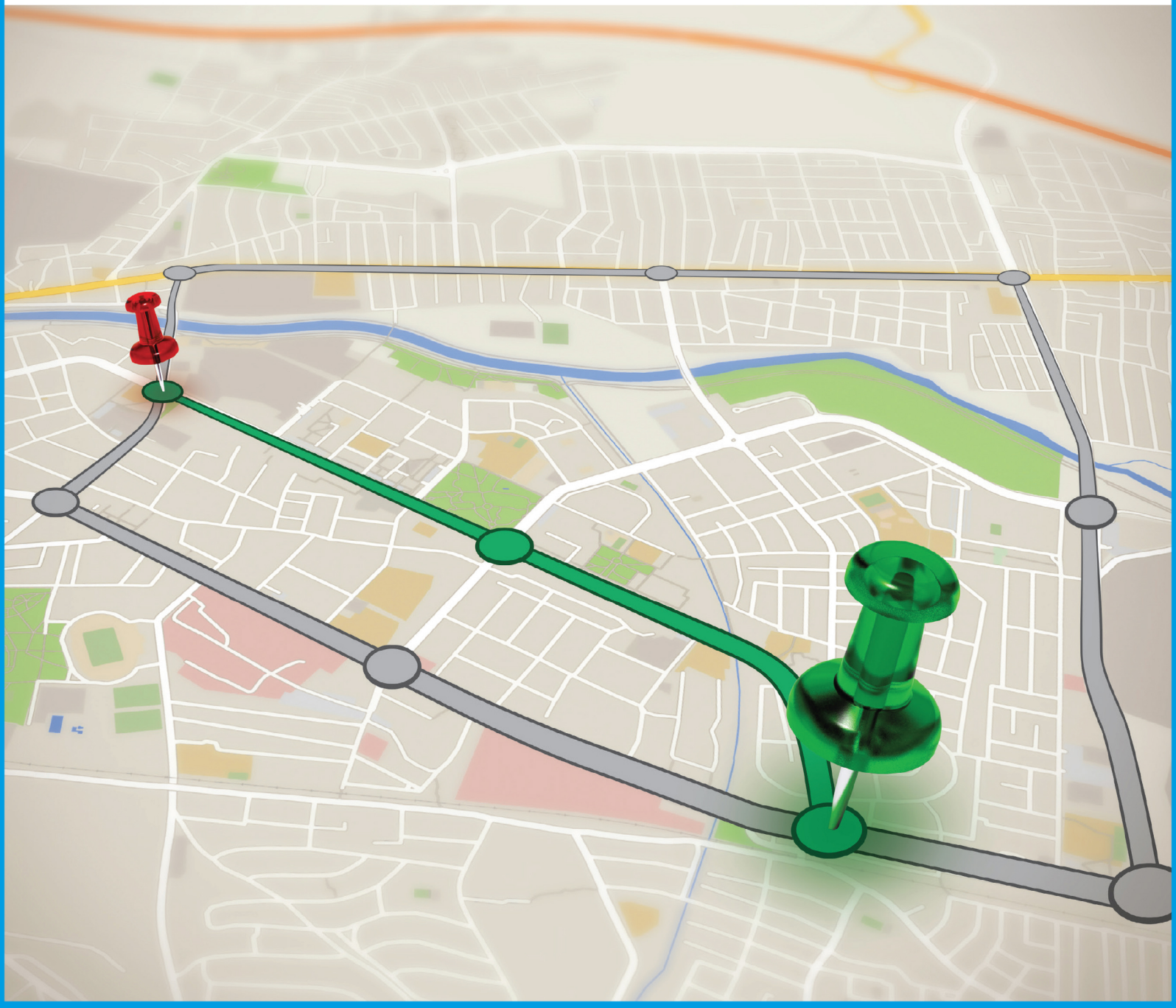
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WARREN / TAYLER 15

Managerial Accounting



Managerial Accounting 15e

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***Managerial Accounting,* 15e**
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Preface

Roadmap for Success

Warren/Tayler *Managerial Accounting*, *15e*, provides a sound pedagogy for giving students a solid foundation in managerial accounting. Warren/Tayler covers the fundamentals AND motivates students to learn by showing how accounting is important to businesses.

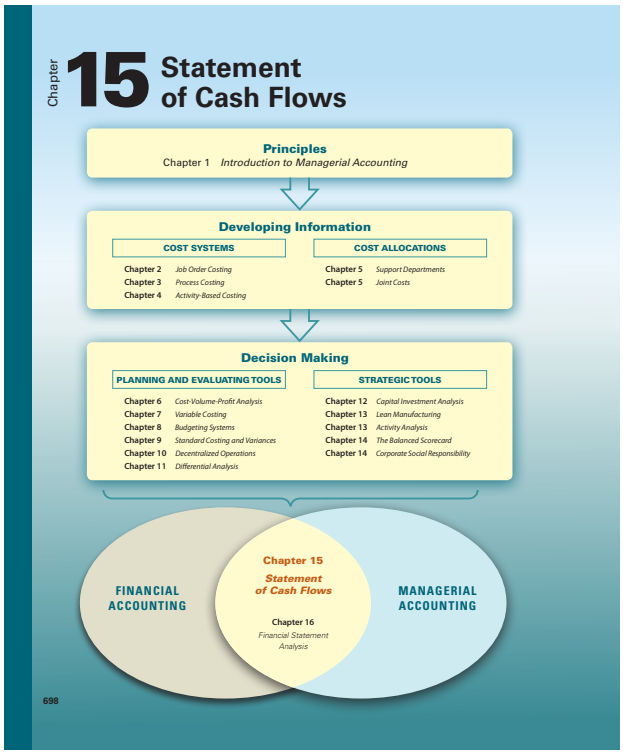
Warren/Tayler is successful because it reaches students with a combination of new and tried-and-tested pedagogy.

This revision includes a range of new and existing features that help Warren/Tayler provide students with the context to see how accounting is valuable to business. These include:

- New! Make a Decision section
- New! Pathways Challenge
- New! Certified Management Accountant (CMA®) Examination Questions

Warren/Tayler also includes a thorough grounding in the fundamentals that any business student will need to be successful. These key features include:

- Presentation style designed around the way students learn
- Updated schema
- At the start of each chapter, **a schema, or roadmap, shows students what they are going to learn and how it is connected to the larger picture**. The schema illustrates how the chapter content lays the foundation with managerial concepts and principles. Then it moves students through developing the information and ultimately into evaluating and analyzing information in order to make decisions.



- **Link to the "opening company" of each chapter** calls out examples of how the concepts introduced in the chapter are connected to the opening company. **This shows how accounting is used in the real world by real companies.**



Adobe Systems Inc.

Assume that you have three different options for a summer job. How would you evaluate these options? Naturally there are many things to consider, including how much you could earn from each job.

Determining how much you could earn from each job may not be as simple as comparing the wage rate per hour. For example, a job as an office clerk at a local company pays $8 per hour. A job delivering pizza pays $10 per hour (including estimated tips), although you must use your own transportation. Another job working in a beach resort over 500 miles away from your home pays $8 per hour. All three jobs offer 40 hours per week for the whole summer. If these options were ranked according to their pay per hour, the pizza delivery job would be the most attractive. However, the costs associated with each job must also be evaluated. For example, the office job may require that you pay for downtown parking and purchase office clothes. The pizza delivery job will require you to pay for gas and maintenance for your car. The resort job will require you to move to the resort city and incur additional living costs. Only by considering the costs for each job will you be able to determine which job will provide you with the most income.

Just as you should evaluate the relative income of various choices, a business also evaluates the income earned from its choices. Important choices include the products offered and the geographical regions to be served.

A company will often evaluate the profitability of products and regions. For example, **Adobe Systems Inc. (ADBE)**, one of the largest software companies in the world, determines the income earned from its various product lines, such as Acrobat®, Photoshop®, Premiere®, and Dreamweaver® software. Adobe uses this information to establish product line pricing, as well as sales, support, and development effort. Likewise, Adobe evaluates the income earned in the geographic regions it serves, such as the United States, Europe, and Asia. Again, such information aids management in managing revenue and expenses within the regions.

In this chapter, how businesses measure profitability using absorption costing and variable costing is discussed. After illustrating and comparing these concepts, how businesses use them for controlling costs, pricing products, planning production, analyzing market segments, and analyzing contribution margins is described and illustrated.

PETE JENKINS/ALAMY STOCK PHOTO

Link to Adobe Systems ..... Pages 305, 309, 312, 316, 319

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Link to Adobe Systems In a recent absorption costing income statement, **Adobe Systems** reported (in millions) total revenue of $5,854, cost of revenue of $820, gross profit of $5,034, operating expenses of $3,541, and operating income of $1,493.

- To aid comprehension and to demonstrate the impact of transactions, **journal entries include the net effect of the transaction on the accounting equation**.

A summary of the materials requisitions is used as a basis for the journal entry recording the materials used for the month. For direct materials, this entry increases (debits) Work in Process and decreases (credits) Materials as follows:

A = L + E
+ −

b.

Work in Process	13,000	
Materials		13,000
Materials requisitioned to jobs ($2,000 + $11,000).		

- Located in each chapter, **Why It Matters** shows students how accounting is important to businesses with which they are familiar. A Concept Clip icon indicates which Why It Matters features have an accompanying concept clip video in CNOWv2.

CONCEPT CLIP

Why It Matters

CONCEPT CLIP

Coca-Cola Company: Go West Young Man

A major decision early in the history of **Coca-Cola (KO)** was to expand outside of the United States to the rest of the world. As a result, Coca-Cola is known today the world over. What is revealing is how this decision has impacted the revenues and profitability of Coca-Cola across its international and North American segments. The following table shows the percent of revenues and percent of operating income from the international and North American geographic segments.

	Revenues	Operating Income
International segments	58.4%	65.6%
North American segment	41.6	34.4
Total	100%	100%

The first column shows that the international segments provide over 58% of the revenues, while North America provides almost 42% of the revenues. However, the operating income tells a different story. More than 65% of Coca-Cola's profitability comes from international segments. Given the revenue segmentation, this suggests that the international profit margins must be higher than the North American profit margin. Indeed this is the case, as can be seen in the following table:

	Profit Margin
International average	48.4%
North America	24.2%

The average profit margin for all the international segments is two times as large as the North American segment. These results reflect the heart of the Coca-Cola marketing strategy. In international markets, Coca-Cola is able to charge relatively higher prices due to high demand and less competition as compared to the North American market.

Source: The Coca-Cola Company, *Form 10-K for the Fiscal Year Ended December 31, 2017.*

- **New! Pathways Challenge** encourages students' interest in accounting and emphasizes the critical thinking aspect of accounting. A suggested answer to the Pathways Challenge is provided at the end of the chapter.

Pathways Challenge



This is Accounting!

Economic Activity

Absorption costing is required by generally accepted accounting principles (GAAP) for reporting to external stakeholders. Thus, auto manufacturers like **Ford Motor Company (F)** and **General Motors Company (GM)** use absorption costing in preparing their financial statements. Under absorption costing, fixed manufacturing costs are included in inventory. Thus, the more cars the auto companies make, the lower the fixed cost per car and the smaller the cost of goods sold. In the years preceding the U.S. financial crisis and economic downturn of 2008, Ford and General Motors produced more cars than were sold to customers.[1]

Critical Thinking/Judgment

If Ford and General Motors have high fixed costs and low variable costs, how would producing more cars affect their operating income under absorption costing? under variable costing?
If absorption costing allows companies like Ford and General Motors to change their operating income by increasing or decreasing production, why does GAAP require absorption costing?

Suggested answer at end of chapter.

Pathways Challenge



This is Accounting!

Information/Consequences

By producing more cars than were sold, **Ford (F)** and **General Motors (GM)** increased their operating income reported under absorption costing. This is because a portion of their fixed manufacturing costs were included in ending inventory rather than cost of goods sold.

Under variable costing, producing more cars would not affect operating income, because all fixed manufacturing costs are included in cost of goods sold regardless of how many cars are produced.

A reason often given for why GAAP requires absorption costing is that it focuses on operating income "over the long term." In other words, while operating income may vary from year to year, all manufacturing costs are eventually reported on the income statement as cost of goods sold or as a write-down of inventory using the lower-of-cost-or-market rule. Thus, over the life of a company, the total amount of operating income will be the same regardless of whether absorption or variable costing is used.

Suggested Answer

- To aid learning and problem solving, throughout each chapter the **Check Up Corner** exercises provide students with step-by-step guidance on how to solve problems. Problem-solving tips help students avoid common errors.

Check Up Corner 10-1 Cost Center Responsibility Measures

Delinco Tech Inc. manufactures corrosion-resistant water pumps and fluid meters. Its Commercial Products Division is organized as a cost center. The division's budget for the month ended July 31 is as follows (in thousands):

Materials	$140,000
Factory wages	77,000
Supervisor salaries	15,500
Utilities	8,700
Depreciation of plant equipment	9,000
Maintenance	3,200
Insurance	750
Property taxes	800
	$254,950

During July, actual costs incurred in the Commercial Products Division were as follows:

Materials	$152,000
Factory wages	77,800
Supervisor salaries	15,500
Utilities	8,560
Depreciation of plant equipment	9,000
Maintenance	3,025
Insurance	750
Property taxes	820
	$267,455

Prepare a budget performance report for the director of the Commercial Products Division for July.

Solution:

The report shows the budgeted costs and actual costs along with the differences.

Budget Performance Report
Director, Commercial Products Division
For the Month Ended July 31

	Actual	Budget	Over Budget	(Under) Budget
Materials	$152,000	$140,000	$12,000	
Factory wages	77,800	77,000	800	
Supervisor salaries	15,500	15,500		
Utilities	8,560	8,700		$(140)
Depreciation of plant equipment	9,000	9,000		
Maintenance	3,025	3,200		(175)
Insurance	750	750		
Property taxes	820	800	20	
	$267,455	$254,950	$12,820	$(315)

The report allows cost center managers to focus on areas of significant differences.

Each difference is classified as *over* budget or *under* budget.

Check Up Corner

- **Analysis for Decision Making** highlights how companies use accounting information to make decisions and evaluate their business. This provides students with context of why accounting is important to companies.

Analysis for Decision Making

Objective 6
Describe and illustrate the use of staffing budgets for nonmanufacturing businesses.

Nonmanufacturing Staffing Budgets

The budgeting illustrated in this chapter is similar to budgeting used for nonmanufacturing businesses. However, many nonmanufacturing businesses often do not have direct materials purchases budgets, direct labor cost budgets, or factory overhead cost budgets. Thus, the budgeted income statement is simplified in many nonmanufacturing settings.

A primary budget in nonmanufacturing businesses is the labor, or staffing, budget. This budget, which is highly flexible to service demands, is used to manage staffing levels. For example, a theme park will have greater staffing in the summer vacation months than in the fall months. Likewise, a retailer will have greater staffing during the holidays than on typical weekdays.

To illustrate, Concord Hotel operates a hotel in a business district. The hotel has 150 rooms that average 120 guests per night during the weekdays and 50 guests per night during the weekend. The housekeeping staff is able to clean 10 rooms per employee. The number of housekeepers required for an average weekday and weekend is determined as follows:

	Weekday	Weekend
Number of guests per day	120	50
Rooms per housekeeper	÷ 10	÷ 10
Number of housekeepers per day	12	5

If each housekeeper is paid $15 per hour for an eight-hour shift per day, the annual budget for the staff is as follows:

	Weekday	Weekend	Total
Number of housekeepers per day	12	5	
Hours per shift	× 8	× 8	
Days per year	× 260*	× 104**	
Number of hours per year	24,960	4,160	
Rate per hour	× $15	× $15	
Housekeeping staff annual budget	$374,400	$62,400	$436,800

* 52 weeks × 5 days
** 52 weeks × 2 days

The budget can be used to plan and manage the staffing of the hotel. For example, if a wedding were booked for the weekend, the budgeted increase in staffing could be compared with the increased revenue from the wedding to verify the profit plan.

- **Make a Decision** in the end-of-chapter material gives students a chance to analyze real-world business decisions.

Make a Decision
Cost-Volume-Profit Analysis for Service Companies

MAD 6-1 Analyze Global Air's cost-volume-profit relationships **Obj. 6**

Global Air is considering a new flight between Atlanta and Los Angeles. The average fare per seat for the flight is $760. The costs associated with the flight are as follows:

Fixed costs for the flight:	
Crew salaries	$ 5,000
Operating costs	50,000
Aircraft depreciation	25,000
Total	$80,000
Variable costs per passenger:	
Passenger check-in	$ 20
Operating costs	100
Total	$120

The airline estimates that the flight will sell 175 seats.

a. Determine the break-even number of passengers per flight.
b. Based on your answer in (a), should the airline add this flight to its schedule?
c. How much profit should each flight produce?
d. What additional issues might the airline consider in this decision?

MAD 6-2 Analyze Ocean Escape Cruise Lines' cost-volume-profit relationships **Obj. 6**

Ocean Escape Cruise Lines has a boat with a capacity of 1,200 passengers. An eight-day ocean cruise involves the following costs:

Crew	$240,000
Fuel	60,000
Fixed operating costs	800,000

The variable costs per passenger for the eight-day cruise include the following:

Meals	$900
Variable operating costs	400

The price of the cruise is $2,400 per passenger.

a. Determine the break-even number of passengers for the eight-day cruise.
b. Assume 900 passengers booked the cruise. What would be the profit or loss for the cruise?
c. Assume the cruise was booked to capacity. What would be the profit or loss for the cruise?
d. If the cruise cannot book enough passengers to break even, how might the cruise line respond?

- At the end of each chapter, **Let's Review** is a new chapter summary and self-assessment feature that is designed to help busy students prepare for an exam. It includes a summary of each learning objective's key points, key terms, multiple-choice questions, exercises, and a sample problem that students may use to practice.
- Sample multiple-choice questions allow students to practice with the type of assessments they are likely to see on an exam.
- Short exercises and a longer problem allow students to apply their knowledge.
- **Answers** provided at the end of the Let's Review section let students check their knowledge immediately.
- **Take It Further** in the end-of-chapter activities allows instructors to assign other special activities related to ethics, communication, and teamwork.
- **NEW! Certified Management Accountant (CMA®) Examination Questions** help students prepare for the CMA exam so they can earn CMA certification.



CengageNOWv2

CengageNOWv2 is a powerful course management and online homework resource that provides control and customization to optimize the student learning experience. Included are many proven resources, such as algorithmic activities, a test bank, course management tools, reporting and assessment options, and much more.

NEW! Excel Online

Cengage and Microsoft have partnered in CNOWv2 to provide students with a uniform, authentic Excel experience. It provides instant feedback, built-in video tips, and easily accessible spreadsheet work. These features allow you to spend more time teaching college accounting applications and less time troubleshooting Excel.

These new algorithmic activities offer pre-populated data directly in Microsoft Excel Online. Each student receives his or her own version of the problem to perform the necessary data calculations in Excel Online. Their work is constantly saved in Cengage cloud storage as a part of homework assignments in CNOWv2. It's easily retrievable so students can review their answers without cumbersome file management and numerous downloads/uploads.

Motivation: Set Expectations and Prepare Students for the Course

CengageNOWv2 helps motivate students and get them ready to learn by reshaping their misconceptions about the introductory accounting course and providing a powerful tool to engage students.

CengageNOWv2 Start-Up Center

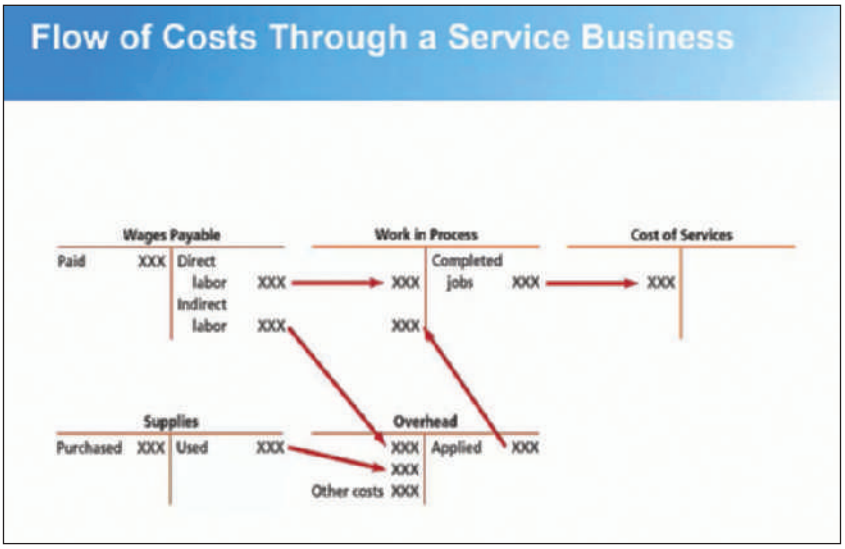
Students are often surprised by the amount of time they need to spend outside of class working through homework assignments in order to succeed. The CengageNOWv2 Start-Up Center will help students identify what they need to do and where they need to focus in order to be successful with a variety of new resources.

- What Is Accounting? Module ensures students understand course expectations and how to be successful in the introductory accounting course. This module consists of two assignable videos: *Introduction to Accounting* and *Success Strategies*. The Student Advice Videos offer advice from real students about what it takes to do well in the course.
- Math Review Module, designed to help students get up to speed with necessary math skills, includes math review assignments and Show Me How math review videos to ensure that students have an understanding of basic math skills.
- How to Use CengageNOWv2 Module focuses on learning accounting, not on a particular software system. Quickly familiarize your students with CengageNOWv2 and direct them to all of its built-in student resources.

Motivation: Prepare Them for Class

With all the outside obligations accounting students have, finding time to read the textbook before class can be a struggle. Point students to the key concepts they need to know before they attend class.

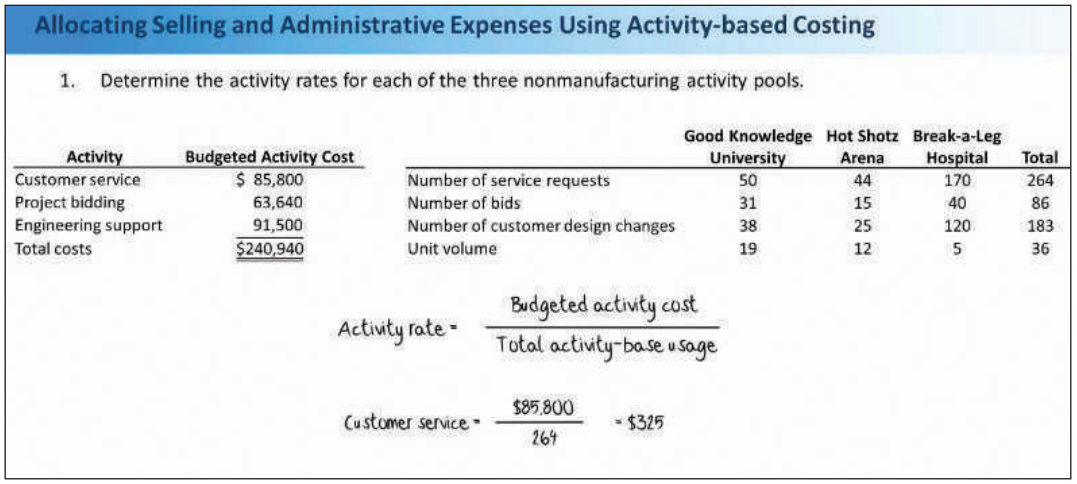
- **Video: Tell Me More.** Short Tell Me More lecture activities explain the core concepts of the chapter through an engaging auditory and visual presentation. Available either on a stand-alone basis or as an assignment, they are ideal for all class formats—flipped model, online, hybrid, or face-to-face.



Provide Help Right When Students Need It

The best way to learn accounting is through practice, but students often get stuck when attempting homework assignments on their own.

- **Video: Show Me How.** Created for the most frequently assigned end-of-chapter items, Show Me How problem demonstration videos provide a step-by-step model of a similar problem. Embedded tips help students avoid common mistakes and pitfalls.



SHOW ME HOW

Help Students Go Beyond Memorization to True Understanding

Students often struggle to understand how concepts relate to one another. For most students, an introductory accounting course is their first exposure to both business transactions and the accounting system. While these concepts are already difficult to master individually, their combination and interdependency in the introductory accounting course often pose a challenge for students.

- **Mastery Problems.** Mastery Problems enable you to assign problems and activities designed to test students' comprehension and mastery of difficult concepts.

MindTap eReader

The MindTap eReader for Warren/Tayler's *Managerial Accounting* is the most robust digital reading experience available. Hallmark features include:

- Fully optimized for the iPad.
- Note taking, highlighting, and more.
- Embedded digital media.
- The MindTap eReader also features ReadSpeaker®, an online text-to-speech application that vocalizes, or "speech-enables," online educational content. This feature is ideally suited for both instructors and learners who would like to listen to content instead of (or in addition to) reading it.

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New to This Edition

In all chapters, the following improvements have been made:

- Chapter schemas revised throughout.
- *Link to* page references added at the beginning of the chapter allow students to easily locate the ties to the opening company throughout the chapter.
- New learning objective for Analysis for Decision Making.
- Stock ticker symbol has been inserted for all real-world (publicly listed) companies. This helps students to use financial websites to locate real company data.
- New Pathways Challenge feature added, consistent with the work of the Pathways Commission. This feature emphasizes the critical thinking aspect of accounting. A Suggested Answer to the Pathways Challenge is provided at the end of the chapter.
- New Make a Decision section at the end of the Analysis for Decision Making directs students and instructors to the real-world company end-of-chapter materials related to Analysis for Decision Making. Also, the continuing company analysis is identified and referenced in this Make a Decision section.
- New items have been added to the Take It Further section at the end of the chapter.
- New Certified Management Accountant (CMA®) Examination Questions help students prepare for the CMA exam so they can earn CMA certification.

Chapter 1

- "Managerial Accounting in the Organization" section significantly revised to discuss horizonal and vertical business units; McAfee, Inc., is used as an illustration.
- New Why It Matters features the IMA and CMA.
- New Why It Matters features vertical and horizontal functions for service companies.
- Discussion of sustainability and accounting moved to new Chapter 14.

Chapter 2

- Discussion of sustainability and accounting moved to new Chapter 14.
- Added one new Analysis for Decision Making item.

Chapter 3

- Why It Matters feature (Sustainable Papermaking) moved to Chapter 14.
- Lean manufacturing discussion with related homework items moved to Chapter 13.
- Added one new Analysis for Decision Making item.

Chapter 4

- Added Learning Objective 7: Describe and illustrate the use of activity-based costing information in decision making.

Chapter 5—NEW Chapter

- Learning Objectives:
  - Describe support departments and support department costs.
  - Describe the allocation of support department costs using a single plantwide rate, multiple department rates, and activity-based costing.
  - Allocate support department costs to production departments using the direct method, sequential method, and reciprocal services method.
  - Describe joint products and joint costs.
  - Allocate joint costs using the physical units, weighted average, market value at split-off, and net realizable value methods.
  - Describe and illustrate the use of support department and joint cost allocations to evaluate the performance of production managers.

Chapter 6

- Added one new Analysis for Decision Making item.

Chapter 7

- Contribution margin analysis deleted from chapter.
- Revenue variance added as an appendix to Chapter 9.

Chapter 8

- Added one new Analysis for Decision Making item.

Chapter 9

- Added new appendix on revenue variances.
- Nonfinancial performance measures (previously Learning Objective 6) moved to new Chapter 14.
- Added four new revenue variance exercises.
- Added one new Analysis for Decision Making item.

Chapter 10

- Balanced scorecard discussion moved to new Chapter 14.
- Added one new Analysis for Decision Making item.

Chapter 11

- Total cost and variable cost concepts for product pricing were moved to an end-of-chapter appendix.
- Added one new Make a Decision item.

Chapter 12

- Analysis for Decision Making on capital investment for sustainability has been moved to new Chapter 14.
- Added new Analysis for Decision Making entitled "Uncertainty: Sensitivity and Expected Value Analyses."
- Added six new Make a Decision items.

Chapter 13

- Added Objective 4: Describe and illustrate the use of lean principles and activity analysis in a service or administrative setting.

Chapter 14—NEW chapter

- Learning objectives:
  - Describe the concept of a performance measurement system.
  - Describe and illustrate the basic elements of a balanced scorecard.
  - Describe and illustrate the balance scorecard, including the use and impact of strategy maps, measure maps, strategic learning, scorecard cascading, and cognitive biases.
  - Describe corporate social responsibility (CSR), including methods of measuring and encouraging social responsibility using the balanced scorecard.
  - Use capital investment analysis to evaluate CSR projects.

Acknowledgements

The many enhancements to this edition of *Managerial Accounting* are the direct result of reviews, surveys, and focus groups with instructors at institutions across the country. We would like to take this opportunity to thank those who have helped us better understand the challenge of the financial accounting course and provided valuable feedback on our content and digital assets.

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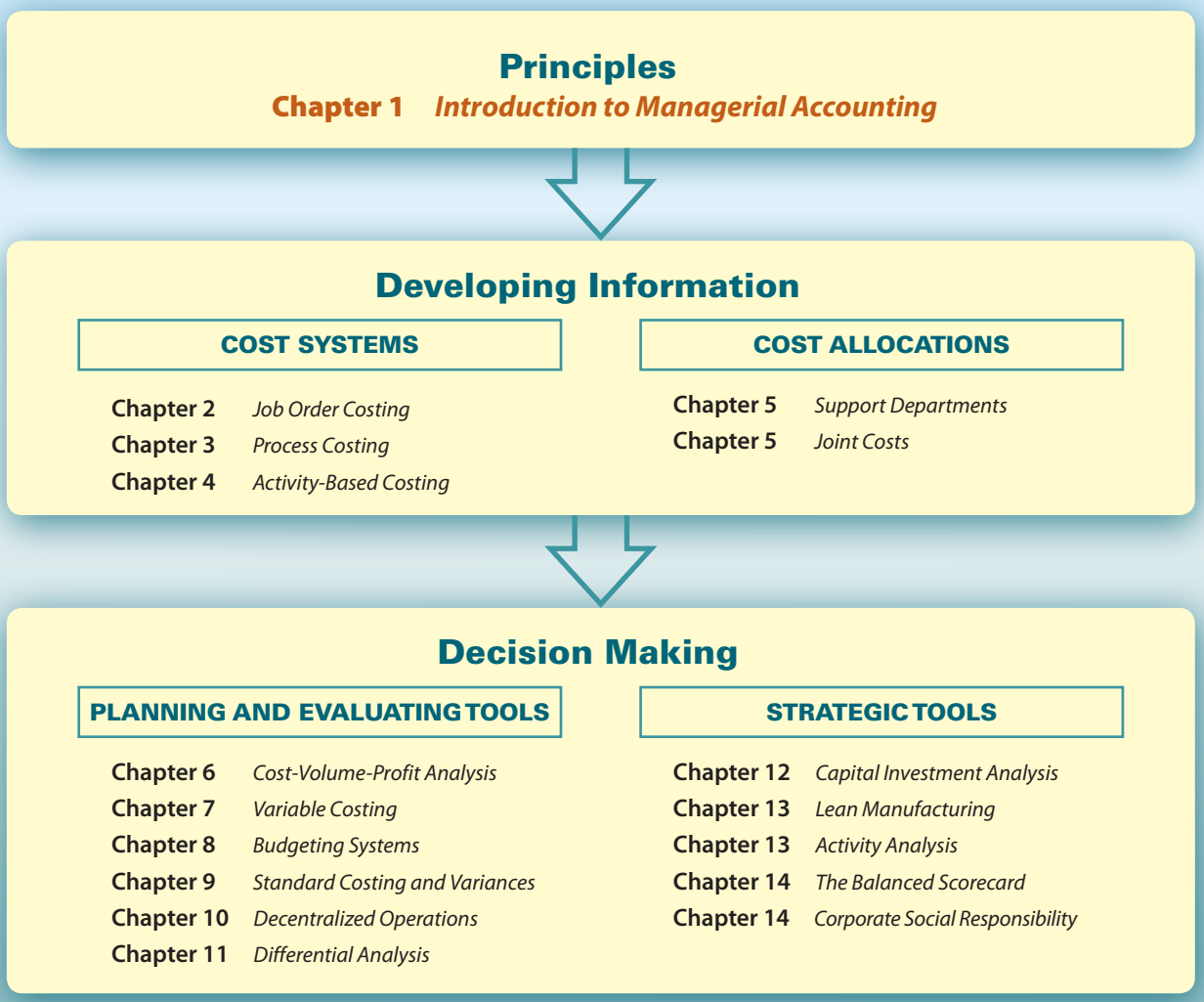
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Managerial Accounting 15e

Chapter 1

Introduction to Managerial Accounting



Gibson Guitars

Gibson guitars have been used by musical legends over the years, including B.B. King, Chet Atkins, Brian Wilson (Beach Boys), Jimmy Page (Led Zeppelin), Jackson Browne, John Fogerty, Jose Feliciano, Miranda Lambert, Sheryl Crow, and Wynonna Judd. For example, Sheryl Crow has used her 1964 Gibson Country Western guitar in all of her recordings.

Known for its quality, **Gibson Guitars** celebrated its 120th anniversary in 2014. Staying in business for over 120 years requires a thorough understanding of how to manufacture high-quality guitars.[1] In addition, it requires knowledge of how to account for the costs of making guitars. For example, Gibson needs cost information to answer the following questions:

- What should be the selling price of its guitars?
- How many guitars does it have to sell in a year to cover its costs and earn a profit?
- How many employees should the company have working on each stage of the manufacturing process?
- How would purchasing automated equipment affect the costs of its guitars?

This chapter introduces managerial accounting concepts that are useful in addressing these questions. This chapter begins by describing managerial accounting and its relationship to financial accounting. Following this overview, the management process is described along with the role of managerial accounting. Finally, characteristics of managerial accounting reports, managerial accounting terms, and uses of managerial accounting information are described and illustrated.

Sources: http://www.gibson.com/Gibson/History.aspx. Chris Kornelis, *The Wall Street Journal*, "How Sheryl Crow Finally Broke Her Starbucks Habit," May 24, 2017.



FABIO PAGANI/SHUTTERSTOCK.COM

Link to Gibson Guitars . . . . . Pages 4, 5, 6, 7, 9, 11, 16

[1] In May 2016, Gibson Guitars filed for bankruptcy. Gibson blamed its financial woes on the debt it had incurred by acquiring companies that produced headphones, turntables, and speakers. After satisfying its creditors and reorganizing, Gibson plans to focus its future operations on its core competency—the manufacture of guitars.

What's Covered

Introduction to Managerial Accounting

Role of Managerial Accounting
- Differences with Financial Accounting (Obj. 1)
- Management Organization (Obj. 1)
- Management Process (Obj. 1)
- Uses of Managerial Accounting Information (Obj. 1)

Manufacturing Operations
- Nature of Manufacturing (Obj. 2)
- Direct and Indirect Costs (Obj. 2)
- Manufacturing Costs (Obj. 2)

Manufacturing Financial Statements
- Balance Sheet (Obj. 3)
- Income Statement (Obj. 3)

Learning Objectives

Obj. 1 Describe managerial accounting, including its differences with financial accounting, its place in the organization, and its uses.

Obj. 2 Describe and illustrate the nature of manufacturing operations, including different types and classifications of costs.

Obj. 3 Describe and illustrate financial statements for a manufacturing business, including the balance sheet, statement of cost of goods manufactured, and income statement.

Analysis for Decision Making

Obj. 4 Describe and illustrate utilization rates in evaluating performance for service companies.

Objective 1
Describe managerial accounting, including its differences with financial accounting, its place in the organization, and its uses.

Managerial Accounting

Managers make numerous decisions during the day-to-day operations of a business and in planning for the future. Managerial accounting provides much of the information used for these decisions.

Some examples of managerial accounting information along with the chapter in which it is described and illustrated follow:

- Classifying manufacturing and other costs and reporting them in the financial statements (Chapter 1)
- Determining the cost of manufacturing a product or providing a service (Chapters 2, 3, 4, and 5)
- Evaluating the impact of cost allocation and activity-based costing (Chapters 4, 5)
- Estimating the behavior of costs for various levels of activity and assessing cost-volume-profit relationships (Chapter 6)
- Evaluating operating performance using cost behavior relationships (Chapter 7)
- Planning for the future by preparing budgets (Chapter 8)
- Evaluating manufacturing costs by comparing actual with expected results (Chapter 9)
- Evaluating decentralized operations by comparing actual and budgeted costs as well as computing various measures of profitability (Chapter 10)
- Evaluating special decision-making situations by comparing differential revenues and costs, pricing products, and managing bottlenecks (Chapter 11)
- Evaluating alternative proposals for long-term investments in fixed assets (Chapter 12)
- Planning operations using principles of lean manufacturing and activity analysis (Chapter 13)
- Evaluating company performance using the balanced scorecard and corporate responsibility metrics (Chapter 14)

Link to Gibson Guitars

Orville Gibson started producing guitars in 1894 in Kalamazoo, Michigan. He produced guitars and mandolins based upon the arch-top design of violins.

Differences Between Managerial and Financial Accounting

Accounting information is often classified into two types: financial and managerial. Exhibit 1 shows the relationship between financial accounting and managerial accounting.

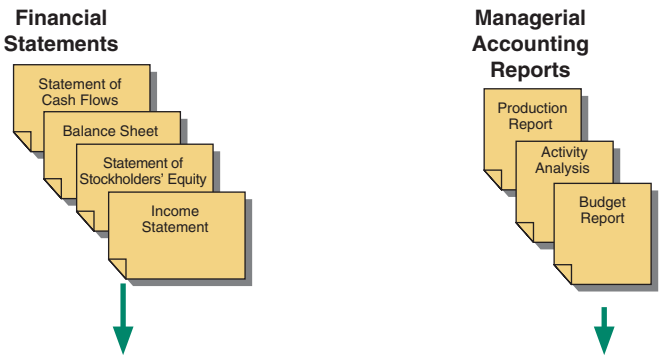


Exhibit 1
Financial Accounting and Managerial Accounting

	Financial Statements	Managerial Accounting Reports
Users of Information	External users and company management	Management
Nature of Information	Objective	Objective and subjective
Guidelines for Preparation	Prepared according to GAAP	Prepared according to management needs
Timeliness of Reporting	Prepared at fixed intervals	Prepared at fixed intervals and on an as-needed basis
Focus of Reporting	Company as a whole	Company as a whole or segment

Financial accounting information is reported at fixed intervals (monthly, quarterly, yearly) in general-purpose financial statements. These financial statements—the income statement, statement of stockholders' equity, balance sheet, and statement of cash flows—are prepared according to generally accepted accounting principles (GAAP). These statements are used by external users such as the following:

- Shareholders
- Creditors
- Government agencies
- The general public

Gibson Mandolin-Guitar Mfg. Co., Ltd. was formed in 1902 in Kalamazoo, Michigan, with the support of five investors.

Link to Gibson Guitars

Managers of a company also use general-purpose financial statements. For example, in planning future operations, managers often begin by evaluating the current income statement and statement of cash flows.

Managerial accounting information is designed to meet the specific needs of a company's management. This information includes the following:

- Historical data, which provide *objective measures* of past operations
- Estimated data, which provide *subjective estimates* about future decisions

Management uses both types of information in directing daily operations, planning future operations, and developing business strategies.

Unlike the financial statements prepared in financial accounting, managerial accounting reports do *not* always have to be:

- Prepared according to generally accepted accounting principles (GAAP). This is because GAAP may not always be relevant to the specific decision-making needs of management.

- Prepared at fixed intervals (monthly, quarterly, yearly). Although some management reports are prepared at fixed intervals, most reports are prepared as management needs the information.
- Prepared for the business as a whole. Most management reports are prepared for products, projects, sales territories, or other segments of the company.

Link to Gibson Guitars

Chicago Musical Instrument Company purchased **Gibson** in 1944.

Managerial Accounting in the Organization

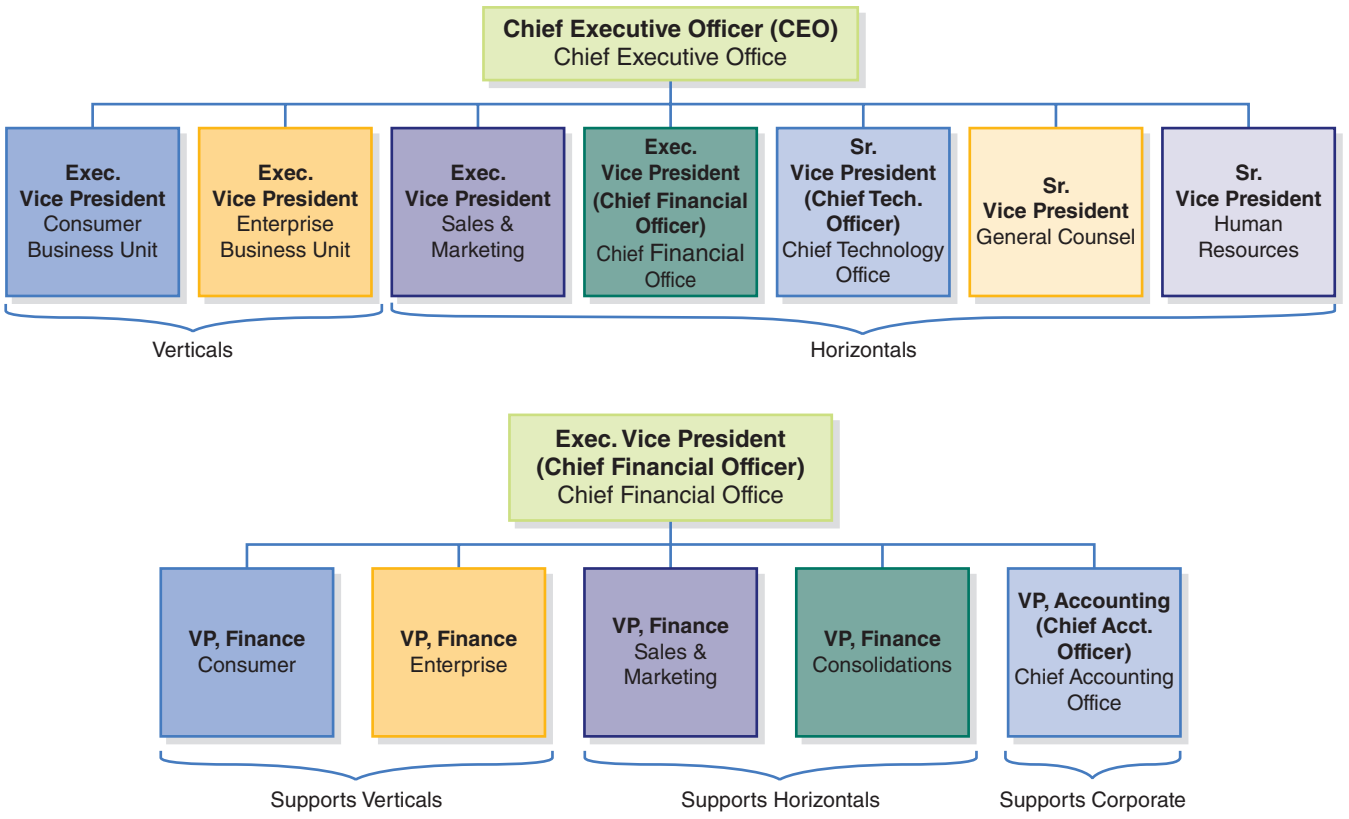
While no two company structures are identical, most large companies are organized in terms of "verticals" and "horizontals." **Verticals** are sometimes referred to as *business units*, because they are often structured as separate businesses within the parent company. These verticals normally develop products that are sold directly to customers. Verticals prepare their own income statements, also referred to as *profit and loss (P&L) statements*, which report their ongoing performance and profitability.

Horizontals are departments within the company that are not responsible for developing products. The role of horizontals is to provide services to the various verticals and other horizontals. As such, horizontals do not report profit and loss (P&L) statements. Marketing, human resources, information technology, legal, facilities, accounting, and finance are normally horizontal departments within a company.

At **McAfee, Inc. (MFE)**, a cyber security provider, the Chief Financial Office functions as a horizontal department that serves McAfee's two main verticals: the Consumer Business Unit and the Enterprise Business Unit. Rather than hire and train separate accounting and finance departments within each vertical, it is more efficient to centralize this function as a horizontal department.

To illustrate, a partial organizational chart of McAfee's Chief Executive Office and Chief Financial Office are shown in Exhibit 2.

Exhibit 2 Partial Organization Chart for McAfee



As shown in Exhibit 2, the **chief financial officer (CFO)** is an executive vice president, who, along with leadership of the other verticals and horizontals, reports directly to the **chief executive officer (CEO)**. Each of the two verticals (Consumer Business Unit and Enterprise Business Unit) has a "VP of Finance" that reports to the CFO. In addition, the Sales & Marketing and Consolidations horizontals have their own "VP of Finance" that reports to the CFO.[2] The "VP of Accounting" is called the **chief accounting officer (CAO)** and oversees technical accounting, accounting policy, credit, collections, tax, treasury, and internal audit at McAfee. The functions reporting to the CFO sometimes are grouped together and are referred to as *corporate finance*.

Finance and accounting professionals often work within verticals and other horizontals managing budgets, tracking key metrics, and generating accounting reports. Doing so requires coordinating and interacting closely with operational employees. As a result, the functions of these professionals are sometimes referred to as *operations finance* or as *financial planning and analysis*. Although finance and accounting professionals often work within verticals and other horizontals, they do not normally report directly to the heads of those units or departments. Instead, they report to an accounting and finance VP, who in turn reports to the CFO. This allows the accounting and finance professionals to maintain their independence.

At some companies, the manager of the accounting function of a vertical (business unit) is referred to as the **controller**. At smaller companies, controller may be used to refer to the chief financial officer. At still other companies, controller may be used to signify rank within the accounting and finance function. For example, the head accountant of a manufacturing facility at **Deere & Company (DE)** is called a controller. In contrast, at **Intel Corporation (INTC)**, accounting and finance employees start as *analysts,* are promoted to *senior analysts*, then to *managers*, and then to *controllers*.

As discussed above, few accounting and finance professionals are called "managerial accountants." However, the work of accounting and finance professionals requires a thorough knowledge and understanding of managerial accounting, which, in turn, provides a valuable foundation for advancing to senior management positions.

One of **Gibson**'s most influential managers was Ted McCarty, who was the company president from 1950–1966. During this period, Gibson was known for its innovations. For example, in 1954, McCarty invented the tune-o-matic bridge with adjustable saddles.

Link to Gibson Guitars

Why It Matters

Certified Management Accountants

The Institute of Management Accountants (IMA®) is a worldwide association of over 100,000 accounting and finance professionals across more than 140 countries. The IMA works to support the management accounting profession with programs involving continuing education, certification, networking, ethics, research, and scholarships. In the United States, there are over 1.3 million accountants and auditors, most of whose work involves management accounting. The projected growth rate of the accounting profession over the coming decade is 11%, which is 4% higher than the projected average growth rate of all professions.

To meet the growing needs of the accounting profession, IMA offers the Certified Management Accountant (CMA) certificate. The CMA is not a state or local certificate, but a globally recognized credential. The CMA is earned by passing a two-part examination. Part 1 covers financial reporting, planning and budgeting, performance management, cost management, and internal controls. Part 2 covers financial statement analysis, corporate finance, decision analysis, risk management, investment decisions, and professional ethics. Those passing the examination have proven that they have mastered the skills required to oversee the management accounting and finance functions within a company or other entity. For more information, visit the IMA's website at www.imanet.org.

Source: ***U.S. Bureau of Labor Statistics:*** www.bls.gov/ooh/business-and-*financial/accountants-and-auditors.htm#tab-6*.

[2] Consolidations supports the aggregation of financial statements from other units.

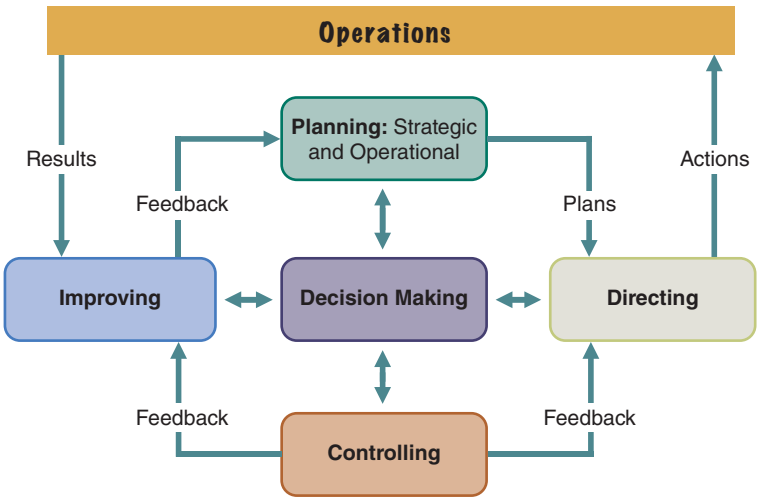
The Management Process

Managerial accounting supports management and the management process. The **management process** has the following five basic phases, as shown in Exhibit 3:

- Planning
- Directing
- Controlling
- Improving
- Decision making

As Exhibit 3 illustrates, the five phases interact with one another.

Exhibit 3
The Management Process



Planning Management uses **planning** in developing the company's **objectives (goals)** and translating these objectives into courses of action. For example, a company may set an objective to increase market share by 15% by introducing three new products. The actions to achieve this objective might be as follows:

- Increase the advertising budget
- Open a new sales territory
- Increase the research and development budget

Planning may be classified as follows:

- **Strategic planning**, which is developing long-term actions to achieve the company's objectives. These long-term actions are called **strategies**, which often involve periods of 5 to 10 years.

Why It Matters

Vertical and Horizontal Functions for Service Companies

Functions that are normally performed by vertical and horizontal units may be applied to service companies. Some examples are as follows:

Service Industry	Vertical Function	Horizontal Function
Airline	Crew, baggage handling, and gate staff	Information systems, accounting, human resources
Hotel	Housekeeping and reception staff	Maintenance, hotel manager, grounds
Hospital	Doctors, nurses, other caregivers	Admissions, records, billing
Banking	Tellers, loan officers, trust officers, and brokers	Branch manager, information systems
Telecommunications	Sales, customer service, and customer installation staff	Information systems, regional management, and network maintenance

- **Operational planning**, which develops short-term actions for managing the day-to-day operations of the company.

Directing The process by which managers run day-to-day operations is called **directing**. An example of directing is a production supervisor's efforts to keep the production line moving without interruption (downtime). A credit manager's development of guidelines for assessing the ability of potential customers to pay their bills is also an example of directing.

Controlling Monitoring operating results and comparing actual results with the expected results is **controlling**. This **feedback** allows management to isolate areas for further investigation and possible remedial action. It may also lead to revising future plans. This philosophy of controlling by comparing actual and expected results is called **management by exception**.

Improving Feedback is also used by managers to support continuous process improvement. **Continuous process improvement** is the philosophy of continually improving employees, business processes, and products. The objective of continuous improvement is to eliminate the *source* of problems in a process. In this way, the right products (services) are delivered in the right quantities at the right time.

Decision Making Inherent in each of the preceding management processes is **decision making**. In managing a company, management must continually decide among alternative actions. For example, in directing operations, managers must decide on an operating structure, training procedures, and staffing of day-to-day operations.

Managerial accounting supports managers in all phases of the management process. For example, accounting reports comparing actual and expected operating results help managers plan and improve current operations. Such a report might compare the actual and expected costs of defective materials. If the cost of defective materials is unusually high, management might decide to change suppliers.

Gibson struggled financially from 1966–1986. The company was purchased and sold several times and experienced declining sales.

Link to Gibson Guitars



Ethics: Do It!

Environmental Managerial Accounting

Throughout the last decade, environmental issues have become an increasingly important part of the business environment for most companies. Companies and managers must now consider the environmental impact of their business decisions in the same way that they would consider other operational issues.

To help managers make sound business decisions, the emerging field of environmental management accounting focuses on computing the environmental-related costs of business decisions. Environmental managerial accountants evaluate a variety of issues such as the volume and level of emissions, the estimated costs of different levels of emissions, and the impact that environmental costs have on product cost. Managers use these results to consider the environmental effects of their business decisions.

Uses of Managerial Accounting Information

As mentioned earlier, managerial accounting provides information and reports for managers to use in operating a business. Some examples of how managerial accounting could be used by a guitar manufacturer include the following:

- The cost of manufacturing each guitar could be used to determine its selling price.
- Comparing the costs of guitars over time can be used to monitor and control costs.
- Performance reports could be used to identify any large amounts of scrap or employee downtime. For example, large amounts of unusable wood (scrap) after the cutting process should be investigated to determine the underlying cause. Such scrap may be caused by saws that have not been properly maintained.

- A report could analyze the potential efficiencies and savings of purchasing a new computerized saw to speed up the production process.
- A report could analyze how many guitars need to be sold to cover operating costs and expenses. Such information could be used to set monthly selling targets and bonuses for sales personnel.

As the prior examples illustrate, managerial accounting information can be used for a variety of purposes. For example, managers must consider the social and environmental settings in which a business operates, in order to make sound strategic and operational decisions. Issues such as population growth, resource scarcity, declining ecosystems, increasing urbanization, and climate change all have a direct impact on a company's potential for long-term success. As a result, managers are using new management techniques and measures that consider these issues. These new management techniques and measures are described and illustrated in Chapter 14, "The Balanced Scorecard and Corporate Social Responsibility."

Check Up Corner 1-1 Management Process

1. Indicate whether the following statements are true or false:
   a. Managerial accounting information is designed primarily to meet the needs of external users such as shareholders, creditors, and the general public.
   b. Managerial accounting reports must be prepared for the business as a whole.
   c. Operational planning develops short-term actions for managing the day-to-day operations of the company.
2. Three phases of the management process are planning, controlling, and improving. Match the following descriptions to the proper phase:

Phase of Management Process	Description
Planning	a. Monitoring the operating results and comparing the actual results with expected results
Controlling	b. Rejects solving problems with temporary solutions that fail to address the root cause of the problem
Improving	c. Used by management to develop the company's objectives

Solution:

1. a. False. The primary focus and design of managerial accounting information is to meet the specific needs of a company's management.
   b. False. Managerial accounting reports do not have to be prepared for the business as a whole. Most management reports are prepared for products, projects, sales territories, or other segments of the company.
   c. True. Operational planning develops short-term actions for managing the day-to-day operations of the company. In contrast, strategic planning develops long-term actions (strategies) to achieve the company's objectives.
2. Planning: **c.** Used by management to develop the company's objectives
   Controlling: **a.** Monitoring the operating results and comparing the actual results with expected results
   Improving: **b.** Rejects solving problems with temporary solutions that fail to address the root cause of the problem

Check Up Corner

Why It Matters

Not According to Plan

There are times even the best of plans go awry. Sometimes plans are impacted by events outside of management control. For example, Hurricane Sandy ruined the beach and resort businesses along the New Jersey shore. Few management plans would be able to provide for such an extreme contingency. Force majeure (meaning "superior force") clauses in contracts can be used to nullify contracts when such events occur. Such clauses are used when the normal operating plans are disrupted by events beyond management control or expectation. For example, a hotel damaged by Hurricane Sandy under a force majeure clause would not be required to fulfill a contract to supply rooms for a convention. In other cases, events may be dramatic, but can be anticipated. An example was the dramatic decline in oil prices during the middle 2010s that reduced the oil revenue earned by U.S. shale oil producers. Many of these producers planned and then executed financial contracts, termed hedges, that earned money from lower oil prices, to partially offset revenue losses.

Manufacturing Operations

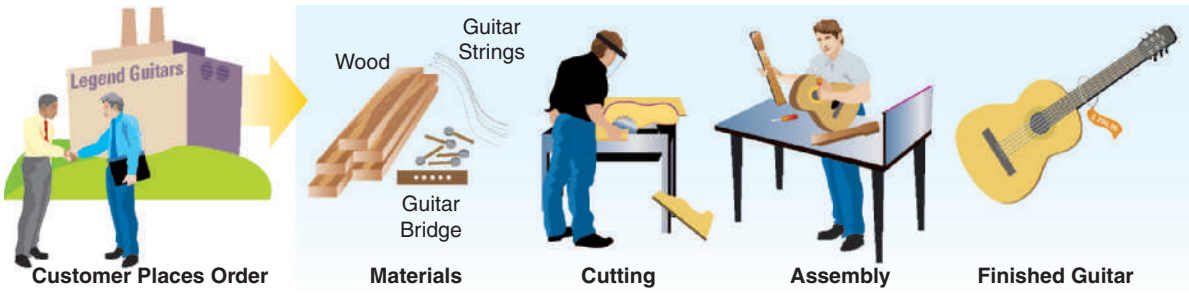
Objective 2
Describe and illustrate the nature of manufacturing operations, including different types and classifications of costs.

The operations of a business can be classified as service, retail, or manufacturing. Although the chapters of this text focus primarily on manufacturing and service businesses, most of the managerial accounting concepts discussed also apply to retail businesses.

Nature of Manufacturing

As a basis for illustration of manufacturing operations, a guitar manufacturer, **Legend Guitars**, is used. Exhibit 4 is an overview of Legend's guitar manufacturing operations.

Exhibit 4 Guitar-Making Operations of Legend Guitars



Legend's guitar-making process begins when a customer places an order for a guitar. Once the order is accepted, the manufacturing process begins by obtaining the necessary materials. An employee then cuts the body and neck of the guitar out of raw lumber. Once the wood is cut, the body and neck of the guitar are assembled. When the assembly is complete, the guitar is painted and finished.

Gibson provides tours of its Memphis guitar factory located at 145 Lt. George W. Lee Avenue.

Link to Gibson Guitars

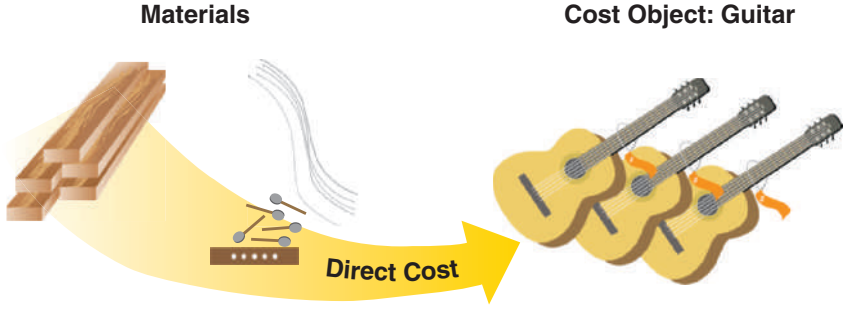
Direct and Indirect Costs

A **cost** is a sacrifice made to obtain some benefit. For example, cash (or credit) used to purchase equipment is the cost of the equipment. If equipment is purchased by exchanging assets other than cash, the current market value of the assets given up is the cost of the equipment purchased.

In managerial accounting, costs are often assigned to a cost object. A **cost object** can be anything to which costs are assigned and will vary depending upon the decision-making needs of management. For example, a cost object may be a product, a sales territory, a department, or an activity, such as research and development. Costs identified with cost objects are either direct costs or indirect costs.

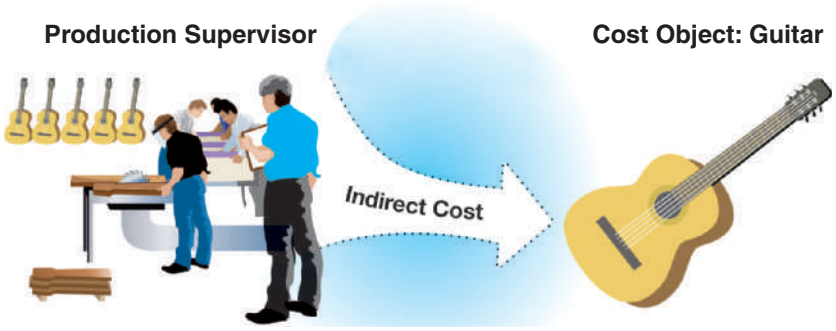
Direct costs are identified with and can be traced to a cost object. For example, as shown in Exhibit 5, the cost of wood (materials) used by **Legend Guitars** in manufacturing a guitar is a direct cost of the guitar.

Exhibit 5
Direct Costs of Legend Guitars



Indirect costs are not identified with or traced to a cost object. For example, as shown in Exhibit 6, the salaries of the **Legend Guitars** production supervisors are indirect costs of producing a guitar. Although the production supervisors contribute to the production of a guitar, their salaries cannot be identified with or traced to any individual guitar.

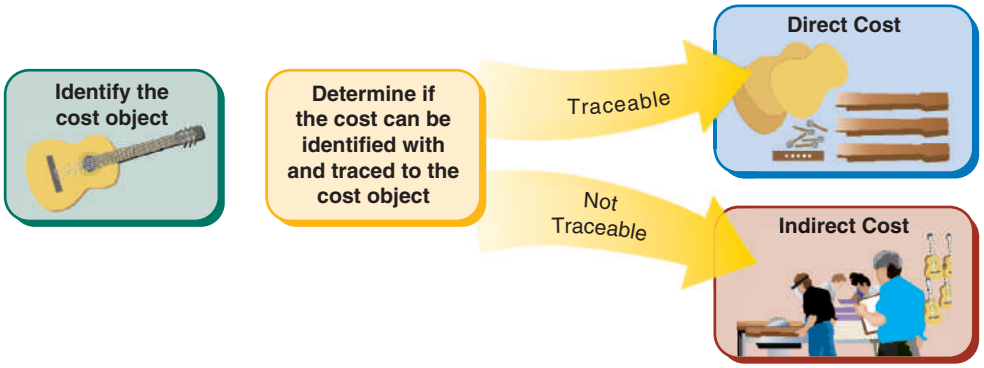
Exhibit 6
Indirect Costs of Legend Guitars



Depending on the cost object, a cost may be either a direct or an indirect cost. For example, the salaries of production supervisors are indirect costs when the cost object is an individual guitar. If, however, the cost object is **Legend Guitars**' overall production process, then the salaries of production supervisors are direct costs.

This process of classifying a cost as direct or indirect is illustrated in Exhibit 7.

Exhibit 7
Classifying Direct and Indirect Costs



Manufacturing Costs

The cost of a manufactured product includes the cost of materials used in making the product. In addition, the cost of a manufactured product includes the cost of converting the materials into a finished product. For example, **Legend Guitars** uses employees (direct labor) and machines (factory overhead) to convert wood (direct materials) into finished guitars. Thus, as shown in Exhibit 8, the cost of a finished guitar (the cost object) includes the following:

- Direct materials cost
- Direct labor cost
- Factory overhead cost



Direct Materials | Direct Labor | Factory Overhead

Exhibit 8
Manufacturing Costs of Legend Guitars

Direct Materials Cost Manufactured products begin with raw materials that are converted into finished products. The cost of any material that is an integral part of the finished product is classified as a **direct materials cost**. For **Legend Guitars**, direct materials cost includes the cost of the wood used in producing each guitar. Other examples of direct materials costs include the cost of electronic components for a television, silicon wafers for microcomputer chips, and tires for an automobile.

For Legend, the cost of the glue used in the guitar is not a direct materials cost. This is because the cost of glue is an insignificant part of the total cost of each guitar and is difficult to trace accurately to a guitar. Instead, the cost of glue is classified as a factory overhead cost, which is discussed later.

Direct Labor Cost Most manufacturing processes use employees to convert materials into finished products. The cost of employee wages that is an integral part of the finished product is classified as **direct labor cost**. For **Legend Guitars**, direct labor cost includes the wages of the employees who cut each guitar out of raw lumber and assemble it. Other examples of direct labor costs include mechanics' wages for repairing an automobile, machine operators' wages for manufacturing tools, and assemblers' wages for assembling a laptop computer.

For Legend, the wages of the janitors who clean the factory are not a direct labor cost. This is because janitorial costs are not an integral part or a significant cost of each guitar. Instead, janitorial costs are classified as a factory overhead cost, which is discussed next.

Pathways Challenge



This is Accounting!

Economic Activity

Whether a specific expenditure is considered a direct cost or an indirect cost with respect to a cost object depends on a number of factors. While some costs are impossible to trace directly to the cost object, many costs *can* be traced directly, but doing so may not be economically feasible or justifiable given the benefits of direct tracing. In most cases, management subjectively determines whether to treat a cost as direct or indirect. **Larson & Company, PC**, a regional CPA firm based in Utah, bills clients based, in part, on the costs incurred to serve the client. Some costs, such as billable professional hours, are directly traced to clients and billed accordingly. Other costs, such as office supplies, are treated as indirect costs. These costs are not traced directly to clients. Instead, the hourly professional rate is set high enough to provide sufficient revenue to cover both direct and indirect costs.

Critical Thinking/Judgment

What are the effects of considering indirect costs when determining the hourly professional rate to charge clients?
What happens if serving some clients requires more supplies (printed documents, folders, etc.) than other clients? Will Larson & Company's current billing practice capture this difference?
Should Larson & Company consider directly tracing office supplies costs to clients?

Suggested answer at end of chapter.

Factory Overhead Cost Costs other than direct materials and direct labor that are incurred in the manufacturing process are combined and classified as **factory overhead cost**. Factory overhead is sometimes called **manufacturing overhead** or **factory burden.**

All factory overhead costs are indirect costs of the product. Some factory overhead costs include the following:

- Heating and lighting the factory
- Repairing and maintaining factory equipment
- Property taxes on factory buildings and land
- Insurance on factory buildings
- Depreciation on factory plant and equipment

Factory overhead cost also includes materials and labor costs that are not directly traced to the finished product. Examples include the cost of glue used to assemble guitars and the wages of janitorial and supervisory employees.

For **Legend Guitars**, the costs of glue and janitorial wages are factory overhead costs. Additional factory overhead costs of making guitars are as follows:

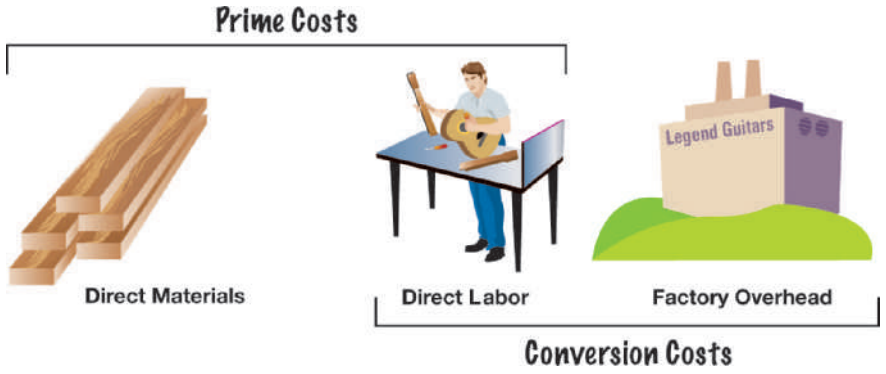
- Sandpaper
- Buffing compound
- Oil used to lubricate machines
- Power (electricity) to run the machines
- Depreciation of the machines and building
- Salaries of production supervisors

Prime Costs and Conversion Costs Direct materials, direct labor, and factory overhead costs may be grouped together for analysis and reporting. Two such common groupings are as follows:

- **Prime costs**, which consist of direct materials and direct labor costs
- **Conversion costs**, which consist of direct labor and factory overhead costs

Conversion costs are the costs of converting the materials into a finished product. Direct labor is both a prime cost and a conversion cost, as shown in Exhibit 9.

Exhibit 9
Prime Costs and Conversion Costs



Product Costs and Period Costs For financial reporting purposes, costs are classified as product costs or period costs.

Why It Matters

Factory Overhead Costs

Defense contractors such as **General Dynamics (GD)**, **Boeing (BA)**, and **Lockheed Martin (LMT)** sell products such as airplanes, ships, and military equipment to the U.S. Department of Defense. Building large products such as these requires a significant investment in facilities and tools, all of which are classified as factory overhead costs. As a result, factory overhead costs are a much larger portion of the cost of goods sold for defense contractors than they are in other industries. For example, a U.S. General Accounting Office study of six defense contractors found that overhead costs were almost one-third of the price of the final product. This is more than three times greater than the factory overhead costs for a laptop computer, which are typically about 10% of the price of the final product.

- **Product costs** consist of manufacturing costs: direct materials, direct labor, and factory overhead.
- **Period costs** consist of selling and administrative expenses. *Selling expenses* are incurred in marketing the product and delivering the product to customers. *Administrative expenses* are incurred in managing the company and are not directly related to the manufacturing or selling functions.

Examples of product costs and period costs for **Legend Guitars** are presented in Exhibit 10.

Exhibit 10 Examples of Product Costs and Period Costs—Legend Guitars

Product (Manufacturing) Costs



Direct Materials Cost
- Wood used in neck and body



Direct Labor Cost
- Wages of saw operator
- Wages of employees who assemble the guitar





Factory Overhead
- Guitar strings
- Wages of janitor
- Power to run the machines
- Depreciation expense—factory building
- Sandpaper and buffing materials
- Oil used to lubricate machines
- Salary of production supervisors

Period (Nonmanufacturing) Costs

Selling Expenses
- Advertising expenses
- Sales salaries expenses
- Commissions expenses

Administrative Expenses
- Office salaries expense
- Office supplies expense
- Depreciation expense—office building and equipment

To facilitate control, selling and administrative expenses may be reported by level of responsibility. For example, selling expenses may be reported by products, salespersons, departments, divisions, or territories. Likewise, administrative expenses may be reported by areas such as human resources, computer services, legal, accounting, or finance.

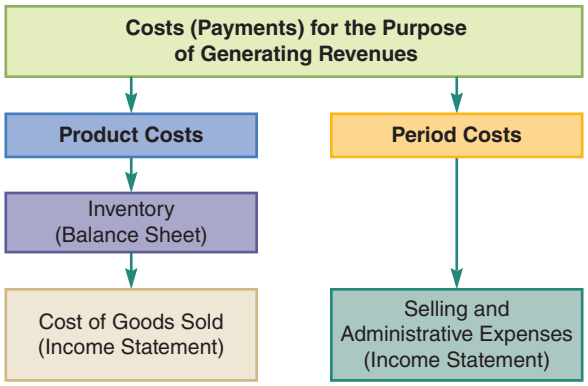
The impact on the financial statements of product and period costs is summarized in Exhibit 11. As product costs are incurred, they are recorded and reported on the balance sheet as *inventory*. When the inventory is sold, the cost of the manufactured product sold is reported as *cost of goods sold* on the income statement. Period costs are reported as *expenses* on the income statement in the period in which they are incurred and, thus, never appear on the balance sheet.

Why It Matters CONCEPT CLIP

Service Companies and Product Costs

Though service companies do not produce a tangible product, they usually still have labor, materials, and overhead costs. These costs are not associated with manufacturing product, but with serving customers. An example is a hospital. Caregivers provide care (similar to direct labor), drugs and health supplies are administered (similar to direct materials), and administrative salaries and utilities are paid (similar to factory overhead).

Exhibit 11
Product Costs, Period Costs, and the Financial Statements



Link to Gibson Guitars

In January 1986, guitar enthusiasts Henry Juszkiewicz and David Berryman purchased **Gibson**. Together they restored Gibson's reputation for innovation and quality. Under their leadership, Gibson began generating profits.

Check Up Corner 1-2 Manufacturing Operations

A partial list of the costs for MLB Mitt Company, a baseball glove manufacturer, is as follows:

a. Ink used to print a player's autograph
b. Salesperson's salary and commission
c. Padding material
d. Coolants for machines that sew the baseball gloves
e. Wages of assembly line employees
f. Cost of endorsement from a professional baseball player
g. Salary of manufacturing plant supervisor
h. Leather used to make the gloves
i. Office supplies used at company headquarters
j. Wages of office administrative staff

Using the following headings, classify each cost as a product cost or a period cost. In addition, identify product costs as:

- Direct materials, direct labor, or factory overhead, and
- Prime cost, conversion cost, or both.

	Product Cost					Period Cost
Item	Direct Materials	Direct Labor	Factory Overhead	Prime Cost	Conversion Cost	

Solution:

	Product Cost					Period Cost
Item	Direct Materials	Direct Labor	Factory Overhead	Prime Cost	Conversion Cost	
a.			X		X	
b.						X
c.	X			X		
d.			X		X	
e.		X		X	X	
f.						X
g.			X		X	
h.	X			X		
i.						X
j.						X

Financial Statements for a Manufacturing Business

Objective 3
Describe and illustrate financial statements for a manufacturing business, including the balance sheet, statement of cost of goods manufactured, and income statement.

The statement of stockholders' equity and statement of cash flows for a manufacturing business are similar to those for service and retail businesses. However, the balance sheet and income statement for a manufacturing business are more complex. This is because a manufacturer makes the products that it sells and, thus, must record and report product costs. The reporting of product costs primarily affects the balance sheet and the income statement.

Balance Sheet

A manufacturing business reports three types of inventory on its balance sheet as follows:

- **Materials inventory** (sometimes called raw materials inventory). This inventory consists of the costs of the direct and indirect materials that have not entered the manufacturing process.
  Examples for **Legend Guitars**: Wood, guitar strings, glue, sandpaper
- **Work in process inventory.** This inventory consists of the direct materials, direct labor, and factory overhead costs for products that have entered the manufacturing process, but are not yet completed (in process).
  Example for Legend: Unfinished (partially assembled) guitars
- **Finished goods inventory.** This inventory consists of completed (or finished) products that have not been sold.
  Example for Legend: Unsold guitars

Exhibit 12 illustrates the reporting of inventory on the balance sheet for a retail and a manufacturing business. MusicLand Stores, Inc., a retailer of musical instruments, reports only Inventory. In contrast, **Legend Guitars**, a manufacturer of guitars, reports Finished Goods, Work in Process, and Materials inventories. In both balance sheets, inventory is reported in the "Current assets" section.

Exhibit 12
Balance Sheet Presentation of Inventory in Retail and Manufacturing Companies

MusicLand Stores, Inc.
Balance Sheet
December 31, 20Y8

Current assets:	
Cash	$ 25,000
Accounts receivable (net)	85,000
Inventory	142,000
Supplies	10,000
Total current assets	$262,000

Legend Guitars
Balance Sheet
December 31, 20Y8

Current assets:		
Cash		$ 21,000
Accounts receivable (net)		120,000
Inventory:		
Direct materials	$35,000	
Work in process	24,000	
Finished goods	62,500	
Total inventory		121,500
Supplies		2,000
Total current assets		$264,500

Income Statement

The income statements for retail and manufacturing businesses differ primarily in the reporting of the cost of goods (merchandise) *available for sale* and *sold* during the period. These differences are shown in Exhibit 13.

Exhibit 13
Income Statements for Retail and Manufacturing Businesses

Retail Business

Income Statement

Sales		$ XXX
Beginning inventory	$ XXX	
Net purchases	XXX	
Inventory available for sale	$ XXX	
Ending inventory	(XXX)	
Cost of goods sold		(XXX)
Gross profit		$ XXX

Manufacturing Business

Income Statement

Sales		$ XXX
Beginning finished goods inventory	$ XXX	
Cost of goods manufactured	XXX	
Cost of finished goods available for sale	$ XXX	
Ending finished goods inventory	(XXX)	
Cost of goods sold		(XXX)
Gross profit		$ XXX

As shown in Exhibit 13, a retail business determines its cost of goods sold by first adding its net purchases for the period to its beginning inventory. This determines inventory available for sale during the period. The ending inventory is then subtracted to determine the **cost of goods sold**.[3]

In contrast, a manufacturing business makes the products it sells using direct materials, direct labor, and factory overhead. As a result, a manufacturing business must determine its **cost of goods manufactured** during the period.

The cost of goods manufactured is determined by preparing a **statement of cost of goods manufactured**.[4] This statement summarizes the cost of goods manufactured during the period, as follows:

Statement of Cost of Goods Manufactured

Beginning work in process inventory			$ XXX
Direct materials:			
Beginning materials inventory	$ XXX		
Purchases	XXX		
Cost of materials available for use	$ XXX		
Ending materials inventory	(XXX)		
Cost of direct materials used		$XXX	
Direct labor		XXX	
Factory overhead		XXX	
Total manufacturing costs incurred in period			XXX
Total manufacturing costs			$ XXX
Ending work in process inventory			(XXX)
Cost of goods manufactured			$ XXX

[3] To simplify, we use the computation of cost of goods sold for periodic inventory systems.

[4] Chapters 2 and 3 describe and illustrate the use of job order and process cost systems. As will be illustrated, these systems do not require a statement of cost of goods manufactured.

To illustrate, the following data for **Legend Guitars** are used:

	Jan. 1, 20Y8	Dec. 31, 20Y8
Inventories:		
Materials	$ 65,000	$ 35,000
Work in process	30,000	24,000
Finished goods	60,000	62,500
Total inventories	$155,000	$121,500
Manufacturing costs incurred during 20Y8:		
Materials purchased		$100,000
Direct labor		110,000
Factory overhead:		
Indirect labor	$ 24,000	
Depreciation on factory equipment	10,000	
Factory supplies and utility costs	10,000	
Total factory overhead		44,000
Total		$254,000
Sales		$366,000
Selling expenses		20,000
Administrative expenses		15,000

The statement of cost of goods manufactured is prepared using the following three steps:

- Step 1. Determine the *cost of direct materials used* during the period.
- Step 2. Determine the *total manufacturing costs incurred* during the period.
- Step 3. Determine the *cost of goods manufactured* during the period.

Using the data for **Legend Guitars**, the cost of direct materials used, total manufacturing costs incurred, and cost of goods manufactured are computed as follows:

Step 1. The *cost of direct materials used* in production is determined as follows:

Materials inventory, January 1, 20Y8	$ 65,000
Purchases	100,000
Cost of materials available for use	$165,000
Materials inventory, December 31, 20Y8	(35,000)
Cost of direct materials used	$130,000

The January 1, 20Y8 (beginning), materials inventory of $65,000 is added to the cost of materials purchased of $100,000 to yield the $165,000 total cost of materials that are available for use during 20Y8. Deducting the December 31, 20Y8 (ending), materials inventory of $35,000 yields the $130,000 cost of direct materials used in production.

Step 2. The *total manufacturing costs incurred in 20Y8* are determined as follows:

Direct materials used in production (Step 1)	$130,000
Direct labor	110,000
Factory overhead	44,000
Total manufacturing costs incurred in 20Y8	$284,000

The total manufacturing costs incurred in 20Y8 of $284,000 are determined by adding the cost of direct materials used in production (Step 1), the direct labor cost, and the factory overhead costs.

Step 3. The *cost of goods manufactured* is determined as follows:

Work in process inventory, January 1, 20Y8	$ 30,000
Total manufacturing costs incurred (Step 2)	284,000
Total manufacturing costs incurred	$314,000
Work in process inventory, December 31, 20Y8	(24,000)
Cost of goods manufactured in 20Y8	$290,000

The cost of goods manufactured of $290,000 is determined by adding the total manufacturing costs incurred (Step 2) to the January 1, 20Y8 (beginning), work in process inventory of $30,000. This yields total manufacturing costs incurred of $314,000. The December 31, 20Y8 (ending), work in process inventory of $24,000 is then deducted to determine the cost of goods manufactured of $290,000.

The income statement and statement of cost of goods manufactured for **Legend Guitars** are shown in Exhibit 14.

Exhibit 14
Manufacturing Company—Income Statement with Statement of Cost of Goods Manufactured

Legend Guitars
Income Statement
For the Year Ended December 31, 20Y8

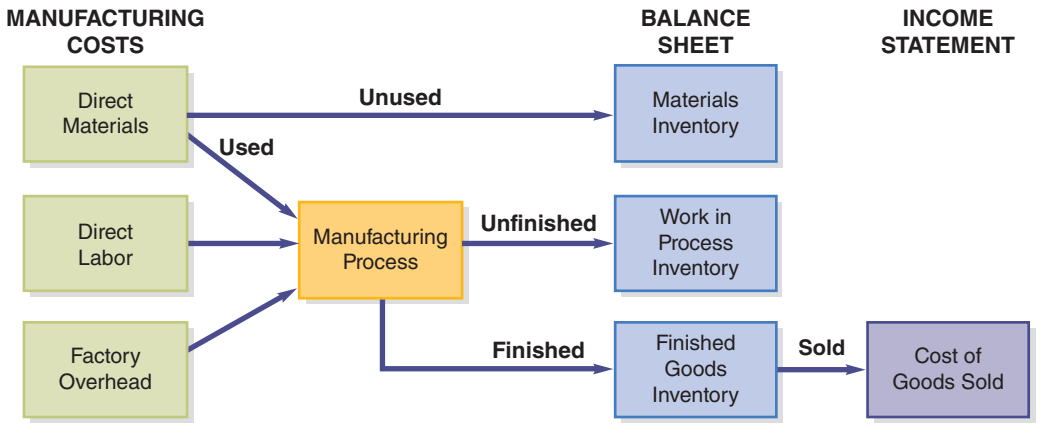
Sales		$ 366,000
Cost of goods sold:		
Finished goods inventory, January 1, 20Y8	$ 60,000	
Cost of goods manufactured	290,000	
Cost of finished goods available for sale	$350,000	
Finished goods inventory, December 31, 20Y8	(62,500)	
Cost of goods sold		(287,500)
Gross profit		$ 78,500
Operating expenses:		
Selling expenses	$ 20,000	
Administrative expenses	15,000	
Total operating expenses		(35,000)
Net income		$ 43,500

Legend Guitars
Statement of Cost of Goods Manufactured
For the Year Ended December 31, 20Y8

Work in process inventory, January 1, 20Y8			$ 30,000
Direct materials:			
Materials inventory, January 1, 20Y8	$ 65,000		
Purchases	100,000		
Cost of materials available for use	$165,000		
Materials inventory, December 31, 20Y8	(35,000)		
Cost of direct materials used		$130,000	
Direct labor		110,000	
Factory overhead:			
Indirect labor	$ 24,000		
Depreciation on factory equipment	10,000		
Factory supplies and utility costs	10,000		
Total factory overhead		44,000	
Total manufacturing costs incurred in 20Y8			284,000
Total manufacturing costs			$314,000
Work in process inventory, December 31, 20Y8			(24,000)
Cost of goods manufactured			$290,000

Exhibit 15 summarizes how manufacturing costs flow to the income statement and balance sheet of a manufacturing business.

Exhibit 15
Flow of Manufacturing Costs



Check Up Corner 1-3 Manufacturing Financial Statements

The following information is available for January for MLB Mitt Company, a baseball glove manufacturer:

Cost of direct materials used in production	$25,000
Direct labor	35,000
Factory overhead	20,000
Work in process inventory, January 1	30,000
Work in process inventory, January 31	25,000
Finished goods inventory, January 1	15,000
Finished goods inventory, January 31	12,000

For January, determine (a) the cost of goods manufactured and (b) the cost of goods sold.

Solution:

The cost of goods manufactured is determined by adding the total manufacturing costs incurred to the beginning work in process inventory.

a.	Work in process inventory, January 1		$ 30,000
	Cost of direct materials used	$ 25,000	
	Direct labor	35,000	
	Factory overhead	20,000	
	Total manufacturing costs incurred in January		80,000
	Total manufacturing costs		$110,000
	Work in process inventory, January 31		(25,000)
	Cost of goods manufactured		$ 85,000
b.	Finished goods inventory, January 1	$ 15,000	
	Cost of goods manufactured	85,000	
	Cost of finished goods available for sale	$ 100,000	
	Finished goods inventory, January 31	(12,000)	
	Cost of goods sold	$ 88,000	

The cost of goods manufactured is added to the beginning finished goods inventory to determine the finished goods available for sale.

Check Up Corner

Analysis for Decision Making

Utilization Rates

Objective 4
Describe and illustrate utilization rates in evaluating performance for service companies.

Nearly 80% of U.S. economic activity (gross domestic product) is represented by services. Services are activities that do not result in the transfer, possession, or ownership of goods. Services benefit a customer or an item under a customer's control. An example of the latter is an automobile that the owner brings in for maintenance by the dealer. Services cannot be stored and are often used instantly. For example, a hotel provides a room to a guest for a night. The guest does not own the room, but only receives the service for one night. Upon receiving the room, the service is used or completed by the next morning. Other examples of services are provided in Exhibit 16.

Many of the principles discussed in this chapter for manufacturing companies can be applied to service companies. However, the unique characteristics of service companies also create some differences, as shown in Exhibit 17.

Exhibit 16
Examples of Service Industries, Services, and Companies

Service Industry	Service Example	Company Example
Utilities	Electric power generation	**Consolidated Edison (ED)**
Transportation	Overnight delivery	**FedEx (FDX)**
Information	Social media	**Facebook (FB)**
Financial Services	Banking	**Bank of America (BAC)**
Education	Higher education	**University of Phoenix**
Leisure and Hospitality	Entertainment	**The Walt Disney Company (DIS)**
Health	General healthcare	**Hospital Corporation of America (HCA)**
Personal Services	Fitness club	**Life Time Fitness**

Most of the differences in Exhibit 17 are caused by the nature of services. Service companies have no inventory or product costs. Managerial accounting in service companies is concerned with the economic use of people and fixed assets in serving customers.

Exhibit 17
Managerial Accounting Differences Between Manufacturing and Service Companies

Manufacturing	Services
Uses materials, work in process, and finished goods inventory.	Inventory is often limited to supplies.
Uses both product and period costs.	Uses only period costs.
Uses cost of goods sold on the income statement.	May use cost of services on the income statement.
Manufacturing requires a physical production site.	Many services require a network that connects the service to the customer. Examples include telecommunications, banking, power distribution, distributed entertainment, and transportation.
Manufacturing overhead is an indirect cost in manufacturing products.	Overhead is an indirect cost incurred in serving customers.
Labor is a direct cost to products.	Labor is not a direct cost to products, but may be a direct cost to customers. Examples are accountants in an accounting firm or doctors in a medical practice.
Materials are a direct cost to products.	Materials are often an indirect cost, but may be significant, such as fuel for transportation or utilities. In other cases, materials are not significant, such as financial, leisure, information, or education services.

The nature of services influences the performance metrics used by management accountants. For example, the productive use of fixed assets is an important contributor to financial success for many service companies. This is because many service companies must build large networks or other fixed assets in order to deliver a service. For example, the cellular network of **Verizon Communications (VZ)** is extremely costly and, thus, the use of the network is key to Verizon's financial success. Cruise lines (ships), utilities (power plants), railroads (track), hotels (buildings), hospitals (buildings), and educational services (buildings) also require costly fixed assets.

An important measure used in many service companies is utilization rate. A **utilization rate** measures the use of a fixed asset in serving customers relative to the asset's capacity. A higher utilization rate is considered favorable, while a lower utilization rate is considered unfavorable. Different service industries will have different names and computations used for measuring utilization rates. Some service industries, such as power generation, freight transportation, and

telecommunications, measure utilization using complex formulas. However, other service industries use simpler methods to measure utilization. In the hotel industry, for example, utilization is measured by the *occupancy rate*, which is computed as:

$$\text{Occupancy Rate} = \frac{\text{Guest Nights}}{\text{Available Room Nights}}$$

where,

Guest nights = number of guests × number of nights per visit (per time period)
Available room nights = number of available rooms × number of nights per time period

The number of guests is determined under single room occupancy, so that the number of guests is equal to the number of occupied rooms.

To illustrate, assume the EasyRest Hotel is a single hotel with 150 rooms. During the month of June, the hotel had 3,600 guests, each staying for a single night. The occupancy rate would be determined as follows:

$$\text{Occupancy Rate} = \frac{\text{Guest Nights}}{\text{Available Room Nights}}$$

$$= \frac{\text{3,600 guest nights}}{\text{150 rooms} \times \text{30 days}} = 80\%$$

The hotel was occupied to 80% of capacity, which would be considered favorable.

Make a Decision Utilization Rates

Analyze and compare Comfort Plus and Connors Hotel (MAD 1-1)
Analyze and compare Hilton Hotels and Marriott International (MAD 1-2)
Compare Sunrise Suites and Nationwide Inns (MAD 1-3)
Analyze Valley Hospital (MAD 1-4)
Analyze Eastern Skies Airlines (MAD 1-5)

Make a Decision

Let's Review

Chapter Summary

1. Managerial accounting supports the management process by providing reports to aid management in planning, directing, controlling, improving, and decision making. This differs from financial accounting, which provides information to users outside of the organization. Managerial accounting reports are designed to meet the specific needs of management and aid management in planning long-term strategies and running the day-to-day operations. Managerial accounting provides a variety of information for decision making for use in operating a business.

2. Manufacturing companies use machinery and labor to convert materials into a finished product. A direct cost can be

(Continued)

directly traced to a finished product, while an indirect cost cannot. The cost of a finished product is made up of three components: direct materials, direct labor, and factory overhead. These three manufacturing costs can be categorized into prime costs (direct materials and direct labor) or conversion costs (direct labor and factory overhead). Product costs consist of the elements of manufacturing cost—direct materials, direct labor, and factory overhead—while period costs consist of selling and administrative expenses.

3. The financial statements of manufacturing companies differ from those of retail companies. Manufacturing company balance sheets report three types of inventory: materials, work in process, and finished goods. The income statement of manufacturing companies reports the cost of goods sold, which is the total manufacturing cost of the goods sold. The income statement is supported by the statement of cost of goods manufactured, which provides the details of the cost of goods manufactured during the period.
4. A utilization rate measures the use of a fixed asset in serving customers relative to the asset's capacity. Higher utilization rates are considered favorable, while lower utilization rates are considered unfavorable. Different service industries will have different names and computations used for measuring utilization. For example, a common utilization rate in the hotel industry is the *occupancy rate*, which is computed by dividing guest nights by available room nights.

Key Terms

chief accounting officer (CAO) (7)
chief executive officer (CEO) (7)
chief financial officer (CFO) (7)
continuous process improvement (9)
controller (7)
controlling (9)
conversion costs (14)
cost (11)
cost object (11)
cost of goods manufactured (18)
cost of goods sold (18)
decision making (9)
direct costs (11)
direct labor cost (13)
direct materials cost (13)
directing (9)
factory burden (14)
factory overhead cost (14)
feedback (9)
financial accounting (5)
finished goods inventory (17)
horizontals (6)
indirect costs (12)
management by exception (9)
management process (8)
managerial accounting (5)
manufacturing overhead (14)
materials inventory (17)
objectives (goals) (8)
operational planning (9)
period costs (15)
planning (8)
prime costs (14)
product costs (15)
statement of cost of goods manufactured (18)
strategic planning (8)
strategies (8)
utilization rate (22)
verticals (6)
work in process inventory (17)

Practice

Multiple-Choice Questions

1. Which of the following best describes the difference between financial and managerial accounting?
   a. Managerial accounting provides information to support decisions, while financial accounting does not.
   b. Managerial accounting is not restricted to generally accepted accounting principles, while financial accounting is restricted to GAAP.
   c. Managerial accounting does not result in financial reports, while financial accounting does result in financial reports.
   d. Managerial accounting is concerned solely with the future and does not record events from the past, while financial accounting records only events from past transactions.
2. Which of the following is *not* one of the five basic phases of the management process?
   a. Planning
   b. Controlling
   c. Decision making
   d. Operating
3. Which of the following is *not* considered a cost of manufacturing a product?
   a. Direct materials cost
   b. Factory overhead cost
   c. Sales salaries
   d. Direct labor cost

4. Which of the following costs would be included as part of the factory overhead costs of a microcomputer manufacturer?
   a. The cost of memory chips
   b. Depreciation of testing equipment
   c. Wages of microcomputer assemblers
   d. The cost of disk drives
5. For the month of May, Latter Company has beginning finished goods inventory of $50,000, ending finished goods inventory of $35,000, and cost of goods manufactured of $125,000. What is the cost of goods sold for May?
   a. $90,000
   b. $110,000
   c. $140,000
   d. $170,000

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Management process — Obj. 1

Three phases of the management process are controlling, planning, and decision making. Match the following descriptions to the proper phase:

Phase of Management Process	Description
Controlling	a. Monitoring the operating results of implemented plans and comparing the actual results with expected results
Planning	b. Inherent in planning, directing, controlling, and improving
Decision making	c. Long-range courses of action

2. Direct materials, direct labor, and factory overhead — Obj. 2

Identify the following costs as direct materials (DM), direct labor (DL), or factory overhead (FO) for an automobile manufacturer:

a. Wages of employees that operate painting equipment
b. Wages of the plant manager
c. Steel
d. Oil used for assembly line machinery

3. Prime and conversion costs — Obj. 2

Identify the following costs as a prime cost (P), conversion cost (C), or both (B) for an automobile manufacturer:

a. Wages of employees that operate painting equipment
b. Wages of the plant manager
c. Steel
d. Oil used for assembly line machinery

4. Product and period costs — Obj. 2

Identify the following costs as a product cost or a period cost for an automobile manufacturer:

a. Steel
b. Wages of employees that operate painting equipment
c. Rent on office building
d. Sales staff salaries

5. Cost of goods sold, cost of goods manufactured — Obj. 3

Timbuk 3 Company has the following information for March:

Cost of direct materials used in production	$21,000
Direct labor	54,250
Factory overhead	35,000
Work in process inventory, March 1	87,500
Work in process inventory, March 31	92,750
Finished goods inventory, March 1	36,750
Finished goods inventory, March 31	42,000

For March, determine (a) the cost of goods manufactured and (b) the cost of goods sold.

6. Occupancy rate **Obj. 4**

Stay-4-Ever is a small motel chain with locations in the northeastern United States. The chain has a total of 200 rooms. The following operating data are available for July:

Number of Guests	Nights per Visit	Guest Nights
1,600	1	1,600
750	2	1,500
275	3	825
80	4	320
19	5	95

a. Determine the guest nights for July.
b. Determine the available room nights for July.
c. Determine the occupancy rate for July.
d. Assume that the occupancy rate for July of the prior year was 75%. Has the utilization rate for Stay-4-Ever improved or declined?

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

The following is a list of costs that were incurred in producing this textbook:

a. Insurance on the factory building and equipment
b. Salary of the vice president of finance
c. Hourly wages of printing press operators during production
d. Straight-line depreciation on the printing presses used to manufacture the text
e. Electricity used to run the presses during the printing of the text
f. Sales commissions paid to textbook representatives for each text sold
g. Paper on which the text is printed
h. Book covers used to bind the pages
i. Straight-line depreciation on an office building
j. Salaries of staff used to develop artwork for the text
k. Glue used to bind pages to cover

Instructions

With respect to the manufacture and sale of this text, classify each cost as either a product cost or a period cost. Indicate whether each product cost is a direct materials cost, a direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **b** Managerial accounting is not restricted to generally accepted accounting principles, as is financial accounting (answer b). Both financial and managerial accounting support decision making (answer a). Financial accounting is mostly concerned with the decision making of external users, while managerial accounting supports decision making of management. Both

financial and managerial accounting can result in financial reports (answer c). Managerial accounting reports are developed for internal use by managers at various levels in the organization. Both managerial and financial accounting record events from the past (answer d); however, managerial accounting can also include information about the future in the form of budgets and cash flow projections.

2. **d** The five basic phases of the management process are planning (answer a), directing (not listed), controlling (answer b), improving (not listed), and decision making (answer c). Operating (answer d) is not one of the five basic phases, but operations are the object of managers' attention.

3. **c** Sales salaries (answer c) is a selling expense and is not considered a cost of manufacturing a product. Direct materials cost (answer a), factory overhead cost (answer b), and direct labor cost (answer d) are costs of manufacturing a product.

4. **b** Depreciation of testing equipment (answer b) is included as part of the factory overhead costs of the microcomputer manufacturer. The cost of memory chips (answer a) and the cost of disk drives (answer d) are both considered a part of direct materials cost. The wages of microcomputer assemblers (answer c) are part of direct labor costs.

5. **c** Cost of goods sold is computed as follows:

Beginning finished goods inventory	$ 50,000
Cost of goods manufactured	125,000
Ending finished goods inventory	(35,000)
Cost of goods sold	$140,000

Exercises

1. Controlling (a)
   Planning (c)
   Decision making (b)
2. a. DL
   b. FO
   c. DM
   d. FO
3. a. B
   b. C
   c. P
   d. C
4. a. Product cost
   b. Product cost
   c. Period cost
   d. Period cost
5. a.

Work in process inventory, March 1		$ 87,500
Cost of direct materials used in production	$21,000	
Direct labor	54,250	
Factory overhead	35,000	
Total manufacturing costs incurred in March		110,250
Total manufacturing costs		$197,750
Work in process inventory, March 31		(92,750)
Cost of goods manufactured		$105,000

   b.

Finished goods inventory, March 1		$ 36,750
Cost of goods manufactured		105,000
Cost of finished goods available for sale		$141,750
Finished goods inventory, March 31		(42,000)
Cost of goods sold		$ 99,750

6. a.

Number of Guests		Nights per Visit		Guest Nights
1,600	×	1	=	1,600
750	×	2	=	1,500
275	×	3	=	825
80	×	4	=	320
19	×	5	=	95
Total guest nights				4,340

b. 6,200 available room nights (200 rooms × 31 nights in July)

c. $$\text{Occupancy Rate} = \frac{\text{Guest Nights}}{\text{Available Room Nights}} = \frac{4,340}{6,200} = 70\%$$

d. The utilization (occupancy) rate has declined from 75% in the prior year to 70% in the current year.

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

	Product Cost			Period Cost	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense
a.			X		
b.					X
c.		X			
d.			X		
e.			X		
f.				X	
g.	X				
h.	X				
i.					X
j.			X		
k.			X		

Discussion Questions

1. What are the major differences between managerial accounting and financial accounting?
2. a. Differentiate between a vertical and horizontal unit within a company.
   b. Are the accounting and legal departments normally considered vertical or horizontal units within a company?
   c. Would a consumer products division that sells products directly to consumers normally be considered a horizontal or vertical unit within a company?
3. What manufacturing cost term is used to describe the cost of materials that are an integral part of the manufactured end product?
4. Distinguish between prime costs and conversion costs.
5. What is the difference between a product cost and a period cost?
6. Name the three inventory accounts for a manufacturing business, and describe what each balance represents at the end of an accounting period.
7. In what order should the three inventories of a manufacturing business be presented on the balance sheet?
8. What are the three categories of manufacturing costs included in the cost of finished goods and the cost of work in process?
9. How do the manufacturing costs incurred during a period differ from the cost of goods manufactured for a period?
10. How does the "Cost of goods sold" section of the income statement differ between retail and manufacturing companies?

Basic Exercises

BE 1-1 Management process — Obj. 1

Three phases of the management process are planning, directing, and controlling. Match the following descriptions to the proper phase:

Phase of Management Process	Description
Planning	a. Developing long-range courses of action to achieve goals
Directing	b. Isolating significant departures from plans for further investigation and possible remedial action; may lead to a revision of future plans
Controlling	c. Process by which managers, given their assigned levels of responsibilities, run day-to-day operations

BE 1-2 Direct materials, direct labor, and factory overhead — Obj. 2

Identify the following costs as direct materials (DM), direct labor (DL), or factory overhead (FO) for a magazine publisher:

a. Staples used to bind magazines
b. Wages of printing machine employees
c. Maintenance on printing machines
d. Paper used in the magazine

BE 1-3 Prime and conversion costs — Obj. 2

Identify the following costs as a prime cost (P), conversion cost (C), or both (B) for a magazine publisher:

a. Paper used for the magazine
b. Wages of printing machine employees
c. Glue used to bind magazine
d. Maintenance on printing machines

BE 1-4 Product and period costs — Obj. 2

Identify the following costs as a product cost or a period cost for a magazine publisher:

a. Sales salaries
b. Paper used for the magazine
c. Maintenance on printing machines
d. Depreciation expense—corporate headquarters

BE 1-5 Cost of goods sold, cost of goods manufactured — Obj. 3



Glenville Company has the following information for April:

Cost of direct materials used in production	$280,000
Direct labor	324,000
Factory overhead	188,900
Work in process inventory, April 1	72,300
Work in process inventory, April 30	76,600
Finished goods inventory, April 1	39,600
Finished goods inventory, April 30	41,200

For April, determine (a) the cost of goods manufactured and (b) the cost of goods sold.

SHOW ME HOW

BE 1-6 Occupancy Rate — Obj. 4

Jake's Cabins is a small motel chain with locations near the national parks of Utah, Wyoming, and Montana. The chain has a total of 500 guest rooms. The following operating data are available for June:

Number of Guests	Nights per Visit	Guest Nights
4,400	1	4,400
1,800	2	3,600
750	3	2,250
600	4	2,400
20	5	100

a. Determine the guest nights for June.
b. Determine the available room nights for June.
c. Determine the occupancy rate for June.
d. Assume that the occupancy rate for June of the prior year was 82%. Has the utilization rate for Jake's Cabins improved or declined?

Exercises

EX 1-1 Classifying costs as materials, labor, or factory overhead — Obj. 2

Indicate whether each of the following costs of an automobile manufacturer would be classified as direct materials cost, direct labor cost, or factory overhead cost:

a. Automobile engine
b. Brake pads
c. Depreciation of robotic assembly line equipment
d. Glass for front and rear windshields
e. Safety helmets and masks for assembly line workers
f. Salary of quality control inspector
g. Steering wheel
h. Tires
i. Wages of assembly line workers

REAL WORLD

EX 1-2 Classifying costs as materials, labor, or factory overhead — Obj. 2

Indicate whether the following costs of **Procter & Gamble (PG)**, a maker of consumer products, would be classified as direct materials cost, direct labor cost, or factory overhead cost:

a. Depreciation on assembly line equipment in the Mehoopany, Pennsylvania, paper products plant
b. Licensing payments for use of Disney characters on children products
c. Maintenance supplies
d. Packaging materials
e. Paper used in bath tissue
f. Plant manager salary for the Iowa City, Iowa, plant
g. Resins for body wash products
h. Salary of process engineers
i. Scents and fragrances used in making soaps and detergents
j. Wages of production line employees at the Pineville, Louisiana, soap and detergent plant

REAL WORLD

EX 1-3 Classifying costs as factory overhead — Obj. 2

Which of the following items are properly classified as part of factory overhead for **Ford Motor Company (F)**, a maker of heavy automobiles and trucks?

a. Air conditioner units for installation in vehicles
b. Consultant fees for a study of production line efficiency

c. Dealership sales incentives
d. Depreciation on headquarters building in Dearborn, Michigan
e. Depreciation on mechanical robots used on the assembly line
f. Leather to be used on vehicles that have leather interiors
g. Machine lubricant used to maintain the assembly line at the Louisville, Kentucky, assembly plant
h. Plant manager's salary at Buffalo, New York, stamping plant, which manufactures auto and truck subassemblies
i. Property taxes on the Dearborn, Michigan, headquarters building
j. Vice president of human resource's salary

EX 1-4 Classifying costs as product or period costs **Obj. 2**



For apparel manufacturer **Abercrombie & Fitch, Inc. (ANF)**, classify each of the following costs as either a product cost or a period cost:

a. Advertising expenses
b. Chief financial officer's salary
c. Depreciation on office equipment
d. Depreciation on sewing machines
e. Fabric used during production
f. Factory janitorial supplies
g. Factory supervisors' salaries
h. Property taxes on factory building and equipment
i. Oil used to lubricate sewing machines
j. Repairs and maintenance costs for sewing machines
k. Research and development costs
l. Sales commissions
m. Salaries of distribution center personnel
n. Salaries of production quality control supervisors
o. Travel costs of media relations employees
p. Utility costs for office building
q. Wages of sewing machine operators

EX 1-5 Concepts and terminology **Obj. 1, 2**

From the choices presented in parentheses, choose the appropriate term for completing each of the following sentences:

a. A product, sales territory, department, or activity to which costs are traced is called a (direct cost, cost object).
b. Advertising costs are usually viewed as (period, product) costs.
c. Factory overhead costs combined with direct labor costs are called (prime, conversion) costs.
d. Feedback is often used to (improve, direct) operations.
e. A sacrifice made to obtain some benefit is a (cost, expense).
f. The balance sheet of a manufacturer would include an account for (cost of goods sold, work in process inventory).
g. The implementation of automatic, robotic factory equipment normally (increases, decreases) the direct labor component of product costs.

EX 1-6 Concepts and terminology **Obj. 1, 2**

From the choices presented in parentheses, choose the appropriate term for completing each of the following sentences:

a. An example of factory overhead is (electricity used to run assembly line, CEO salary).
b. Direct materials costs combined with direct labor costs are called (prime, conversion) costs.
c. Long-term plans are called (strategic, operational) plans.
d. Materials for use in production are called (supplies, materials inventory).
e. The phase of the management process that uses process information to eliminate the source of problems in a process so that the process delivers the correct product in the correct quantities is called (directing, improving).
f. The plant manager's salary would be considered (direct, indirect) to the product.
g. The salaries of salespeople are normally considered a (period, product) cost.

EX 1-7 Classifying costs in a service company

Obj. 2

A partial list of the costs for Wisconsin and Minnesota Railroad, a short hauler of freight, follows. Classify each cost as either indirect or direct. For purposes of classifying each cost, use the train as the cost object.

a. Costs of accident cleanup
b. Cost to lease (rent) locomotives and railroad cars
c. Cost of track and bed (ballast) replacement
d. Depreciation of terminal facilities
e. Diesel fuel costs
f. Information technology support staff salaries
g. Insurance costs
h. Maintenance costs of right of way, bridges, and buildings
i. Safety training costs
j. Salaries of dispatching and communications personnel
k. Wages of switch and classification yard personnel
l. Wages of train engineers

EX 1-8 Classifying costs

Obj. 2, 3

The following is a manufacturing cost report of Marching Ants Inc.

Marching Ants Inc.
Manufacturing Costs
For the Quarter Ended June 30

Materials used in production (including $56,200 of indirect materials)	$ 607,500
Direct labor (including $84,400 maintenance salaries)	562,500
Factory overhead:	
Supervisor salaries—plant	517,500
Heat, light, and power—plant	140,650
Sales salaries	348,750
Promotional expenses	315,000
Insurance and property taxes—plant	151,900
Insurance and property taxes—corporate offices	219,400
Depreciation—plant and equipment	123,750
Depreciation—corporate offices	90,000
Total	$3,076,950

a. List the errors in the preceding report.
b. Prepare a corrected report.

EX 1-9 Financial statements of a manufacturing firm

Obj. 3

✔ a. Net income, $185,000



SHOW ME HOW

The following events took place for Sorensen Manufacturing Company during January, the first month of its operations as a producer of digital video monitors:

a. Purchased $250,000 of materials.
b. Used $180,000 of direct materials in production.
c. Incurred $450,000 of direct labor wages.
d. Incurred $180,000 of factory overhead.
e. Transferred $760,000 of work in process to finished goods.
f. Sold goods for $1,200,000.
g. Sold goods with a cost of $675,000.
h. Incurred $215,000 of selling expense.
i. Incurred $125,000 of administrative expense.

Using the information given, complete the following:

a. Prepare the January income statement for Sorensen Manufacturing Company.
b. Determine the inventory balances at the end of the first month of operations.


SHOW ME HOW

EX 1-10 Manufacturing company balance sheet

Obj. 3

Partial balance sheet data for Diesel Additives Company at August 31 are as follows:

Finished goods inventory	$ 89,400	Supplies	$ 13,800
Prepaid insurance	9,000	Materials inventory	26,800
Accounts receivable	348,200	Cash	167,500
Work in process inventory	61,100		

Prepare the "Current assets" section of Diesel Additives Company's balance sheet at August 31.


SHOW ME HOW

EX 1-11 Cost of direct materials used in production for a manufacturing company

Obj. 3

Walker Manufacturing Company reported the following materials data for the month ending June 30:

Materials purchased	$845,700
Materials inventory, June 1	238,500
Materials inventory, June 30	190,400

Determine the cost of direct materials used in production by Walker during the month ended June 30.

EX 1-12 Cost of goods manufactured for a manufacturing company

Obj. 3

✔ e. $165,000

Two items are omitted from each of the following three lists of cost of goods manufactured statement data. Determine the amounts of the missing items, identifying them by letter.


SHOW ME HOW

Work in process inventory, August 1	$ 19,660	$ 41,650	(e)
Total manufacturing costs incurred during August	332,750	(c)	1,075,000
Total manufacturing costs	(a)	$515,770	$1,240,000
Work in process inventory, August 31	23,500	54,000	(f)
Cost of goods manufactured	(b)	(d)	$1,068,000


SHOW ME HOW

EX 1-13 Cost of goods manufactured for a manufacturing company

Obj. 3

The following information is available for Fuller Manufacturing Company for the month ending October 31:

Cost of direct materials used in production	$1,323,600
Direct labor	1,680,000
Work in process inventory, October 1	455,300
Work in process inventory, October 31	378,100
Total factory overhead	3,544,200

Determine Fuller Manufacturing's cost of goods manufactured for the month ended October 31.

EX 1-14 Income statement for a manufacturing company

Obj. 3

✔ d. $470,000

Two items are omitted from each of the following three lists of cost of goods sold data from a manufacturing company income statement. Determine the amounts of the missing items, identifying them by letter.

Finished goods inventory, June 1	$116,600	$ 38,880	(e)
Cost of goods manufactured	825,900	(c)	180,000
Cost of finished goods available for sale	(a)	$540,000	$1,100,000
Finished goods inventory, June 30	130,000	70,000	(f)
Cost of goods sold	(b)	(d)	$ 945,000

EX 1-15 Statement of cost of goods manufactured for a manufacturing company — Obj. 3

✔ a. Cost of goods manufactured, $6,924,200

SHOW ME HOW EXCEL TEMPLATE

Cost data for Johnstone Manufacturing Company for the month ended March 31 are as follows:

Inventories	March 1	March 31
Materials	$210,000	$193,100
Work in process	435,900	510,400
Finished goods	586,200	615,900

Direct labor	$3,500,000
Materials purchased during January	2,666,200
Factory overhead incurred during January:	
Indirect labor	320,000
Machinery depreciation	210,000
Heat, light, and power	175,000
Supplies	34,900
Property taxes	30,000
Miscellaneous costs	45,700

a. Prepare a cost of goods manufactured statement for March.
b. Determine the cost of goods sold for March.

EX 1-16 Cost of goods sold, profit margin, and net income for a manufacturing company — Obj. 3

✔ a. Cost of goods sold, $4,595,000

SHOW ME HOW

The following information is available for Bandera Manufacturing Company for the month ending January 31:

Cost of goods manufactured	$4,490,000
Selling expenses	530,000
Administrative expenses	340,000
Sales	6,600,000
Finished goods inventory, January 1	880,000
Finished goods inventory, January 31	775,000

For the month ended January 31, determine Bandera Manufacturing's (a) cost of goods sold, (b) gross profit, and (c) net income.

EX 1-17 Cost flow relationships — Obj. 3

✔ a. $330,000

SHOW ME HOW

The following information is available for the first month of operations of Bahadir Company, a manufacturer of mechanical pencils:

Sales	$792,000
Gross profit	462,000
Cost of goods manufactured	396,000
Indirect labor	171,600
Factory depreciation	26,400
Materials purchased	244,200
Total manufacturing costs for the period	455,400
Materials inventory, ending	33,000

Using the information given, determine the following missing amounts:

a. Cost of goods sold
b. Finished goods inventory at the end of the month
c. Direct materials cost
d. Direct labor cost
e. Work in process inventory at the end of the month

Problems: Series A

PR 1-1A Classifying costs

Obj. 2

The following is a list of costs that were incurred in the production and sale of large commercial airplanes:

a. Annual bonus paid to the chief operating officer of the company
b. Annual fee to a celebrity to promote the aircraft
c. Cost of electronic guidance system installed in the airplane cockpit
d. Cost of electrical wiring throughout the airplane
e. Cost of miniature replicas of the airplane used to promote and market the airplane
f. Cost of normal scrap from production of airplane body
g. Cost of paving the headquarters employee parking lot
h. Decals for cockpit door, the cost of which is immaterial to the cost of the final product
i. Depreciation on factory equipment
j. Hourly wages of employees that assemble the airplane
k. Hydraulic pumps used in the airplane's flight control system
l. Instrument panel installed in the airplane cockpit
m. Interior trim material used throughout the airplane cabin
n. Masks for use by painters in painting the airplane body
o. Metal used for producing the airplane body
p. Oil to lubricate factory equipment
q. Power used by painting equipment
r. Prebuilt leather seats installed in the first-class cabin
s. Production Quality Control Department costs for the year
t. Salaries of Marketing Department personnel
u. Salaries of test pilots
v. Salary of chief financial officer
w. Salary of plant manager
x. Special advertising campaign in *Aviation World* magazine
y. Turbo-charged airplane engine
z. Yearly cost of the maintenance contract for robotic equipment

Instructions

Classify each cost as either a product cost or a period cost. Indicate whether each product cost is a direct materials cost, a direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense. Use the following tabular headings for your answer, placing an "X" in the appropriate column:

	Product Costs			Period Costs	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense

PR 1-2A Classifying costs

Obj. 2

The following is a list of costs incurred by several manufacturing companies:

a. Annual picnic for plant employees and their families
b. Cost of fabric used by clothing manufacturer
c. Cost of plastic for a toy manufacturer
d. Cost of sewing machine needles used by a shirt manufacturer
e. Cost of television commercials
f. Depreciation of copying machines used by the Marketing Department
g. Depreciation of microcomputers used in the factory to coordinate and monitor the production schedules
h. Depreciation of office building

(Continued)

i. Depreciation of robotic equipment used to assemble a product
j. Electricity used to operate factory machinery
k. Factory janitorial supplies
l. Fees charged by collection agency on past-due customer accounts
m. Fees paid to lawn service for office grounds
n. Maintenance costs for factory equipment
o. Oil lubricants for factory plant and equipment
p. Pens, paper, and other supplies used by the Accounting Department
q. Repair costs for factory equipment
r. Rent for a warehouse used to store work in process and finished products
s. Salary of a physical therapist who treats plant employees
t. Salary of the manager of a manufacturing plant
u. Telephone charges by corporate office
v. Travel costs of marketing executives to annual sales meeting
w. Wages of a machine operator on the production line
x. Wages of production quality control personnel

Instructions

Classify each of the preceding costs as a product cost or period cost. Indicate whether each product cost is a direct materials cost, a direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense. Use the following tabular headings for preparing your answer, placing an "X" in the appropriate column:

	Product Costs			Period Costs	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense

PR 1-3A Cost classifications for a service company

Obj. 2

A partial list of Foothills Medical Center's costs follows:

a. Advertising hospital services on television
b. Blood tests
c. Cost of drugs used for patients
d. Cost of maintaining the staff and visitors' cafeteria
e. Cost of building a new heart wing
f. Cost of X-ray test
g. Depreciation of patient rooms
h. Depreciation of X-ray equipment
i. Doctor's fee
j. General maintenance costs of the hospital
k. Improvements on the employee parking lot
l. Intravenous solutions used for patients
m. Laundry services for operating room personnel
n. Operating room supplies used on patients (catheters, sutures, etc.)
o. Overtime incurred in the Patient Records Department due to a computer failure
p. Patient meals
q. Nurses' salaries
r. Salary of the nutritionist
s. Salary of intensive care personnel
t. Training costs for nurses
u. Utility costs of the hospital

Instructions

1. What would be Foothills Medical Center's most logical definition for the final cost object?
2. Identify whether each of the costs is to be classified as direct or indirect. For purposes of classifying each cost as direct or indirect, use the patient as the cost object.

PR 1-4A Manufacturing income statement, statement of cost of goods manufactured

Obj. 3

✔ 1. b. Yakima Company, $1,330,000

EXCEL TEMPLATE

Several items are omitted from the income statement and cost of goods manufactured statement data for two different companies for the month of May:

	Rainier Company	Yakima Company
Materials inventory, May 1	$ 100,000	$ 48,200
Materials inventory, May 31	(a)	50,000
Materials purchased	950,000	710,000
Cost of direct materials used in production	938,500	(a)
Direct labor	2,860,000	(b)
Factory overhead	1,800,000	446,000
Total manufacturing costs incurred in May	(b)	2,484,200
Total manufacturing costs	5,998,500	2,660,600
Work in process inventory, May 1	400,000	176,400
Work in process inventory, May 31	382,000	(c)
Cost of goods manufactured	(c)	2,491,500
Finished goods inventory, May 1	615,000	190,000
Finished goods inventory, May 31	596,500	(d)
Sales	9,220,000	4,550,000
Cost of goods sold	(d)	2,470,000
Gross profit	(e)	(e)
Operating expenses	1,000,000	(f)
Net income	(f)	1,500,000

Instructions

1. For both companies, determine the amounts of the missing items (a) through (f), identifying them by letter.
2. Prepare Yakima Company's statement of cost of goods manufactured for May.
3. Prepare Yakima Company's income statement for May.

PR 1-5A Statement of cost of goods manufactured and income statement for a manufacturing company

Obj. 3

✔ 1. Cost of goods manufactured, $1,989,250

SHOW ME HOW EXCEL TEMPLATE

The following information is available for Robstown Corporation for 20Y8:

Inventories	January 1	December 31
Materials	$ 44,250	$ 31,700
Work in process	63,900	80,000
Finished goods	101,200	99,800

Advertising expense	$ 400,000
Depreciation expense—office equipment	30,000
Depreciation expense—factory equipment	80,000
Direct labor	1,100,000
Heat, light, and power—factory	53,300
Indirect labor	115,000
Materials purchased	556,600
Office salaries expense	318,000
Property taxes—factory	40,000
Property taxes—office building	25,000
Rent expense—factory	27,000
Sales	3,850,000
Sales salaries expense	200,000
Supplies—factory	9,500
Miscellaneous costs—factory	11,400

Instructions

1. Prepare the 20Y8 statement of cost of goods manufactured.
2. Prepare the 20Y8 income statement.

Problems: Series B

PR 1-1B Classifying costs — Obj. 2

The following is a list of costs that were incurred in the production and sale of lawn mowers:

a. Attorney fees for drafting a new lease for headquarter offices
b. Cash paid to outside firm for janitorial services for factory
c. Commissions paid to sales representatives, based on the number of lawn mowers sold
d. Cost of advertising in a national magazine
e. Cost of boxes used in packaging lawn mowers
f. Electricity used to run the robotic machinery
g. Engine oil used in mower engines prior to shipment
h. Factory cafeteria employees' wages
i. Filter for spray gun used to paint the lawn mowers
j. Gasoline engines used for lawn mowers
k. Hourly wages of operators of robotic machinery used in production
l. License fees for use of patent for lawn mower blade, based on the number of lawn mowers produced
m. Maintenance costs for new robotic factory equipment, based on hours of usage
n. Paint used to coat the lawn mowers, the cost of which is immaterial to the cost of the final product
o. Payroll taxes on hourly assembly line employees
p. Plastic for outside housing of lawn mowers
q. Premiums on insurance policy for factory buildings
r. Property taxes on the factory building and equipment
s. Salary of factory supervisor
t. Salary of quality control supervisor who inspects each lawn mower before it is shipped
u. Salary of vice president of marketing
v. Steel used in producing the lawn mowers
w. Steering wheels for lawn mowers
x. Straight-line depreciation on the robotic machinery used to manufacture the lawn mowers
y. Telephone charges for company controller's office
z. Tires for lawn mowers

Instructions

Classify each cost as either a product cost or a period cost. Indicate whether each product cost is a direct materials cost, a direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense. Use the following tabular headings for your answer, placing an "X" in the appropriate column:

	Product Costs			Period Costs	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense

PR 1-2B Classifying costs — Obj. 2

The following is a list of costs incurred by several manufacturing companies:

a. Bonus for vice president of marketing
b. Costs of operating a research laboratory
c. Cost of unprocessed milk for a dairy
d. Depreciation of factory equipment
e. Entertainment expenses for sales representatives
f. Factory supplies
g. First-aid nurse for factory workers

h. Health insurance premiums paid for factory workers
i. Hourly wages of warehouse laborers
j. Lumber used by furniture manufacturer
k. Maintenance costs for factory equipment
l. Microprocessors for a microcomputer manufacturer
m. Packing supplies for products sold, which are insignificant to the total cost of the product
n. Paper used by commercial printer
o. Paper used in processing various managerial reports
p. Protective glasses for factory machine operators
q. Salaries of quality control personnel
r. Sales commissions
s. Seed for grain farmer
t. Television advertisement
u. Prebuilt transmissions for an automobile manufacturer
v. Wages of a machine operator on the production line
w. Wages of secretary of company controller
x. Wages of telephone operators for a toll-free, customer hotline

Instructions

Classify each of the preceding costs as a product cost or period cost. Indicate whether each product cost is a direct materials cost, a direct labor cost, or a factory overhead cost. Indicate whether each period cost is a selling expense or an administrative expense. Use the following tabular headings for preparing your answer. Place an "X" in the appropriate column.

	Product Costs			Period Costs	
Cost	Direct Materials Cost	Direct Labor Cost	Factory Overhead Cost	Selling Expense	Administrative Expense

PR 1-3B Cost classifications for a service company

Obj. 2

A partial list of The Grand Hotel's costs follows:

a. Advertising in local newspaper
b. Bedding (sheets, blankets, pillows)
c. Bellhop wages
d. Champagne for special guest packages
e. Coffee and tea for rooms
f. Cost of customer surveys
g. Depreciation of the hotel
h. Desk clerk wages
i. Guest long-distance telephone costs
j. Kitchen employee wages
k. Laundering towels and sheets
l. Lobby furniture
m. Maid wages
n. Mini-bar supplies
o. New carpeting
p. Painting lobby
q. Pay-per-view movie rental costs (in rooms)
r. Salary of the hotel manager
s. Soaps and shampoos for rooms
t. Training for hotel restaurant servers
u. Utility costs for hotel

(Continued)

v. Valet parking services
w. Wages of convention setup employees

Instructions

1. What would be The Grand Hotel's most logical definition for the final cost object?
2. Identify whether each of the costs is to be classified as direct or indirect. For purposes of classifying each cost as direct or indirect, use the hotel guest as the cost object.

PR 1-4B Manufacturing income statement, statement of cost of goods manufactured

Obj. 3

✔ 1. c. On Company, $800,800

EXCEL TEMPLATE

Several items are omitted from the income statement and cost of goods manufactured statement data for two different companies for the month of December:

	On Company	Off Company
Materials inventory, December 1	$ 65,800	$ 195,300
Materials inventory, December 31	(a)	91,140
Materials purchased	282,800	(a)
Cost of direct materials used in production	317,800	(b)
Direct labor	387,800	577,220
Factory overhead	148,400	256,060
Total manufacturing costs incurred in December	(b)	1,519,000
Total manufacturing costs	973,000	1,727,320
Work in process inventory, December 1	119,000	208,320
Work in process inventory, December 31	172,200	(c)
Cost of goods manufactured	(c)	1,532,020
Finished goods inventory, December 1	224,000	269,080
Finished goods inventory, December 31	197,400	(d)
Sales	1,127,000	1,944,320
Cost of goods sold	(d)	1,545,040
Gross profit	(e)	(e)
Operating expenses	117,600	(f)
Net income	(f)	164,920

Instructions

1. For both companies, determine the amounts of the missing items (a) through (f), identifying them by letter.
2. Prepare On Company's statement of cost of goods manufactured for December.
3. Prepare On Company's income statement for December.

PR 1-5B Statement of cost of goods manufactured and income statement for a manufacturing company

Obj. 3

✔ 1. Cost of goods manufactured, $367,510

SHOW ME HOW EXCEL TEMPLATE

The following information is available for Shanika Company for 20Y6:

Inventories	January 1	December 31
Materials	$ 77,350	$ 95,550
Work in process	109,200	96,200
Finished goods	113,750	100,100

Advertising expense	$ 68,250
Depreciation expense—office equipment	22,750
Depreciation expense—factory equipment	14,560
Direct labor	186,550
Heat, light, and power—factory	5,850
Indirect labor	23,660
Materials purchased	123,500
Office salaries expense	77,350
Property taxes—factory	4,095

	December 31
Property taxes—headquarters building	$ 13,650
Rent expense—factory	6,825
Sales	864,500
Sales salaries expense	136,500
Supplies—factory	3,250
Miscellaneous costs—factory	4,420

Instructions

1. Prepare the 20Y6 statement of cost of goods manufactured.
2. Prepare the 20Y6 income statement.

Make a Decision
Utilization Rates

MAD 1-1 Analyze and compare Comfort Plus and Connors Hotel — Obj. 4

Comfort Plus, Inc., has a hotel with 300 rooms in a metropolitan city. Its main competitor, Connors Hotel, has a hotel with 350 rooms in the same city. The following operating data are available for April for the two hotels:

Comfort Plus		Connors	
Number of Guests	**Nights per Visit**	**Number of Guests**	**Nights per Visit**
3,680	1	4,390	1
1,100	2	700	2
500	3	800	3

a. Determine the guest nights for each hotel in April.
b. Determine the available room nights for each hotel in April.
c. Determine the occupancy rate for each hotel in April.
d. Which hotel has the better utilization of capacity in April?

REAL WORLD

MAD 1-2 Analyze and compare Hilton Hotels and Marriott International — Obj. 4

A recent annual report of **Hilton Worldwide Holdings Inc. (HLT)** and **Marriott International Inc. (MAR)** provided the following occupancy data for two recent years:

	Year 2	Year 1
Hilton Hotels	74.6%	72.2%
Marriott International	73.3%	71.3%

a. Is the change in the occupancy rate favorable or unfavorable for Hilton Hotels?
b. Is the change in the occupancy rate favorable or unfavorable for Marriott International?
c. Which company has the stronger occupancy?
d. What additional information would supplement occupancy in evaluating the performance of these two hotels?

MAD 1-3 Compare Sunrise Suites and Nationwide Inns — Obj. 4

Sunrise Suites and Nationwide Inns operate competing hotel chains across the region. Hotel capacity information for both hotels is as follows:

	Number of Hotels	Average Number of Rooms per Hotel
Sunrise Suites	120	90
Nationwide Inns	150	76

(Continued)

Information on the number of guests for each hotel and the average length of visit for June were as follows:

	Number of Guests	Average Length of Visit (in Nights)
Sunrise Suites	183,600	1.5
Nationwide Inns	228,000	1.2

a. Determine the guest nights for each hotel in June.
b. Determine the room nights for each hotel in June.
c. Determine the occupancy rate of each hotel in June.
d. Interpret the results in (c).

MAD 1-4 Analyze Valley Hospital

Obj. 4

Valley Hospital measures the in-patient occupancy of the hospital by determining the number of patient days divided by the number of available bed days in the hospital for a time period. The following in-patient data are available for the months of April, May, and June:

	April	May	June
Admitted patients	1,440	1,860	2,250
Average length of stay per patient	4.0 days	3.5 days	3.0 days

The hospital has 200 rooms. One hundred rooms are private and have a single bed per room. The other 100 rooms are semi-private with two beds per room.

a. Determine the number of in-patient days for each month.
b. Determine the available bed days rate for each month.
c. Determine the occupancy rate for each month.
d. Interpret the results in (c).

MAD 1-5 Analyze Eastern Skies Airlines

Obj. 4

Eastern Skies Airlines has three flights that depart from New York City and arrive in Chicago every day. The three flights are as follows:

Flight Number	Flight Departure Time	Flight Frequency
57	8:00 AM	7 days per week
85	10:00 AM	7 days per week
94	11:30 AM	7 days per week

Each flight uses a jet with a capacity of 180 seats. The airline measures the utilization of the aircraft by passenger load. Passenger load is the number of seats sold divided by the number of available seats on a flight for a time period. The following operating data are available for June:

Flight Number	Number of Seats Sold
57	5,130
85	2,592
94	2,376

a. Determine the available seat capacity for each flight number for June.
b. Determine the passenger load for each flight number for June.
c. What recommendations could you provide Eastern Skies based on the passenger load data?

Take It Further

ETHICS

TIF 1-1 Purchase of materials for personal use

Avett Manufacturing Company allows employees to purchase materials, such as metal and lumber, for personal use at a price equal to the company's cost. To purchase materials, an employee must complete a materials requisition form, which must then be approved by the employee's immediate supervisor. Brian Dadian, an assistant cost accountant, then charges the employee an amount based on Avett's net purchase cost.

Brian is in the process of replacing a deck on his home and has requisitioned lumber for personal use, which has been approved in accordance with company policy. In computing the cost of the lumber, Brian reviewed all the purchase invoices for the past year. He then used the lowest price to compute the amount due the company for the lumber.

The Institute of Management Accountants (IMA) is the professional organization for managerial accountants. The IMA has established four principles of ethical conduct for its members: honesty, fairness, objectivity, and responsibility. These principles are available at the IMA website: www.imanet.org.

Using the IMA's four principles of ethical conduct, evaluate Brian's behavior. Has he acted in an ethical manner? Why?

TEAM ACTIVITY REAL WORLD

TIF 1-2 Classifying real-world costs

In teams, visit a local restaurant. As you observe the operation, consider the costs associated with running the business. As a group, identify as many costs as you can and classify them according to the following table headings:

Cost	Direct Materials	Direct Labor	Overhead	Selling Expenses

COMMUNICATION

TIF 1-3 Financial and managerial accounting

Todd Johnson is the Vice President of Finance for Boz Zeppelin Industries Inc. At a recent finance meeting, Todd made the following statement: "The managers of a company should use the same information as the shareholders of the firm. When managers use the same information to guide their internal operations as shareholders use in evaluating their investments, the managers will be aligned with the stockholders' profit objectives."

Prepare a one-half page memo to Todd discussing any concerns you might have with his statement.

TIF 1-4 Managerial accounting in the real world

For each of the following managers, describe how managerial accounting could be used to satisfy strategic or operational objectives:

a. The vice president of the Information Systems Division of a bank.
b. A hospital administrator.
c. The chief executive officer of a food company. The food company is divided into three divisions: Nonalcoholic Beverages, Snack Foods, and Fast-Food Restaurants.
d. The manager of the local campus copy shop.

TIF 1-5 Managerial accounting in the real world

The following situations describe scenarios that could use managerial accounting information:

a. The manager of High Times Restaurant wants to determine the price to charge for various lunch plates.
b. By evaluating the cost of leftover materials, the plant manager of a precision tool facility wants to determine how effectively the plant is being run.
c. The division controller of West Coast Supplies needs to determine the cost of products left in inventory.
d. The manager of the Maintenance Department of a large manufacturing company wants to plan next year's anticipated expenditures.

For each situation, discuss how managerial accounting information could be used.

TIF 1-6 Classifying costs

Geek Chic Company provides computer repair services for the community. Obie Won's computer was not working, and he called Geek Chic for a home repair visit. Geek Chic Company's technician arrived at 2:00 PM to begin work. By 4:00 PM, the problem was diagnosed as a failed circuit board. Unfortunately, the technician did not have a new circuit board in the truck because the technician's previous customer had the same problem and a board was used on that visit. Replacement boards were available back at Geek Chic Company's shop. Therefore, the technician drove back to the shop to retrieve a replacement board. From 4:00 to 5:00 PM, Geek Chic Company's technician drove the round trip to retrieve the replacement board from the shop.

At 5:00 PM, the technician was back on the job at Obie's home. The replacement procedure is somewhat complex because a variety of tests must be performed once the board is installed. The job was completed at 6:00 PM.

Obie's repair bill showed the following:

Circuit board	$100
Labor charges	300
Total	$400

Obie was surprised at the size of the bill and asked for more detail supporting the calculations. Geek Chic Company responded with the following explanations:

Cost of materials:	
Purchase price of circuit board	$ 80
Markup on purchase price to cover storage and handling	20
Total materials charge	$100

The labor charge per hour is detailed as follows:

2:00–3:00 PM	$ 70
3:00–4:00 PM	60
4:00–5:00 PM	80
5:00–6:00 PM	90
Total labor charge	$300

Further explanations in the differences in the hourly rates are as follows:

First hour:	
Base labor rate	$42
Fringe benefits	10
Overhead (other than storage and handling)	8
Total base labor rate	$60
Additional charge for first hour of any job to cover the cost of vehicle depreciation, fuel, and employee time in transit. A 30-minute transit time is assumed	10
	$70
Third hour:	
Base labor rate	$60
The trip back to the shop includes vehicle depreciation and fuel; therefore, a charge was added to the hourly rate to cover these costs. The round trip took an hour	20
	$80
Fourth hour:	
Base labor rate	$60
Overtime premium for time worked in excess of an eight-hour day (starting at 5:00 PM) is equal to 1.5 times the base rate	30
	$90

a. If you were in Obie's position, how would you respond to the bill? Are there parts of the bill that appear incorrect to you? If so, what argument would you employ to convince Geek Chic Company that the bill is too high?

b. Use the headings that follow to construct a table. Fill in the table by listing the costs identified in the activity in the left-hand column. For each cost, place a check mark in the appropriate column identifying the correct cost classification. Assume that each service call is a job.

Cost	Direct Materials	Direct Labor	Overhead

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Which of the following items would **not** be considered a manufacturing cost?
   a. Cream for an ice cream maker.
   b. Sales commissions for a car manufacturer.
   c. Plant property taxes for an ice cream maker.
   d. Tires for an automobile manufacturer.

2. A review of Plunkett Corporation's accounting records revealed the following selected information for the previous year:

Direct materials used	$ 56,000
Direct labor	179,100
Manufacturing overhead	421,000
Selling expenses	235,900
Administrative expenses	229,400

   In addition, the company suffered a $27,700 uninsured factory fire loss during the year. What were Plunkett's product costs and period costs for last year?

	Product	Period
a.	$235,100	$914,000.
b.	$497,500	$651,600.
c.	$656,100	$493,000.
d.	$683,800	$465,300.

3. A firm has $100,000 in direct materials costs, $50,000 in direct labor costs, and $80,000 in overhead. Which of the following is true?
   a. Prime costs are $150,000; conversion costs are $180,000.
   b. Prime costs are $130,000; conversion costs are $150,000.
   c. Prime costs are $150,000; conversion costs are $130,000.
   d. Prime costs are $180,000; conversion costs are $150,000.

4. In practice, items such as wood screws and glue used in the production of school desks and chairs would most likely be classified as:
   a. period costs.
   b. direct labor.
   c. factory overhead.
   d. direct materials.

Pathways Challenge



This is Accounting!

Information/Consequences

If the hourly professional rate is set based, in part, on the desire to cover indirect costs, the rate will be higher than if it is only based on the direct costs of professionals. However, **Larson & Company** needs to set its rates high enough to cover all of its costs and generate a profit.

If some clients use more supplies than others, the current billing system will not accurately reflect the fact that these clients are slightly more costly for Larson & Company to serve. However, given the overall cost of providing CPA services to clients, costs relating to office supplies, even for clients who require an above average level of supplies, are insignificant.

While employees at Larson & Company could exert the effort necessary to directly trace the costs of office supplies to each client, the cost of doing so would outweigh the benefit. In addition, even clients who use very few supplies would likely be turned off by being "nickeled and dimed" with charges for print jobs, faxes, and other office supply costs. In the end, just because a cost *can* be directly traced to a cost object, that doesn't mean a cost *should be* directly traced to a cost object.

Suggested Answer

Chapter 2

Job Order Costing

Principles

Chapter 1 *Introduction to Managerial Accounting*

Developing Information

COST SYSTEMS

Chapter 2 ***Job Order Costing***
Chapter 3 *Process Costing*
Chapter 4 *Activity-Based Costing*

COST ALLOCATIONS

Chapter 5 *Support Departments*
Chapter 5 *Joint Costs*

Decision Making

PLANNING AND EVALUATING TOOLS

Chapter 6 *Cost-Volume-Profit Analysis*
Chapter 7 *Variable Costing*
Chapter 8 *Budgeting Systems*
Chapter 9 *Standard Costing and Variances*
Chapter 10 *Decentralized Operations*
Chapter 11 *Differential Analysis*

STRATEGIC TOOLS

Chapter 12 *Capital Investment Analysis*
Chapter 13 *Lean Manufacturing*
Chapter 13 *Activity Analysis*
Chapter 14 *The Balanced Scorecard*
Chapter 14 *Corporate Social Responsibility*

Gibson Guitars

The selling price of a Gibson guitar ranges from less than $500 to over $10,000. These differences in selling prices reflect the quality of the materials and the craftsmanship required in making a guitar. In all cases, however, the selling price of a guitar must be greater than the cost of producing it. So, how does **Gibson** determine the cost of producing a guitar?

Costs associated with creating a guitar include materials such as wood and strings, the wages of employees who build the guitar, and factory overhead. To determine the purchase price of a guitar, Gibson identifies and records the costs that go into the guitar during each step of the manufacturing process. As the guitar moves through the production process, the costs of direct materials, direct labor, and factory overhead are recorded. When the guitar is complete, the costs that have been recorded are added up to determine the cost of the guitar. The company then prices the guitar to achieve a level of profit (or revenue greater than the cost of the guitar).

This chapter describes a job order cost accounting system that illustrates how costs could be recorded and accumulated in manufacturing a guitar. The chapter also describes how a job order cost system could be used by service businesses.

Source: www.gibson.com/Gibson/History.aspx.



ANTONIODIAZ/SHUTTERSTOCK.COM

Link to Gibson Guitars . . . . . Pages 50, 51, 53, 58, 61

What's Covered

Job Order Costing

Cost Accounting Systems Overview
- Job Order Cost Systems (Obj. 1)
- Process Cost Systems (Obj. 1)

Job Order Cost Systems for Manufacturing Businesses
- Materials (Obj. 2)
- Factory Labor (Obj. 2)
- Factory Overhead (Obj. 2)
- Work in Process (Obj. 2)
- Finished Goods (Obj. 2)
- Sales and Cost of Goods Sold (Obj. 2)
- Period Costs (Obj. 2)

Job Order Cost Systems for Service Businesses
- Job Order Service Businesses (Obj. 3)
- Flow of Costs (Obj. 3)

Learning Objectives

Obj. 1 Describe cost accounting systems used by manufacturing businesses.

Obj. 2 Describe and illustrate a job order cost accounting system for a manufacturing business.

Obj. 3 Describe job order cost accounting systems for service businesses.

Analysis for Decision Making

Obj. 4 Describe the use of job order cost information for decision making.

Objective 1
Describe cost accounting systems used by manufacturing businesses.

Cost Accounting Systems Overview

Cost accounting systems measure, record, and report product costs. Managers use product costs for setting product prices, controlling operations, and developing financial statements.

The two main types of cost accounting systems for manufacturing operations are job order cost and process cost systems. Each system differs in how it accumulates and records costs.

Job Order Cost Systems

A **job order cost system** provides product costs for each quantity of product that is manufactured. Each quantity of product that is manufactured is called a *job*. Job order cost systems are often used by companies that manufacture custom products for customers or batches of similar products. For example, an apparel manufacturer, such as **Levi Strauss & Co.**, or a guitar manufacturer, such as **Gibson Guitars**, would use a job order cost system.

This chapter illustrates the job order cost system. As a basis for illustration, **Legend Guitars**, a manufacturer of guitars, is used. Exhibit 1 summarizes Legend Guitars' manufacturing operations.[1]

Process Cost Systems

A **process cost system** provides product costs for each manufacturing department or process. Process cost systems are often used by companies that manufacture units of a product that are indistinguishable from each other and are manufactured using a continuous production process. Examples would be oil refineries, paper producers, chemical processors, and food processors. The process cost system is illustrated in Chapter 3.

[1] Legend Guitars' manufacturing operation is described in more detail in Chapter 1.

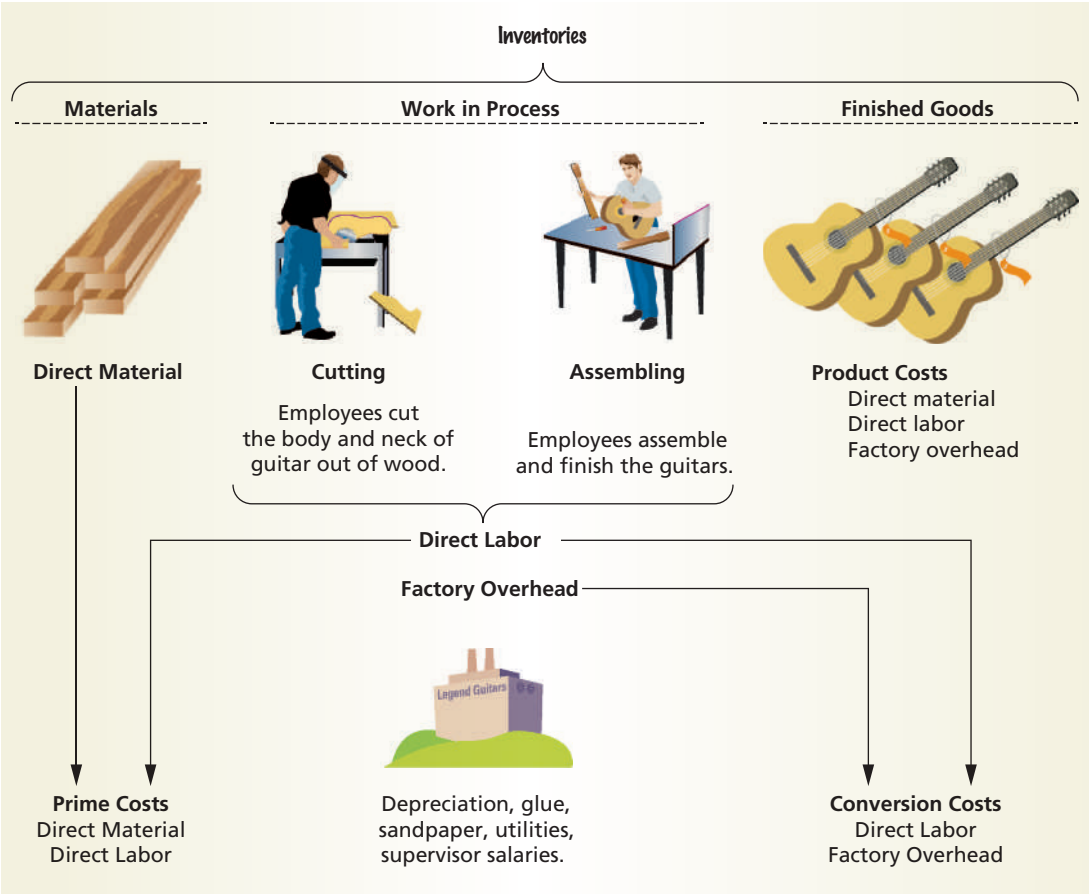


Exhibit 1
Summary of Legend Guitars' Manufacturing Operations

Job Order Cost Systems for Manufacturing Businesses

Objective 2
Describe and illustrate a job order cost accounting system for a manufacturing business.

A job order cost system records and summarizes manufacturing costs by jobs. The flow of manufacturing costs in a job order system is illustrated in Exhibit 2.

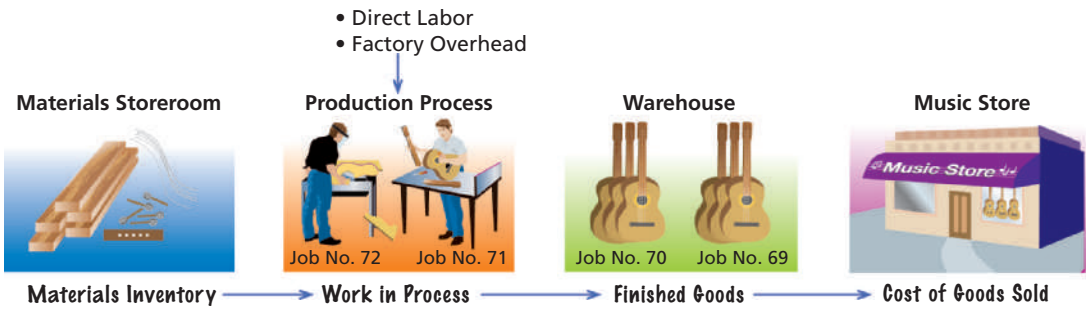
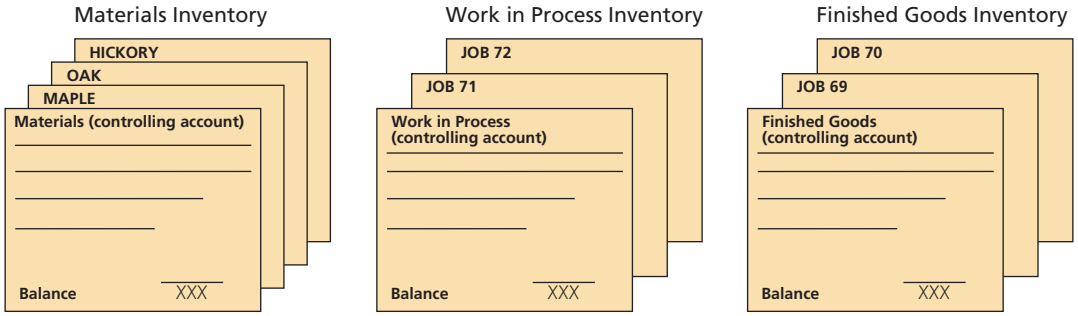


Exhibit 2
Flow of Manufacturing Costs

Exhibit 2 indicates that although the materials for Jobs 71 and 72 have been added, both jobs are still in the production process. Thus, Jobs 71 and 72 are part of *Work in Process Inventory*. In contrast, Exhibit 2 indicates that Jobs 69 and 70 have been completed. Thus, Jobs 69 and 70 are part of *Finished Goods Inventory*. Exhibit 2 also indicates that when finished guitars are sold to music stores, their costs become part of *Cost of Goods Sold*.

In a job order cost accounting system, perpetual inventory controlling accounts and subsidiary ledgers are maintained for materials, work in process, and finished goods inventories as shown in Exhibit 3.

Exhibit 3
Inventory Ledger Accounts



Link to Gibson Guitars

At any one point in time, **Gibson** will have materials, work in process, and finished goods inventories.

Materials

The materials account in the general ledger is a controlling account. A separate account for each type of material is maintained in a subsidiary **materials ledger**.

Why It Matters

CONCEPT CLIP

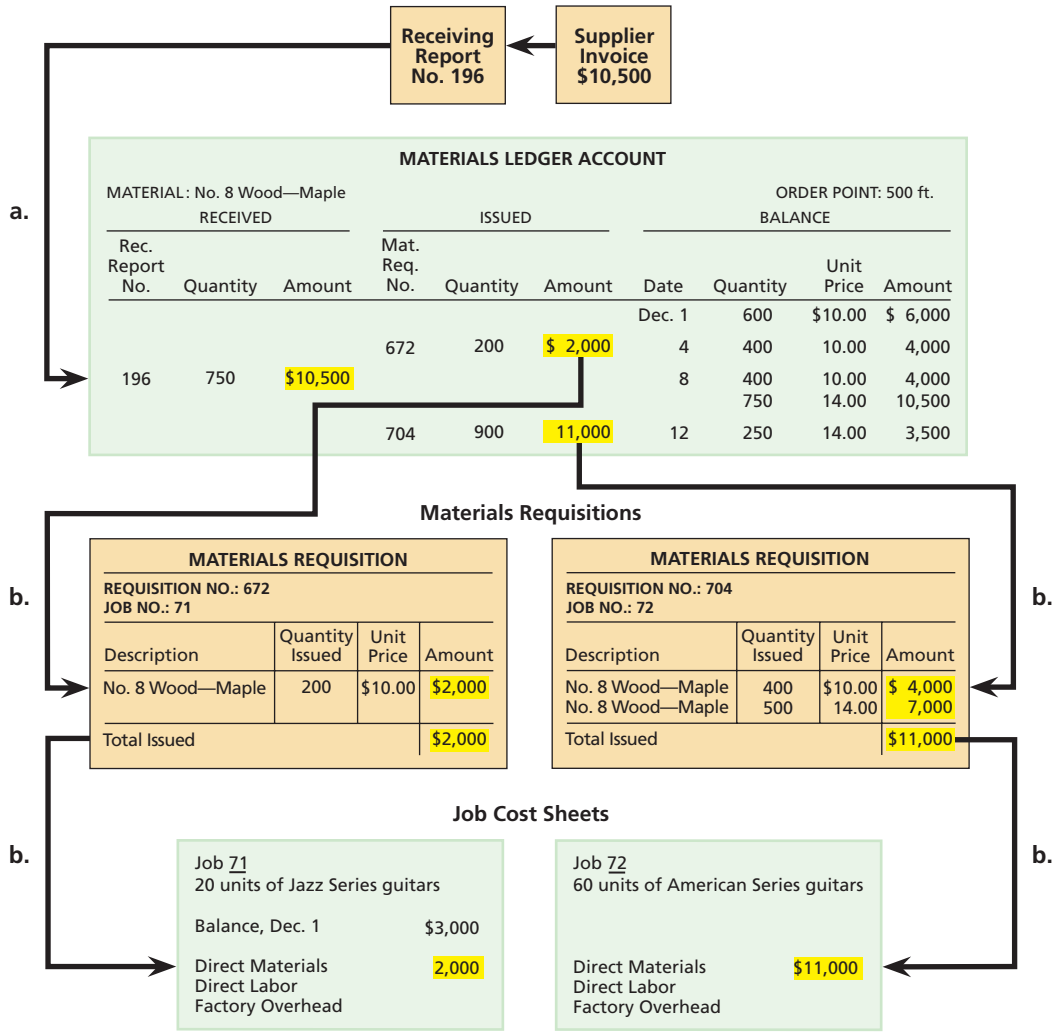
3D Printing

3D printing is a technology that creates a three-dimensional product from an "additive" process. "Additive" means the product is built from plastic, metal, or other material that is built layer by successive layer until the final object is complete. The layers are very thin, allowing for extremely precise final specifications. The process is like printing on a piece of paper (which adds a layer of ink), but in three dimensions, hence the term 3D printing. The machines that add the thin material layers are computer controlled, so that the layers are added in exactly the right way to create the final product. 3D printers can manufacture very complex final products. 3D printing fits well within a job shop environment because the technology provides an economical way to create custom products.

Exhibit 4 shows **Legend Guitars**' materials ledger account for maple. Increases (debits) and decreases (credits) to the account are as follows:

- Increases (debits) are based on *receiving reports* such as Receiving Report No. 196 for $10,500, which is supported by the supplier's invoice.
- Decreases (credits) are based on *materials requisitions* such as Requisition No. 672 for $2,000 for Job 71 and Requisition No. 704 for $11,000 for Job 72.

Exhibit 4
Materials Information and Cost Flows



Gibson uses a variety of woods (direct materials) in making guitars, including cedar.

Link to Gibson Guitars

A **receiving report** is prepared when materials that have been ordered are received and inspected. The quantity received and the condition of the materials are entered on the receiving report. When the supplier's invoice is received, it is compared to the receiving report. If there are

no discrepancies, a journal entry is made to record the purchase. The journal entry to record the supplier's invoice related to Receiving Report No. 196 in Exhibit 4 is as follows:

A = L + E
+ +

a.

Materials	10,500	
Accounts Payable		10,500
Materials purchased during December.		

The storeroom releases materials for use in manufacturing when a **materials requisition** is received. Examples of materials requisitions are shown in Exhibit 4.

The materials requisitions for each job serve as the basis for recording materials used. For direct materials, the quantities and amounts from the materials requisitions are posted to job cost sheets. **Job cost sheets**, which are also illustrated in Exhibit 4, make up the work in process subsidiary ledger.

Exhibit 4 shows the posting of $2,000 of direct materials to Job 71 and $11,000 of direct materials to Job 72.[2] Job 71 is an order for 20 units of Jazz Series guitars, while Job 72 is an order for 60 units of American Series guitars.

A summary of the materials requisitions is used as a basis for the journal entry recording the materials used for the month. For direct materials, this entry increases (debits) Work in Process and decreases (credits) Materials as follows:

A = L + E
+ −

b.

Work in Process	13,000	
Materials		13,000
Materials requisitioned to jobs ($2,000 + $11,000).		

Many companies use computerized information processes to record the use of materials. In such cases, storeroom employees electronically record the release of materials, which automatically updates the materials ledger and job cost sheets.



Ethics: Do It!

Phony Invoice Scams

A popular method for defrauding a company is to issue a phony invoice. The scam begins by initially contacting the target firm to discover details of key business contacts, business operations, and products. The swindler then uses this information to create a fictitious invoice. The invoice will include names, figures, and other details to give it the appearance of legitimacy. This type of scam can be avoided if invoices are matched with receiving documents prior to issuing a check.

Factory Labor

When employees report for work, they may use *electronic badges, clock cards,* or *in-and-out cards* to clock in. When employees work on an individual job, they use **time tickets** to record the amount of time they have worked on a specific job. Exhibit 5 illustrates time tickets for Jobs 71 and 72 at **Legend Guitars**.

Exhibit 5 shows that on December 13, 20Y8, D. McInnis spent six hours working on Job 71 at an hourly rate of $10 for a cost of $60 (6 hrs. × $10). Exhibit 5 also indicates that a total of 350 hours was spent by employees on Job 71 during December for a total cost of $3,500. This total direct labor cost of $3,500 is posted to the job cost sheet for Job 71, as shown in Exhibit 5.

Likewise, Exhibit 5 shows that on December 26, 20Y8, S. Andrews spent eight hours on Job 72 at an hourly rate of $15 for a cost of $120 (8 hrs. × $15). A total of 500 hours was spent by employees on Job 72 during December for a total cost of $7,500. This total direct labor cost of $7,500 is posted to the job cost sheet for Job 72, as shown in Exhibit 5.

[2]To simplify, Exhibit 4 and this chapter use the first-in, first-out cost flow method.

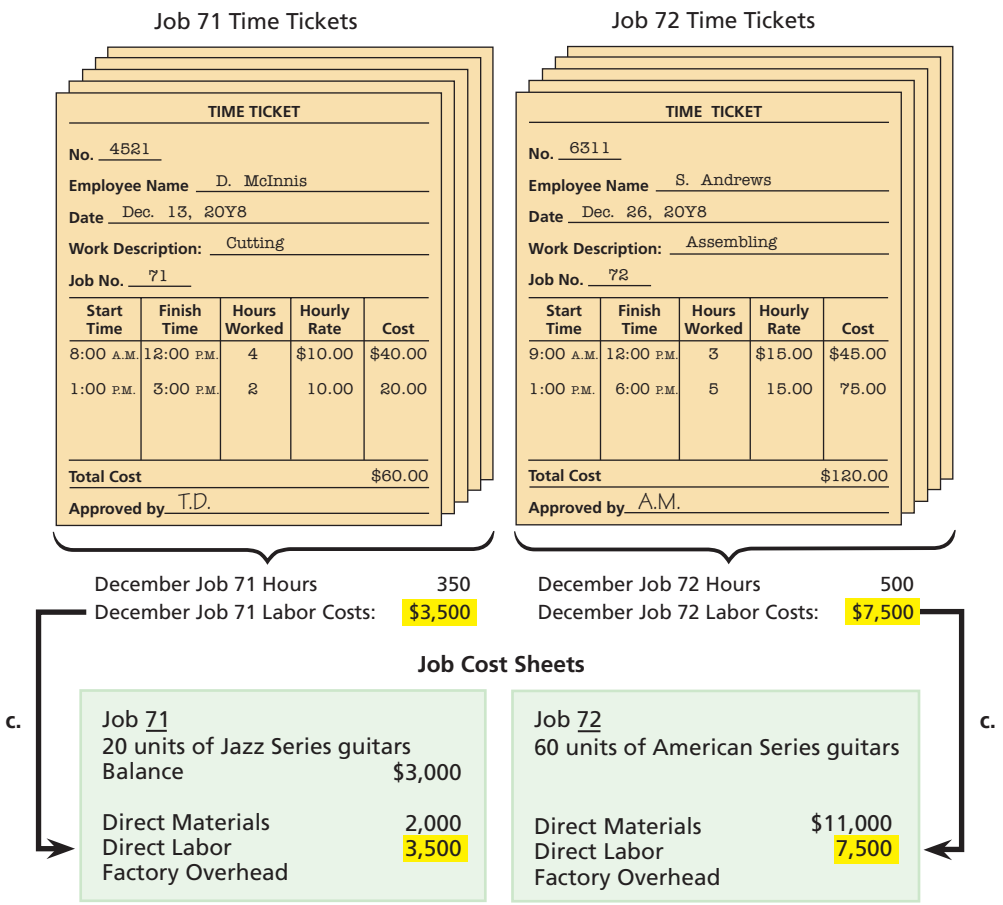


Exhibit 5
Labor Information and Cost Flows

A summary of the time tickets is used as the basis for the journal entry recording direct labor for the month. This entry increases (debits) Work in Process and increases (credits) Wages Payable, as follows:

c.	Work in Process	11,000	
	Wages Payable		11,000
	Factory labor used in production of jobs ($3,500 + $7,500).		

A = **L** + **E**
\+ \+

As with direct materials, many businesses use computerized information processing to record direct labor. In such cases, employees may log their time directly into computer terminals at their workstations. In other cases, employees may be issued magnetic cards, much like credit cards, to log in and out of work assignments.

Gibson uses workers (factory labor) to perform a variety of tasks in making guitars, including cutting, matching wood grains, fitting braces, shaping and fitting necks, coloring, polishing, tuning, and inspecting.

Link to Gibson Guitars

Factory Overhead

Factory overhead includes all manufacturing costs except direct materials and direct labor. Factory overhead costs come from a variety of sources, including the following:

- Indirect materials come from a summary of materials requisitions. **Indirect materials** are any materials needed to make a product, but that are not directly traced to the product.
- Indirect labor comes from the salaries of production supervisors and the wages of other employees such as janitors. **Indirect labor** is any labor needed to make a product, but that is not directly traced to the product.
- Factory power comes from utility bills.
- Factory depreciation comes from Accounting Department computations of depreciation.

To illustrate the recording of factory overhead, assume that **Legend Guitars** incurred $4,600 of overhead during December, which included $500 of indirect materials, $2,000 of indirect labor, $900 of utilities, and $1,200 of factory depreciation. The $500 of indirect materials consisted of $200 of glue and $300 of sandpaper. The entry to record the factory overhead is as follows:

A = L + E
+ − +

d.	Factory Overhead	4,600	
	Materials		500
	Wages Payable		2,000
	Utilities Payable		900
	Accumulated Depreciation		1,200
	Factory overhead incurred in production.		

Check Up Corner 2-1 Direct Materials, Direct Labor, and Factory Overhead Costs

Grayson Company is a manufacturer that uses a job order cost system. The following data summarize the operations related to production for January, the first month of operations:

a. Purchased 400 units of materials at $14 per unit on account.

b. Requisitioned materials for production as follows:
- 200 units for Job 101 at $12 per unit.
- 300 units for Job 102 at $14 per unit.

c. Accumulated direct labor cost as follows:
- 700 hours of direct labor on Job 101 at $16 per hour.
- 600 hours of direct labor on Job 102 at $12 per hour.

d. Incurred factory overhead costs as follows: indirect materials, $800; indirect labor, $3,400; utilities cost, $1,600; and factory depreciation, $2,500.

Journalize the entries to record these transactions.

Solution:

a.	Materials	5,600	
	Accounts Payable		5,600
b.	Work in Process	6,600	
	Materials		6,600
c.	Work in Process	18,400	
	Wages Payable		18,400
d.	Factory Overhead	8,300	
	Materials		800
	Wages Payable		3,400
	Utilities Payable		1,600
	Accumulated Depreciation—Factory		2,500

Purchase of Materials
400 units × $14 per unit

Requisition of Materials

	Qty.		Price		Total Cost
Job 101	200	×	$12	=	$2,400
Job 102	300	×	$14	=	4,200
Total					$6,600

Direct Labor Cost

	Hours		Rate		Total Cost
Job 101	700	×	$16	=	$11,200
Job 102	600	×	$12	=	7,200
Total					$18,400

Check Up Corner

Allocating Factory Overhead Factory overhead is different from direct labor and direct materials in that it is *indirectly* related to the jobs. That is, factory overhead costs cannot be identified with or traced to specific jobs. For this reason, factory overhead costs are allocated to jobs. The process by which factory overhead or other costs are assigned to a cost object, such as a job, is called **cost allocation**.

The factory overhead costs are *allocated* to jobs using a common measure related to each job. This measure is called an **activity base**, *allocation base*, or *activity driver*. The activity base used to allocate overhead should reflect the consumption or use of factory overhead costs. Three common activity bases used to allocate factory overhead costs are direct labor hours, direct labor cost, and machine hours.

Predetermined Factory Overhead Rate Factory overhead costs are normally allocated or *applied* to jobs using a **predetermined factory overhead rate**. The predetermined factory overhead rate is computed as follows:

$$\text{Predetermined Factory Overhead Rate} = \frac{\text{Estimated Total Factory Overhead Costs}}{\text{Estimated Activity Base}}$$

To illustrate, assume that **Legend Guitars** estimates the total factory overhead cost as $50,000 for the year and the activity base as 10,000 direct labor hours. The predetermined factory overhead rate of $5 per direct labor hour is computed as follows:

$$\text{Predetermined Factory Overhead Rate} = \frac{\$50{,}000}{10{,}000 \text{ direct labor hours}} = \$5 \text{ per direct labor hour}$$

As illustrated, the predetermined overhead rate is computed using *estimated* amounts at the beginning of the period. This is because managers need timely information on the product costs of each job. If a company waited until all overhead costs were known at the end of the period, the allocated factory overhead would be accurate, but not timely. Only through timely reporting can managers adjust manufacturing methods or product pricing.

Why It Matters

Advanced Robotics

Boston Consulting Group (BCG) believes the use of advanced robotics in manufacturing is about to take off. It estimates that by 2025, 25% of all tasks will be automated through robotics, driving a 10–30% increase in productivity. China, the United States, Japan, Germany, and South Korea will be the primary drivers of this trend. BCG anticipates significant use of advanced robotics will have a number of important impacts on manufacturing:

- Robotics reduces the need to move factories to low-labor cost countries to save costs.
- Robotics will reduce the size of manufacturing facilities, allowing for greater flexibility and a more regional focus.
- The economic costs of robotics will decline, opening up their broad use.
- The workforce will require new skills, such as programming and technical maintenance, to support robotic manufacturing. For example, **Shenzhen Everwin Precision Technology** recently announced plans to replace 90% of its 1,800 employees with advanced robotics in the near future. The remaining employees will be retrained to work with the robots.

Increasing use of robots will cause direct labor to go down, while factory overhead will increase. As a result, accurate factory overhead allocation will become increasingly important in these advanced manufacturing environments.

Source: Boston Consulting Group, *"The Shifting Economics of Global Manufacturing: How a Takeoff in Advanced Robotics Will Power the Next Productivity Surge,"* February 2015.

Many companies are using a method for accumulating and allocating factory overhead costs. This method, called **activity-based costing**, uses a different overhead rate for each type of factory overhead activity, such as inspecting, moving, and machining. Activity-based costing is discussed and illustrated in Chapter 4.

Applying Factory Overhead to Work in Process **Legend Guitars** applies factory overhead using a rate of $5 per direct labor hour. The factory overhead applied to each job is recorded in the job cost sheets, as shown in Exhibit 6.

Exhibit 6
Applying Factory Overhead to Jobs

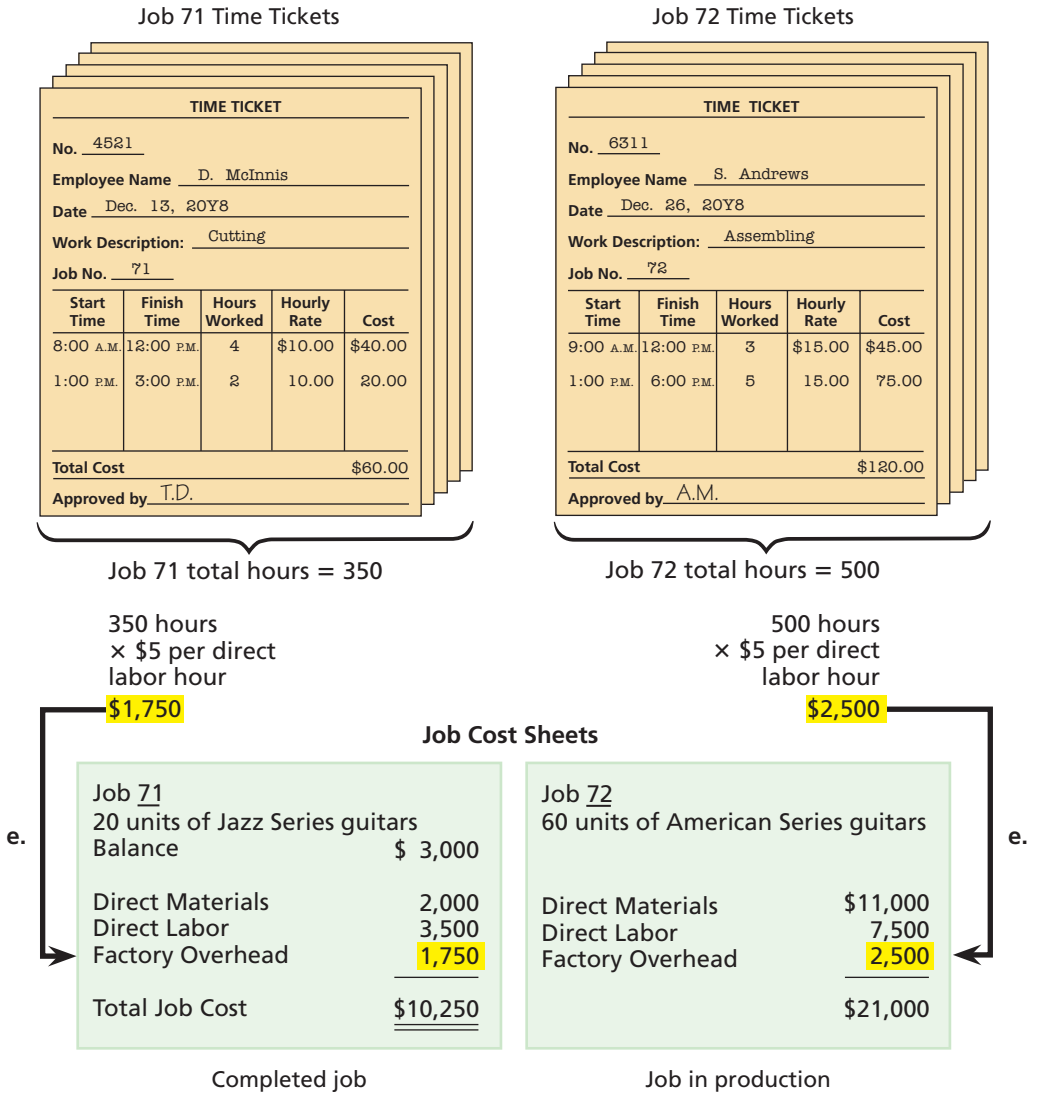


Exhibit 6 shows that 850 direct labor hours were used in Legend Guitars' December operations. Based on the time tickets, 350 hours can be traced to Job 71, and 500 hours can be traced to Job 72.

Using a factory overhead rate of $5 per direct labor hour, $4,250 of factory overhead is applied as follows:

	Direct Labor Hours	Factory Overhead Rate	Factory Overhead Applied
Job 71	350	$5	$1,750 (350 hrs. × $5)
Job 72	500	$5	2,500 (500 hrs. × $5)
Total	850		$4,250

As shown in Exhibit 6, the applied overhead is posted to each job cost sheet. Factory overhead of $1,750 is posted to Job 71, which results in a total product cost on December 31, 20Y8, of $10,250. Factory overhead of $2,500 is posted to Job 72, which results in a total product cost on December 31, 20Y8, of $21,000.

The journal entry to apply factory overhead increases (debits) Work in Process and decreases (credits) Factory Overhead. The journal entry to apply overhead to Jobs 71 and 72 is as follows:

e.	Work in Process	4,250	
	Factory Overhead		4,250
	Factory overhead applied to jobs according to the predetermined overhead rate (850 hrs. × $5).		

A = L + E
+ −

To summarize, the factory overhead account is:

- Increased (debited) for the *actual overhead* costs incurred, as shown for transaction (d).
- Decreased (credited) for the *applied overhead*, as shown for transaction (e).

The actual and applied overhead usually differ because the actual overhead costs are normally different from the estimated overhead costs. Depending on whether actual overhead is greater or less than applied overhead, the factory overhead account will either have a debit or credit ending balance as follows:

- If the applied overhead is *less than* the actual overhead incurred, the factory overhead account will have a debit balance. This debit balance is called **underapplied factory overhead** or *underabsorbed factory overhead*.
- If the applied overhead is *more than* the actual overhead incurred, the factory overhead account will have a credit balance. This credit balance is called **overapplied factory overhead** or *overabsorbed factory overhead*.

The factory overhead account for Legend Guitars, which follows, illustrates both underapplied and overapplied factory overhead. Specifically, the December 1, 20Y8, credit balance of $200 represents overapplied factory overhead. In contrast, the December 31, 20Y8, debit balance of $150 represents underapplied factory overhead.

Account *Factory Overhead* *Account No.*

Date	Item	Post. Ref.	Debit	Credit	Balance Debit	Balance Credit
20Y8 Dec. 1	Balance					200
31	Factory overhead cost incurred		4,600		4,400	
31	Factory overhead cost applied			4,250	150	

Underapplied balance
Overapplied balance

If the balance of factory overhead (either underapplied or overapplied) becomes large, the balance and related overhead rate should be investigated. For example, a large balance could be caused by changes in manufacturing methods. In this case, the factory overhead rate should be revised.

Link to Gibson Guitars

Gibson incurs a variety of overhead costs in making guitars, including depreciation on buildings and equipment.

Check Up Corner 2-2 Applying Overhead and Determining Job Cost

Grayson Company estimates that total factory overhead costs will be $100,000 for the year. Direct labor hours are estimated as 25,000 for the year. The company has two completed jobs at the end of January, Jobs 101 and 102. The direct labor hours and units produced for these jobs are as follows:

	Direct Labor Hours	Units Produced
Job 101	700	500
Job 102	600	1,000

a. Using the information provided, determine:
   1. The predetermined factory overhead rate using direct labor hours as the activity base.
   2. The amount of factory overhead applied to Jobs 101 and 102 in January.

b. Prepare the journal entry to apply factory overhead to both jobs in January using the predetermined overhead rate from (a).

c. Using the information provided along with the job cost information from Check Up Corner 2-1, determine:
   1. The balance on the job cost sheets for Jobs 101 and 102 at the end of the month.
   2. The cost per unit for Jobs 101 and 102.

Solution:

a. 1.

$$\text{Predetermined Factory Overhead Rate} = \frac{\text{Estimated Total Factory Overhead Costs}}{\text{Estimated Activity Base}} = \frac{\$100{,}000}{25{,}000 \text{ direct labor hours}} = \$4.00 \text{ per direct labor hour}$$

A predetermined overhead rate is used to apply overhead costs to individual jobs.

2.

	Direct Labor Hours		Factory Overhead Rate		Factory Overhead Applied
Job 101	700	×	$4.00	=	$2,800
Job 102	600	×	$4.00	=	2,400
Total					$5,200

The factory overhead cost applied to each job is recorded on the job cost sheet for each job.

b.

Work in Process	5,200	
Factory Overhead		5,200

c. 1.

	Job 101	Job 102
Direct materials	$ 2,400	$ 4,200
Direct labor	11,200	7,200
Factory overhead	2,800	2,400
Total costs	$16,400	$13,800

The direct materials cost and direct labor cost for each job were determined in Check Up Corner 2-1.

The total costs of each job are accumulated on the job cost sheet.

2. Cost per unit: $ 32.80 ($16,400 ÷ 500 units); $ 13.80 ($13,800 ÷ 1,000 units)

The total cost is divided by the number of units to determine the cost per unit.

Check Up Corner

Disposal of Factory Overhead Balance During the year, the balance in the factory overhead account is carried forward and reported as a deferred debit or credit on the monthly (interim) balance sheets. However, any balance in the factory overhead account should not be carried over to the next year. This is because any such balance applies only to operations of the current year.

If the estimates for computing the predetermined overhead rate are reasonably accurate, the ending balance of Factory Overhead should be relatively small. For this reason, the balance of Factory Overhead at the end of the year is disposed of by transferring it to the cost of goods sold account as follows:[3]

- If there is an ending debit balance (underapplied overhead) in the factory overhead account, it is disposed of by the entry that follows:

Cost of Goods Sold	XXX	
Factory Overhead		XXX
Transfer of underapplied overhead to cost of goods sold.		

- If there is an ending credit balance (overapplied overhead) in the factory overhead account, it is disposed of by the entry that follows:

Factory Overhead	XXX	
Cost of Goods Sold		XXX
Transfer of overapplied overhead to cost of goods sold.		

To illustrate, the journal entry to dispose of **Legend Guitars**' December 31, 20Y8, underapplied overhead balance of $150 is as follows:

f.	Cost of Goods Sold	150	
	Factory Overhead		150
	Closed underapplied factory overhead to cost of goods sold.		

A = L + E
– – Exp

Pathways Challenge



This is Accounting!

Economic Activity

Over- or underapplied overhead is normally transferred to cost of goods sold. However, if the amount of over- or underapplied overhead is large enough that it could impact the decisions of users, it should be allocated among the work in process, finished goods, and cost of goods sold accounts.

Critical Thinking/Judgment

Could a manager increase the company's operating income by allocating over- or underapplied overhead allocation to work in process, finished goods, and cost of goods sold?

If operating income could be manipulated by allocating over- or underapplied overhead, why don't generally accepted accounting principles (GAAP) *always* require allocation?

Suggested answer at end of chapter.

[3] An ending balance in the factory overhead account may also be allocated among the work in process, finished goods, and cost of goods sold accounts. This brings these accounts into agreement with the actual costs incurred. This approach is rarely used and is only required for large ending balances in the factory overhead account. For this reason, it will not be used in this text.

Work in Process

During the period, Work in Process is increased (debited) for the following:

- Direct materials cost
- Direct labor cost
- Applied factory overhead cost

To illustrate, the work in process account for **Legend Guitars** is shown in Exhibit 7. The balance of Work in Process on December 1, 20Y8 (beginning balance), was $3,000. As shown in Exhibit 7, this balance relates to Job 71, which was the only job in process on this date. During December, Work in Process was debited for the following:

- Direct materials cost of $13,000 [transaction (b)], based on materials requisitions.
- Direct labor cost of $11,000 [transaction (c)], based on time tickets.
- Applied factory overhead of $4,250 [transaction (e)], based on the predetermined overhead rate of $5 per direct labor hour.

Exhibit 7
Job Cost Sheets and the Work in Process Controlling Account

Job Cost Sheets

Job 71 20 units of Jazz Series guitars	
Balance	$ 3,000
Direct Materials	2,000
Direct Labor	3,500
Factory Overhead	1,750
Total Job Cost	$10,250
Unit Cost	$512.50

Job 72 60 units of American Series guitars	
Direct Materials	$11,000
Direct Labor	7,500
Factory Overhead	2,500
Total Job Cost	$21,000

g.

Account *Work in Process* *Account No.*

Date		Item	Post. Ref.	Debit	Credit	Balance Debit	Balance Credit
20Y8 Dec.	1	Balance				3,000	
	31	Direct materials		13,000		16,000	
	31	Direct labor		11,000		27,000	
	31	Factory overhead		4,250		31,250	
	31	Jobs completed—Job 71			10,250	21,000	

The preceding Work in Process debits are supported by the postings to job cost sheets for Jobs 71 and 72, as shown in Exhibit 7.

During December, Job 71 was completed. Upon completion, the product costs (direct materials, direct labor, factory overhead) are totaled. This total is divided by the number of units produced to determine the cost per unit. Thus, the 20 Jazz Series guitars produced as Job 71 cost $512.50 ($10,250 ÷ 20) per guitar.

After completion, Job 71 is transferred from Work in Process to Finished Goods by the following entry:

A = **L** + **E**
+ −

g.	Finished Goods	10,250	
	Work in Process		10,250
	Job 71 completed in December.		

Job 72 was started in December but was not completed by December 31, 20Y8. Thus, Job 72 is still part of work in process on December 31, 20Y8. As shown in Exhibit 7, the balance of the job cost sheet for Job 72 ($21,000) is also the December 31, 20Y8, balance of Work in Process.

Finished Goods

The finished goods account is a controlling account for the subsidiary **finished goods ledger** or *stock ledger*. Each account in the finished goods ledger contains cost data for the units manufactured, units sold, and units on hand.

Exhibit 8 illustrates the finished goods ledger account for **Legend Guitars**' Jazz Series guitars. The exhibit indicates that there were 40 Jazz Series guitars on hand on December 1, 20Y8. During the month, 20 additional Jazz guitars were completed and transferred to Finished Goods from the completion of Job 71. In addition, the beginning inventory of 40 Jazz guitars was sold during the month.

Exhibit 8
Finished Goods Ledger Account

ITEM: *Jazz Series guitars*

Manufactured			Shipped			Balance			
Job Order No.	Quantity	Amount	Ship Order No.	Quantity	Amount	Date	Quantity	Amount	Unit Cost
						Dec. 1	40	$20,000	$500.00
			643	40	$20,000	9	—	—	—
71	20	$10,250				31	20	10,250	512.50

A virtual tour of **Gibson**'s Bozeman, Montana, manufacturing plant can be found at www2.gibson.com. The Bozeman plant makes acoustical guitars similar to those illustrated in this chapter. Acoustical guitars that do not require power or amps to produce sound are often used for folk and country music. Electric guitars are most often used for metal and rock music.

Link to Gibson Guitars

Sales and Cost of Goods Sold

During December, **Legend Guitars** sold 40 Jazz Series guitars for $850 each, generating total sales of $34,000 ($850 × 40 guitars). Exhibit 8 indicates that the cost of these guitars was $500 per guitar or a total cost of $20,000 ($500 × 40 guitars). The entries to record the sale and related cost of goods sold are as follows:

h.	Accounts Receivable	34,000		
	Sales		34,000	
	Revenue received from guitars sold on account.			

A = L + E
+ + Rev

i.	Cost of Goods Sold	20,000		
	Finished Goods		20,000	
	Cost of 40 Jazz Series guitars sold.			

A = L + E
− − Exp

In a job order cost accounting system, the preparation of a statement of cost of goods manufactured, which was discussed in Chapter 1, is not necessary. This is because job order costing uses the perpetual inventory system and, thus, the cost of goods sold can be directly determined from the finished goods ledger as illustrated in Exhibit 8.

Period Costs

Period costs are used in generating revenue during the current period but are not involved in the manufacturing process. As discussed in Chapter 1, *period costs* are recorded as expenses of the current period as either selling or administrative expenses.

Selling expenses are incurred in marketing the product and delivering sold products to customers. Administrative expenses are incurred in managing the company but are not related to the manufacturing or selling functions. During December, **Legend Guitars** recorded the following selling and administrative expenses:

A = L + E
+ − Exp

j.	Sales Salaries Expense	2,000	
	Office Salaries Expense	1,500	
	Salaries Payable		3,500
	Recorded December period costs.		

Summary of Cost Flows for Legend Guitars

Exhibit 9 shows the cost flows through the manufacturing accounts of **Legend Guitars** for December. In addition, summary details of the following subsidiary ledgers are shown:

- *Materials Ledger*—the subsidiary ledger for Materials.
- *Job Cost Sheets*—the subsidiary ledger for Work in Process.
- *Finished Goods Ledger*—the subsidiary ledger for Finished Goods.

Entries in the accounts shown in Exhibit 9 are identified by letters. These letters refer to the journal entries described and illustrated in the chapter. Entries (h) and (j) are not shown because they do not involve a flow of manufacturing costs.

As shown in Exhibit 9, the balances of Materials, Work in Process, and Finished Goods are supported by their subsidiary ledgers. These balances are as follows:

Controlling Account	Balance and Total of Related Subsidiary Ledger
Materials	$ 3,500
Work in Process	21,000
Finished Goods	10,250

The income statement for **Legend Guitars** is shown in Exhibit 10.

Why It Matters

Job Order Costing in Hollywood

A manufacturer uses a job order system to accumulate direct labor, direct material, and factory overhead costs by production job. In a similar way, Hollywood accumulates costs for a particular movie. However, rather than factory labor, a movie has the salaries of actors, directors, writers, and other creative and technical staff in making the movie. Rather than manufacturing materials, a movie will have scenery, costumes, props, and other materials in making the film. A movie will also have indirect costs associated with supervision, accounting, casting, and other costs that the studio shares with other movies. Such shared costs are allocated to each movie project using an overhead rate similar to that found in manufacturing. Work in process represents the costs accumulated while a movie is in production. A completed movie is treated similarly to finished goods inventory. Upon release, the accumulated costs will be expensed on the income statement as revenues from theatrical release, online streaming, cable, DVDs, and Blu-ray discs are being earned.

Exhibit 9 Flow of Manufacturing Costs for Legend Guitars

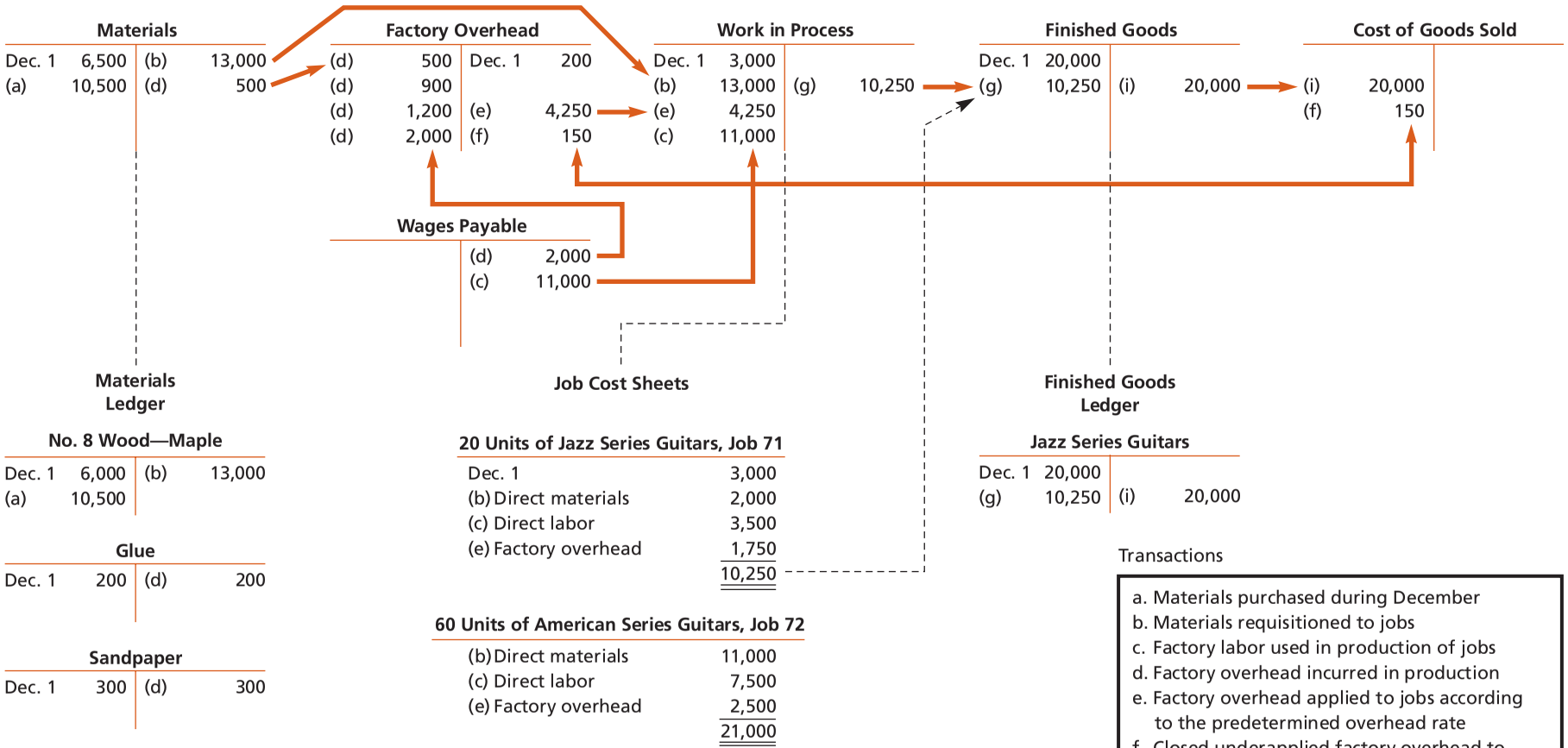


Exhibit 10
Income Statement of Legend Guitars

Legend Guitars
Income Statement
For the Month Ended December 31, 20Y8

Sales		$ 34,000
Cost of goods sold		(20,150)*
Gross profit		$ 13,850
Selling and administrative expenses:		
Sales salaries expense	$2,000	
Office salaries expense	1,500	
Total selling and administrative expenses		(3,500)
Operating income		$ 10,350

*$20,150 = ($500 × 40 guitars) + $150 underapplied factory overhead

Objective 3
Describe job order cost accounting systems for service businesses.

Job Order Cost Systems for Service Businesses

A job order cost accounting system may be used by a service business. However, whether a service business uses a job order cost system depends upon the nature of the service provided to customers.

Types of Service Businesses

Hotels, taxis, newspapers, attorneys, accountants, and hospitals provide services to customers. All these businesses, however, would not use job order costing. For example, hotels, taxis, and newspapers would normally not use a job order cost system. In contrast, attorneys, accountants, and hospitals normally would use a job order system.

A service business using job order costing normally renders a service that is unique to each customer with related costs that vary significantly with each customer. For example, while hotels provide a service, the service is the same for each guest on any given night. In contrast, an attorney or hospital provides a unique service for each client or patient. In addition, each client or patient incurs costs that are unique to them. For this reason, attorneys and hospitals normally use job order cost systems.[4] Other examples of service businesses using job order cost systems include advertising agencies, event planners, and car repair shops.

Flow of Costs in a Service Job Order Cost System

A service business using a job order cost system views each customer, client, or patient as a separate job for which costs are accumulated and reported.

Since a service is being provided, the primary product costs are normally direct labor and overhead. Any materials or supplies used in rendering services are usually insignificant. As a result, materials and supply costs are included as part of the overhead cost.

Like a manufacturing business, the direct labor and overhead costs of rendering services to clients are accumulated in a work in process account. Work in Process is supported by a cost ledger with a job cost sheet for each client.

When a job is completed and the client is billed, the costs are transferred to a cost of services account. Cost of Services is similar to the cost of goods sold account for a merchandising or manufacturing business. A finished goods account and related finished goods ledger are not necessary. This is because services cannot be inventoried and the revenues for the services are recorded upon completion.

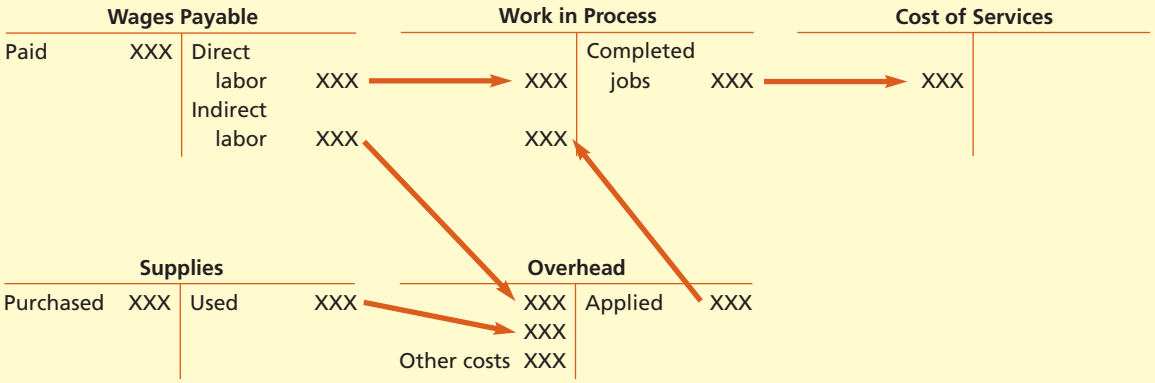
In practice, other considerations unique to service businesses may need to be considered. For example, a service business may bill clients on a weekly or monthly basis rather than when a job is completed. In such cases, a portion of the costs related to each billing is transferred from the work in process account to the cost of services account. A service business may also bill clients

[4] Service businesses using job order cost systems often require each customer, client, or patient to sign a contract that describes the nature of the service being rendered.

for services in advance, which would be accounted for as deferred revenue until the services are completed.

The flow of costs through a service business using a job order cost accounting system is shown in Exhibit 11.

Exhibit 11 Flow of Costs Through a Service Business



Check Up Corner 2-3 Job Order Costing for a Service Business

The Mad-Fly Agency provides consulting services to a variety of clients across the country. The agency accumulates costs for each consulting project on the basis of direct labor costs and allocated overhead costs. Mad-Fly's estimated direct labor and overhead costs for the year are as follows:

Direct labor hours (professional staff)	20,000 hours
Hourly rate for professional staff	$180 per hour
Estimated total overhead costs	$1,200,000

Mad-Fly allocates overhead costs to individual jobs based on the total estimated direct labor hours of its professional services staff.

a. Determine Mad-Fly's estimated predetermined overhead rate for the year.

b. Mad-Fly started and completed a consulting job for MT Industries during the year (Job 402). The job required 200 direct labor hours of professional staff. Determine the cost of the MT Industries job (Job 402).

Solution:

a. $$\text{Predetermined Overhead Rate} = \frac{\text{Estimated Total Overhead Costs}}{\text{Estimated Activity Base}} = \frac{\$1{,}200{,}000}{20{,}000 \text{ direct labor hours}} = \$60 \text{ per direct labor hour}$$

The primary costs for a service business are direct labor and overhead costs.

b.

$$\underbrace{\text{Direct Labor Hours} \times \text{Hourly Rate for Professional Staff} = \text{Direct Labor Cost}}_{\text{Direct Labor Cost (Job 402)}}$$

$$200 \times \$180 = \$36{,}000$$

$$\underbrace{\text{Direct Labor Hours} \times \text{Predetermined Overhead Rate} = \text{Overhead Applied}}_{\text{Overhead Applied (Job 402)}}$$

$$200 \times \$60 = \$12{,}000$$

A predetermined overhead rate is used to apply overhead costs to individual jobs.

Job 402	
Direct labor	$36,000
Overhead applied	12,000
Total cost of services	$48,000

When a job is completed and the client is billed, the costs are transferred to a cost of services account.

Check Up Corner

Analysis for Decision Making

Objective 4
Describe the use of job order cost information for decision making.

Analyzing Job Costs

A job order cost accounting system accumulates and records product costs by jobs. The resulting total and unit product costs can be compared to similar jobs, compared over time, or compared to expected costs. In this way, a job order cost system can be used by managers for evaluating and controlling costs.

To illustrate, Exhibit 12 shows the direct materials used for Jobs 54 and 63 for **Legend Guitars**. The wood used in manufacturing guitars is measured in board feet. Because Jobs 54 and 63 produced the same type and number of guitars, the direct materials cost per unit should be about the same. However, the materials cost per guitar for Job 54 is $100, while for Job 63 it is $125. Thus, the materials costs are significantly more for Job 63.

The job cost sheets shown in Exhibit 12 can be analyzed for possible reasons for the increased materials cost for Job 63. Because the materials price did not change ($10 per board foot), the increased materials cost must be related to the wood used.

Exhibit 12
Comparing Data from Job Cost Sheets

Job 54
Item: 40 Jazz Series guitars

	Materials Quantity (board feet)	Materials Price	Materials Amount
Direct materials:			
No. 8 Wood—Maple	400	$10.00	$4,000
Direct materials per guitar			$ 100*

*$4,000 ÷ 40

Job 63
Item: 40 Jazz Series guitars

	Materials Quantity (board feet)	Materials Price	Materials Amount
Direct materials:			
No. 8 Wood—Maple	500	$10.00	$5,000
Direct materials per guitar			$ 125*

*$5,000 ÷ 40

Job 54 used 400 board feet to produce 40 guitars. In contrast, Job 63 used 500 board feet to produce the same number of guitars. Thus, the cause of the extra 100 board feet used for Job 63 should be investigated. Possible explanations could include the following:

- A new employee, who was not properly trained, cut the wood for Job 63. As a result, there was excess waste and scrap.
- The wood used for Job 63 was purchased from a new supplier. The wood was of poor quality, which created excessive waste and scrap.
- The cutting tools needed repair and were not properly maintained. As a result, the wood was miscut, which created excessive waste and scrap.
- The instructions attached to the job were incorrect. The wood was cut according to the instructions. The incorrect instructions were discovered later in assembly. As a result, the wood had to be recut and the initial cuttings scrapped.

Make a Decision Analyzing Job Costs

Analyze Antolini Enterprises' job costs (MAD 2-1)
Analyze Alvarez Manufacturing Inc.'s job costs (MAD 2-2)
Analyze Raneri Trophies Inc.'s job costs (MAD 2-3)
Analyze Brady Furniture Company's job costs (MAD 2-4)

Make a Decision

Let's Review

Chapter Summary

1. A cost accounting system accumulates product costs. The two primary cost accounting systems are the job order and the process cost systems. Job order cost systems accumulate costs for each quantity of product that passes through the factory. Process cost systems accumulate costs for each department or process within the factory.
2. A job order cost system accumulates costs for each quantity of product, or "job," that passes through the factory. Direct materials, direct labor, and factory overhead are accumulated on the job cost sheet, which is the subsidiary cost ledger for each job. Direct materials and direct labor are assigned to individual jobs, based on the quantity used. Factory overhead costs are assigned to each job, based on an activity base that reflects the use of factory overhead costs.
3. Job order cost accounting systems can be used by service businesses to plan and control operations. Because the product is a service, the focus is on direct labor and overhead costs. The costs of providing a service are accumulated in a work in process account and transferred to a cost of services account upon completion.
4. A job order cost accounting system accumulates and records product costs by jobs. The resulting total and unit product costs can be compared to similar jobs, compared over time, or compared to expected costs. In this way, a job order cost system can be used by managers for evaluating and controlling costs.

Key Terms

activity base (55)
activity-based costing (56)
cost accounting systems (48)
cost allocation (55)
finished goods ledger (61)
indirect labor (54)
indirect materials (54)
job cost sheets (52)
job order cost system (48)
materials ledger (50)
materials requisition (52)
overapplied factory overhead (57)
predetermined factory overhead rate (55)
process cost system (48)
receiving report (51)
time tickets (52)
underapplied factory overhead (57)

Practice

Multiple-Choice Questions

1. For which of the following would the job order cost system be appropriate?
   a. Antique furniture repair shop
   b. Rubber manufacturer
   c. Coal manufacturer
   d. Computer chip manufacturer

2. The journal entry to record the requisition of materials to the factory in a job order cost system is a debit to:
   a. Materials.
   b. Accounts Payable.
   c. Work in Process.
   d. Cost of Goods Sold.

3. Job cost sheets accumulate all of the following costs except for:
   a. direct materials.
   b. indirect materials.
   c. direct labor.
   d. factory overhead applied.

4. A company estimated $420,000 of factory overhead cost and 16,000 direct labor hours for the period. During the period, a job was completed with $4,500 of direct materials and $3,000 of direct labor. The direct labor rate was $15 per hour. What is the factory overhead applied to this job?
   a. $2,100
   b. $5,250
   c. $78,750
   d. $420,000

5. If the factory overhead account has a credit balance, factory overhead is said to be:
   a. underapplied.
   b. overapplied.
   c. underabsorbed.
   d. in error.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Issuance of materials — Obj. 2

On April 6, Almerinda Company purchased on account 60,000 units of raw materials at $12 per unit. On April 21, raw materials were requisitioned for production as follows: 25,000 units for Job 50 at $10 per unit and 27,000 units for Job 51 at $12 per unit. Journalize the entry on April 6 to record the purchase and on April 21 to record the requisition from the materials storeroom.

2. Direct labor costs — Obj. 2

During April, Almerinda Company accumulated 20,000 hours of direct labor costs on Job 50 and 24,000 hours on Job 51. The total direct labor was incurred at a rate of $20 per direct labor hour for Job 50 and $22 per direct labor hour for Job 51. Journalize the entry to record the flow of labor costs into production during April.

3. Factory overhead costs — Obj. 2

During April, Almerinda Company incurred factory overhead costs as follows: indirect materials, $42,000; indirect labor, $90,000; utilities cost, $16,000; and factory depreciation, $54,000. Journalize the entry to record the factory overhead incurred during April.

4. Applying factory overhead — Obj. 2

Almerinda Company estimates that total factory overhead costs will be $1,750,000 for the year. Direct labor hours are estimated to be 500,000. For Almerinda Company, (a) determine the predetermined factory overhead rate using direct labor hours as the activity base, (b) determine the amount of factory overhead applied to Jobs 50 and 51 in April using the data on direct labor hours from Exercises 2 and 3, and (c) prepare the journal entry to apply factory overhead to both jobs in April according to the predetermined overhead rate.

5. Job costs **Obj. 2**

At the end of April, Almerinda Company had completed Jobs 50 and 51. Job 50 is for 23,040 units, and Job 51 is for 26,000 units. Using the data from Exercises 1 through 4, determine (a) the balance on the job cost sheets for Jobs 50 and 51 at the end of April and (b) the cost per unit for Jobs 50 and 51 at the end of April.

6. Cost of goods sold **Obj. 2**

Hosmer Company completed 312,000 units during the year at a cost of $7,800,000. The beginning finished goods inventory was 22,000 units at $440,000. Determine the cost of goods sold for 325,000 units, assuming a FIFO cost flow.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Wildwing Entertainment Inc. is a manufacturer that uses a job order cost system. The following data summarize the operations related to production for March, the first month of operations:

a. Materials purchased on account, $15,500.

b. Materials requisitioned and labor used:

	Materials	Factory Labor
Job No. 100	$2,650	$1,770
Job No. 101	1,240	650
Job No. 102	980	420
Job No. 103	3,420	1,900
Job No. 104	1,000	500
Job No. 105	2,100	1,760
For general factory use	450	650

c. Factory overhead costs incurred on account, $2,700.

d. Depreciation of machinery, $1,750.

e. Factory overhead is applied at a rate of 70% of direct labor cost.

f. Jobs completed: Nos. 100, 101, 102, 104.

g. Jobs 100, 101, and 102 were shipped, and customers were billed for $8,100, $3,800, and $3,500, respectively.

Instructions

1. Journalize the entries to record these transactions.
2. Determine the account balances for Work in Process and Finished Goods.
3. Prepare a schedule of unfinished jobs to support the balance in the work in process account.
4. Prepare a schedule of completed jobs on hand to support the balance in the finished goods account.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **a** Job order cost systems are best suited to businesses manufacturing special orders from customers, such as would be the case for a repair shop for antique furniture (answer a). A process cost system is best suited for manufacturers of similar units of products such as rubber manufacturers (answer b), coal manufacturers (answer c), and computer chip manufacturers (answer d).

2. **c** The journal entry to record the requisition of materials to the factory in a job order cost system is a debit to Work in Process and a credit to Materials.

3. **b** The job cost sheet accumulates the cost of direct materials (answer a), direct labor (answer c), and factory overhead applied (answer d). Indirect materials (answer b) are NOT accumulated on the job cost sheets, but are included as part of factory overhead applied.

4. **b**

$$\text{Predetermined Factory Overhead Rate} = \frac{\text{Estimated Total Factory Overhead Costs}}{\text{Estimated Activity Base}}$$

$$= \frac{\$420{,}000}{16{,}000 \text{ dlh}} = \$26.25$$

$$\text{Hours applied to the job} = \frac{\$3{,}000}{\$15 \text{ per hour}} = 200 \text{ hours}$$

Factory overhead applied to the job = 200 hours × $26.25 = $5,250

5. **b** If the amount of factory overhead applied during a particular period exceeds the actual overhead costs, the factory overhead account will have a credit balance and is said to be overapplied (answer b) or overabsorbed. If the amount applied is less than the actual costs, the account will have a debit balance and is said to be underapplied (answer a) or underabsorbed (answer c). Since an "estimated" predetermined overhead rate is used to apply overhead, a credit balance does not necessarily represent an error (answer d).

Exercises

1.

Apr.	6	Materials	720,000	
		Accounts Payable		720,000
		$720,000 = 60,000 × $12.		
	21	Work in Process*	574,000	
		Materials		574,000

* Job 50 $250,000 = 25,000 × $10
Job 51 324,000 = 27,000 × $12
Total $574,000

2.

Work in Process*		928,000	
Wages Payable			928,000

* Job 50 $400,000 = 20,000 hours × $20
Job 51 528,000 = 24,000 hours × $22
Total $928,000

3.

Factory Overhead	202,000	
Materials		42,000
Wages Payable		90,000
Utilities Payable		16,000
Accumulated Depreciation—Factory		54,000

4. a. $3.50 per direct labor hour = $1,750,000 ÷ 500,000 direct labor hours
   b. Job 50 $ 70,000 = 20,000 hours × $3.50 per hour
   Job 51 84,000 = 24,000 hours × $3.50 per hour
   $154,000

   c.

Work in Process	154,000	
Factory Overhead		154,000

5. a.

	Job 50	Job 51
Direct materials	$250,000	$324,000
Direct labor	400,000	528,000
Factory overhead	70,000	84,000
Total costs	$720,000	$936,000

   b. Job 50 $31.25 = $720,000 ÷ 23,040 units
   Job 51 $36.00 = $936,000 ÷ 26,000 units

6. $8,015,000 = $440,000 + (303,000 × $25)*

   *Cost per unit of goods produced during the year = $25 = $7,800,000 ÷ 312,000 units

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1. a.

Materials	15,500	
Accounts Payable		15,500

   b.

Work in Process	11,390	
Materials		11,390
Work in Process	7,000	
Wages Payable		7,000
Factory Overhead	1,100	
Materials		450
Wages Payable		650

   c.

Factory Overhead	2,700	
Accounts Payable		2,700

(Continued)

d.

Factory Overhead	1,750	
Accumulated Depreciation—Machinery		1,750

e.

Work in Process	4,900	
Factory Overhead (70% of $7,000)		4,900

f.

Finished Goods	11,548	
Work in Process		11,548

Computation of the cost of jobs finished:

Job	Direct Materials	Direct Labor	Factory Overhead	Total
Job No. 100	$2,650	$1,770	$1,239	$ 5,659
Job No. 101	1,240	650	455	2,345
Job No. 102	980	420	294	1,694
Job No. 104	1,000	500	350	1,850
				$11,548

g.

Accounts Receivable	15,400	
Sales		15,400
Cost of Goods Sold	9,698	
Finished Goods		9,698

Cost of jobs sold computation:

Job No. 100	$5,659
Job No. 101	2,345
Job No. 102	1,694
	$9,698

2. Work in Process: $11,742 ($11,390 + $7,000 + $4,900 – $11,548)

   Finished Goods: $1,850 ($11,548 – $9,698)

3.

Schedule of Unfinished Jobs

Job	Direct Materials	Direct Labor	Factory Overhead	Total
Job No. 103	$3,420	$1,900	$1,330	$ 6,650
Job No. 105	2,100	1,760	1,232	5,092
Balance of Work in Process, March 31				$11,742

4.

Schedule of Completed Jobs

Job No. 104:	
Direct materials	$1,000
Direct labor	500
Factory overhead	350
Balance of Finished Goods, March 31	$1,850

Discussion Questions

1. a. Name two principal types of cost accounting systems.
   b. Which system provides for a separate record of each particular quantity of product that passes through the factory?
   c. Which system accumulates the costs for each department or process within the factory?
2. What kind of firm would use a job order cost system?
3. Which account is used in the job order cost system to accumulate direct materials, direct labor, and factory overhead applied to production costs for individual jobs?
4. What document is the source for (a) debiting the accounts in the materials ledger and (b) crediting the accounts in the materials ledger?
5. What is a job cost sheet?
6. What is the difference between a clock card and time ticket?
7. Discuss how the predetermined factory overhead rate can be used in job order cost accounting to assist management in pricing jobs.
8. a. How is a predetermined factory overhead rate computed?
   b. Name three common bases used in computing the rate.
9. a. What is (1) overapplied factory overhead and (2) underapplied factory overhead?
   b. If the factory overhead account has a debit balance, was factory overhead underapplied or overapplied?
   c. If the factory overhead account has a credit balance at the end of the first month of the fiscal year, where will the amount of this balance be reported on the interim balance sheet?
10. Describe how a job order cost system can be used for professional service businesses.

Basic Exercises



BE 2-1 Issuance of materials **Obj. 2**

On May 7, Bergan Company purchased on account 10,000 units of raw materials at $8 per unit. During May, raw materials were requisitioned for production as follows: 7,500 units for Job 200 at $8 per unit and 1,480 units for Job 305 at $5 per unit. Journalize the entry on May 7 to record the purchase and on May 31 to record the requisition from the materials storeroom.



BE 2-2 Direct labor costs **Obj. 2**

During May, Bergan Company accumulated 2,500 hours of direct labor costs on Job 200 and 3,000 hours on Job 305. The total direct labor was incurred at a rate of $28 per direct labor hour for Job 200 and $24 per direct labor hour for Job 305. Journalize the entry to record the flow of labor costs into production during May.



BE 2-3 Factory overhead costs **Obj. 2**

During May, Bergan Company incurred factory overhead costs as follows: indirect materials, $8,800; indirect labor, $6,600; utilities cost, $4,800; and factory depreciation, $9,000. Journalize the entry to record the factory overhead incurred during May.



BE 2-4 Applying factory overhead **Obj. 2**

Bergan Company estimates that total factory overhead costs will be $620,000 for the year. Direct labor hours are estimated to be 80,000. For Bergan Company, (a) determine the predetermined factory overhead rate using direct labor hours as the activity base, (b) determine the amount of factory overhead applied to Jobs 200 and 305 in May using the data on direct labor hours from BE 2-2, and (c) prepare the journal entry to apply factory overhead to both jobs in May according to the predetermined overhead rate.

SHOW ME HOW

BE 2-5 Job costs — Obj. 2

At the end of May, Bergan Company had completed Jobs 200 and 305. Job 200 is for 2,390 units, and Job 305 is for 2,053 units. Using the data from BE 2-1, BE 2-2, and BE 2-4, determine (a) the balance on the job cost sheets for Jobs 200 and 305 at the end of May, and (b) the cost per unit for Jobs 200 and 305 at the end of May.

SHOW ME HOW

BE 2-6 Cost of goods sold — Obj. 2

Pine Creek Company completed 200,000 units during the year at a cost of $3,000,000. The beginning finished goods inventory was 25,000 units at $310,000. Determine the cost of goods sold for 210,000 units, assuming a FIFO cost flow.

Exercises

EX 2-1 Transactions in a job order cost system — Obj. 2

Five selected transactions for the current month are indicated by letters in the following T accounts in a job order cost accounting system:

Materials	
	(a)

Work in Process	
(a)	(d)
(b)	
(c)	

Wages Payable	
	(b)

Finished Goods	
(d)	(e)

Factory Overhead	
(a)	(c)
(b)	

Cost of Goods Sold	
(e)	

Describe each of the five transactions.

EX 2-2 Cost flow relationships — Obj. 2

✔ b. $3,655,000

SHOW ME HOW

The following information is available for the first year of operations of Creston Inc., a manufacturer of fabricating equipment:

Sales	$12,375,000
Gross profit	5,200,000
Indirect labor	410,000
Indirect materials	180,000
Other factory overhead	810,000
Materials purchased	4,125,000
Total manufacturing costs for the period	7,880,000
Materials inventory, end of period	290,000

Determine the following amounts:

a. Cost of goods sold

b. Direct materials cost

c. Direct labor cost

EX 2-3 Cost of materials issuances under the FIFO method

Obj. 2

✔ b. $2,280

EXCEL TEMPLATE

An incomplete subsidiary ledger of materials inventory for May is as follows:

RECEIVED			ISSUED			BALANCE			
Receiving Report Number	Quantity	Unit Price	Materials Requisition Number	Quantity	Amount	Date	Quantity	Unit Price	Amount
						May 1	285	$30.00	$8,550
40	130	$32.00				May 4	_____	_____	_____
			91	365		May 10	_____	_____	_____
44	110	38.00				May 21	_____	_____	_____
			97	100		May 27	_____	_____	_____

a. Complete the materials issuances and balances for the materials subsidiary ledger under FIFO.

b. Determine the materials inventory balance at the end of May.

c. Journalize the summary entry to transfer materials to work in process.

d. Explain how the materials ledger might be used as an aid in maintaining inventory quantities on hand.

EX 2-4 Entry for issuing materials

Obj. 2

SHOW ME HOW

Materials issued are as follows:

Requisition No.	Material	Job No.	Amount
201	Aluminum	500	$976,000
202	Plastic	503	412,300
203	Rubber	504	187,700
204	Glue	Indirect	150,000
205	Steel	510	619,000

Journalize the entry to record the issuance of materials.

EX 2-5 Entries for materials

Obj. 2

✔ c. fabric, $68,300

SHOW ME HOW

Kingsford Furnishings Company manufactures designer furniture. Kingsford Furnishings uses a job order cost system. Balances on April 1 from the materials ledger are as follows:

Fabric	$58,300
Polyester filling	30,000
Lumber	58,800
Glue	9,950

The materials purchased during April are summarized from the receiving reports as follows:

Fabric	$820,000
Polyester filling	315,000
Lumber	555,000
Glue	80,000

Materials were requisitioned to individual jobs as follows:

	Fabric	Polyester Filling	Lumber	Glue	Total
Job 601	$190,000	$ 66,200	$118,500		$ 374,700
Job 602	365,000	152,100	219,300		736,400
Job 603	255,000	101,700	196,200		552,900
Factory overhead—indirect materials				$83,600	83,600
Total	$810,000	$320,000	$534,000	$83,600	$1,747,600

The glue is not a significant cost, so it is treated as indirect materials (factory overhead).

a. Journalize the entry to record the purchase of materials in April.

b. Journalize the entry to record the requisition of materials in April.

c. Determine the April 30 balances that would be shown in the materials ledger accounts.


SHOW ME HOW

EX 2-6 Entry for factory labor costs

Obj. 2

A summary of the time tickets is as follows:

Job No.	Amount	Job No.	Amount
100	$ 4,800	Indirect	$ 8,220
101	5,875	111	9,430
104	18,250	115	12,675
108	15,500	117	19,225

Journalize the entry to record the factory labor costs.

EX 2-7 Entry for factory labor costs

Obj. 2

The weekly time tickets indicate the following distribution of labor hours for three direct labor employees:

	Hours			
	Job 301	Job 302	Job 303	Process Improvement
Tom Couro	10	15	13	2
David Clancy	12	12	14	2
Jose Cano	11	13	15	1

The direct labor rate earned per hour by the three employees is as follows:

Tom Couro	$32
David Clancy	36
Jose Cano	28

The process improvement category includes training, quality improvement, and other indirect tasks.

a. Journalize the entry to record the factory labor costs for the week.

b. Assume that Jobs 301 and 302 were completed but not sold during the week and that Job 303 remained incomplete at the end of the week. How would the direct labor costs for all three jobs be reflected on the financial statements at the end of the week?


SHOW ME HOW

EX 2-8 Entries for direct labor and factory overhead

Obj. 2

Schumacher Industries Inc. manufactures recreational vehicles. Schumacher Industries uses a job order cost system. The time tickets from June jobs are summarized as follows:

Job 11-101	$ 4,640
Job 11-102	5,510
Job 11-103	6,612
Job 11-104	12,760
Job 11-105	18,270
Factory supervision	12,500

Factory overhead is applied to jobs on the basis of a predetermined overhead rate of $23 per direct labor hour. The direct labor rate is $29 per hour.

a. Journalize the entry to record the factory labor costs.

b. Journalize the entry to apply factory overhead to production for June.

EX 2-9 Factory overhead rates, entries, and account balance

Obj. 2

✔ b. $55.00 per direct labor hour


SHOW ME HOW

Eclipse Solar Company operates two factories. The company applies factory overhead to jobs on the basis of machine hours in Factory 1 and on the basis of direct labor hours in Factory 2. Estimated factory overhead costs, direct labor hours, and machine hours are as follows:

	Factory 1	Factory 2
Estimated factory overhead cost for fiscal year beginning August 1	$18,500,000	$44,000,000
Estimated direct labor hours for year		800,000
Estimated machine hours for year	1,250,000	
Actual factory overhead costs for August	$1,515,800	$3,606,300
Actual direct labor hours for August		64,500
Actual machine hours for August	105,000	

a. Determine the factory overhead rate for Factory 1.
b. Determine the factory overhead rate for Factory 2.
c. Journalize the entries to apply factory overhead to production in each factory for August.
d. Determine the balances of the factory overhead accounts for each factory as of August 31, and indicate whether the amounts represent over- or underapplied factory overhead.

EX 2-10 Predetermined factory overhead rate

Obj. 2



Exotic Engine Shop uses a job order cost system to determine the cost of performing engine repair work. Estimated costs and expenses for the coming period are as follows:

Engine parts	$ 380,000
Shop direct labor	1,872,000
Shop and repair equipment depreciation	62,500
Shop supervisor salaries	240,000
Shop property taxes	36,940
Shop supplies	10,000
Advertising expense	28,000
Administrative office salaries	150,000
Administrative office depreciation expense	8,000
Total costs and expenses	$2,787,440

The average shop direct labor rate is $37.50 per hour.
Determine the predetermined shop overhead rate per direct labor hour.

EX 2-11 Predetermined factory overhead rate

Obj. 2

✔ a. $290 per hour



Poehling Medical Center has a single operating room that is used by local physicians to perform surgical procedures. The cost of using the operating room is accumulated by each patient procedure and includes the direct materials costs (drugs and medical devices), physician surgical time, and operating room overhead. On January 1 of the current year, the annual operating room overhead is estimated to be:

Disposable supplies	$299,600
Depreciation expense	75,000
Utilities	32,000
Nurse salaries	278,500
Technician wages	126,900
Total operating room overhead	$812,000

The overhead costs will be assigned to procedures, based on the number of surgical room hours. Poehling Medical Center expects to use the operating room an average of eight hours per day, seven days per week. In addition, the operating room will be shut down two weeks per year for general repairs.

a. Determine the predetermined operating room overhead rate for the year.
b. Bill Harris had a five-hour procedure on January 22. How much operating room overhead would be charged to his procedure, using the rate determined in part (a)?
c. During January, the operating room was used 240 hours. The actual overhead costs incurred for January were $67,250. Determine the overhead under- or overapplied for the period.

EX 2-12 Entry for jobs completed; cost of unfinished jobs

Obj. 2

✔ b. $76,760



The following account appears in the ledger prior to recognizing the jobs completed in January:

	Work in Process
Balance, January 1	$ 85,800
Direct materials	115,000
Direct labor	140,000
Factory overhead	296,200

(Continued)

Jobs finished during January are summarized as follows:

Job 210	$182,500	Job 224	$232,190
Job 216	78,300	Job 230	67,250

a. Journalize the entry to record the jobs completed.

b. Determine the cost of the unfinished jobs at January 31.

EX 2-13 Entries for factory costs and jobs completed

Obj. 2

✔ d. $122,750

Collegiate Publishing Inc. began printing operations on March 1. Jobs 301 and 302 were completed during the month, and all costs applicable to them were recorded on the related cost sheets. Jobs 303 and 304 are still in process at the end of the month, and all applicable costs except factory overhead have been recorded on the related cost sheets. In addition to the materials and labor charged directly to the jobs, $4,500 of indirect materials and $8,200 of indirect labor were used during the month. The cost sheets for the four jobs entering production during the month are as follows, in summary form:

Job 301	
Direct materials	$12,500
Direct labor	31,000
Factory overhead	7,750
Total	$51,250

Job 302	
Direct materials	$18,750
Direct labor	42,200
Factory overhead	10,550
Total	$71,500

Job 303	
Direct materials	$ 9,940
Direct labor	16,500
Factory overhead	—

Job 304	
Direct materials	$14,310
Direct labor	17,100
Factory overhead	—

Journalize the summary entry to record each of the following operations for March (one entry for each operation):

a. Direct and indirect materials used.

b. Direct and indirect labor used.

c. Factory overhead applied to all four jobs (a single overhead rate is used based on direct labor cost).

d. Completion of Jobs 301 and 302.

EX 2-14 Financial statements of a manufacturing firm

Obj. 2

✔ a. Operating income, $85,000



EXCEL TEMPLATE

The following events took place for Rushmore Biking Inc. during February, the first month of operations as a producer of road bikes:

- Purchased $480,000 of materials.
- Used $434,500 of direct materials in production.
- Incurred $125,000 of direct labor wages.
- Applied factory overhead at a rate of 40% of direct labor cost.
- Transferred $578,000 of work in process to finished goods.
- Sold goods with a cost of $550,000.
- Revenues earned by selling bikes, $910,000.
- Incurred $185,000 of selling expenses.
- Incurred $90,000 of administrative expenses.

a. Prepare the income statement for Rushmore Biking for the month ending February 28.

b. Determine the inventory balances on February 28, the end of the first month of operations.

EX 2-15 Job order cost accounting for a service company

Obj. 3

✔ b. Underapplied, $5,530

The law firm of Furlan and Benson accumulates costs associated with individual cases, using a job order cost system. The following transactions occurred during July:

July 3. Charged 175 hours of professional (lawyer) time to the Obsidian Co. breech of contract suit to prepare for the trial, at a rate of $150 per hour.

10. Reimbursed travel costs to employees for depositions related to the Obsidian case, $12,500.

14. Charged 260 hours of professional time for the Obsidian trial at a rate of $185 per hour.

July 18. Received invoice from consultants Wadsley and Harden for $30,000 for expert testimony related to the Obsidian trial.

27. Applied office overhead at a rate of $62 per professional hour charged to the Obsidian case.

31. Paid administrative and support salaries of $28,500 for the month.

31. Used office supplies for the month, $4,000.

31. Paid professional salaries of $74,350 for the month.

31. Billed Obsidian $172,500 for successful defense of the case.

a. Provide the journal entries for each of these transactions.

b. How much office overhead is over- or underapplied?

c. Determine the gross profit on the Obsidian case, assuming that over- or underapplied office overhead is closed monthly to cost of services.

EX 2-16 Job order cost accounting for a service company — Obj. 3

✔ d. Dr. Cost of Services, $2,827,750

The Fly Company provides advertising services for clients across the nation. The Fly Company is presently working on four projects, each for a different client. The Fly Company accumulates costs for each account (client) on the basis of both direct costs and allocated indirect costs. The direct costs include the charged time of professional personnel and media purchases (air time and ad space). Overhead is allocated to each project as a percentage of media purchases. The predetermined overhead rate is 65% of media purchases.

On August 1, the four advertising projects had the following accumulated costs:

	August 1 Balances
Vault Bank	$270,000
Take Off Airlines	80,000
Sleepy Tired Hotels	210,000
Tastee Beverages	115,000
Total	$675,000

During August, The Fly Company incurred the following direct labor and media purchase costs related to preparing advertising for each of the four accounts:

	Direct Labor	Media Purchases
Vault Bank	$ 190,000	$ 710,000
Take Off Airlines	85,000	625,000
Sleepy Tired Hotels	372,000	455,000
Tastee Beverages	421,000	340,000
Total	$1,068,000	$2,130,000

At the end of August, both the Vault Bank and Take Off Airlines campaigns were completed. The costs of completed campaigns are debited to the cost of services account.

Journalize the summary entry to record each of the following for the month:

a. Direct labor costs

b. Media purchases

c. Overhead applied

d. Completion of Vault Bank and Take Off Airlines campaigns

Problems: Series A



PR 2-1A Entries for costs in a job order cost system — Obj. 2

Barnes Company uses a job order cost system. The following data summarize the operations related to production for October:

a. Materials purchased on account, $315,500.

b. Materials requisitioned, $290,100, of which $8,150 was for general factory use.

(Continued)

c. Factory labor used, $489,500 of which $34,200 was indirect.

d. Other costs incurred on account for factory overhead, $600,000; selling expenses, $150,000; and administrative expenses, $100,000.

e. Prepaid expenses expired for factory overhead were $18,000; for selling expenses, $6,000; and for administrative expenses, $5,000.

f. Depreciation of office building was $30,000; of office equipment, $7,500; and of factory equipment, $60,000.

g. Factory overhead costs applied to jobs, $711,600.

h. Jobs completed, $1,425,000.

i. Cost of goods sold, $1,380,000.

Instructions

Journalize the entries to record the summarized operations.

PR 2-2A Entries and schedules for unfinished jobs and completed jobs

Obj. 2

✔ 3. Work in Process balance, $11,840

EXCEL TEMPLATE

Kurtz Fencing Inc. uses a job order cost system. The following data summarize the operations related to production for March, the first month of operations:

a. Materials purchased on account, $45,000.

b. Materials requisitioned and factory labor used:

Job	Materials	Factory Labor
301	$1,850	$2,500
302	3,150	7,220
303	2,200	5,350
304	1,800	2,400
305	4,230	6,225
306	1,770	2,900
For general factory use	1,200	5,000

c. Factory overhead costs incurred on account, $1,800.

d. Depreciation of machinery and equipment, $2,500.

e. The factory overhead rate is $30 per machine hour. Machine hours used:

Job	Machine Hours
301	30
302	60
303	41
304	63
305	70
306	36
Total	300

f. Jobs completed: 301, 302, 303, and 305.

g. Jobs were shipped and customers were billed as follows: Job 301, $8,500; Job 302, $16,150; Job 303, $13,400.

Instructions

1. Journalize the entries to record the summarized operations.
2. Post the appropriate entries to T accounts for Work in Process and Finished Goods, using the identifying letters as transaction codes. Insert memo account balances as of the end of the month.
3. Prepare a schedule of unfinished jobs to support the balance in the work in process account.
4. Prepare a schedule of completed jobs on hand to support the balance in the finished goods account.

PR 2-3A Job cost sheet

Obj. 2

EXCEL TEMPLATE

Remnant Carpet Company sells and installs commercial carpeting for office buildings. Remnant Carpet Company uses a job order cost system. When a prospective customer asks for a price quote on a job, the estimated cost data are inserted on an unnumbered job cost sheet. If the

offer is accepted, a number is assigned to the job, and the costs incurred are recorded in the usual manner on the job cost sheet. After the job is completed, reasons for the variances between the estimated and actual costs are noted on the sheet. The data are then available to management in evaluating the efficiency of operations and in preparing quotes on future jobs. On October 1, Remnant Carpet Company gave Jackson Consulting an estimate of $9,450 to carpet the consulting firm's newly leased office. The estimate was based on the following data:

Estimated direct materials:	
200 meters at $35 per meter	$7,000
Estimated direct labor:	
16 hours at $20 per hour	320
Estimated factory overhead (75% of direct labor cost)	240
Total estimated costs	$7,560
Markup (25% of production costs)	1,890
Total estimate	$9,450

On October 3, Jackson Consulting signed a purchase contract, and the delivery and installation were completed on October 10.

The related materials requisitions and time tickets are summarized as follows:

Materials Requisition No.	Description	Amount
112	140 meters at $35	$4,900
114	68 meters at $35	2,380

Time Ticket No.	Description	Amount
H10	10 hours at $20	$200
H11	10 hours at $20	200

Instructions

1. Complete that portion of the job cost sheet that would be prepared when the estimate is given to the customer.
2. Record the costs incurred, and prepare a job cost sheet. Comment on the reasons for the variances between actual costs and estimated costs. For this purpose, assume that the additional meters of material used in the job were spoiled, the factory overhead rate has proven to be satisfactory, and an inexperienced employee performed the work.

PR 2-4A Analyzing manufacturing cost accounts

Obj. 2

✔ g. $751,870



EXCEL TEMPLATE

Fire Rock Company manufactures designer paddle boards in a wide variety of sizes and styles. The following incomplete ledger accounts refer to transactions that are summarized for June:

Materials

June 1	Balance	82,500	June 30	Requisitions	(a)
30	Purchases	330,000			

Work in Process

June 1	Balance	(b)	June 30	Completed jobs	(f)
30	Materials	(c)			
30	Direct labor	(d)			
30	Factory overhead applied	(e)			

Finished Goods

June 1	Balance	0	June 30	Cost of goods sold	(g)
30	Completed jobs	(f)			

Wages Payable

			June 30	Wages incurred	330,000

Factory Overhead

June 1	Balance	33,000	June 30	Factory overhead applied	(e)
30	Indirect labor	(h)			
30	Indirect materials	44,000			
30	Other overhead	237,500			

(Continued)

In addition, the following information is available:

a. Materials and direct labor were applied to six jobs in June:

Job No.	Style	Quantity	Direct Materials	Direct Labor
201	T100	550	$ 55,000	$ 41,250
202	T200	1,100	93,500	71,500
203	T400	550	38,500	22,000
204	S200	660	82,500	69,300
205	T300	480	60,000	48,000
206	S100	380	22,000	12,400
Total		3,720	$351,500	$264,450

b. Factory overhead is applied to each job at a rate of 140% of direct labor cost.

c. The June 1 Work in Process balance consisted of two jobs, as follows:

Job No.	Style	Work in Process, June 1
201	T100	$16,500
202	T200	44,000
Total		$60,500

d. Customer jobs completed and units sold in June were as follows:

Job No.	Style	Completed in June	Units Sold in June
201	T100	X	440
202	T200	X	880
203	T400		0
204	S200	X	570
205	T300	X	420
206	S100		0

Instructions

1. Determine the missing amounts associated with each letter. Provide supporting computations by completing a table with the following headings:

Job No.	Quantity	June 1 Work in Process	Direct Materials	Direct Labor	Factory Overhead	Total Cost	Unit Cost	Units Sold	Cost of Goods Sold

2. Determine the June 30 balances for each of the inventory accounts and factory overhead.

PR 2-5A Flow of costs and income statement

Obj. 2

✔ 1. Operating income, $432,000

EXCEL TEMPLATE

Ginocera Inc. is a designer, manufacturer, and distributor of custom gourment kitchen knives. A new kitchen knife series called the Kitchen Ninja was released for production in early 20Y8. In January, the company spent $600,000 to develop a late-night advertising infomercial for the new product. During 20Y8, the company spent an additional $1,400,000 promoting the product through these infomercials, and $800,000 in legal costs. The knives were ready for manufacture on January 1, 20Y8.

Ginocera uses a job order cost system to accumulate costs associated with the Kitchen Ninja Knife. The unit direct materials cost for the knife is:

Hardened steel blanks (used for knife shaft and blade)	$4.00
Wood (for handle)	1.50
Packaging	0.50

The production process is straightforward. First, the hardened steel blanks, which are purchased directly from a raw material supplier, are stamped into a single piece of metal that includes both the blade and the shaft. The stamping machine requires one hour per 250 knives.

After the knife shafts are stamped, they are brought to an assembly area where an employee attaches the handle to the shaft and packs the knife into a decorative box. The direct labor cost is $0.50 per unit.

The knives are sold to stores. Each store is given promotional materials, such as posters and aisle displays. Promotional materials cost $60 per store. In addition, shipping costs average $0.20 per knife.

Total completed production was 1,200,000 units during the year. Other information is as follows:

Number of customers (stores)	60,000
Number of knives sold	1,120,000
Wholesale price (to store) per knife	$16

Factory overhead cost is applied to jobs at the rate of $800 per stamping machine hour after the knife blanks are stamped. There were an additional 25,000 stamped knives, handles, and cases in process and waiting to be assembled on December 31, 20Y8.

Instructions

1. Prepare an annual income statement for the Kitchen Ninja knife series, including supporting computations, from the information provided.
2. Determine the balances in the work in process and finished goods inventories for the Kitchen Ninja knife series on December 31, 20Y8.

Problems: Series B

SHOW ME HOW

PR 2-1B Entries for costs in a job order cost system — Obj. 2

Royal Technology Company uses a job order cost system. The following data summarize the operations related to production for March:

a. Materials purchased on account, $770,000.
b. Materials requisitioned, $680,000, of which $75,800 was for general factory use.
c. Factory labor used, $756,000, of which $182,000 was indirect.
d. Other costs incurred on account for factory overhead, $245,000; selling expenses, $171,500; and administrative expenses, $110,600.
e. Prepaid expenses expired for factory overhead were $24,500; for selling expenses, $28,420; and for administrative expenses, $16,660.
f. Depreciation of factory equipment was $49,500; of office equipment, $61,800; and of office building, $14,900.
g. Factory overhead costs applied to jobs, $568,500.
h. Jobs completed, $1,500,000.
i. Cost of goods sold, $1,375,000.

Instruction

Journalize the entries to record the summarized operations.

✔ 3. Work in Process balance, $127,880

EXCEL TEMPLATE

PR 2-2B Entries and schedules for unfinished jobs and completed jobs — Obj. 2

Hildreth Company uses a job order cost system. The following data summarize the operations related to production for April, the first month of operations:

a. Materials purchased on account, $147,000.
b. Materials requisitioned and factory labor used:

Job No.	Materials	Factory Labor
101	$19,320	$19,500
102	23,100	28,140
103	13,440	14,000
104	38,200	36,500
105	18,050	15,540
106	18,000	18,700
For general factory use	9,000	20,160

c. Factory overhead costs incurred on account, $6,000.
d. Depreciation of machinery and equipment, $4,100.

(Continued)

e. The factory overhead rate is $40 per machine hour. Machine hours used:

Job	Machine Hours
101	154
102	160
103	126
104	238
105	160
106	174
Total	1,012

f. Jobs completed: 101, 102, 103, and 105.

g. Jobs were shipped and customers were billed as follows: Job 101, $62,900; Job 102, $80,700; Job 105, $45,500.

Instructions

1. Journalize the entries to record the summarized operations.
2. Post the appropriate entries to T accounts for Work in Process and Finished Goods, using the identifying letters as transaction codes. Insert memo account balances as of the end of the month.
3. Prepare a schedule of unfinished jobs to support the balance in the work in process account.
4. Prepare a schedule of completed jobs on hand to support the balance in the finished goods account.



PR 2-3B Job cost sheet

Obj. 2

Stretch and Trim Carpet Company sells and installs commercial carpeting for office buildings. Stretch and Trim Carpet Company uses a job order cost system. When a prospective customer asks for a price quote on a job, the estimated cost data are inserted on an unnumbered job cost sheet. If the offer is accepted, a number is assigned to the job, and the costs incurred are recorded in the usual manner on the job cost sheet. After the job is completed, reasons for the variances between the estimated and actual costs are noted on the sheet. The data are then available to management in evaluating the efficiency of operations and in preparing quotes on future jobs. On May 9, Stretch and Trim gave Lunden Consulting an estimate of $18,044 to carpet the consulting firm's newly leased office. The estimate was based on the following data:

Estimated direct materials:	
400 meters at $32 per meter	$12,800
Estimated direct labor:	
30 hours at $20 per hour	600
Estimated factory overhead (80% of direct labor cost)	480
Total estimated costs	$13,880
Markup (30% of production costs)	4,164
Total estimate	$18,044

On May 10, Lunden Consulting signed a purchase contract, and the carpet was delivered and installed on May 15.

The related materials requisitions and time tickets are summarized as follows:

Materials Requisition No.	Description	Amount
132	360 meters at $32	$11,520
134	50 meters at $32	1,600

Time Ticket No.	Description	Amount
H9	18 hours at $19	$342
H12	18 hours at $19	342

Instructions

1. Complete that portion of the job cost sheet that would be prepared when the estimate is given to the customer. Round factory overhead applied to the nearest dollar.
2. Record the costs incurred, and prepare a job cost sheet. Comment on the reasons for the variances between actual costs and estimated costs. For this purpose, assume that the additional meters of material used in the job were spoiled, the factory overhead rate has proven to be satisfactory, and an inexperienced employee performed the work.

PR 2-4B Analyzing manufacturing cost accounts

Obj. 2

✔ g. $700,284

EXCEL TEMPLATE

Clapton Company manufactures custom guitars in a wide variety of styles. The following incomplete ledger accounts refer to transactions that are summarized for May:

Materials

May	1	Balance	105,600	May 31	Requisitions	(a)
	31	Purchases	500,000			

Work in Process

May	1	Balance	(b)	May 31	Completed jobs	(f)
	31	Materials	(c)			
	31	Direct labor	(d)			
	31	Factory overhead applied	(e)			

Finished Goods

May	1	Balance	0	May 31	Cost of goods sold	(g)
	31	Completed jobs	(f)			

Wages Payable

				May 31	Wages incurred	396,000

Factory Overhead

May	1	Balance	26,400	May 31	Factory overhead applied	(e)
	31	Indirect labor	(h)			
	31	Indirect materials	15,400			
	31	Other overhead	122,500			

In addition, the following information is available:

a. Materials and direct labor were applied to six jobs in May:

Job No.	Style	Quantity	Direct Materials	Direct Labor
101	AF1	330	$ 82,500	$ 59,400
102	AF3	380	105,400	72,600
103	AF2	500	132,000	110,000
104	VY1	400	66,000	39,600
105	VY2	660	118,800	66,000
106	AF4	330	66,000	30,800
	Total	2,600	$570,700	$378,400

b. Factory overhead is applied to each job at a rate of 50% of direct labor cost.

c. The May 1 Work in Process balance consisted of two jobs, as follows:

Job No.	Style	Work in Process, May 1
101	AF1	$26,400
102	AF3	46,000
Total		$72,400

d. Customer jobs completed and units sold in May were as follows:

Job No.	Style	Completed in May	Units Sold in May
101	AF1	X	264
102	AF3	X	360
103	AF2		0
104	VY1	X	384
105	VY2	X	530
106	AF4		0

(Continued)

Instructions

1. Determine the missing amounts associated with each letter. Provide supporting computations by completing a table with the following headings:

Job No.	Quantity	May 1 Work in Process	Direct Materials	Direct Labor	Factory Overhead	Total Cost	Unit Cost	Units Sold	Cost of Goods Sold

2. Determine the May 31 balances for each of the inventory accounts and factory overhead.

PR 2-5B Flow of costs and income statement — Obj. 2

✔ 1. Operating income, $656,000

EXCEL TEMPLATE

Technology Accessories Inc. is a designer, manufacturer, and distributor of accessories for consumer electronic products. Early in 20Y3, the company began production of a leather cover for tablet computers, called the iLeather. The cover is made of stitched leather with a velvet interior and fits snugly around most tablet computers. In January, $750,000 was spent on developing marketing and advertising materials. For the first six months of 20Y3, the company spent an additional $1,400,000 promoting the iLeather. The product was ready for manufacture on January 21, 20Y3.

Technology Accessories Inc. uses a job order cost system to accumulate costs for the iLeather. Direct materials unit costs for the iLeather are as follows:

Leather	$10.00
Velvet	5.00
Packaging	0.40
Total	$15.40

The actual production process for the iLeather is fairly straightforward. First, leather is brought to a cutting and stitching machine. The machine cuts the leather and stitches an exterior edge into the product. The machine requires one hour per 125 iLeathers.

After the iLeather is cut and stitched, it is brought to assembly, where assembly personnel affix the velvet interior and pack the iLeather for shipping. The direct labor cost for this work is $0.50 per unit.

The completed packages are then sold to retail outlets through a sales force. The sales force is compensated by a 20% commission on the wholesale price for all sales.

Total completed production was 500,000 units during the year. Other information is as follows:

Number of iLeather units sold in 20Y3	460,000
Wholesale price per unit	$40

Factory overhead cost is applied to jobs at the rate of $1,250 per machine hour. There were an additional 22,000 cut and stitched iLeathers waiting to be assembled on December 31, 20Y3.

Instructions

1. Prepare an annual income statement for the iLeather product, including supporting computations, from the information provided.
2. Determine the balances in the finished goods and work in process inventories for the iLeather product on December 31, 20Y3.

Make a Decision
Analyzing Job Costs

MAD 2-1 Analyze Antolini Enterprises' job costs — Obj. 4

Antolini Enterprises produces men's sports coats that are sold by popular department stores. Each retail order is treated as a job that accumulates materials, labor, and overhead costs for a batch of sports coats. Management has obtained data on the labor costs for four selected jobs over a six-month period. Each selected job represents a similar style and size of sports coat. The data are as follows:

	Count	Direct Labor Hours	Direct Labor Rate per Hour	Total Direct Labor Cost
Job 107	10	4.50	$14.00	$ 63.00
Job 125	14	7.00	14.00	98.00
Job 160	16	8.80	14.00	123.20
Job 192	8	3.20	16.00	51.20

a. Determine the direct labor cost per unit for each job.
b. Interpret the trend in per-unit labor cost.
c. Determine the direct labor hours per sports coat.
d. Interpret what may be happening with Job 192.

MAD 2-2 Analyze Alvarez Manufacturing Inc.'s job costs — Obj. 4

Alvarez Manufacturing Inc. is a job shop. The management of Alvarez Manufacturing Inc. uses the cost information from the job sheets to assess cost performance. Information on the total cost, product type, and quantity of items produced is as follows:

Date	Job No.	Product	Quantity	Amount
Jan. 2	1	TT	520	$16,120
Jan. 15	22	SS	1,610	20,125
Feb. 3	30	SS	1,420	25,560
Mar. 7	41	TT	670	15,075
Mar. 24	49	SLK	2,210	22,100
May 19	58	SLK	2,550	31,875
June 12	65	TT	620	10,540
Aug. 18	78	SLK	3,110	48,205
Sept. 2	82	SS	1,210	16,940
Nov. 14	92	TT	750	8,250
Dec. 12	98	SLK	2,700	52,650

a. Develop a graph for *each* product (three graphs), with Job Number (in date order) on the horizontal axis and Unit Cost on the vertical axis. Use this information to determine Alvarez Manufacturing Inc.'s cost performance over time for the three products.
b. What additional information would you require in order to investigate Alvarez Manufacturing Inc.'s cost performance more precisely?

MAD 2-3 Analyze Raneri Trophies Inc.'s job costs — Obj. 4

Raneri Trophies Inc. uses a job order cost system for determining the cost to manufacture award products (plaques and trophies). Among the company's products is an engraved plaque that is awarded to participants who complete a training program at a local business. The company sells the plaques to the local business for $80 each.

Each plaque has a brass plate engraved with the name of the participant. Engraving requires approximately 30 minutes per name. Improperly engraved names must be redone. The plate is screwed to a walnut backboard. This assembly takes approximately 15 minutes per unit. Improper assembly must be redone using a new walnut backboard.

During the first half of the year, Raneri had two separate plaque orders. The job cost sheets for the two separate jobs indicated the following information:

Job 101	May 4		
	Cost per Unit	Units	Job Cost
Direct materials:			
Wood	$20/unit	40 units	$ 800
Brass	15/unit	40 units	600
Engraving labor	20/hr.	20 hrs.	400
Assembly labor	30/hr.	10 hrs.	300
Factory overhead	10/hr.	30 hrs.	300
			$2,400
Plaques shipped			÷ 40
Cost per plaque			$ 60

(Continued)

Job 105	June 10		
	Cost per Unit	**Units**	**Job Cost**
Direct materials:			
Wood	$20/unit	34 units	$ 680
Brass	15/unit	34 units	510
Engraving labor	20/hr.	17 hrs.	340
Assembly labor	30/hr.	8.5 hrs.	255
Factory overhead	10/hr.	25.5 hrs.	255
			$2,040
Plaques shipped			÷ 30
Cost per plaque			$ 68

a. Why did the cost per plaque increase from $60 to $68?

b. What improvements would you recommend for Raneri Trophies Inc.?

MAD 2-4 Analyze Brady Furniture Company's job costs — Obj. 4

Brady Furniture Company manufactures wooden oak furniture. The company employs a job cost system to trace manufacturing costs to jobs. Each job represents a batch of furniture of the same type. Information regarding direct materials on selected jobs throughout the year is as follows:

Job No.	Date	Count	Style	Board Feet	Cost per Board Foot	Total Direct Materials Cost per Job
Job 102	Jan. 20	20	Dining tables	400	$5.00	$ 2,000
Job 106	Jan. 20	100	Coffee tables	1,000	5.00	5,000
Job 107	Jan. 20	50	Chairs	250	5.00	1,250
Job 203	Apr. 21	20	Dining tables	404	5.00	2,020
Job 205	Apr. 21	100	Coffee tables	990	5.00	4,950
Job 206	Apr. 21	52	Chairs	259	5.00	1,295
Job 289	July 20	20	Dining tables	448	6.00	2,688
Job 294	July 20	140	Coffee tables	1,414	6.00	8,484
Job 295	July 20	60	Chairs	312	6.00	1,872
Job 389	Oct. 18	22	Dining tables	517	6.00	3,102
Job 391	Oct. 18	160	Coffee tables	1,600	6.00	9,600
Job 392	Oct. 18	80	Chairs	400	6.00	2,400
Job 570	Dec. 11	25	Dining tables	615	6.00	3,690
Job 573	Dec. 11	180	Coffee tables	1,836	6.00	11,016
Job 574	Dec. 11	90	Chairs	450	6.00	2,700

Dining tables are the most difficult furniture item in Brady's catalog to manufacture. Thus, the most skilled employees are scheduled to make dining tables, unless they are required for other jobs.

a. Determine the material cost per unit for each job.

b. Use the January material cost per unit for each type of furniture as the base material cost. For each month and each type of furniture, determine the unit material cost as a percent of the base unit material cost. Round percent to one decimal place. Use the following table format:

	Jan.	Apr.	July	Oct.	Dec.
Dining tables	100%				
Coffee tables	100%				
Chairs	100%				

c. Develop a line chart of the percent of unit material cost to the base unit material cost. Place the months on the horizontal axis and use three lines for the three different types of furniture.

d. Interpret the chart. What is happening to the dining tables?

Take It Further

ETHICS

TIF 2-1 Assigning direct labor costs to jobs

TAC Industries Inc. sells heavy equipment to large corporations and federal, state, and local governments. Corporate sales are the result of a competitive bidding process, where TAC competes against other companies based on selling price. Sales to the government, however, are determined on a cost plus basis, where the selling price is determined by adding a fixed markup percentage to the total job cost.

Tandy Lane is the cost accountant for the Equipment Division of TAC Industries Inc. The division is under pressure from senior management to improve operating income. As Tandy reviewed the division's job cost sheets, she realized that she could increase the division's operating income by moving a portion of the direct labor hours that had been assigned to the job cost sheets of corporate customers onto the job order costs sheets of government customers. She believed that this would create a "win–win" for the division by (1) reducing the cost of corporate jobs, and (2) increasing the cost of government jobs whose profit is based on a percentage of job cost. Tandy submitted this idea to her division manager, who was impressed by her creative solution for improving the division's profitability.

Is Tandy's plan ethical?

TEAM ACTIVITY

TIF 2-2 Predetermined overhead rates

As an assistant cost accountant for Firewall Industries, you have been assigned to review the activity base for the predetermined factory overhead rate. The president, JoJo Gunn, is concerned about the wide fluctuation in the amount of over- or underapplied overhead in recent years.

An analysis of the company's operations and use of the current overhead rate (direct labor cost) has narrowed the possible alternative overhead bases to direct labor cost and machine hours. For the past five years, the following data have been gathered:

	Year 5	Year 4	Year 3	Year 2	Year 1
Actual overhead	$ 790,000	$ 870,000	$ 935,000	$ 845,000	$ 760,000
Applied overhead	777,000	882,000	924,000	840,000	777,000
(Over-) underapplied overhead	$ 13,000	$ (12,000)	$ 11,000	$ 5,000	$ (17,000)
Direct labor cost	$3,885,000	$4,410,000	$4,620,000	$4,200,000	$3,885,000
Machine hours	93,000	104,000	111,000	100,400	91,600

In teams:

a. Compute a predetermined factory overhead rate for each alternative base, assuming that rates would have been determined using the total actual amount of factory overhead for the past five years to the total associated activity base for the same five-year period.

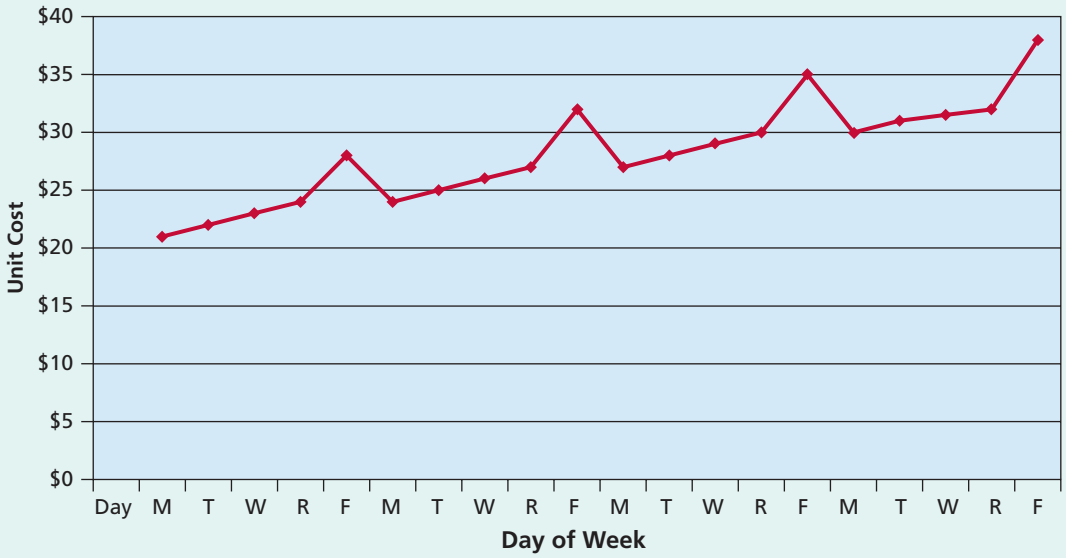
b. For each of the past five years, determine the over- or underapplied overhead, based on the two predetermined overhead rates developed in (a).

c. Select a predetermined overhead rate that the company should use, and discuss the basis for your recommendation.

COMMUNICATION

TIF 2-3 Interpreting unit job costs

Carol Creedence, the plant manager of the Clearwater Company's Revival plant, has prepared the following graph of the unit costs from the job cost reports for the plant's highest volume product, Product CCR.



Carol is concerned about the erratic and increasing cost of Product CCR and has asked for your help. Prepare a one-half page memo to Carol, interpreting this graph and requesting any additional information that might be needed to explain this situation.

TIF 2-4 Interpreting job order unit costs

RIRA Company makes attachments such as backhoes and grader and bulldozer blades for construction equipment. The company uses a job order cost system. Management is concerned about cost performance and evaluates the job cost sheets to learn more about the cost effectiveness of the operations. To facilitate a comparison, the job cost sheets for Job 206 (for 50 backhoe buckets completed in October) and Job 228 (for 75 backhoe buckets completed in December) were pulled and presented as follows:

Job 206

Item: 50 backhoe buckets

	Direct Materials Quantity	×	Direct Materials Price	=	Amount
Materials:					
Steel (tons)	105		$1,200		$ 126,000
Steel components (pieces)	630		7		4,410
Total materials					$ 130,410
	Direct Labor Hours	×	**Direct Labor Rate**	=	**Amount**
Direct labor:					
Foundry	400		$22.50		$ 9,000
Welding	550		27.00		14,850
Shipping	180		18.00		3,240
Total direct labor	1,130				$ 27,090
	Direct Total Labor Cost	×	**Factory Overhead Rate**	=	**Amount**
Factory overhead:					
(200% of direct labor dollars)	$27,090	×	200%		$ 54,180
Total cost					$ 211,680
Total units					÷ 50
Unit cost (rounded)					$4,233.60

Job 228

Item: 75 backhoe buckets

	Direct Materials Quantity	×	Direct Materials Price	=	Amount
Materials:					
Steel (tons)	195		$1,100		$ 214,500
Steel components (pieces)	945		7		6,615
Total materials					$ 221,115
	Direct Labor Hours	×	**Direct Labor Rate**	=	**Amount**
Direct labor:					
Foundry	750		$22.50		$ 16,875
Welding	1,050		27.00		28,350
Shipping	375		18.00		6,750
Total direct labor	2,175				$ 51,975
	Direct Total Labor Cost	×	**Factory Overhead Rate**	=	**Amount**
Factory overhead:					
(200% of direct labor dollars)	$51,975	×	200%		$ 103,950
Total cost					$ 377,040
Total units					÷ 75
Unit cost					$5,027.20

Management is concerned about the increase in unit costs over the months from October to December. To understand what has occurred, management interviewed the purchasing manager and quality manager.

Purchasing Manager: Prices have been holding steady for our raw materials during the first half of the year. I found a new supplier for our bulk steel that was willing to offer a better price than we received in the past. I saw these lower steel prices and jumped on them, knowing that a reduction in steel prices would have a very favorable impact on our costs.

Quality Manager: Something happened around mid-year. All of a sudden, we were experiencing problems with respect to the quality of our steel. As a result, we've been having all sorts of problems on the shop floor in our foundry and welding operation.

a. Analyze the two job cost sheets and identify why the unit costs have changed for the backhoe buckets. Complete the following schedule to help in your analysis:

Item	Input Quantity per Unit—Job 206	Input Quantity per Unit—Job 228
Steel		
Foundry labor		
Welding labor		

b. How would you interpret what has happened in light of your analysis and the interviews?

TIF 2-5 Recording manufacturing costs

Todd Lay just began working as a cost accountant for Enteron Industries Inc., which manufactures gift items. Todd is preparing to record summary journal entries for the month. Todd begins by recording the factory wages as follows:

Wages Expense	60,000	
Wages Payable		60,000

(Continued)

Then the factory depreciation:

Depreciation Expense—Factory Machinery	20,000	
Accumulated Depreciation—Factory Machinery		20,000

Todd's supervisor, Jeff Fastow, walks by and notices the entries. The following conversation takes place:

Jeff: That's a very unusual way to record our factory wages and depreciation for the month.

Todd: What do you mean? This is the way I was taught in school to record wages and depreciation.

You know, debit an expense and credit Cash or payables or, in the case of depreciation, credit Accumulated Depreciation.

Jeff: Well, it's not the credits I'm concerned about. It's the debits—I don't think you've recorded the debits correctly. I wouldn't mind if you were recording the administrative wages or office equipment depreciation this way, but I've got real questions about recording factory wages and factory machinery depreciation this way.

Todd: Now I'm really confused. You mean this is correct for administrative costs but not for factory costs? Well, what am I supposed to do—and why?

a. Play the role of Jeff and answer Todd's questions.

b. Why would Jeff accept the journal entries if they were for administrative costs?

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Baldwin Printing Company uses a job order cost system and applies overhead based on machine hours. A total of 150,000 machine hours have been budgeted for the year. During the year, an order for 1,000 units was completed and incurred the following:

Direct material costs	$1,000
Direct labor costs	$1,500
Actual overhead	$1,980
Machine hours	450

The accountant computed the inventory cost of this order to be $4.30 per unit. The annual budgeted overhead in dollars was:

a. $577,500.
b. $600,000.
c. $645,000.
d. $660,000.

2. John Sheng, a cost accountant at Starlet Company, is developing departmental factory overhead application rates for the company's Tooling and Fabricating departments. The budgeted overhead for each department and the data for one job are as follows:

	Departments	
	Tooling	**Fabricating**
Supplies	$ 850	$ 200
Supervisors' salaries	1,500	2,000
Indirect labor	1,200	4,880
Depreciation	1,000	5,500
Repairs	4,075	3,540
Total budgeted overhead	$8,625	$16,120
Total direct labor hours	460	620
Direct labor hours on Job 231	12	3

Using the departmental overhead application rates, total overhead applied to Job 231 in the Tooling and Fabricating departments will be:

a. $225.
b. $303.
c. $537.
d. $671.

3. Lucy Sportswear manufactures a specialty line of T-shirts using a job order cost system. During March, the following costs were incurred in completing Job ICU2: direct materials, $13,700; direct labor, $4,800; administrative, $1,400; and selling, $5,600. Factory overhead was applied at the rate of $25 per machine hour, and Job ICU2 required 800 machine hours. If Job ICU2 resulted in 7,000 good shirts, the cost of goods sold per unit would be:
   a. $5.70.
   b. $6.50.
   c. $5.50.
   d. $6.30.

4. Patterson Corporation expects to incur $70,000 of factory overhead and $60,000 of general and administrative costs next year. Direct labor costs at $5 per hour are expected to total $50,000. If factory overhead is to be applied per direct labor hour, how much overhead will be applied to a job incurring 20 hours of direct labor?
   a. $120
   b. $260
   c. $28
   d. $140

Pathways Challenge



This is Accounting!

Information/Consequences

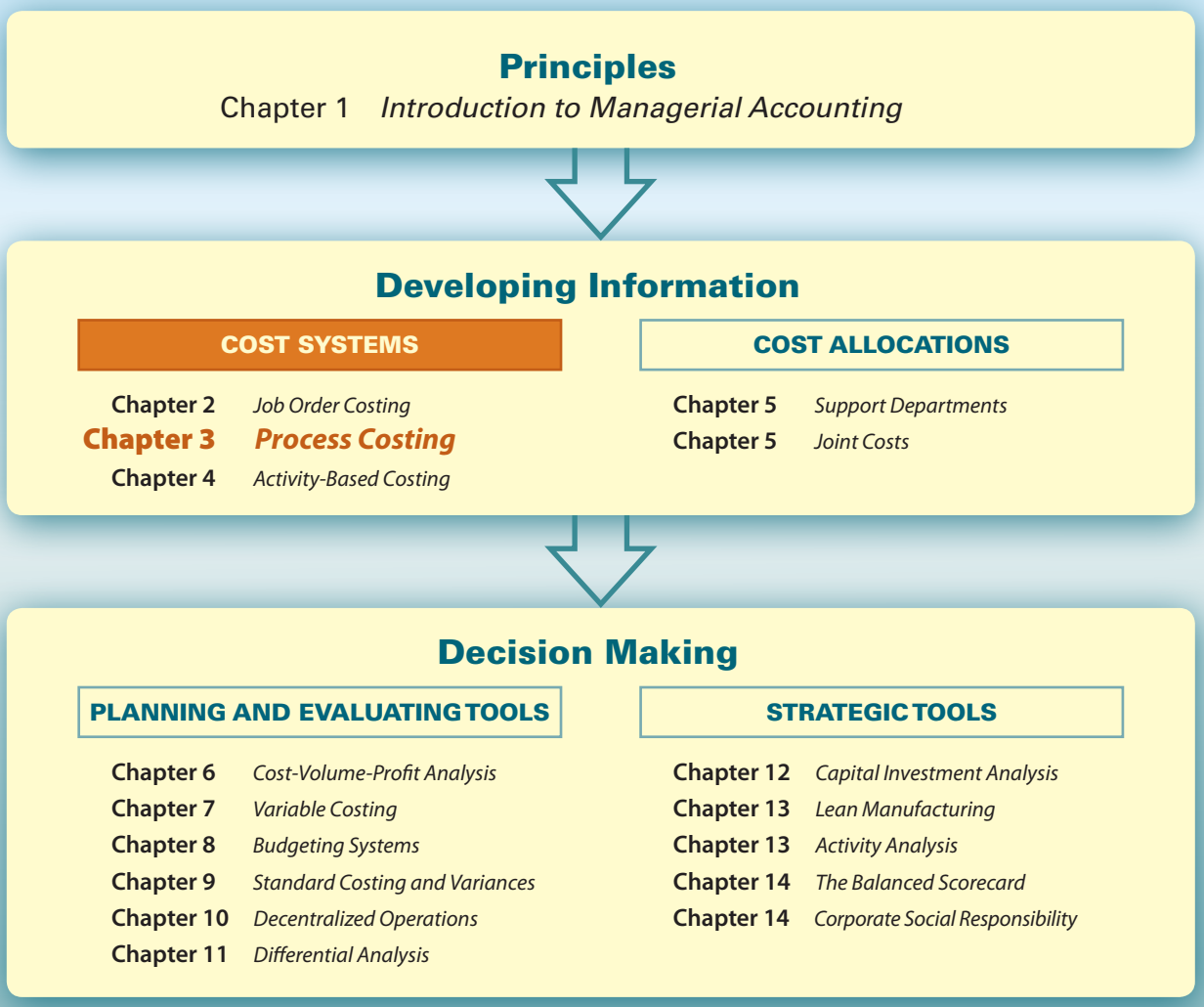
Yes. A manager could increase operating income by increasing the predetermined factory overhead so that overhead would be significantly *overapplied* for the period. Some of the overapplied overhead would be allocated to work in process and finished goods inventories. As a result, cost of goods sold would be less than if all of the overapplied overhead were transferred to cost of goods sold. However, the costs allocated to work in process and finished goods inventories would affect the income statement of the next period. Specifically, the next period's cost of goods sold would be higher when the inventories are further processed and sold.

Transferring the over- and underapplied overhead to the cost of goods sold account is easier than allocating it to work in process, finished goods, and cost of goods sold. Since over- and underapplied overhead is normally small, it makes sense for generally accepted accounting principles (GAAP) to simplify the accounting.

Suggested Answer

Chapter 3

Process Cost Systems



Dreyer's Ice Cream

In making ice cream, an electric ice cream maker is used to mix ingredients, which include milk, cream, sugar, and flavoring. After the ingredients are added, the mixer is packed with ice and salt to cool the ingredients, and it is then turned on.

After mixing for half of the required time, would you have ice cream? Of course not, because the ice cream needs to mix longer to freeze. Now, assume that you ask the question:

What costs have I incurred so far in making ice cream?

The answer to this question requires knowing the cost of the ingredients and electricity. The ingredients are added at the beginning; thus, all the ingredient costs have been incurred. Because the mixing is only half complete, only 50% of the electricity cost has been incurred. Therefore, the answer to the preceding question is:

All the materials costs and half the electricity costs have been incurred.

These same cost concepts apply to larger ice cream processes like those of **Dreyer's Ice Cream** (a subsidiary of **Nestlé**), manufacturer of Dreyer's® and Edy's® ice cream. Dreyer's mixes ingredients in 3,000-gallon vats in much the same way you would with an electric ice cream maker. Dreyer's also records the costs of the ingredients, labor, and factory overhead used in making ice cream. These costs are used by managers for decisions such as setting prices and improving operations.

This chapter describes and illustrates process cost systems that are used by manufacturers such as Dreyer's. The use of cost of production reports in decision making is also discussed.

Source: www.dreyers.com.



ISTOCK.COM/PRAETORIANPHOTO

Link to Dreyer's Ice Cream . . . . . Pages 97, 99, 101, 109

What's Covered

Process Cost Systems

Accounting for Process Manufacturers
- Compared to Job Order Cost Systems (Obj. 1)
- Cost Flows for Process Manufacturers (Obj. 1)

Cost of Production Report
- Units to Be Assigned Costs (Obj. 2)
- Equivalent Units (Obj. 2)
- Cost per Equivalent Unit (Obj. 2)
- Allocation of Costs (Obj. 2)

Using the Cost of Production Report
- Journalizing Costs (Obj. 3)
- Unit Cost Analysis (Obj. 4)

Learning Objectives

Obj. 1 Describe process cost systems.
Obj. 2 Prepare a cost of production report.
Obj. 3 Journalize entries for transactions using a process cost system.
Obj. 4 Describe and illustrate the analysis of unit cost changes between periods.

Analysis for Decision Making

Obj. 5 Describe and Illustrate the use of a cost of production report in evaluating a company's performance.

Appendix

Obj. App. Describe and illustrate the weighted average method of preparing a cost of production report.

Objective 1
Describe process cost systems.

Process Manufacturers

A **process manufacturer** produces products that are indistinguishable from each other using a continuous production process. For example, an oil refinery processes crude oil through a series of steps to produce a barrel of gasoline. One barrel of gasoline, the product, cannot be distinguished from another barrel. Other examples of process manufacturers include paper producers, chemical processors, aluminum smelters, and food processors.

The cost accounting system used by process manufacturers is called the **process cost system**. A process cost system records product costs for each manufacturing department or process.

In contrast, a job order manufacturer produces custom products for customers or batches of similar products. For example, a custom printer produces wedding invitations, graduation announcements, or other special print items that are tailored to the specifications of each customer. Each item manufactured is unique to itself. Other examples of job order manufacturers include furniture manufacturers, shipbuilders, and home builders.

As described and illustrated in Chapter 2, the cost accounting system used by job order manufacturers is called the *job order cost system*. A job order cost system records product costs for each job, using job cost sheets.

Ethics: Do It!

On Being Green

Process manufacturing often involves significant energy and material resources, which can be harmful to the environment. Thus, many process manufacturing companies, such as chemical, electronic, and metal processors, must address environmental issues. Companies such as **DuPont (DD)**, **Intel (INTC)**, **Apple (AAPL)**, and **Alcoa (AA)** are at the forefront of providing environmental solutions for their products and processes.

For example, Apple provides free recycling programs for Macs®, iPhones®, and iPads®. Apple recovers more than 90% by weight of the original product in reusable components, glass, and plastic. You can even receive a free gift card for voluntarily recycling an older Apple product.

Source: www.apple.com.

Some examples of process and job order companies and their products are shown in Exhibit 1.

Exhibit 1
Examples of Process Cost and Job Order Companies

Process Manufacturing Companies		Job Order Companies	
Company	**Product**	**Company**	**Product**
PepsiCo (PEP)	soft drinks	**Disney (DIS)**	movies
Alcoa (AA)	aluminum	**Nike (NKE)**	athletic shoes
Intel (INTC)	computer chips	**Nicklaus Design**	golf courses
Apple (AAPL)	iPhone	**Tennessee Heritage**	log homes
Hershey (HSY)	chocolate bars	**DDB Worldwide**	advertising

William Dreyer, an ice cream maker, and Joseph Edy, a candymaker, partnered to introduce **Dreyer's and Edy's Grand Ice Cream** in 1928. The ice cream was sold out of their ice cream parlor on Grand Avenue in Oakland, California.

Link to Dreyer's Ice Cream

Comparing Job Order and Process Cost Systems

Process and job order cost systems are similar in that each system:

- Records and summarizes product costs.
- Classifies product costs as direct materials, direct labor, and factory overhead.
- Allocates factory overhead costs to products.
- Uses a perpetual inventory system for materials, work in process, and finished goods.
- Provides useful product cost information for decision making.

Process and job costing systems are different in several ways. As a basis for illustrating these differences, the cost systems for **Frozen Delight** and **Legend Guitars** are used.

Exhibit 2 illustrates the process cost system for Frozen Delight, an ice cream manufacturer. As a basis for comparison, Exhibit 2 also illustrates the job order cost system for Legend Guitars, a custom guitar manufacturer. Legend Guitars was described and illustrated in Chapters 1 and 2.

Exhibit 2 indicates that Frozen Delight manufactures ice cream, using two departments:

- The Mixing Department mixes the ingredients, using large vats.
- The Packaging Department puts the ice cream into cartons for shipping to customers.

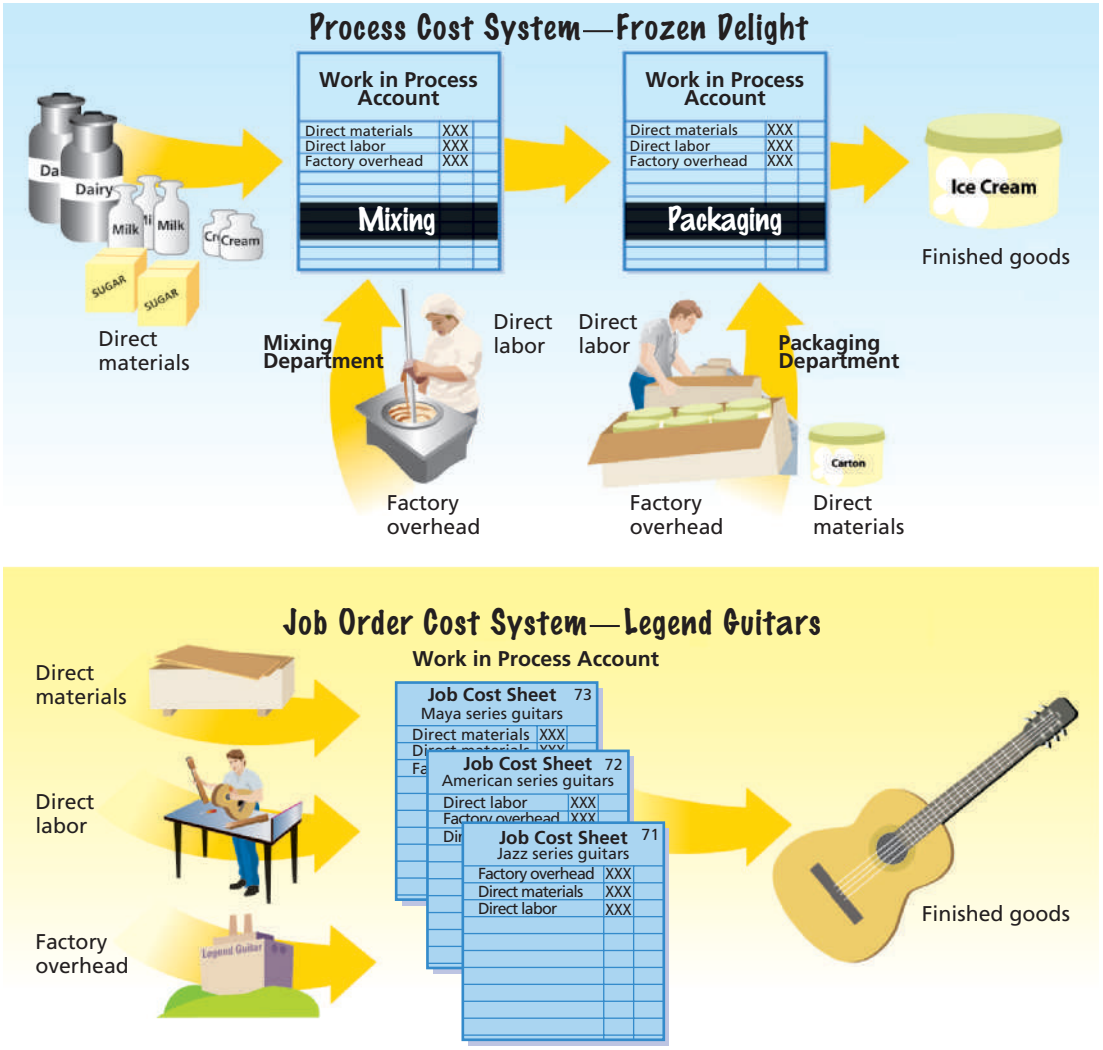
Because each gallon of ice cream is similar, product costs are recorded in each department's work in process account. As shown in Exhibit 2, Frozen Delight accumulates (records) the cost of making ice cream in *work in process accounts* for the Mixing and Packaging departments.

The product costs of making a gallon of ice cream include:

- *Direct materials costs*, which include milk, cream, sugar, and packing cartons. All materials costs are added at the beginning of the process for both the Mixing Department and the Packaging Department.
- *Direct labor costs*, which are incurred by employees in each department who run the equipment and load and unload product.
- *Factory overhead costs*, which include the utility costs (power) and depreciation on the equipment.

When the Mixing Department completes the mixing process, its product costs are transferred to the Packaging Department. When the Packaging Department completes its process, the product costs are transferred to Finished Goods. In this way, the cost of the product (a gallon of ice cream) accumulates across the entire production process.

Exhibit 2
Process Cost and Job Order Cost Systems



In contrast, Exhibit 2 shows that Legend Guitars accumulates (records) product costs by jobs, using a job cost sheet for each type of guitar. Thus, Legend Guitars uses just one work in process account. As each job is completed, its product costs are transferred to Finished Goods.

In a job order cost system, the work in process at the end of the period is the sum of the job cost sheets for partially completed jobs. In a process cost system, the work in process at the end of the period is the sum of the costs remaining in each department account at the end of the period.

Cost Flows for a Process Manufacturer

Exhibit 3 illustrates the *physical flow* of materials for **Frozen Delight**. Ice cream is made in a manufacturing plant in much the same way you would make it at home, except on a larger scale.

In the Mixing Department, direct materials in the form of milk, cream, and sugar are placed into a vat. An employee fills each vat, sets the cooling temperature, and sets the mix speed. The vat is cooled as the direct materials are being mixed by agitators (paddles). Factory overhead includes equipment depreciation and indirect materials.



Exhibit 3
Physical Flows for a Process Manufacturer

Dreyer's slow-churned ice cream uses a proprietary process that mixes nonfat milk slowly. This process, called low-temperature extrusion, allows ice cream to be made with one-third fewer calories and half the fat while tasting like normal ice cream.

Link to Dreyer's Ice Cream

In the Packaging Department, the ice cream is received from the Mixing Department in a form ready for packaging. The Packaging Department uses direct labor and factory overhead to package the ice cream into one-gallon containers. The ice cream is then transferred to finished goods, where it is frozen and stored in refrigerators prior to shipment to customers.

The *cost flows* in a process cost accounting system are similar to the *physical flow* of materials illustrated in Exhibit 3. The cost flows for **Frozen Delight** are illustrated in Exhibit 4 as follows:

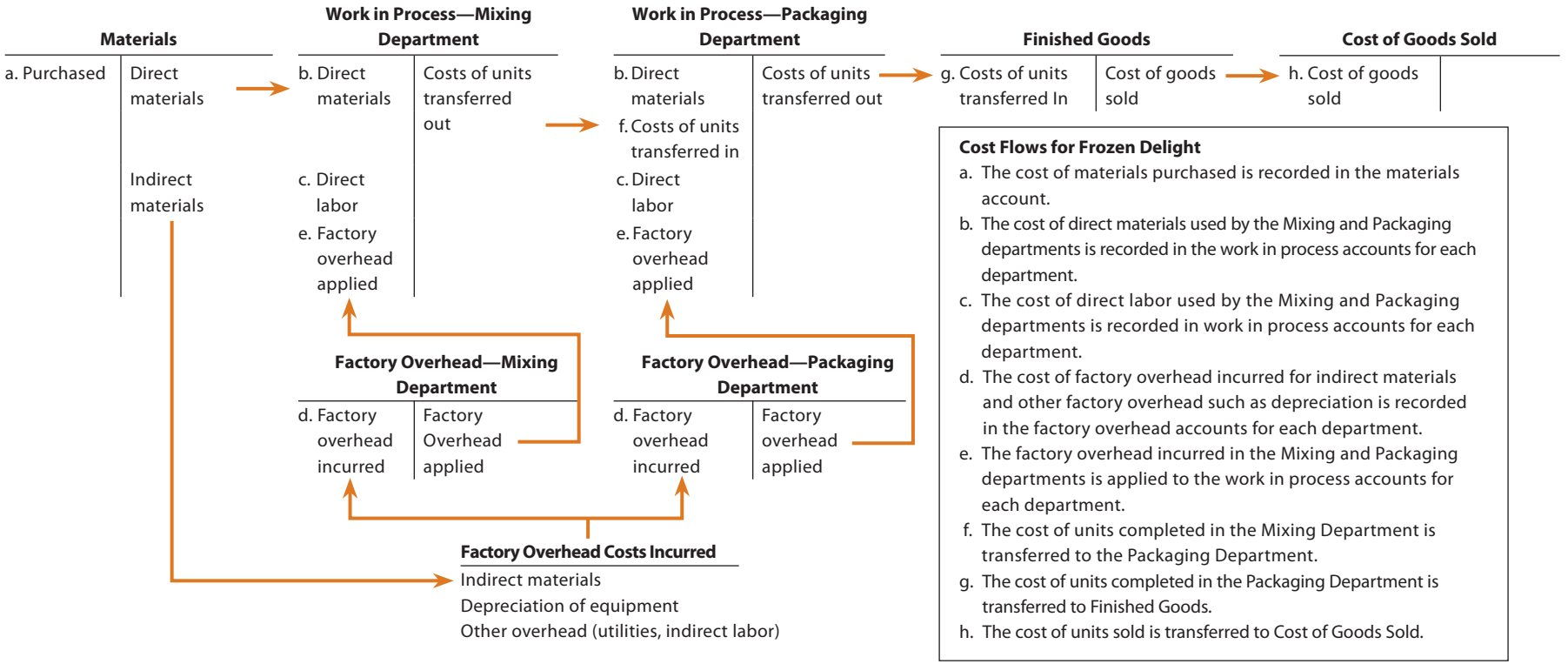
a. The cost of materials purchased is recorded in the materials account.
b. The cost of direct materials used by the Mixing and Packaging departments is recorded in the work in process accounts for each department.
c. The cost of direct labor used by the Mixing and Packaging departments is recorded in work in process accounts for each department.
d. The cost of factory overhead incurred for indirect materials and other factory overhead such as depreciation is recorded in the factory overhead accounts for each department.
e. The factory overhead incurred in the Mixing and Packaging departments is applied to the work in process accounts for each department.
f. The cost of units completed in the Mixing Department is transferred to the Packaging Department.
g. The cost of units completed in the Packaging Department is transferred to Finished Goods.
h. The cost of units sold is transferred to Cost of Goods Sold.

As shown in Exhibit 4, the Mixing and Packaging departments have separate factory overhead accounts. The factory overhead costs incurred for indirect materials, depreciation, and other overhead are debited to each department's factory overhead account. The overhead is applied to work in process by debiting each department's work in process account and crediting the department's factory overhead account.

Exhibit 4 illustrates how the Mixing and Packaging departments have separate work in process accounts. Each work in process account is debited for direct materials, direct labor, and applied factory overhead. In addition, the work in process account for the Packaging Department is debited for the cost of the units transferred in from the Mixing Department. Each work in process account is credited for the cost of the units transferred to the next department.

Exhibit 4 shows that the finished goods account is debited for the cost of the units transferred from the Packaging Department. The finished goods account is credited for the cost of the units sold, which is debited to the cost of goods sold account.

Exhibit 4 Cost Flows for a Process Manufacturer—Frozen Delight



Cost Flows for Frozen Delight

a. The cost of materials purchased is recorded in the materials account.
b. The cost of direct materials used by the Mixing and Packaging departments is recorded in the work in process accounts for each department.
c. The cost of direct labor used by the Mixing and Packaging departments is recorded in work in process accounts for each department.
d. The cost of factory overhead incurred for indirect materials and other factory overhead such as depreciation is recorded in the factory overhead accounts for each department.
e. The factory overhead incurred in the Mixing and Packaging departments is applied to the work in process accounts for each department.
f. The cost of units completed in the Mixing Department is transferred to the Packaging Department.
g. The cost of units completed in the Packaging Department is transferred to Finished Goods.
h. The cost of units sold is transferred to Cost of Goods Sold.

Dreyer's is currently a subsidiary of **Nestlé**, which produces Dreyer's ice cream at its Bakersfield, California plant.

Link to Dreyer's Ice Cream

Cost of Production Report

Objective 2
Prepare a cost of production report.

In a process cost system, the cost of units transferred out of each processing department must be determined along with the cost of any partially completed units remaining in the department. The report that summarizes these costs is a cost of production report.

The **cost of production report** summarizes the production and cost data for a department as follows:

- The units the department is accountable for and the disposition of those units.
- The product costs incurred by the department and the allocation of those costs between completed (transferred out) and partially completed units.

A cost of production report is prepared using the following four steps:

- Step 1. Determine the units to be assigned costs.
- Step 2. Compute equivalent units of production.
- Step 3. Determine the cost per equivalent unit.
- Step 4. Allocate costs to units transferred out and partially completed units.

Preparing a cost of production report requires making a cost flow assumption. Like merchandise inventory, costs can be assumed to flow through the manufacturing process, using the first-in, first-out (FIFO), last-in, first-out (LIFO), or weighted average methods. Because the **first-in, first-out (FIFO) inventory cost flow method** is often the same as the physical flow of units, the FIFO method is used in this chapter.[1]

To illustrate, a cost of production report for the Mixing Department of **Frozen Delight** for July is prepared. The July data for the Mixing Department are as follows:

Inventory in process, July 1, 5,000 gallons:		
Direct materials cost, for 5,000 gallons	$5,000	
Conversion costs, for 5,000 gallons, 70% completed	1,225	
Total inventory in process, July 1		$ 6,225
Direct materials cost for July, 60,000 gallons		66,000
Direct labor cost for July		10,500
Factory overhead applied for July		7,275
Total production costs to account for		$90,000
Gallons transferred to Packaging in July (includes units in process on July 1), 62,000 gallons		?
Inventory in process, July 31, 3,000 gallons, 25% completed as to conversion costs		?

By preparing a cost of production report, the cost of the gallons transferred to the Packaging Department in July and the ending work in process inventory in the Mixing Department are determined. These amounts are indicated by question marks (?).

[1] The weighted average method is illustrated in an appendix to this chapter.

Step 1: Determine the Units to Be Assigned Costs

The first step is to determine the units to be assigned costs. A unit can be any measure of completed production, such as tons, gallons, pounds, barrels, or cases. For **Frozen Delight**, a unit is a gallon of ice cream.

The Mixing Department is accountable for 65,000 gallons of direct materials during July, computed as follows:

Total units (gallons) charged to production:	
In process, July 1	5,000 gallons
Received from materials storage	60,000
Total units (gallons) accounted for	65,000 gallons

For July, the following three groups of units (gallons) are assigned costs:

- Group 1. Units (gallons) in beginning work in process inventory on July 1.
- Group 2. Units (gallons) started and completed during July.
- Group 3. Units (gallons) in ending work in process inventory on July 31.

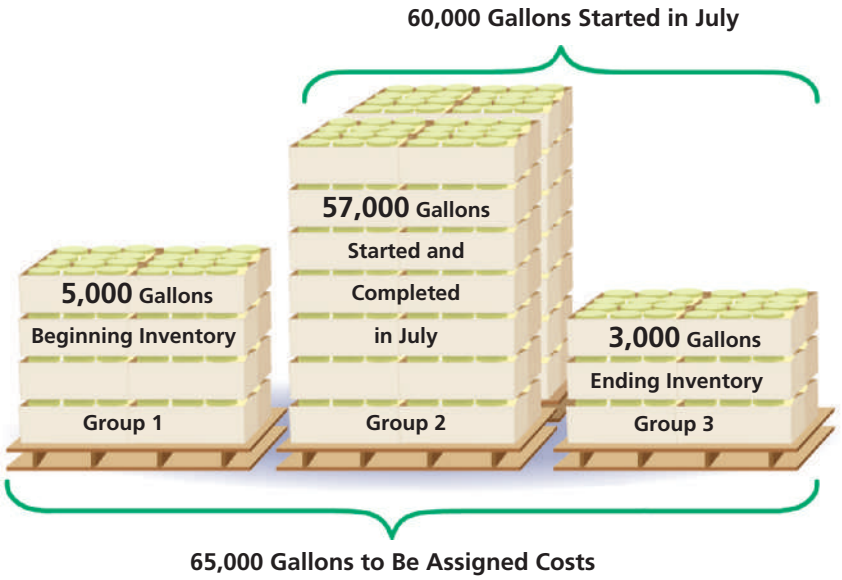
Exhibit 5 illustrates these groups of units (gallons) in the Mixing Department for July. The 5,000 gallons of beginning inventory were completed and transferred to the Packaging Department. During July, 60,000 gallons of material were started (entered into mixing). Of the 60,000 gallons started in July, 3,000 gallons were incomplete on July 31. Thus, 57,000 gallons (60,000 – 3,000) were started and completed in July.

The total units (gallons) to be assigned costs for July are summarized as follows:

Group 1	Inventory in process, July 1, completed in July	5,000 gallons
Group 2	Started and completed in July	57,000
	Transferred out to the Packaging Department in July	62,000 gallons
Group 3	Inventory in process, July 31	3,000
	Total units (gallons) to be assigned costs	65,000 gallons

The total gallons to be assigned costs (65,000) equal the total gallons accounted for (65,000) by the Mixing Department.

Exhibit 5
July Units to Be Costed—Mixing Department



Step 2: Compute Equivalent Units of Production

Whole units are the number of units in production during a period, whether completed or not. **Equivalent units of production** are the portion of whole units that are complete with respect to materials or conversion (direct labor and factory overhead) costs.

To illustrate, assume that a 1,000-gallon batch (vat) of ice cream at **Frozen Delight** is only 40% complete in the mixing process on May 31. Thus, the batch is only 40% complete as to conversion costs such as power. In this case, the whole units and equivalent units of production are as follows:

	Whole Units	Equivalent Units
Materials costs	1,000 gallons	1,000 gallons
Conversion costs	1,000 gallons	400 gallons (1,000 × 40%)

Because the materials costs are all added at the beginning of the process, the materials costs are 100% complete for the 1,000-gallon batch of ice cream. Thus, the whole units and equivalent units for materials costs are 1,000 gallons. However, because the batch is only 40% complete as to conversion costs, the equivalent units for conversion costs are 400 gallons.

Equivalent units for materials and conversion costs are usually determined separately as shown earlier. This is because materials and conversion costs normally enter production at different times and rates. In contrast, direct labor and factory overhead normally enter production at the same time and rate. For this reason, direct labor and factory overhead are combined as conversion costs in computing equivalent units.

Materials Equivalent Units To compute equivalent units for materials, it is necessary to know how materials are added during the manufacturing process. In the case of **Frozen Delight**, all the materials are added at the beginning of the mixing process. Thus, the equivalent units for materials in July are computed as follows:

		Whole Units	Percent Materials Added in July	Equivalent Units for Direct Materials
Group 1	Inventory in process, July 1	5,000	0%	0
Group 2	Started and completed in July (62,000 − 5,000)	57,000	100%	57,000
	Transferred out to Packaging Department in July	62,000	—	57,000
Group 3	Inventory in process, July 31	3,000	100%	3,000
	Total gallons to be assigned costs	65,000		60,000

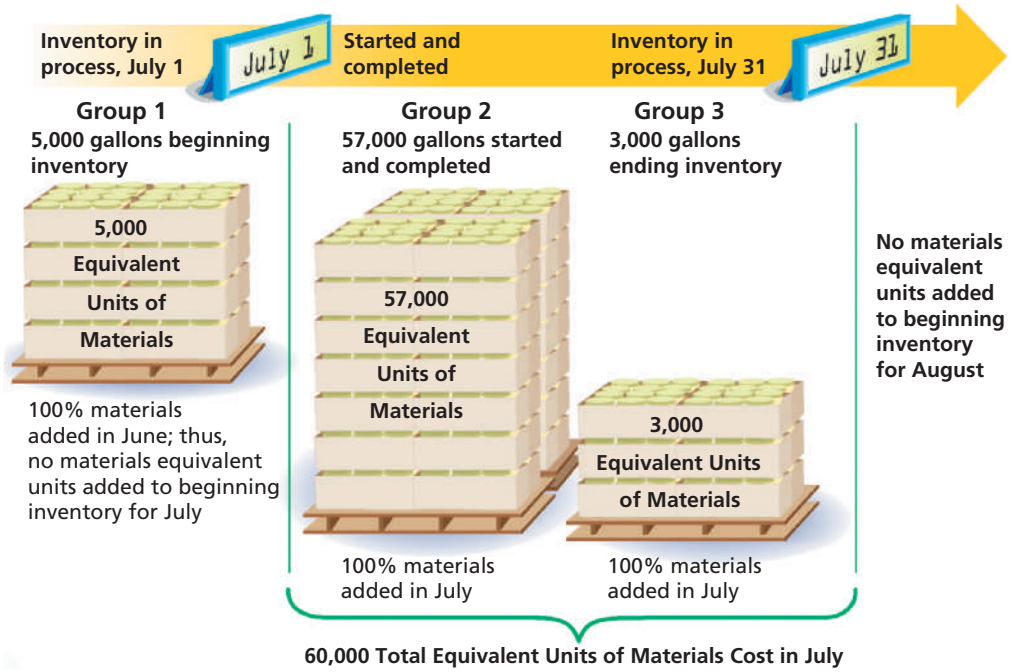
As shown, the whole units for the three groups of units determined in Step 1 are listed in the first column. The percent of materials added in July is then listed. The equivalent units are determined by multiplying the whole units by the percent of materials added.

To illustrate, the July 1 inventory (Group 1) has 5,000 gallons of whole units, which are complete as to materials. That is, all the direct materials for the 5,000 gallons in process on July 1 were added in June. Thus, the percent of materials added in July is zero, and the equivalent units added in July are zero.

The 57,000 gallons started and completed in July (Group 2) are 100% complete as to materials. Thus, the equivalent units for the gallons started and completed in July are 57,000 (57,000 × 100%) gallons. The 3,000 gallons in process on July 31 (Group 3) are also 100% complete as to materials because all materials are added at the beginning of the process. Therefore, the equivalent units for the inventory in process on July 31 are 3,000 (3,000 × 100%) gallons.

The equivalent units for direct materials for **Frozen Delight** are summarized in Exhibit 6.

Exhibit 6
Direct Materials Equivalent Units



Conversion Equivalent Units To compute equivalent units for conversion costs, it is necessary to know how direct labor and factory overhead enter the manufacturing process. Direct labor, utilities, and equipment depreciation are often incurred uniformly during processing. For this reason, it is assumed that **Frozen Delight** incurs conversion costs evenly throughout its manufacturing process. Thus, the equivalent units for conversion costs in July are computed as follows:

		Whole Units	Percent Conversion Completed in July	Equivalent Units for Conversion
Group 1	Inventory in process, July 1 (70% completed)	5,000	30%	1,500
Group 2	Started and completed in July (62,000 − 5,000)	57,000	100%	57,000
	Transferred out to Packaging Department in July	62,000	—	58,500
Group 3	Inventory in process, July 31 (25% completed)	3,000	25%	750
	Total gallons to be assigned costs	65,000		59,250

As shown, the whole units for the three groups of units determined in Step 1 are listed in the first column. The percent of conversion costs added in July is then listed. The equivalent units are determined by multiplying the whole units by the percent of conversion costs added.

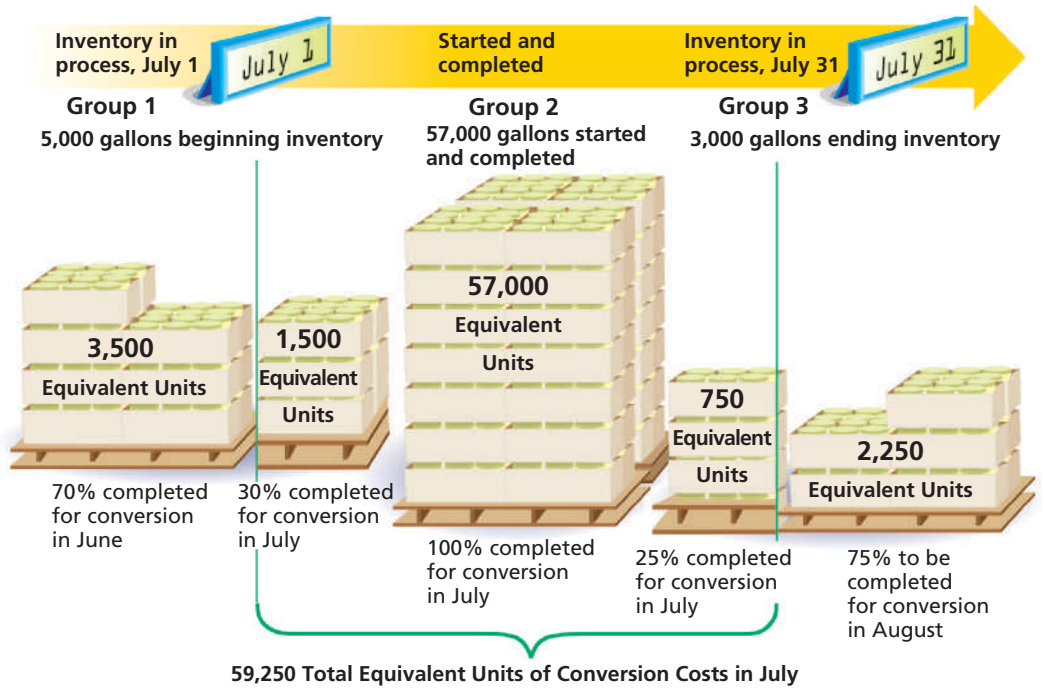
To illustrate, the July 1 inventory has 5,000 gallons of whole units (Group 1), which are 70% complete as to conversion costs. During July, the remaining 30% (100% – 70%) of conversion costs was added. Therefore, the equivalent units of conversion costs added in July are 1,500 (5,000 × 30%) gallons.

The 57,000 gallons started and completed in July (Group 2) are 100% complete as to conversion costs. Thus, the equivalent units of conversion costs for the gallons started and completed in July are 57,000 (57,000 × 100%) gallons.

The 3,000 gallons in process on July 31 (Group 3) are 25% complete as to conversion costs. Hence, the equivalent units for the inventory in process on July 31 are 750 (3,000 × 25%) gallons.

The equivalent units for conversion costs for **Frozen Delight** are summarized in Exhibit 7.

Exhibit 7
Conversion Equivalent Units



Check Up Corner 3-1 Equivalent Units

The Bottling Department of Rocky Springs Beverage Company had 2,000 liters in the beginning work in process (30% complete). During the month, 28,500 liters were started and 29,000 liters were completed. The ending work in process inventory was 1,500 liters (60% complete). Materials are added at the beginning of the process, while conversion costs are added evenly throughout the process.

a. How many units were started and completed during the month?

b. What are the total equivalent units for: (1) direct materials and (2) conversion costs?

Solution:

a. The units started and completed can be computed as follows:

Alternative One	Units	Alternative Two	Units
Completed (transferred out)	29,000	Started (during month)	28,500
Inventory in process (beginning)	(2,000)	Inventory in process (ending)	(1,500)
Started and completed	27,000	Started and completed	27,000

b. 1. Direct Materials

Whole units are the number of units in production.

	Whole Units	Percent Materials Added in Month	Equivalent Units for Direct Materials
Inventory in process, beginning of month	2,000	0%	0
Started and completed during the month	27,000	100%	27,000
Transferred out of Bottling (completed)	29,000	—	27,000
Inventory in process, end of month	1,500	100%	1,500
Total units to be assigned costs	30,500		28,500

Equivalent units are the portion of whole units that are complete for direct materials.

The equivalent units for beginning inventory is 0, because all (100%) of the materials are added at the beginning of the process, which occurred in the prior month.

Materials costs in ending inventory are 100% complete because all materials are added at the beginning of the process.

(Continued)

2. Conversion Costs

	Whole Units	Percent Conversion Completed in Month	Equivalent Units for Conversion
Inventory in process, beginning of month	2,000	70%	1,400
Started and completed during the month	27,000	100%	27,000
Transferred out of Bottling (completed)	29,000	—	28,400
Inventory in process, end of month	1,500	60%	900
Total units to be assigned costs	30,500		29,300

Equivalent units are the portion of whole units that are complete for conversion.

To complete the units in beginning inventory, an additional 70% of conversion costs (100% – 30% completed in prior month) must be added during the month.

Conversion costs in ending inventory are 60% complete because they are added evenly throughout the process during the current month.

Check Up Corner

Step 3: Determine the Cost per Equivalent Unit

The next step in preparing the cost of production report is to compute the cost per equivalent unit for direct materials and conversion costs. The **cost per equivalent unit** for direct materials and conversion costs is computed as follows:

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\text{Total Direct Materials Cost for the Period}}{\text{Total Equivalent Units of Direct Materials}}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\text{Total Conversion Costs for the Period}}{\text{Total Equivalent Units of Conversion Costs}}$$

The July direct materials and conversion cost equivalent units for **Frozen Delight**'s Mixing Department from Step 2 are as follows:

		Equivalent Units	
		Direct Materials	Conversion
Group 1	Inventory in process, July 1	0	1,500
Group 2	Started and completed in July (62,000 – 5,000)	57,000	57,000
	Transferred out to Packaging Department in July	57,000	58,500
Group 3	Inventory in process, July 31	3,000	750
	Total gallons to be assigned costs	60,000	59,250

The direct materials and conversion costs incurred by Frozen Delight in July are as follows:

Direct materials		$66,000
Conversion costs:		
Direct labor	$10,500	
Factory overhead	7,275	17,775
Total product costs incurred in July		$83,775

The direct materials and conversion costs per equivalent unit are $1.10 and $0.30 per gallon, respectively, computed as follows:

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\text{Total Direct Materials Cost for the Period}}{\text{Total Equivalent Units of Direct Materials}}$$

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\$66{,}000}{60{,}000 \text{ gallons}} = \$1.10 \text{ per gallon}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\text{Total Conversion Costs for the Period}}{\text{Total Equivalent Units of Conversion Costs}}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\$17{,}775}{59{,}250 \text{ gallons}} = \$0.30 \text{ per gallon}$$

The preceding costs per equivalent unit are used in Step 4 to allocate the direct materials and conversion costs to the completed and partially completed units.

Step 4: Allocate Costs to Units Transferred Out and Partially Completed Units

Product costs must be allocated to the units transferred out and the partially completed units on hand at the end of the period. The product costs are allocated using the costs per equivalent unit for materials and conversion costs that were computed in Step 3.

The total production costs to be assigned for **Frozen Delight** in July are $90,000, computed as follows:

Inventory in process, July 1, 5,000 gallons:		
Direct materials cost, for 5,000 gallons	$ 5,000	
Conversion costs, for 5,000 gallons, 70% completed	1,225	
Total inventory in process, July 1		$ 6,225
Direct materials cost for July, 60,000 gallons	$66,000	
Direct labor cost for July	10,500	
Factory overhead applied for July	7,275	
Costs incurred in July		83,775
Total production costs to account for		$90,000

The units to be assigned these costs follow. The costs to be assigned these units are indicated by question marks (?).

		Whole Units	Total Cost
Group 1	Inventory in process, July 1, completed in July	5,000 gallons	?
Group 2	Started and completed in July	57,000	?
	Transferred out to the Packaging Department in July	62,000 gallons	?
Group 3	Inventory in process, July 31	3,000	?
	Total	65,000 gallons	$90,000

Group 1: Inventory in Process on July 1 The 5,000 gallons of inventory in process on July 1 (Group 1) were completed and transferred out to the Packaging Department in July. The cost of these units of $6,675 is determined as follows:

	Direct Materials Costs	Conversion Costs	Total Costs
Inventory in process, July 1 balance			$6,225
Equivalent units for completing the July 1 in-process inventory	0	1,500	
Cost per equivalent unit	× $1.10	× $0.30	
Cost of completed July 1 in-process inventory	0	$450	450
Cost of July 1 in-process inventory transferred to Packaging Department			$6,675

As shown, $6,225 of the cost of the July 1 in-process inventory of 5,000 gallons was carried over from June. This cost plus the cost of completing the 5,000 gallons in July was transferred to the Packaging Department during July. The cost of completing the 5,000 gallons during July is $450. The $450 represents the conversion costs necessary to complete the remaining 30% of the processing. There were no direct materials costs added in July because all the materials costs had been added in June. Thus, the cost of the 5,000 gallons in process on July 1 (Group 1) transferred to the Packaging Department is $6,675.

Group 2: Started and Completed The 57,000 units started and completed in July (Group 2) incurred all (100%) of their direct materials and conversion costs in July. Thus, the cost of the 57,000 gallons started and completed is $79,800, computed by multiplying 57,000 gallons by the costs per equivalent unit for materials and conversion costs as follows:

	Direct Materials Costs	Conversion Costs	Total Costs
Units started and completed in July	57,000 gallons	57,000 gallons	
Cost per equivalent unit	× $1.10	× $0.30	
Cost of the units started and completed in July	$62,700	$17,100	$79,800

The total cost of $86,475 transferred to the Packaging Department in July is the sum of the beginning inventory cost and the costs of the units started and completed in July, computed as follows:

Group 1	Cost of July 1 in-process inventory	$ 6,675
Group 2	Cost of the units started and completed in July	79,800
	Total costs transferred to Packaging Department in July	$86,475

Why It Matters

CONCEPT CLIP

Fill 'Er Up

A study of the cost per gallon of unleaded gasoline in various parts of the country revealed the following:

Los Angeles	$3.71	Cleveland	$2.65
Chicago	3.58	Atlanta	2.49
Seattle	3.11	Boston	2.49
New York	2.87	St. Louis	2.42
Detroit	2.84	Austin	2.36
Omaha	2.66		

The cost per gallon ranged from a high of $3.71 in Los Angeles to a low of $2.36 in Austin, or a 57% difference. The price per barrel of oil was around $50 at the time of this study. Why would the price per gallon of gasoline be so different, when the price per barrel of oil, the basic material for making gasoline, is the same for everyone? Normally, the final price would be determined by the price of oil, the conversion cost of refining oil to gasoline, plus some additional amounts for distribution and profits. However, during this time period, refinery operations were shut down in parts of the country for repairs and overhauls. As a result, some regions were experiencing supply shortfalls that caused the price of gasoline to increase relative to those regions that remained well supplied. Refiners focus on minimizing downtime, so these types of disruptions do not occur.

Source: Alison Sider, "Refinery Woes Keep Pump Prices Up," *The Wall Street Journal*, August 24, 2015, p. A1.

Group 3: Inventory in Process on July 31 The 3,000 gallons in process on July 31 (Group 3) incurred all their direct materials costs and 25% of their conversion costs in July. The cost of these partially completed units of $3,525 is computed as follows:

	Direct Materials Costs	Conversion Costs	Total Costs
Equivalent units in ending inventory	3,000 gallons	750 gallons	
Cost per equivalent unit	× $1.10	× $0.30	
Cost of July 31 in-process inventory	$3,300	$225	$3,525

The 3,000 gallons in process on July 31 received all (100%) of their materials in July. Therefore, the direct materials cost incurred in July is $3,300 (3,000 × $1.10). The conversion costs of $225 represent the cost of the 750 (3,000 × 25%) equivalent gallons multiplied by the cost of $0.30 per equivalent unit for conversion costs. The sum of the direct materials cost ($3,300) and the conversion costs ($225) equals the total cost of the July 31 work in process inventory of $3,525 ($3,300 + $225).

To summarize, the total manufacturing costs for Frozen Delight in July were assigned as follows. In doing so, the question marks (?) for the costs to be assigned to units in Groups 1, 2, and 3 have been answered.

		Whole Units	Total Cost
Group 1	Inventory in process, July 1, completed in July	5,000 gallons	$ 6,675
Group 2	Started and completed in July	57,000	79,800
	Transferred out to the Packaging Department in July	62,000 gallons	$86,475
Group 3	Inventory in process, July 31	3,000	3,525
	Total	65,000 gallons	$90,000

Dreyer's invented Rocky Road ice cream in 1929.

Link to Dreyer's Ice Cream

Preparing the Cost of Production Report

A cost of production report is prepared for each processing department at periodic intervals. The report summarizes the following production quantity and cost data:

- The units for which the department is accountable and the disposition of those units
- The production costs incurred by the department and the allocation of those costs between completed (transferred out) and partially completed units

Using Steps 1–4, the July cost of production report for **Frozen Delight**'s Mixing Department is shown in Exhibit 8. During July, the Mixing Department was accountable for 65,000 units (gallons). Of these units, 62,000 units were completed and transferred to the Packaging Department. The remaining 3,000 units are partially completed and are part of the in-process inventory as of July 31.

The Mixing Department was responsible for $90,000 of production costs during July. The cost of goods transferred to the Packaging Department in July was $86,475. The remaining cost of $3,525 is part of the in-process inventory as of July 31.

Exhibit 8 Cost of Production Report for Frozen Delight's Mixing Department—FIFO

	A	B	C	D	E
1	**Frozen Delight**				
2	**Cost of Production Report—Mixing Department**				
3	**For the Month Ended July 31**				
4					
5			**Equivalent Units**		
6	**UNITS**	**Whole Units**	**Direct Materials**	**Conversion**	
7	Units charged to production:				
8	Inventory in process, July 1	5,000			
9	Received from materials storeroom	60,000			
10	Total units accounted for by the Mixing Department	65,000			
11					
12	Units to be assigned costs:				
13	Inventory in process, July 1 (70% completed)	5,000	0	1,500	
14	Started and completed in July	57,000	57,000	57,000	
15	Transferred to Packaging Department in July	62,000	57,000	58,500	
16	Inventory in process, July 31 (25% completed)	3,000	3,000	750	
17	Total units to be assigned costs	65,000	60,000	59,250	
18					
19			**Costs**		
20	**COSTS**		**Direct Materials**	**Conversion**	**Total**
21					
22	Cost per equivalent unit:				
23	Total costs for July in Mixing Department		$ 66,000	$ 17,775	
24	Total equivalent units (from Step 2)		÷60,000	÷59,250	
25	Cost per equivalent unit		$ 1.10	$ 0.30	
26					
27	Costs assigned to production:				
28	Inventory in process, July 1				$ 6,225
29	Costs incurred in July				83,775[a]
30	Total costs accounted for by the Mixing Department				$90,000
31					
32					
33	Costs allocated to completed and partially				
34	completed units:				
35	Inventory in process, July 1—balance				$ 6,225
36	To complete inventory in process, July 1		$ 0	+ $ 450[b]	= 450
37	Cost of completed July 1 work in process				$ 6,675
38	Started and completed in July		$ 62,700[c]	+ $ 17,100[d]	= 79,800
39	Transferred to Packaging Department in July				$86,475
40	Inventory in process, July 31		$ 3,300[e]	+ $ 225[f]	= 3,525
41	Total costs assigned by the Mixing Department				$90,000
42					

Step 1
Step 2
Step 3
Step 4

[a] $66,000 + $10,500 + $7,275 = $83,775
[b] 1,500 units × $0.30 = $450
[c] 57,000 units × $1.10 = $62,700
[d] 57,000 units × $0.30 = $17,100
[e] 3,000 units × $1.10 = $3,300
[f] 750 units × $0.30 = $225

Check Up Corner 3-2 Cost per Equivalent Unit

The cost of direct materials transferred into the Bottling Department of Rocky Springs Beverage Company is $22,800. The conversion costs for the period in the Bottling Department are $8,790. The total equivalent units for direct materials and conversion costs are as follows:

	Equivalent Units (in liters)	
	Direct Materials	**Conversion**
Inventory in process, beginning of period	0	1,400
Started and completed during the period	27,000	27,000
Transferred out of Bottling (completed)	27,000	28,400
Inventory in process, end of period	1,500	900
Total units to be assigned costs	28,500	29,300

The beginning work in process inventory had a cost of $1,860.

a. Determine the cost per equivalent unit for: (1) direct materials and (2) conversion costs.

b. Determine the cost of units transferred out and the ending work in process inventory.

Note: The units transferred out and the equivalent units of production are computed in Check Up Corner 3-1.

Solution:

a. 1.

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\text{Total Direct Materials Cost for the Period}}{\text{Total Equivalent Units of Direct Materials}}$$

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\$22,800}{28,500 \text{ liters}} = \$0.80 \text{ per liter}$$

2.

$$\text{Conversion Cost per Equivalent Unit} = \frac{\text{Total Conversion Costs for the Period}}{\text{Total Equivalent Units of Conversion Costs}}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\$8,790}{29,300 \text{ liters}} = \$0.30 \text{ per liter}$$

Costs per equivalent unit are used to allocate the direct materials and conversion costs to the completed and partially completed units in part b.

b.

Materials costs added during the current period

Conversion costs added during the current period

	Direct Materials Costs	**Conversion Costs**	**Total Costs**
Inventory in process, beginning of period			$ 1,860
To complete inventory in process, beginning of period	$ 0	$ 420[a]	420
Started and completed during the period	21,600[b]	8,100[c]	29,700
Transferred out of Bottling (completed)			$31,980
Inventory in process, end of period	1,200[d]	270[e]	1,470
Total costs assigned by the Bottling Department			$33,450
Completed and transferred out of production			$31,980
Inventory in process, ending			$ 1,470

No materials cost is added during the current period for beginning inventory.

[a] 1,400 units × $0.30 = $420
[b] 27,000 units × $0.80 = $21,600
[c] 27,000 units × $0.30 = $8,100
[d] 1,500 units × $0.80 = $1,200
[e] 900 units × $0.30 = $270

Check Up Corner

Objective 3
Journalize entries for transactions using a process cost system.

Journal Entries for a Process Cost System

The journal entries to record the cost flows and transactions for a process cost system are illustrated in this section. As a basis for illustration, the July transactions for **Frozen Delight** are used. To simplify, the entries are shown in summary form, even though many of the transactions would be recorded daily.

a. Purchased materials, including milk, cream, sugar, packaging, and indirect materials on account, $88,000.

A = L + E
+ +

a.	Materials	88,000	
	Accounts Payable		88,000

b. The Mixing Department requisitioned milk, cream, and sugar, $66,000. This is the total amount from the original July data. Packaging materials of $8,000 were requisitioned by the Packaging Department. Indirect materials for the Mixing and Packaging departments were $4,125 and $3,000, respectively.

A = L + E
+ –

b.	Work in Process—Mixing	66,000	
	Work in Process—Packaging	8,000	
	Factory Overhead—Mixing	4,125	
	Factory Overhead—Packaging	3,000	
	Materials		81,125

Pathways Challenge



This is Accounting!

Economic Activity

Spoilage occurs in a manufacturing process when units, fully or partially completed, do not meet quality standards. Some normal spoilage normally occurs in all manufacturing processes and is considered a part of the cost of goods manufactured. Thus, the cost of normal spoilage is included as part of work in process, finished goods, and cost of goods sold. Abnormal spoilage should not occur under normal operating conditions and is considered avoidable.

Critical Thinking/Judgment

Because work on spoiled units is stopped when the unit is considered spoiled, these units may not have incurred as many costs as unspoiled units. For example, if 100 units are inspected when they are 80% complete and 10 units are considered spoiled, how many equivalent units of spoilage is there?
If the company expects that for every 100 units manufactured there is one spoiled unit, how many of the 10 spoiled units in the preceding example would be considered normal spoilage, and how many would be considered abnormal spoilage?
What are the equivalent units of normal and abnormal spoilage?
Why does the computation of spoilage matter?
Are the costs of spoilage just the cost of doing business?

Suggested answer at end of chapter.

c. Incurred direct labor in the Mixing and Packaging departments of $10,500 and $12,000, respectively.

c.	Work in Process—Mixing	10,500		A = L + E
	Work in Process—Packaging	12,000		+ +
	Wages Payable		22,500	

d. Recognized equipment depreciation for the Mixing and Packaging departments of $3,350 and $1,000, respectively.

d.	Factory Overhead—Mixing	3,350		A = L + E
	Factory Overhead—Packaging	1,000		+ –
	Accumulated Depreciation—Equipment		4,350	

e. Applied factory overhead to Mixing and Packaging departments of $7,275 and $3,500, respectively.

e.	Work in Process—Mixing	7,275		A = L + E
	Work in Process—Packaging	3,500		+ –
	Factory Overhead—Mixing		7,275	
	Factory Overhead—Packaging		3,500	

f. Transferred costs of $86,475 from the Mixing Department to the Packaging Department per the cost of production report in Exhibit 8.

f.	Work in Process—Packaging	86,475		A = L + E
	Work in Process—Mixing		86,475	+ –

g. Transferred goods of $106,000 out of the Packaging Department to Finished Goods according to the Packaging Department cost of production report (not illustrated).

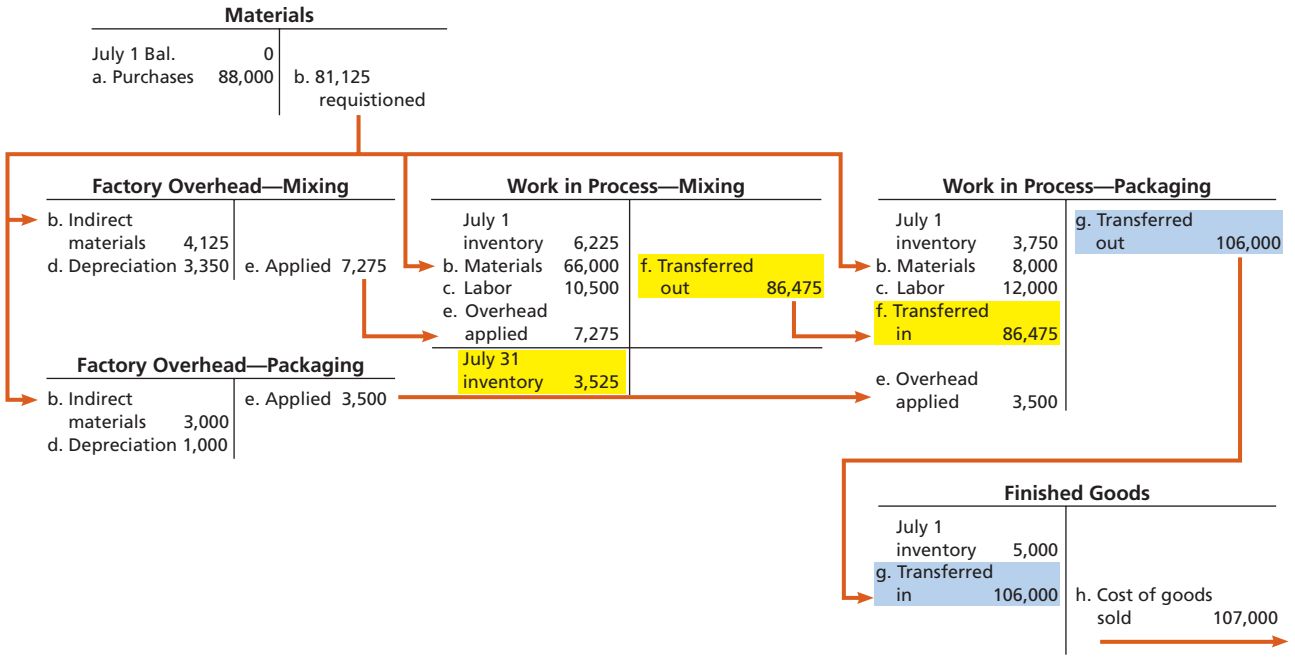
g.	Finished Goods—Ice Cream	106,000		A = L + E
	Work in Process—Packaging		106,000	+ –

h. Recorded the cost of goods sold out of the finished goods inventory of $107,000.

h.	Cost of Goods Sold	107,000		A = L + E
	Finished Goods—Ice Cream		107,000	– – Exp

Exhibit 9 shows the flow of costs for each transaction. The highlighted amounts in Exhibit 9 were determined from assigning the costs in the Mixing Department. These amounts were computed and are shown at the bottom of the cost of production report for the Mixing Department in Exhibit 8. Likewise, the highlighted amount transferred out of the Packaging Department to Finished Goods would have also been determined from a cost of production report for the Packaging Department.

Exhibit 9 Frozen Delight's Cost Flows

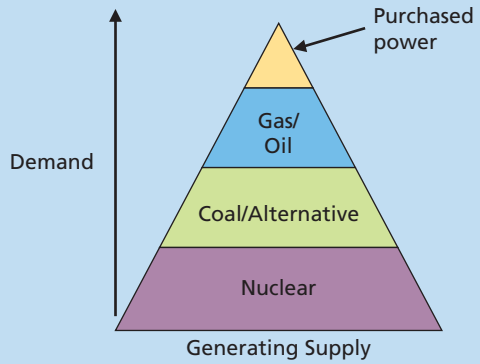


Why It Matters

Process Costing for Services: Costing the Power Stack

Process costing can also be used in service businesses where the nature of the service is uniform across all units. Examples include electricity generation, wastewater treatment, and natural gas transmission. To illustrate, the unit of production in generating electricity is called a megawatt hour, where each megawatt hour is the same across all sources of generation.

Unlike product manufacturing, service companies often do not have inventory. For example, in generating electricity, the electricity cannot be stored. Thus, electric companies such as **Duke Energy Corporation (DUK)** match the production of electricity to the demand in real time. Electric companies use what is termed the *power stack* to match power supply to demand by arranging generating facilities in order of cost per megawatt hour. The least-cost-per-megawatt-hour facilities satisfy initial demand at the bottom of the stack, while the highest-cost-per-megawatt-hour power sources are placed at the top of the stack to satisfy peak loads, as illustrated in the graph to the right:



The cost per megawatt hour is determined using process costing by accumulating the conversion costs such as equipment depreciation, labor, and maintenance plus the cost of fuel for each facility. These costs are divided by the megawatt hours generated. Because there are no inventories, the additional complexity of equivalent units is avoided. The resulting cost per megawatt hour by facility is used to develop the power stack.

The ending inventories for Frozen Delight are reported on the July 31 balance sheet as follows:

Materials	$ 6,875
Work in Process—Mixing Department	3,525
Work in Process—Packaging Department	7,725
Finished Goods	4,000
Total inventories	$22,125

The $3,525 balance of Work in Process—Mixing Department is the amount determined from the bottom of the cost of production report in Exhibit 8.

Check Up Corner 3-3 Process Costing Journal Entries

The cost of materials transferred into the Bottling Department of Rocky Springs Beverage Company is $22,800, including $20,000 from the Blending Department and $2,800 from the materials storeroom. The conversion costs for the period in the Bottling Department are $8,790 ($3,790 factory overhead applied and $5,000 direct labor). The total cost transferred to Finished Goods during the period is $31,980. The Bottling Department had a beginning work in process inventory of $1,860.

a. Journalize (1) the cost of transferred-in materials, (2) the conversion costs, and (3) the costs transferred out to Finished Goods.

b. Determine the balance of Work in Process—Bottling at the end of the period.

Note: The costs transferred out of the Bottling Department and the cost of the Bottling Department's ending inventory are computed in Check Up Corner 3-2.

Solution:

a. 1.

Work in Process—Bottling	22,800		
Work in Process—Blending		20,000	← Transferred $20,000 in from the Blending Department
Materials		2,800	← Transferred $2,800 from the materials storeroom

2.

Work in Process—Bottling	8,790		
Wages Payable		5,000	← Incurred direct labor of $5,000 in the Bottling Department
Factory Overhead—Bottling		3,790	← Applied $3,790 of factory overhead

3.

Finished Goods	31,980		
Work in Process—Bottling		31,980	← Transferred $31,980 out of Work in Process—Bottling and into Finished Goods inventory

b.

Work in Process—Bottling

Beg. bal.	1,860	Transferred out	31,980
From Blending	20,000		
Materials	2,800		
Labor	5,000		
Overhead applied	3,790		
Ending bal.	1,470		← The balance in Work in Process—Bottling at the end of the period

Check Up Corner

Objective 4
Describe and illustrate the analysis of unit cost changes between periods.

Using the Cost of Production Report

The cost of production report is often used by managers for analyzing the change in the conversion and direct materials cost per equivalent unit between periods. To illustrate, the cost of production report for **Frozen Delight** is used.

The cost of production report for the Mixing Department is shown in Exhibit 8. The cost per equivalent unit for June can be determined from the beginning inventory. The original Frozen Delight data indicate that the July 1 inventory in process of $6,225 consists of the following costs:

Direct materials cost, 5,000 gallons	$5,000
Conversion costs, 5,000 gallons, 70% completed	1,225
Total inventory in process, July 1	$6,225

Using the preceding data, the June costs per equivalent unit of materials and conversion costs can be determined as follows:

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\text{Total Direct Materials Cost for the Period}}{\text{Total Equivalent Units of Direct Materials}}$$

$$\text{Direct Materials Cost per Equivalent Unit} = \frac{\$5{,}000}{5{,}000 \text{ gallons}} = \$1.00 \text{ per gallon}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\text{Total Conversion Costs for the Period}}{\text{Total Equivalent Units of Conversion Costs}}$$

$$\text{Conversion Cost per Equivalent Unit} = \frac{\$1{,}225}{(5{,}000 \times 70\%) \text{ gallons}} = \$0.35 \text{ per gallon}$$

In July, the cost per equivalent unit of materials increased by $0.10 per gallon, while the cost per equivalent unit for conversion costs decreased by $0.05 per gallon, computed as follows:

	July*	June	Increase (Decrease)
Cost per equivalent unit for direct materials	$1.10	$1.00	$ 0.10
Cost per equivalent unit for conversion costs	0.30	0.35	(0.05)

*From Exhibit 8

Frozen Delight's management could use the preceding analysis as a basis for investigating the increase in the direct materials cost per equivalent unit and the decrease in the conversion cost per equivalent unit.

Analysis for Decision Making

Objective 5
Describe and illustrate the use of a cost of production report in evaluating a company's performance.

Analyzing Process Costs

Cost of production reports may be prepared showing more than direct materials and conversion costs. This greater detail can help managers isolate problems and seek opportunities for improvement.

To illustrate, the Blending Department of Holland Beverage Company prepared cost of production reports for April and May. Assume that the Blending Department had no beginning or ending work in process inventory in either month. That is, all units started were completed in

each month. The cost of production reports showing multiple cost categories for April and May in the Blending Department are as follows:

	A	B	C
1	**Cost of Production Reports**		
2	**Holland Beverage Company—Blending Department**		
3	**For the Months Ended April 30 and May 31**		
4		**April**	**May**
5	Direct materials	$ 20,000	$ 40,600
6	Direct labor	15,000	29,400
7	Energy	8,000	20,000
8	Repairs	4,000	8,000
9	Tank cleaning	3,000	8,000
10	Total	$ 50,000	$106,000
11	Units completed	÷100,000	÷200,000
12	Cost per unit	$ 0.50	$ 0.53
13			

The reports indicate that total unit costs have increased in May from $0.50 to $0.53, or 6%. To determine the possible causes for this increase, the cost of production reports are restated in per-unit terms by dividing the costs by the number of units completed, as follows:

	A	B	C	D
1	**Blending Department**			
2	**Per-Unit Expense Comparisons**			
3		**April**	**May**	**% Change**
4	Direct materials	$0.200	$0.203	1.50%
5	Direct labor	0.150	0.147	−2.00%
6	Energy	0.080	0.100	25.00%
7	Repairs	0.040	0.040	0.00%
8	Tank cleaning	0.030	0.040	33.33%
9	Total	$0.500	$0.530	6.00%
10				

Both energy and tank cleaning per-unit costs have increased significantly in May. These increases should be further investigated. For example, the increase in energy may be due to the machines losing fuel efficiency. This could lead management to repair the machines. The tank cleaning costs could be investigated in a similar fashion.

Cost of production reports can also be used to compare the materials output quantity to the materials input quantity. Dividing the output quantities by the input quantities is termed the *yield* of a process. Often, there are materials losses from waste that will cause the materials output to be less than the materials input into the process. These materials losses can be investigated to improve the efficiency in using materials.

Make a Decision Analyzing Process Costs

Analyze Dura-Conduit Corporation's process costs (MAD 3-1)

Analyze Mystic Bottling Company's process costs (MAD 3-2)

Analyze Pix Paper Inc.'s process costs (MAD 3-3)

Analyze Midstate Containers Inc.'s process costs (MAD 3-4)

Objective App

Describe and illustrate the weighted average method of preparing a cost of production report.

Appendix Weighted Average Method

A cost flow assumption must be used as product costs flow through manufacturing processes. In this chapter, the first-in, first-out cost flow method was used for the Mixing Department of Frozen Delight. In this appendix, the **weighted average inventory cost flow method** is illustrated for **S&W Ice Cream Company (S&W)**.

Determining Costs Using the Weighted Average Method

S&W's operations are similar to those of Frozen Delight. Like Frozen Delight, S&W mixes direct materials (milk, cream, sugar) in refrigerated vats and has two manufacturing departments, Mixing and Packaging.

The manufacturing data for the Mixing Department for July are as follows:

Inventory in process, July 1, 5,000 gallons (70% completed)	$ 6,200
Direct materials cost incurred in July, 60,000 gallons	66,000
Direct labor cost incurred in July	10,500
Factory overhead applied in July	6,405
Total production costs to account for	$89,105
Cost of goods transferred to Packaging in July (includes units in process on July 1), 62,000 gallons	?
Cost of work in process inventory, July 31, 3,000 gallons, 25% completed as to conversion costs	?

Using the weighted average method, the objective is to allocate the total costs of production of $89,105 to the following:

- The 62,000 gallons completed and transferred to the Packaging Department
- The 3,000 gallons in the July 31 (ending) work in process inventory

The preceding costs show two question marks. These amounts are determined by preparing a cost of production report, using the following four steps:

- Step 1. Determine the units to be assigned costs.
- Step 2. Compute equivalent units of production.
- Step 3. Determine the cost per equivalent unit.
- Step 4. Allocate costs to transferred out and partially completed units.

To simplify, we assume all of S&W's production costs (materials and conversion costs) occur at the same rate. By doing so, all production costs are combined together in determining the number of equivalent units and cost per equivalent unit.

Step 1: Determine the Units to Be Assigned Costs The first step is to determine the units to be assigned costs. A unit can be any measure of completed production, such as tons, gallons, pounds, barrels, or cases. For **S&W**, a unit is a gallon of ice cream.

S&W's Mixing Department had 65,000 gallons of direct materials to account for during July, as shown here.

Total gallons to account for:	
Inventory in process, July 1	5,000 gallons
Received from materials storeroom	60,000
Total units to account for by the Packaging Department	65,000 gallons

There are two groups of units to be assigned costs for the period.

Group 1	Units completed and transferred out
Group 2	Units in the July 31 (ending) work in process inventory

During July, the Mixing Department completed and transferred 62,000 gallons to the Packaging Department. Of the 60,000 gallons started in July, 57,000 (60,000 − 3,000) gallons were completed and transferred to the Packaging Department. Thus, the ending work in process inventory consists of 3,000 gallons.

The total units (gallons) to be assigned costs for S&W can be summarized as follows:

Group 1	Units transferred out to the Packaging Department in July	62,000 gallons
Group 2	Inventory in process, July 31	3,000
	Total gallons to be assigned costs	65,000 gallons

The total units (gallons) to be assigned costs (65,000 gallons) equal the total units to account for (65,000 gallons).

Step 2: Compute Equivalent Units of Production **S&W** has 3,000 gallons of whole units in the work in process inventory for the Mixing Department on July 31. Because these units are 25% complete, the number of equivalent units in process in the Mixing Department on July 31 is 750 gallons (3,000 gallons × 25%). Because the units transferred to the Packaging Department have been completed, the whole units (62,000 gallons) transferred are the same as the equivalent units transferred.

The total equivalent units of production for the Mixing Department are determined by adding the equivalent units in the ending work in process inventory to the units transferred and completed during the period, computed as follows:

Equivalent units completed and transferred to the Packaging Department during July	62,000 gallons
Equivalent units in ending work in process, July 31	750
Total equivalent units	62,750 gallons

Step 3: Determine the Cost per Equivalent Unit Because materials and conversion costs are combined under the weighted average method, the cost per equivalent unit is determined by dividing the total production costs by the total equivalent units of production as follows:

$$\text{Cost per Equivalent Unit} = \frac{\text{Total Production Costs}}{\text{Total Equivalent Units}} = \frac{\$89{,}105}{62{,}750 \text{ gallons}} = \$1.42$$

The cost per equivalent unit is used in Step 4 to allocate the production costs to the completed and partially completed units.

Step 4: Allocate Costs to Transferred Out and Partially Completed Units

The cost of transferred and partially completed units is determined by multiplying the cost per equivalent unit times the equivalent units of production. For **S&W**'s Mixing Department, these costs are determined as follows:

Group 1	Transferred out to the Packaging Department (62,000 gallons × $1.42)	$88,040
Group 2	Inventory in process, July 31 (3,000 gallons × 25% × $1.42).....	1,065
	Total production costs assigned	$89,105

The Cost of Production Report

The July cost of production report for **S&W**'s Mixing Department is shown in Exhibit 10. This cost of production report summarizes the following:

- The units for which the department is accountable and the disposition of those units
- The production costs incurred by the department and the allocation of those costs between completed and partially completed units

Exhibit 10
Cost of Production Report for S&W's Mixing Department—Weighted Average Method

	A	B	C
1	**S&W Ice Cream Company**		
2	**Cost of Production Report—Mixing Department**		
3	**For the Month Ended July 31**		
4	**UNITS**		
5			**Equivalent Units**
6		**Whole Units**	**of Production**
7	Units charged to production:		
8	Inventory in process, July 1	5,000	
9	Received from materials storeroom	60,000	
10	Total units accounted for by the Mixing Department	65,000	
11			
12	Units to be assigned costs:		
13	Transferred to Packaging Department in July	62,000	62,000
14	Inventory in process, July 31 (25% completed)	3,000	750
15	Total units to be assigned costs	65,000	62,750
16			
17	**COSTS**		**Costs**
18			
19	Cost per equivalent unit:		
20	Total production costs for July in Mixing Department		$89,105
21	Total equivalent units (from Step 2)		÷62,750
22	Cost per equivalent unit		$ 1.42
23			
24	Costs assigned to production:		
25	Inventory in process, July 1		$ 6,200
26	Direct materials, direct labor, and factory overhead incurred in July		82,905
27	Total costs accounted for by the Mixing Department		$89,105
28			
29			
30	Costs allocated to completed and partially completed units:		
31	Transferred to Packaging Department in July (62,000 gallons × $1.42)		$88,040
32	Inventory in process, July 31 (3,000 gallons × 25% × $1.42)		1,065
33	Total costs assigned by the Mixing Department		$89,105
34			

Step 1 — Step 2 (Whole Units; Equivalent Units of Production)
Step 3 (rows 19–27)
Step 4 (rows 30–33)

Let's Review

Chapter Summary

1. The process cost system is best suited for industries that mass produce identical units of a product. Costs are charged to processing departments, rather than to jobs as with the job order cost system. These costs are transferred from one department to the next until production is completed.
2. A cost of production report summarizes the production and cost data for each processing department. The cost of production report is prepared by (1) determining the units to be assigned costs, (2) computing equivalent units of production, (3) determining the cost per equivalent unit, and (4) allocating costs to units transferred out and partially completed units.
3. Journal entries to record the cost flows and transactions for a process cost system include those for the purchase of material, usage of materials and direct labor, incurrence of overhead, application of overhead to departments, and transferring costs among departments and to finished goods. When goods are sold, their costs are transferred from finished goods to cost of goods sold.
4. The cost of production report is used for decision making by providing information for controlling and improving operations. Comparisons of equivalent costs per unit over time can be used to isolate increases or decreases in costs for further investigation.
5. Cost of production reports may be prepared showing per-unit direct materials and conversion costs. This greater detail can help managers isolate problems and seek opportunities for improvement. Cost of production reports can also be used to compare the materials output quantity to the materials input quantity. Dividing the output quantities by the input quantities is termed the yield of a process.

Key Terms

cost of production report (101)
cost per equivalent unit (106)
equivalent units of production (102)
first-in, first-out (FIFO) inventory cost flow method (101)
process cost system (96)
process manufacturer (96)
weighted average inventory cost flow method (118)
whole units (102)

Practice

Multiple-Choice Questions

1. For which of the following businesses would the process cost system be most appropriate?
   a. Custom furniture manufacturer
   b. Commercial building contractor
   c. Crude oil refinery
   d. Automobile repair shop
2. There were 2,000 pounds in process at the beginning of the period in the Packing Department. Packing received 24,000 pounds from the Blending Department during the month, of which 3,000 pounds were in process at the end of the month. How many pounds were completed and transferred to finished goods from the Packing Department?
   a. 23,000
   b. 21,000
   c. 26,000
   d. 29,000
3. Information relating to production in Department A for May is as follows:

May 1	Balance, 1,000 units, ¾ completed	$22,150
31	Direct materials, 5,000 units	75,000
31	Direct labor	32,500
31	Factory overhead	16,250

(Continued)

If 500 units were one-fourth completed at May 31, 5,500 units were completed during May, and the first-in, first-out method is used, what was the number of equivalent units of production with respect to conversion costs for May?

a. 4,500
b. 4,875
c. 5,500
d. 6,000

4. Based on the data presented in Question 3, what is the conversion cost per equivalent unit?
   a. $10
   b. $15
   c. $25
   d. $32

5. Information from the accounting system revealed the following:

	Day 1	Day 2	Day 3	Day 4	Day 5
Materials	$20,000	$18,000	$22,000	$20,000	$20,000
Electricity	2,500	3,000	3,500	4,000	4,700
Maintenance	4,000	3,750	3,400	3,000	2,800
Total costs	$26,500	$24,750	$28,900	$27,000	$27,500
Pounds produced	÷10,000	÷ 9,000	÷11,000	÷10,000	÷10,000
Cost per unit	$ 2.65	$ 2.75	$ 2.63	$ 2.70	$ 2.75

Which of the following statements best interprets this information?

a. The total costs are out of control.
b. The product costs have steadily increased because of higher electricity costs.
c. Electricity costs have steadily increased because of lack of maintenance.
d. The unit costs reveal a significant operating problem.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Job order versus process costing — Obj. 1

Which of the following industries would typically use job order costing, and which would typically use process costing?

Dentist	Movie studio
Gasoline refining	Paper manufacturing
Flour mill	Custom printing

2. Units to be assigned costs — Obj. 2

Lilac Skin Care Company consists of two departments, Blending and Filling. The Filling Department received 45,000 ounces from the Blending Department. During the period, the Filling Department completed 42,800 ounces, including 4,000 ounces of work in process at the beginning of the period. The ending work in process inventory was 6,200 ounces. How many ounces were started and completed during the period?

3. Equivalent units of materials cost — Obj. 2

The Filling Department of Lilac Skin Care Company had 4,000 ounces in beginning work in process inventory (70% complete). During the period, 42,800 ounces were completed. The ending work in process inventory was 6,200 ounces (40% complete). What are the total equivalent units for direct materials if materials are added at the beginning of the process?

4. Equivalent units of conversion costs — Obj. 2

The Filling Department of Lilac Skin Care had 4,000 ounces in beginning work in process inventory (70% complete). During the period, 42,800 ounces were completed. The ending work in process inventory was 6,200 ounces (40% complete). What are the total equivalent units for conversion costs?

5. Cost per equivalent unit **Obj. 2**

The cost of direct materials transferred into the Filling Department of Lilac Skin Care Company is $20,250. The conversion cost for the period in the Filling Department is $6,372. The total equivalent units for direct materials and conversion are 45,000 ounces and 42,480 ounces, respectively. Determine the direct materials and conversion costs per equivalent unit.

6. Cost of units transferred out and ending work in process **Obj. 2**

The costs per equivalent unit of direct materials and conversion in the Filling Department of Lilac Skin Care Company are $0.45 and $0.15, respectively. The equivalent units to be assigned costs are as follows:

	Equivalent Units	
	Direct Materials	Conversion
Inventory in process, beginning of period	0	1,200
Started and completed during the period	38,800	38,800
Transferred out of Filling (completed)	38,800	40,000
Inventory in process, end of period	6,200	2,480
Total units to be assigned costs	45,000	42,480

The beginning work in process inventory had a cost of $2,200. Determine the cost of completed and transferred-out production, the ending work in process inventory, and the total costs assigned by the Filling Department.

7. Process cost journal entries **Obj. 3**

The cost of materials transferred into the Filling Department of Lilac Skin Care Company is $20,250, including $6,000 from the Blending Department and $14,250 from the materials storeroom. The conversion cost for the period in the Filling Department is $6,372 ($1,600 factory overhead applied and $4,772 direct labor). The total cost transferred to Finished Goods for the period was $25,660. The Filling Department had a beginning inventory of $2,200.

a. Journalize the cost of transferred-in materials, the conversion costs, and the costs transferred out to Finished Goods.

b. Determine the balance of Work in Process—Filling at the end of the period.

8. Analyzing changes in unit costs **Obj. 4**

The costs of energy consumed in producing good units in the Baking Department of Pan Company were $14,875 and $14,615 for June and July, respectively. The number of equivalent units produced in June and July was 42,500 pounds and 39,500 pounds, respectively. Evaluate the change in the cost of energy between the two months.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Southern Aggregate Company manufactures concrete by a series of four processes. All materials are introduced in Crushing. From Crushing, the materials pass through Sifting, Baking, and Mixing, emerging as finished concrete. All inventories are costed by the first-in, first-out method.

The balances in the accounts Work in Process—Mixing and Finished Goods were as follows on May 1:

Inventory in Process—Mixing (2,000 units, ¼ completed)	$13,700
Finished Goods (1,800 units at $8.00 a unit)	14,400

The following costs were charged to Work in Process—Mixing during May:

Direct materials transferred from Baking: 15,200 units at $6.50 a unit	$98,800
Direct labor	17,200
Factory overhead	11,780

(Continued)

During May, 16,000 units of concrete were completed, and 15,800 units were sold. Inventories on May 31 were as follows:

Inventory in Process—Mixing (1,200 units, ½ completed)
Finished Goods (2,000 units)

Instructions

1. Prepare a cost of production report for the Mixing Department for the month of May.
2. Determine the cost of goods sold (indicate number of units and unit costs).
3. Determine the finished goods inventory, May 31.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **c** The process cost system is most appropriate for a business where manufacturing is conducted by continuous operations and involves a series of uniform production processes, such as the processing of crude oil (answer c). The job order cost system is most appropriate for a business where the product is made to customers' specifications, such as custom furniture manufacturing (answer a), commercial building construction (answer b), or automobile repair shop (answer d).

2. **a** The total pounds transferred to finished goods of 23,000 pounds consists of the 2,000 pounds in-process at the beginning of the period plus 21,000 (24,000 – 3,000) pounds started and completed during the month. Answer b incorrectly assumes that the beginning inventory is not transferred during the month. Answer c assumes that all 24,000 pounds started during the month are transferred to finished goods, instead of only the portion started and completed. Answer d incorrectly adds all the numbers together.

3. **b** The number of units that could have been produced from start to finish during a period is termed *equivalent units*. The 4,875 equivalent units (answer b) is determined as follows:

To process units in inventory on May 1 (1,000 × ¼)	250
To process units started and completed in May (5,500 units – 1,000 units)	4,500
To process units in inventory on May 31 (500 units × ¼)	125
Equivalent units of production in May	4,875

4. **a** The conversion costs (direct labor and factory overhead) totaling $48,750 are divided by the number of equivalent units (4,875) to determine the unit conversion cost of $10 (answer a).

5. **c** The electricity costs have increased, and maintenance costs have decreased. Answer c would be a reasonable explanation for these results. The total costs, materials costs, and costs per unit do not reveal any type of pattern over the time period. In fact, the materials costs have stayed at exactly $2.00 per pound over the time period. This demonstrates that aggregated numbers can sometimes hide underlying information that can be used to improve the process.

Exercises

1.

Dentist	Job order	Movie studio	Job order
Gasoline refining	Process	Paper manufacturing	Process
Flour mill	Process	Custom printing	Job order

2. 38,800 ounces started and completed (42,800 ounces completed – 4,000 ounces beginning work in process), or (45,000 ounces started – 6,200 ounces ending work in process)

3.

	Whole Units	Percent Materials Added in Period	Equivalent Units for Materials
Inventory in process, beginning of period	4,000	0%	0
Started and completed during the period	38,800*	100%	38,800
Transferred out of Filling (completed)	42,800		38,800
Inventory in process, end of period	6,200	100%	6,200
Total units to be assigned costs	49,000		45,000

* 42,800 – 4,000

4.

	Whole Units	Percent Conversion Completed in Period	Equivalent Units for Conversion
Inventory in process, beginning of period	4,000	30%	1,200
Started and completed during the period	38,800*	100%	38,800
Transferred out of Filling (completed)	42,800		40,000
Inventory in process, end of period	6,200	40%	2,480
Total units to be assigned costs	49,000		42,480

* 42,800 – 4,000

5. Equivalent units of direct materials: $\frac{\$20,250}{45,000} = \$0.45$ per ounce

Equivalent units of conversion: $\frac{\$6,372}{42,480} = \$0.15$ per ounce

6.

	Direct Materials Costs		Conversion Costs	Total Costs
Inventory in process, balance				$ 2,200
Inventory in process, beginning of period	$ 0	+	$ 180[a]	180
Cost of completed beginning work in process				$ 2,380
Started and completed during the period	17,460[b]	+	5,820[c]	23,280
Transferred out of Filling (completed)				$25,660
Inventory in process, end of period	2,790[d]	+	372[e]	3,162
Total costs assigned by the Filling Department				$28,822
Completed and transferred-out production				$25,660
Inventory in process, ending				$ 3,162

[a] 1,200 units × $0.15 = $180
[b] 38,800 units × $0.45 = $17,460
[c] 38,800 units × $0.15 = $5,820
[d] 6,200 units × $0.45 = $2,790
[e] 2,480 units × $0.15 = $372

7. a.

Work in Process—Filling	20,250	
Work in Process—Blending		6,000
Materials		14,250
Work in Process—Filling	6,372	
Factory Overhead—Filling		1,600
Wages Payable		4,772
Finished Goods	25,660	
Work in Process—Filling		25,660

b. $3,162 ($2,200 + $20,250 + $6,372 − $25,660)

8. Energy cost per pound, June: $\frac{\$14,875}{42,500} = \$0.35$

   Energy cost per pound, July: $\frac{\$14,615}{39,500} = \$0.37$

   The cost of energy has increased by 2 cents per pound between June and July, indicating inefficiency in the use of energy.

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1.

	A	B	C	D	E
1	**Southern Aggregate Company**				
2	**Cost of Production Report—Mixing Department**				
3	**For the Month Ended May 31**				
4			**Equivalent Units**		
5	**UNITS**	**Whole Units**	**Direct Materials**	**Conversion**	
6	Units charged to production:				
7	Inventory in process, May 1	2,000			
8	Received from Baking	15,200			
9	Total units accounted for by the Mixing Department	17,200			
10					
11	Units to be assigned costs:				
12	Inventory in process, May 1 (25% completed)	2,000	0	1,500	
13	Started and completed in May	14,000	14,000	14,000	
14	Transferred to finished goods in May	16,000	14,000	15,500	
15	Inventory in process, May 31 (50% completed)	1,200	1,200	600	
16	Total units to be assigned costs	17,200	15,200	16,100	
17					
18			**Costs**		
19	**COSTS**		**Direct Materials**	**Conversion**	**Total**
20	Cost per equivalent unit:				
21	Total costs for May in Mixing Department		$ 98,800	$ 28,980	
22	Total equivalent units (row 16)		÷15,200	÷16,100	
23	Cost per equivalent unit		$ 6.50	$ 1.80	
24					
25	Costs assigned to production:				
26	Inventory in process, May 1				$ 13,700
27	Costs incurred in May				127,780
28	Total costs accounted for by the Mixing Department				$141,480
29					
30	Costs allocated to completed and partially				
31	completed units:				
32	Inventory in process, May 1—balance				$ 13,700
33	To complete inventory in process, May 1		$ 0	$ 2,700[a]	2,700
34	Cost of completed May 1 work in process				$ 16,400
35	Started and completed in May		91,000[b]	25,200[c]	116,200
36	Transferred to finished goods in May				$132,600
37	Inventory in process, May 31		7,800[d]	1,080[e]	8,880
38	Total costs assigned by the Mixing Department				$141,480
39					

[a] 1,500 × $1.80 = $2,700
[b] 14,000 × $6.50 = $91,000
[c] 14,000 × $1.80 = $25,200
[d] 1,200 × $6.50 = $7,800
[e] 600 × $1.80 = $1,080

2. Cost of goods sold:

1,800 units at $8.00	$ 14,400	(from finished goods beginning inventory)
2,000 units at $8.20*	16,400	(from inventory in process beginning inventory)
12,000 units at $8.30**	99,600	(from May production started and completed)
15,800 units	$130,400	

*($13,700 + $2,700) ÷ 2,000
**$116,200 ÷ 14,000

3. Finished goods inventory, May 31:
2,000 units at $8.30 = $16,600

Discussion Questions

1. Which type of cost system, process or job order, would be best suited for each of the following: (a) TV assembler, (b) building contractor, (c) automobile repair shop, (d) paper manufacturer, (e) custom jewelry manufacturer? Give reasons for your answers.
2. In job order cost accounting, the three elements of manufacturing cost are charged directly to job orders. Why is it not necessary to charge manufacturing costs in process cost accounting to job orders?
3. In a job order cost system, direct labor and factory overhead applied are debited to individual jobs. How are these items treated in a process cost system and why?
4. Why is the cost per equivalent unit often determined separately for direct materials and conversion costs?
5. What is the purpose for determining the cost per equivalent unit?
6. Rameriz Company is a process manufacturer with two production departments, Blending and Filling. All direct materials are introduced in Blending from the materials store area. What is included in the cost transferred to Filling?
7. What is the most important purpose of the cost of production report?
8. How are cost of production reports used for controlling and improving operations?

Basic Exercises

BE 3-1 Job order versus process costing **Obj. 1**

Which of the following industries would typically use job order costing, and which would typically use process costing?

Steel manufactuirng	Computer chip manufacturing
Business consulting	Candy making
Web designer	Designer clothes manufacturing



BE 3-2 Units to be assigned costs **Obj. 2**

Kraus Steel Company has two departments, Casting and Rolling. In the Rolling Department, ingots from the Casting Department are rolled into steel sheet. The Rolling Department received 4,000 tons from the Casting Department in October. During October, the Rolling Department completed 3,900 tons, including 200 tons of work in process on October 1. The ending work in process inventory on October 31 was 300 tons. How many tons were started and completed during October?



BE 3-3 Equivalent units of materials cost **Obj. 2**

The Rolling Department of Kraus Steel Company had 200 tons in beginning work in process inventory (60% complete) on October 1. During October, 3,900 tons were completed. The ending work in process inventory on October 31 was 300 tons (25% complete). What are the total equivalent units for direct materials for October if materials are added at the beginning of the process?

SHOW ME HOW

BE 3-4 Equivalent units of conversion costs — Obj. 2

The Rolling Department of Kraus Steel Company had 200 tons in beginning work in process inventory (60% complete) on October 1. During October, 3,900 tons were completed. The ending work in process inventory on October 31 was 300 tons (25% complete). What are the total equivalent units for conversion costs?

SHOW ME HOW

BE 3-5 Cost per equivalent unit — Obj. 2

The cost of direct materials transferred into the Rolling Department of Kraus Company is $3,000,000. The conversion cost for the period in the Rolling Department is $462,600. The total equivalent units for direct materials and conversion are 4,000 tons and 3,855 tons, respectively. Determine the direct materials and conversion costs per equivalent unit.

SHOW ME HOW

BE 3-6 Cost of units transferred out and ending work in process — Obj. 2

The costs per equivalent unit of direct materials and conversion in the Rolling Department of Kraus Steel Company are $750 and $120, respectively. The equivalent units to be assigned costs are as follows:

	Equivalent Units	
	Direct Materials	Conversion
Inventory in process, October 1	0	80
Started and completed during October	3,700	3,700
Transferred out of Rolling (completed)	3,700	3,780
Inventory in process, October 31	300	75
Total units to be assigned costs	4,000	3,855

The beginning work in process inventory on October 1 had a cost of $163,800. Determine the cost of completed and transferred-out production, the ending work in process inventory, and the total costs assigned by the Rolling Department.

SHOW ME HOW

BE 3-7 Process cost journal entries — Obj. 3

In October, the cost of materials transferred into the Rolling Department from the Casting Department of Kraus Steel Company is $3,000,000. The conversion cost for the period in the Rolling Department is $462,600 ($275,000 factory overhead applied and $187,600 direct labor). The total cost transferred to Finished Goods for the period was $3,392,400. The Rolling Department had a beginning inventory of $163,800.

a. Journalize for the Rolling Department (1) the cost of transferred-in materials, (2) the conversion costs, and (3) the costs transferred out to Finished Goods.

b. Determine the balance of Work in Process—Rolling at the end of the period.

SHOW ME HOW

BE 3-8 Analyzing changes in unit costs — Obj. 4

The costs of materials consumed in producing good units in the Forming Department of Thomas Company were $76,000 and $77,350 for September and October, respectively. The number of equivalent units produced in September and October was 800 tons and 850 tons, respectively. Evaluate the change in the cost of materials between the two months.

Exercises

REAL WORLD

EX 3-1 Entries for materials cost flows in a process cost system — Obj. 1, 3

The Hershey Company (HSY) manufactures chocolate confectionery products. The three largest raw materials are cocoa, sugar, and dehydrated milk. These raw materials first go into the Blending Department. The blended product is then sent to the Molding Department, where the bars of candy are formed. The candy is then sent to the Packing Department, where the bars are wrapped and boxed. The boxed candy is then sent to the distribution center, where it is eventually sold to food brokers and retailers.

Show the accounts debited and credited for each of the following business events:

a. Materials used by the Blending Department
b. Transfer of blended product to the Molding Department
c. Transfer of chocolate to the Packing Department
d. Transfer of boxed chocolate to the distribution center
e. Sale of boxed chocolate

EX 3-2 Flowchart of accounts related to service and processing departments — Obj. 1


REAL WORLD

Alcoa Inc. (AA) is the world's largest producer of aluminum products. One product that Alcoa manufactures is aluminum sheet products for the aerospace industry. The entire output of the Smelting Department is transferred to the Rolling Department. Part of the fully processed goods from the Rolling Department are sold as rolled sheet, and the remainder of the goods are transferred to the Converting Department for further processing into sheared sheet.

Prepare a chart of the flow of costs from the processing department accounts into the finished goods accounts and then into the cost of goods sold account. The relevant accounts are as follows:

Cost of Goods Sold	Finished Goods—Rolled Sheet
Materials	Finished Goods—Sheared Sheet
Factory Overhead—Smelting Department	Work in Process—Smelting Department
Factory Overhead—Rolling Department	Work in Process—Rolling Department
Factory Overhead—Converting Department	Work in Process—Converting Department

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EX 3-3 Entries for flow of factory costs for process cost system — Obj. 1, 3


SHOW ME HOW

Radford Inc. manufactures a sugar product by a continuous process, involving three production departments—Refining, Sifting, and Packing. Assume that records indicate that direct materials, direct labor, and applied factory overhead for the first department, Refining, were $1,250,000, $660,000, and $975,000, respectively. Also, work in process in the Refining Department at the beginning of the period totaled $328,000, and work in process at the end of the period totaled $295,000.

Journalize the entries to record (a) the flow of costs into the Refining Department during the period for (1) direct materials, (2) direct labor, and (3) factory overhead, and (b) the transfer of production costs to the second department, Sifting.

EX 3-4 Factory overhead rate, entry for applying factory overhead, and factory overhead account balance — Obj. 1, 3

✔ a. 175%


SHOW ME HOW

The cost accountant for River Rock Beverage Co. estimated that total factory overhead cost for the Blending Department for the coming fiscal year beginning February 1 would be $3,150,000, and total direct labor costs would be $1,800,000. During February, the actual direct labor cost totaled $160,000, and factory overhead cost incurred totaled $283,900.

a. What is the predetermined factory overhead rate based on direct labor cost?
b. Journalize the entry to apply factory overhead to production for February.
c. What is the February 28 balance of the account Factory Overhead—Blending Department?
d. Does the balance in part (c) represent over- or underapplied factory overhead?

EX 3-5 Equivalent units of production — Obj. 2

✔ Direct materials, 10,300 units


SHOW ME HOW

The Converting Department of Worley Company had 2,400 units in work in process at the beginning of the period, which were 35% complete. During the period, 10,800 units were completed and transferred to the Packing Department. There were 1,900 units in process at the end of the period, which were 60% complete. Direct materials are placed into the process at the beginning of production. Determine the number of equivalent units of production with respect to direct materials and conversion costs.

EX 3-6 Equivalent units of production

Obj. 2

✔ a. Conversion, 64,250 units



Data for the two departments of Kimble & Pierce Company for June of the current fiscal year are as follows:

	Drawing Department	Winding Department
Work in process, June 1	10,000 units, 38% completed	4,000 units, 35% completed
Completed and transferred to next processing department during June	60,000 units	60,500 units
Work in process, June 30	11,500 units, 70% completed	3,500 units, 60% completed

Production begins in the Drawing Department and finishes in the Winding Department. If all direct materials are placed in process at the beginning of production, determine the direct materials and conversion equivalent units of production for June for (a) the Drawing Department and (b) the Winding Department.

EX 3-7 Equivalent units of production

Obj. 2

✔ b. Conversion, 125,000



The following information concerns production in the Baking Department for December. All direct materials are placed in process at the beginning of production.

ACCOUNT *Work in Process—Baking Department* ACCOUNT NO.

Date		Item	Debit	Credit	Balance Debit	Balance Credit
Dec.	1	Bal., 24,000 units, ¾ completed			116,700	
	31	Direct materials, 134,000 units	234,500		351,200	
	31	Direct labor	150,000		501,200	
	31	Factory overhead	375,000		876,200	
	31	Goods finished, 128,000 units		760,700	115,500	
	31	Bal., ? units, ½ completed			115,500	

a. Determine the number of units in work in process inventory at December 31.

b. Determine the equivalent units of production for direct materials and conversion costs in December.

EX 3-8 Costs per equivalent unit

Obj. 2, 4

✔ a. 2. Conversion cost per equivalent unit, $4.20



a. Based upon the data in Exercise 3-7, determine the following for December:

1. Direct materials cost per equivalent unit
2. Conversion cost per equivalent unit
3. Cost of the beginning work in process completed during December
4. Cost of units started and completed during December
5. Cost of the ending work in process

b. Assuming that the direct materials cost is the same for November and December, did the conversion cost per equivalent unit increase, decrease, or remain the same in December?

EX 3-9 Equivalent units of production

Obj. 2



Kellogg Company (K) manufactures cold cereal products, such as *Frosted Flakes*. Assume that the inventory in process on March 1 for the Packing Department included 1,200 pounds of cereal in the packing machine hopper (enough for 800 24-oz. boxes) and 800 empty 24-oz. boxes held in the package carousel of the packing machine. During March, 65,400 boxes of 24-oz. cereal were packaged. Conversion costs are incurred when a box is filled with cereal. On March 31, the packing machine hopper held 900 pounds of cereal, and the package carousel held 600 empty 24-oz. (1½-pound) boxes. Assume that once a box is filled with cereal, it is immediately transferred to the finished goods warehouse.

Determine the equivalent units of production for cereal, boxes, and conversion costs for March. An equivalent unit is defined as "pounds" for cereal and "24-oz. boxes" for boxes and conversion costs.

EX 3-10 Costs per equivalent unit — Obj. 2

✔ c. $2.40

SHOW ME HOW

Georgia Products Inc. completed and transferred 89,000 particle board units of production from the Pressing Department. There was no beginning inventory in process in the department. The ending in-process inventory was 2,400 units, which were ⅗ complete as to conversion cost. All materials are added at the beginning of the process. Direct materials cost incurred was $219,360, direct labor cost incurred was $28,100, and factory overhead applied was $12,598.

Determine the following for the Pressing Department:

a. Total conversion cost

b. Conversion cost per equivalent unit

c. Direct materials cost per equivalent unit

EX 3-11 Equivalent units of production and related costs — Obj. 2

✔ a. 7,500 units

SHOW ME HOW EXCEL TEMPLATE

The charges to Work in Process—Assembly Department for a period, together with information concerning production, are as follows. All direct materials are placed in process at the beginning of production.

Work in Process—Assembly Department

Bal., 9,000 units, 40% completed	72,360	To Finished Goods, 41,500 units	?
Direct materials, 40,000 units @ $6.80	272,000		
Direct labor	80,000		
Factory overhead	40,450		
Bal., ? units, 30% completed	?		

Determine the following:

a. The number of units in work in process inventory at the end of the period

b. Equivalent units of production for direct materials and conversion

c. Costs per equivalent unit for direct materials and conversion

d. Cost of the units started and completed during the period

EX 3-12 Cost of units completed and in process — Obj. 2, 4

✔ a. 1. $88,560

a. Based on the data in Exercise 3-11, determine the following:

1. Cost of beginning work in process inventory completed this period
2. Cost of units transferred to finished goods during the period
3. Cost of ending work in process inventory
4. Cost per unit of the completed beginning work in process inventory

b. Did the production costs change from the preceding period? Explain.

c. Assuming that the direct materials cost per unit did not change from the preceding period, did the conversion costs per equivalent unit increase, decrease, or remain the same for the current period?

EX 3-13 Errors in equivalent unit computation — Obj. 2

Napco Refining Company processes gasoline. On June 1 of the current year, 6,400 units were ⅗ completed in the Blending Department. During June, 55,000 units entered the Blending Department from the Refining Department. During June, the units in process at the beginning of the month were completed. Of the 55,000 units entering the department, all were completed except 5,200 units that were ⅕ completed. The equivalent units for conversion costs for June for the Blending Department were computed as follows:

Equivalent units of production in June:	
To process units in inventory on June 1: 6,400 × ⅗	3,840
To process units started and completed in June: 55,000 – 6,400	48,600
To process units in inventory on June 30: 5,200 × ⅕	1,040
Equivalent units of production	53,480

List the errors in the computation of equivalent units for conversion costs for the Blending Department for June.

EX 3-14 Cost per equivalent unit

Obj. 2

✔ a. 12,400 units



SHOW ME HOW

The following information concerns production in the Forging Department for November. All direct materials are placed into the process at the beginning of production, and conversion costs are incurred evenly throughout the process. The beginning inventory consists of $9,000 of direct materials.

ACCOUNT *Work in Process—Forging Department* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Nov.	1	Bal., 900 units, 60% completed			10,566	
	30	Direct materials, 12,900 units	123,840		134,406	
	30	Direct labor	21,650		156,056	
	30	Factory overhead	16,870		172,926	
	30	Goods transferred, ? units		?	?	
	30	Bal., 1,400 units, 70% completed			?	

a. Determine the number of units transferred to the next department.

b. Determine the costs per equivalent unit of direct materials and conversion.

c. Determine the cost of units started and completed in November.

EX 3-15 Costs per equivalent unit and production costs

Obj. 2, 4

✔ a. $11,646

Based on the data in Exercise 3-14, determine the following:

a. Cost of beginning work in process inventory completed in November

b. Cost of units transferred to the next department during November

c. Cost of ending work in process inventory on November 30

d. Costs per equivalent unit of direct materials and conversion included in the November 1 beginning work in process

e. The November increase or decrease in costs per equivalent unit for direct materials and conversion from the previous month

EX 3-16 Cost of production report

Obj. 2, 4

✔ a. 4. $2,092



EXCEL TEMPLATE

The debits to Work in Process—Roasting Department for Morning Brew Coffee Company for August, together with information concerning production, are as follows:

Work in process, August 1, 700 pounds, 20% completed		$ 3,479*
*Direct materials (700 × $4.70)	$3,290	
Conversion (700 × 20% × $1.35)	189	
	$3,479	
Coffee beans added during August, 14,300 pounds		65,780
Conversion costs during August		21,942
Work in process, August 31, 400 pounds, 42% completed		?
Goods finished during August, 14,600 pounds		?

All direct materials are placed in process at the beginning of production.

a. Prepare a cost of production report, presenting the following computations:

1. Direct materials and conversion equivalent units of production for August
2. Direct materials and conversion costs per equivalent unit for August
3. Cost of goods finished during August
4. Cost of work in process at August 31

b. Compute and evaluate the change in cost per equivalent unit for direct materials and conversion from the previous month (July).

EX 3-17 Cost of production report

Obj. 2, 4

✔ a. Conversion cost per equivalent unit, $5.10

The Cutting Department of Karachi Carpet Company provides the following data for January. Assume that all materials are added at the beginning of the process.

Work in process, January 1, 1,400 units, 75% completed		$ 22,960*
*Direct materials (1,400 × $12.65)	$17,710	
Conversion (1,400 × 75% × $5.00)	5,250	
	$22,960	
Materials added during January from Weaving Department, 58,000 units		$742,400
Direct labor for January		134,550
Factory overhead for January		151,611
Goods finished during January (includes goods in process, January 1), 56,200 units		—
Work in process, January 31, 3,200 units, 30% completed		—

a. Prepare a cost of production report for the Cutting Department.

b. Compute and evaluate the change in the costs per equivalent unit for direct materials and conversion from the previous month (December).

EX 3-18 Cost of production and journal entries

Obj. 1, 2, 3, 4

✔ b. $29,760

AccuBlade Castings Inc. casts blades for turbine engines. Within the Casting Department, alloy is first melted in a crucible, then poured into molds to produce the castings. On May 1, there were 230 pounds of alloy in process, which were 60% complete as to conversion. The Work in Process balance for these 230 pounds was $32,844, determined as follows:

Direct materials (230 × $132)	$30,360
Conversion (230 × 60% × $18)	2,484
	$32,844

During May, the Casting Department was charged $350,000 for 2,500 pounds of alloy and $19,840 for direct labor. Factory overhead is applied to the department at a rate of 150% of direct labor. The department transferred out 2,530 pounds of finished castings to the Machining Department. The May 31 inventory in process was 44% complete as to conversion.

a. Prepare the following May journal entries for the Casting Department:
   1. The materials charged to production
   2. The conversion costs charged to production
   3. The completed production transferred to the Machining Department

b. Determine the Work in Process—Casting Department May 31 balance.

c. Compute and evaluate the change in the costs per equivalent unit for direct materials and conversion from the previous month (April).

EX 3-19 Cost of production and journal entries

Obj. 1, 2, 3

✔ b. $14,319

Lighthouse Paper Company manufactures newsprint. The product is manufactured in two departments, Papermaking and Converting. Pulp is first placed into a vessel at the beginning of papermaking production. The following information concerns production in the Papermaking Department for March:

ACCOUNT *Work in Process—Papermaking Department* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Mar.	1	Bal., 2,600 units, 35% completed			9,139	
	31	Direct materials, 105,000 units	330,750		339,889	
	31	Direct labor	40,560		380,449	
	31	Factory overhead	54,795		435,244	
	31	Goods transferred, 103,900 units		?	?	
	31	Bal., 3,700 units, 80% completed			?	

(Continued)

a. Prepare the following March journal entries for the Papermaking Department:
   1. The materials charged to production
   2. The conversion costs charged to production
   3. The completed production transferred to the Converting Department

b. Determine the Work in Process—Papermaking Department March 31 balance.

EX 3-20 Process costing for a service company — Obj. 4

✔ a. Fossil plant $95 per MWh

Madison Electric Company uses a fossil fuel (coal) plant for generating electricity. The facility can generate 900 megawatts (million watts) per hour. The plant operates 600 hours during March. Electricity is used as it is generated; thus, there are no inventories at the beginning or end of the period. The March conversion and fuel costs are as follows:

Conversion costs	$40,500,000
Fuel	10,800,000
Total	$51,300,000

Madison also has a wind farm that can generate 100 megawatts per hour. The wind farm receives sufficient wind to run 300 hours for March. The March conversion costs for the wind farm (mostly depreciation) are as follows:

Conversion costs	$2,700,000

a. Determine the cost per megawatt hour (MWh) for the fossil fuel plant and the wind farm to identify the lowest cost facility in March.

b. Why are equivalent units of production not needed in determining the cost per megawatt hour (MWh) for generating electricity?

c. What advantage does the fossil fuel plant have over the wind farm?

Appendix

EX 3-21 Equivalent units of production: weighted average method

✔ a. 17,000

The Converting Department of Tender Soft Tissue Company uses the weighted average method and had 1,900 units in work in process that were 60% complete at the beginning of the period. During the period, 15,800 units were completed and transferred to the Packing Department. There were 1,200 units in process that were 30% complete at the end of the period.

a. Determine the number of whole units to be accounted for and to be assigned costs for the period.

b. Determine the number of equivalent units of production for the period. Assume that direct materials are placed in process during production.

Appendix

EX 3-22 Equivalent units of production: weighted average method

✔ a. 12,100 units to be accounted for

Units of production data for the two departments of Atlantic Cable and Wire Company for July of the current fiscal year are as follows:

	Drawing Department	Winding Department
Work in process, July 1	500 units, 50% completed	350 units, 30% completed
Completed and transferred to next processing department during July	11,400 units	10,950 units
Work in process, July 31	700 units, 55% completed	800 units, 25% completed

Each department uses the weighted average method. For each department, assume that direct materials are placed in process during production.

a. Determine the number of whole units to be accounted for and to be assigned costs and the equivalent units of production for the Drawing Department.

b. Determine the number of whole units to be accounted for and to be assigned costs and the equivalent units of production for the Winding Department.

Appendix
EX 3-23 Equivalent units of production: weighted average method

✔ a. 3,100

The following information concerns production in the Finishing Department for May. The Finishing Department uses the weighted average method.

ACCOUNT *Work in Process—Finishing Department* ACCOUNT NO.

Date		Item	Debit	Credit	Balance	
					Debit	Credit
May	1	Bal., 4,200 units, 70% completed			36,500	
	31	Direct materials, 23,600 units	125,800		162,300	
	31	Direct labor	75,400		237,700	
	31	Factory overhead	82,675		320,375	
	31	Goods transferred, 24,700 units		308,750	11,625	
	31	Bal., ? units, 30% completed			11,625	

a. Determine the number of units in work in process inventory at the end of the month.

b. Determine the number of whole units to be accounted for and to be assigned costs and the equivalent units of production for May. Assume that direct materials are placed in process during production.

Appendix
EX 3-24 Equivalent units of production and related costs

✔ b. 8,820 units



EXCEL TEMPLATE

The charges to Work in Process—Baking Department for a period as well as information concerning production are as follows. The Baking Department uses the weighted average method, and all direct materials are placed in process during production.

Work in Process—Baking Department

Bal., 900 units, 40% completed	2,466	To Finished Goods, 8,100 units	?
Direct materials, 8,400 units	34,500		
Direct labor	16,200		
Factory overhead	8,574		
Bal., 1,200 units, 60% completed	?		

Determine the following:

a. The number of whole units to be accounted for and to be assigned costs

b. The number of equivalent units of production

c. The cost per equivalent unit

d. The cost of units transferred to Finished Goods

e. The cost of units in ending Work in Process

Appendix
EX 3-25 Cost per equivalent unit: weighted average method

✔ a. $26.00

The following information concerns production in the Forging Department for June. The Forging Department uses the weighted average method.

ACCOUNT *Work in Process—Forging Department* ACCOUNT NO.

Date		Item	Debit	Credit	Balance	
					Debit	Credit
June	1	Bal., 500 units, 40% completed			5,000	
	30	Direct materials, 3,700 units	49,200		54,200	
	30	Direct labor	25,200		79,400	
	30	Factory overhead	25,120		104,520	
	30	Goods transferred, 3,600 units		?	?	
	30	Bal., 600 units, 70% completed			?	

(Continued)

a. Determine the cost per equivalent unit.
b. Determine cost of units transferred to Finished Goods.
c. Determine the cost of units in ending Work in Process.

Appendix
EX 3-26 Cost of production report: weighted average method

✔ Cost per equivalent unit, $3.60

The increases to Work in Process—Roasting Department for Highlands Coffee Company for May as well as information concerning production are as follows:

Work in process, May 1, 1,150 pounds, 40% completed	$ 1,700
Coffee beans added during May, 10,900 pounds	28,600
Conversion costs during May	12,504
Work in process, May 31, 800 pounds, 80% completed	—
Goods finished during May, 11,250 pounds	—

Prepare a cost of production report for May, using the weighted average method. Assume that direct materials are placed in process during production.

Appendix
EX 3-27 Cost of production report: weighted average method

✔ Cost per equivalent unit, $9.00



EXCEL TEMPLATE

Prepare a cost of production report for the Cutting Department of Dalton Carpet Company for January. Assuming that direct materials are placed in process during production, use the weighted average method with the following data:

Work in process, January 1, 3,400 units, 75% completed	$ 23,000
Materials added during January from Weaving Department, 64,000 units	366,200
Direct labor for January	105,100
Factory overhead for January	80,710
Goods finished during January (includes goods in process, January 1), 63,500 units	—
Work in process, January 31, 3,900 units, 10% completed	—

Problems: Series A

PR 3-1A Entries for process cost system **Obj. 1, 3**

✔ 2. Materials January 31 balance, $46,500



SHOW ME HOW

Port Ormond Carpet Company manufactures carpets. Fiber is placed in process in the Spinning Department, where it is spun into yarn. The output of the Spinning Department is transferred to the Tufting Department, where carpet backing is added at the beginning of the process and the process is completed. On January 1, Port Ormond Carpet Company had the following inventories:

Finished Goods	$62,000
Work in Process—Spinning Department	35,000
Work in Process—Tufting Department	28,500
Materials	17,000

Departmental accounts are maintained for factory overhead, and both have zero balances on January 1.

Manufacturing operations for January are summarized as follows:

a. Materials purchased on account	$500,000
b. Materials requisitioned for use:	
Fiber—Spinning Department	$275,000
Carpet backing—Tufting Department	110,000
Indirect materials—Spinning Department	46,000
Indirect materials—Tufting Department	39,500
c. Labor used:	
Direct labor—Spinning Department	$185,000
Direct labor—Tufting Department	98,000
Indirect labor—Spinning Department	18,500
Indirect labor—Tufting Department	9,000
d. Depreciation charged on fixed assets:	
Spinning Department	$ 12,500
Tufting Department	8,500
e. Expired prepaid factory insurance:	
Spinning Department	$ 2,000
Tufting Department	1,000
f. Applied factory overhead:	
Spinning Department	$ 80,000
Tufting Department	55,000
g. Production costs transferred from Spinning Department to Tufting Department	$547,000
h. Production costs transferred from Tufting Department to Finished Goods	$807,200
i. Cost of goods sold during the period	$795,200

Instructions

1. Journalize the entries to record the operations, identifying each entry by letter.
2. Compute the January 31 balances of the inventory accounts.
3. Compute the January 31 balances of the factory overhead accounts.

PR 3-2A Cost of production report

Obj. 2, 4

✔ 1. Conversion cost per equivalent unit, $0.76



EXCEL TEMPLATE

Hana Coffee Company roasts and packs coffee beans. The process begins by placing coffee beans into the Roasting Department. From the Roasting Department, coffee beans are then transferred to the Packing Department. The following is a partial work in process account of the Roasting Department at July 31:

ACCOUNT *Work in Process—Roasting Department* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
July	1	Bal., 30,000 units, 10% completed			121,800	
	31	Direct materials, 155,000 units	620,000		741,800	
	31	Direct labor	90,000		831,800	
	31	Factory overhead	33,272		865,072	
	31	Goods transferred, 149,000 units		?		
	31	Bal., ? units, 45% completed			?	

Instructions

1. Prepare a cost of production report, and identify the missing amounts for Work in Process—Roasting Department.
2. Assuming that the July 1 work in process inventory includes $119,400 of direct materials, determine the increase or decrease in the cost per equivalent unit for direct materials and conversion between June and July.

PR 3-3A Equivalent units and related costs; cost of production report; entries

Obj. 2, 3, 4

✔ 2. Transferred to Packaging Dept., $40,183



EXCEL TEMPLATE

White Diamond Flour Company manufactures flour by a series of three processes, beginning with wheat grain being introduced in the Milling Department. From the Milling Department, the materials pass through the Sifting and Packaging departments, emerging as packaged refined flour.

The balance in the account Work in Process—Sifting Department was as follows on July 1:

Work in Process—Sifting Department	
(900 units, ⅗ completed):	
Direct materials (900 × $2.05)	$1,845
Conversion (900 × ⅗ × $0.40)	216
	$2,061

The following costs were charged to Work in Process—Sifting Department during July:

Direct materials transferred from Milling Department:	
15,700 units at $2.15 a unit	$33,755
Direct labor	4,420
Factory overhead	2,708

During July, 15,500 units of flour were completed. Work in Process—Sifting Department on July 31 was 1,100 units, ⅘ completed.

Instructions

1. Prepare a cost of production report for the Sifting Department for July.
2. Journalize the entries for costs transferred from Milling to Sifting and the costs transferred from Sifting to Packaging.
3. Determine the increase or decrease in the cost per equivalent unit from June to July for direct materials and conversion costs.
4. Discuss the uses of the cost of production report and the results of part (3).

PR 3-4A Work in process account data for two months; cost of production reports

Obj. 1, 2, 3, 4

✔ 1. c. Transferred to finished goods in April, $49,818



EXCEL TEMPLATE

Hearty Soup Co. uses a process cost system to record the costs of processing soup, which requires the cooking and filling processes. Materials are entered from the cooking process at the beginning of the filling process. The inventory of Work in Process—Filling on April 1 and debits to the account during April were as follows:

Bal., 800 units, 30% completed:	
Direct materials (800 × $4.30)	$3,440
Conversion (800 × 30% × $1.75)	420
	$3,860
From Cooking Department, 7,800 units	$34,320
Direct labor	8,562
Factory overhead	6,387

During April, 800 units in process on April 1 were completed, and of the 7,800 units entering the department, all were completed except 550 units that were 90% completed.

Charges to Work in Process—Filling for May were as follows:

From Cooking Department, 9,600 units	$44,160
Direct labor	12,042
Factory overhead	6,878

During May, the units in process at the beginning of the month were completed, and of the 9,600 units entering the department, all were completed except 300 units that were 35% completed.

Instructions

1. Enter the balance as of April 1, in a four-column account for Work in Process—Filling. Record the debits and the credits in the account for April. Construct a cost of production report, and present computations for determining (a) equivalent units of production for materials and conversion, (b) costs per equivalent unit, (c) cost of goods finished, differentiating between units started in the prior period and units started and finished in April, and (d) work in process inventory.
2. Provide the same information for May by recording the May transactions in the four-column work in process account. Construct a cost of production report, and present the May computations (a through d) listed in part (1).
3. Comment on the change in costs per equivalent unit for March through May for direct materials and conversion costs.

Appendix

PR 3-5A Cost of production report: weighted average method

✔ Cost per equivalent unit, $2.70

EXCEL TEMPLATE

Sunrise Coffee Company roasts and packs coffee beans. The process begins in the Roasting Department. From the Roasting Department, the coffee beans are transferred to the Packing Department. The following is a partial work in process account of the Roasting Department at December 31:

ACCOUNT *Work in Process—Roasting Department* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Dec.	1	Bal., 10,500 units, 75% completed			21,000	
	31	Direct materials, 210,400 units	246,800		267,800	
	31	Direct labor	135,700		403,500	
	31	Factory overhead	168,630		572,130	
	31	Goods transferred, 208,900 units		?	?	
	31	Bal., ? units, 25% completed			?	

Instructions

Prepare a cost of production report, using the weighted average method, and identify the missing amounts for Work in Process—Roasting Department. Assume that direct materials are placed in process during production.

Problems: Series B

PR 3-1B Entries for process cost system

Obj. 1, 3

✔ 2. Materials July 31 balance, $11,390

SHOW ME HOW

Preston & Grover Soap Company manufactures powdered detergent. Phosphate is placed in process in the Making Department, where it is turned into granulars. The output of Making is transferred to the Packing Department, where packaging is added at the beginning of the process. On July 1, Preston & Grover Soap Company had the following inventories:

Finished Goods	$13,500
Work in Process—Making	6,790
Work in Process—Packing	7,350
Materials	5,100

Departmental accounts are maintained for factory overhead, which both have zero balances on July 1.

(Continued)

Manufacturing operations for July are summarized as follows:

a. Materials purchased on account	$149,800
b. Materials requisitioned for use:	
Phosphate—Making Department	$105,700
Packaging—Packing Department	31,300
Indirect materials—Making Department	4,980
Indirect materials—Packing Department	1,530
c. Labor used:	
Direct labor—Making Department	$ 32,400
Direct labor—Packing Department	40,900
Indirect labor—Making Department	15,400
Indirect labor—Packing Department	18,300
d. Depreciation charged on fixed assets:	
Making Department	$ 10,700
Packing Department	7,900
e. Expired prepaid factory insurance:	
Making Department	$ 2,000
Packing Department	1,500
f. Applied factory overhead:	
Making Department	$ 32,570
Packing Department	30,050
g. Production costs transferred from Making Department to Packing Department	$166,790
h. Production costs transferred from Packing Department to Finished Goods	$263,400
i. Cost of goods sold during the period	$265,200

Instructions

1. Journalize the entries to record the operations, identifying each entry by letter.
2. Compute the July 31 balances of the inventory accounts.
3. Compute the July 31 balances of the factory overhead accounts.

PR 3-2B Cost of production report

Obj. 2, 4

✔ 1. Conversion cost per equivalent unit, $6.00



EXCEL TEMPLATE

Bavarian Chocolate Company processes chocolate into candy bars. The process begins by placing direct materials (raw chocolate, milk, and sugar) into the Blending Department. All materials are placed into production at the beginning of the blending process. After blending, the milk chocolate is then transferred to the Molding Department, where the milk chocolate is formed into candy bars. The following is a partial work in process account of the Blending Department at October 31:

ACCOUNT *Work in Process—Blending Department* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Oct.	1	Bal., 2,300 units, ⅗ completed			46,368	
	31	Direct materials, 26,000 units	429,000		475,368	
	31	Direct labor	100,560		575,928	
	31	Factory overhead	48,480		624,408	
	31	Goods transferred, 25,700 units		?		
	31	Bal., ? units, ⅕ completed			?	

Instructions

1. Prepare a cost of production report, and identify the missing amounts for Work in Process—Blending Department.
2. Assuming that the October 1 work in process inventory includes direct materials of $38,295, determine the increase or decrease in the cost per equivalent unit for direct materials and conversion between September and October.

PR 3-3B Equivalent units and related costs; cost of production report; entries

Obj. 2, 3, 4

✔ 2. Transferred to finished goods, $705,376



EXCEL TEMPLATE

Dover Chemical Company manufactures specialty chemicals by a series of three processes, all materials being introduced in the Distilling Department. From the Distilling Department, the materials pass through the Reaction and Filling departments, emerging as finished chemicals.

The balance in the account Work in Process—Filling was as follows on January 1:

Work in Process—Filling Department	
(3,400 units, 60% completed):	
Direct materials (3,400 × $9.58)	$32,572
Conversion (3,400 × 60% × $3.90)	7,956
	$40,528

The following costs were charged to Work in Process—Filling during January:

Direct materials transferred from Reaction	
Department: 52,300 units at $9.50 a unit	$496,850
Direct labor	101,560
Factory overhead	95,166

During January, 53,000 units of specialty chemicals were completed. Work in Process—Filling Department on January 31 was 2,700 units, 30% completed.

Instructions

1. Prepare a cost of production report for the Filling Department for January.
2. Journalize the entries for costs transferred from Reaction to Filling and the costs transferred from Filling to Finished Goods.
3. Determine the increase or decrease in the cost per equivalent unit from December to January for direct materials and conversion costs.
4. Discuss the uses of the cost of production report and the results of part (3).

PR 3-4B Work in process account data for two months; cost of production reports

Obj. 1, 2, 3, 4

✔ 1. c. Transferred to finished goods in September, $702,195



EXCEL TEMPLATE

Pittsburgh Aluminum Company uses a process cost system to record the costs of manufacturing rolled aluminum, which consists of the smelting and rolling processes. Materials are entered from smelting at the beginning of the rolling process. The inventory of Work in Process—Rolling on September 1 and debits to the account during September were as follows:

Bal., 2,600 units, ¼ completed:	
Direct materials (2,600 × $15.50)	$40,300
Conversion (2,600 × ¼ × $8.50)	5,525
	$45,825
From Smelting Department, 28,900 units	$462,400
Direct labor	158,920
Factory overhead	101,402

During September, 2,600 units in process on September 1 were completed, and of the 28,900 units entering the department, all were completed except 2,900 units that were ⅘ completed.

Charges to Work in Process—Rolling for October were as follows:

From Smelting Department, 31,000 units	$511,500
Direct labor	162,850
Factory overhead	104,494

During October, the units in process at the beginning of the month were completed, and of the 31,000 units entering the department, all were completed except 2,000 units that were ⅖ completed.

(Continued)

Instructions

1. Enter the balance as of September 1 in a four-column account for Work in Process—Rolling. Record the debits and the credits in the account for September. Construct a cost of production report and present computations for determining (a) equivalent units of production for materials and conversion, (b) costs per equivalent unit, (c) cost of goods finished, differentiating between units started in the prior period and units started and finished in September, and (d) work in process inventory.
2. Provide the same information for October by recording the October transactions in the four-column work in process account. Construct a cost of production report, and present the October computations (a through d) listed in part (1).
3. Comment on the change in costs per equivalent unit for August through October for direct materials and conversion cost.

Appendix

PR 3-5B Cost of production report: weighted average method

✔Transferred to Packaging Dept., $54,000

EXCEL TEMPLATE

Blue Ribbon Flour Company manufactures flour by a series of three processes, beginning in the Milling Department. From the Milling Department, the materials pass through the Sifting and Packaging departments, emerging as packaged refined flour.

The balance in the account Work in Process—Sifting Department was as follows on May 1:

Work in Process—Sifting Department (1,500 units, 75% completed)	$3,400

The following costs were charged to Work in Process—Sifting Department during May:

Direct materials transferred from Milling Department: 18,300 units	$32,600
Direct labor	14,560
Factory overhead	7,490

During May, 18,000 units of flour were completed and transferred to finished goods. Work in Process—Sifting Department on May 31 was 1,800 units, 75% completed.

Instructions

Prepare a cost of production report for the Sifting Department for May, using the weighted average method. Assume that direct materials are placed in process during production.

Make a Decision
Analyzing Process Costs

MAD 3-1 Analyze Dura-Conduit Corporation's process costs — Obj. 5

Dura-Conduit Corporation manufactures plastic conduit that is used in the cable industry. A conduit is a tube that encircles and protects the underground cable. In the process for making the plastic conduit, called *extrusion*, the melted plastic (*resin*) is pressed through a die to form a tube. Scrap is produced in this process.

Information from the cost of production reports for three months is as follows, assuming that inventory remains constant:

	May	June	July
Resin pounds input into the process	460,000	600,000	640,000
Price per pound	× $1.05	× $1.05	× $1.05
Plastic material costs	$483,000	$630,000	$672,000
Conversion costs	$90,000	$110,000	$112,000
Conduit output from the process (feet)	900,000	1,100,000	1,120,000

Assume that there is one-half pound of resin per foot of the finished product.

a. Determine the resin materials cost per foot of finished product for each month. Round to the nearest whole cent.

b. Determine the ratio of the number of resin pounds output in conduit by the number of pounds input into the process for each month. Round percentages to one decimal place.

c. Interpret the resin materials cost per foot for the three months. Use the information in (a) and (b) to explain what is happening.

d. Determine the conversion cost per foot of finished product for each month and interpret the result.

MAD 3-2 Analyze Mystic Bottling Company's process costs

Obj. 5

Mystic Bottling Company bottles popular beverages in the Bottling Department. The beverages are produced by blending concentrate with water and sugar. The concentrate is purchased from a concentrate producer. The concentrate producer sets higher prices for the more popular concentrate flavors. A simplified Bottling Department cost of production report separating the cost of bottling the four flavors follows:

	A	B	C	D	E
1		**Orange**	**Cola**	**Lemon-Lime**	**Root Beer**
2	Concentrate	$ 4,625	$129,000	$105,000	$ 7,600
3	Water	1,250	30,000	25,000	2,000
4	Sugar	3,000	72,000	60,000	4,800
5	Bottles	5,500	132,000	110,000	8,800
6	Flavor changeover	3,000	4,800	4,000	10,000
7	Conversion cost	1,750	24,000	20,000	2,800
8	Total cost transferred to finished goods	$19,125	$391,800	$324,000	$36,000
9	Number of cases	2,500	60,000	50,000	4,000
10					

Beginning and ending work in process inventories are negligible, so they are omitted from the cost of production report. The flavor changeover cost represents the cost of cleaning the bottling machines between production runs of different flavors. A production run of a new flavor is produced after a flavor changeover from the previous flavor. Higher-demand flavors are produced in larger production runs, while smaller-demand flavors are produced in smaller production runs.

Prepare a memo to the production manager, analyzing this comparative cost information. In your memo, provide recommendations for further action, along with supporting schedules showing the total cost per case and cost per case by cost element. Round supporting calculations to the nearest cent.

MAD 3-3 Analyze Pix Paper Inc.'s process costs

Obj. 5

Pix Paper Inc. produces photographic paper for printing digital images. One of the processes for this operation is a coating (solvent spreading) operation, where chemicals are coated onto paper stock. There has been some concern about the cost performance of this operation. As a result, you have begun an investigation. You first discover that all materials and conversion prices have been stable for the last six months. Thus, increases in prices for inputs are not an

(Continued)

explanation for increasing costs. However, you have discovered three possible problems from some of the operating personnel whose quotes follow:

Operator 1: "I've been keeping an eye on my operating room instruments. I feel as though our energy consumption is becoming less efficient."

Operator 2: "Every time the coating machine goes down, we produce waste on shutdown and subsequent startup. It seems like during the last half-year we have had more unscheduled machine shutdowns than in the past. Thus, I feel as though our yields must be dropping."

Operator 3: "My sense is that our coating costs are going up. It seems to me like we are spreading a thicker coating than we should. Perhaps the coating machine needs to be recalibrated."

The Coating Department had no beginning or ending inventories for any month during the study period. The following data from the cost of production report are made available:

	A	B	C	D	E	F	G
1		**January**	**February**	**March**	**April**	**May**	**June**
2	Paper stock	$67,200	$63,840	$60,480	$64,512	$57,120	$53,760
3	Coating	$11,520	$11,856	$12,960	$15,667	$16,320	$18,432
4	Conversion cost (incl. energy)	$38,400	$36,480	$34,560	$36,864	$32,640	$30,720
5	Pounds input to the process	100,000	95,000	90,000	96,000	85,000	80,000
6	Pounds transferred out	96,000	91,200	86,400	92,160	81,600	76,800
7							

a. Prepare a table showing the paper cost per output pound, coating cost per output pound, conversion cost per output pound, and yield (pounds transferred out ÷ pounds input) for each month. Round costs to the nearest cent and yield to the nearest whole percent.

b. Interpret your table results.

MAD 3-4 Analyze Midstate Containers Inc.'s process costs

Obj. 5

Midstate Containers Inc. manufactures cans for the canned food industry. The operations manager of a can manufacturing operation wants to conduct a cost study investigating the relationship of tin content in the material (can stock) to the energy cost for enameling the cans. The enameling was necessary to prepare the cans for labeling. A higher percentage of tin content in the can stock increases the cost of material. The operations manager believed that a higher tin content in the can stock would reduce the amount of energy used in enameling. During the analysis period, the amount of tin content in the steel can stock was increased for every month, from April to September. The following operating reports were available from the controller:

	A	B	C	D	E	F	G
1		**April**	**May**	**June**	**July**	**August**	**September**
2	Materials	$ 14,000	$ 34,800	$ 33,000	$ 21,700	$ 28,800	$ 33,000
3	Energy	13,000	28,800	24,200	14,000	17,100	16,000
4	Total cost	$ 27,000	$ 63,600	$ 57,200	$ 35,700	$ 45,900	$ 49,000
5	Units produced	÷ 50,000	÷ 120,000	÷ 110,000	÷ 70,000	÷ 90,000	÷ 100,000
6	Cost per unit	$ 0.54	$ 0.53	$ 0.52	$ 0.51	$ 0.51	$ 0.49
7							

Differences in materials unit costs were entirely related to the amount of tin content. In addition, inventory changes are negligible and are ignored in the analysis.

Interpret this information and report to the operations manager your recommendations with respect to tin content.

Take It Further

ETHICS

TIF 3-1 Materials business strategy

You are the Cookie division controller for Auntie M's Baked Goods Company. Auntie M recently introduced a new chocolate chip cookie brand called Full of Chips, which has more than twice as many chips as any other brand on the market. The brand has quickly become a huge market success, largely because of the number of chips in each cookie. As a result of the brand's success, the product manager who launched the Full of Chips brand has been promoted to division vice president. A new product manager, Brandon, has been brought in to replace the promoted manager.

At Auntie M's, product managers are evaluated on both the sales and profit margin of the products they manage. During his first week on the job, Brandon notices that the Full of Chips cookie uses a lot of chips, which increases the cost of the cookie. To improve the product's profitability, Brandon plans to reduce the amount of chips per cookie by 10%. He believes that a 10% reduction in chips will not adversely affect sales, but will reduce cost and, hence, help him improve the profit margin. Brandon is focused on profit margins, because he knows that if he is able to increase the profitability of the Full of Chips brand, he will be in line for a big promotion.

To confirm this plan, Brandon has enlisted you to help evaluate it. After reviewing the cost of production reports segmented by cookie brand, you notice that there has been a continual drop in the materials costs for the Full of Chips brand since its launch. On further investigation, you discover that chip costs have declined because the previous product manager continually reduced the number of chips in each cookie. Both you and Brandon report to the division vice president, who was the original product manager for the Full of Chips brand who was responsible for reducing the chip count in prior periods.

1. Is this an ethical strategy for Brandon to pursue? What are the potential implications of this strategy?
2. What options might you, as the controller, consider taking in response to Brandon's plan?

TEAM ACTIVITY REAL WORLD

TIF 3-2 Real-world manufacturing company

The following categories represent typical process manufacturing industries:

- Beverages
- Chemicals
- Food
- Forest and paper products
- Metals
- Petroleum refining
- Pharmaceuticals
- Soap and cosmetics

In groups of two or three, identify one company for each category (following your instructor's specific instructions) and determine the following:

a. Typical products manufactured by the selected company, including brand names
b. Typical raw materials used by the selected company
c. Types of processes used by the selected company

Use annual reports, the Internet, or library resources in doing this activity.

COMMUNICATION

TIF 3-3 Interpreting cost of production reports

Jamarcus Bradshaw, plant manager of Georgia Paper Company's papermaking mill, was looking over the cost of production reports for July and August for the Papermaking Department. The reports revealed the following:

	July	August
Pulp and chemicals	$295,600	$304,100
Conversion cost	146,000	149,600
Total cost	$441,600	$453,700
Number of tons	÷ 1,200	÷ 1,130
Cost per ton	$ 368	$ 401.50

Jamarcus was concerned about the increased cost per ton from the output of the department. As a result, he asked the plant controller to perform a study to help explain these results. The controller, Leann Brunswick, began the analysis by performing some interviews of key plant personnel in order to understand what the problem might be. Excerpts from an interview with Len Tyson, a paper machine operator, follow:

Len: We have two papermaking machines in the department. I have no data, but I think paper machine No. 1 is applying too much pulp and, thus, is wasting both conversion and materials resources. We haven't had repairs on paper machine No. 1 in a while. Maybe this is the problem.

Leann: How does too much pulp result in wasted resources?

Len: Well, you see, if too much pulp is applied, then we will waste pulp material. The customer will not pay for the extra product; we just use more material to make the product. Also, when there is too much pulp, the machine must be slowed down in order to complete the drying process. This results in additional conversion costs.

Leann: Do you have any other suspicions?

Len: Well, as you know, we have two products—green paper and yellow paper. They are identical except for the color. The color is added to the papermaking process in the paper machine. I think that during August these two color papers have been behaving very differently. I don't have any data, but it just seems as though the amount of waste associated with the green paper has increased.

Leann: Why is this?

Len: I understand that there has been a change in specifications for the green paper, starting near the beginning of August. This change could be causing the machines to run poorly when making green paper. If this is the case, the cost per ton would increase for green paper.

Leann also asked for a database printout providing greater detail on August's operating results.

September 9 Requested by: Leann Brunswick

Papermaking Department—August detail

	A	B	C	D	E	F
1	**Production**					
2	**Run**	**Paper**		**Material**	**Conversion**	
3	**Number**	**Machine**	**Color**	**Costs**	**Costs**	**Tons**
4	1	1	Green	40,300	18,300	150
5	2	1	Yellow	41,700	21,200	140
6	3	1	Green	44,600	22,500	150
7	4	1	Yellow	36,100	18,100	120
8	5	2	Green	38,300	18,900	160
9	6	2	Yellow	33,900	15,200	140
10	7	2	Green	35,600	18,400	130
11	8	2	Yellow	33,600	17,000	140
12		Total		304,100	149,600	1,130
13						

Prior to preparing a report, Leann resigned from Georgia Paper Company to start her own business. You have been asked to take the data that Leann collected, and write a memo to Jamarcus Bradshaw with a recommendation to management. Your memo should include analysis of the August data to determine whether the paper machine or the paper color explains the increase in the unit cost from July. Include any supporting schedules that are appropriate. Round any calculations to the nearest cent.

REAL WORLD

TIF 3-4 Accounting for materials costs

In papermaking operations for companies such as **International Paper Company**, wet pulp is fed into paper machines, which press and dry pulp into a continuous sheet of paper. The paper is formed at very high speeds (60 mph). Once the paper is formed, the paper is rolled onto a reel at the back end of the paper machine. One of the characteristics of papermaking is the creation of "broke" paper. Broke is paper that fails to satisfy quality standards and is therefore rejected for final shipment to customers. Broke is recycled back to the beginning of the process by combining the recycled paper with virgin (new) pulp material. The combination of virgin pulp and recycled broke is sent to the paper machine for papermaking. Broke is fed into this recycle process continuously from all over the facility.

In this industry, it is typical to charge the papermaking operation with the cost of direct materials, which is a mixture of virgin materials and broke. Broke has a much lower cost than does virgin pulp. Therefore, the more broke in the mixture, the lower the average cost of direct materials to the department. Papermaking managers frequently comment on the importance of broke for keeping their direct materials costs down.

a. How do you react to this accounting procedure?

b. What "hidden costs" are not considered when accounting for broke as described?

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. During December, Krause Chemical Company had the following selected data concerning the manufacture of Xyzine, an industrial cleaner:

Production Flow	Physical Units
Completed and transferred to the next department	100
Add: Ending work in process inventory	10 (40% complete as to conversion)
Total units to account for	110
Less: Beginning work in process inventory	20 (60% complete as to conversion)
Units started during December	90

All materials are added at the beginning of processing in this department, and conversion costs are added uniformly during the process. The beginning work in process inventory had $120 of raw materials and $180 of conversion costs incurred. Materials added during December were $540, and conversion costs of $1,484 were incurred. Krause uses the first-in, first-out (FIFO) process cost method.

The equivalent units of production used to compute conversion costs for December were:

a. 110 units.
b. 104 units.
c. 100 units.
d. 92 units.

2. Jones Corporation uses a first-in, first-out (FIFO) process cost system. Jones has the following unit information for the month of August:

	Units
Beginning work in process inventory, 100% complete for materials, 75% complete for conversion costs	10,000
Units completed and transferred out	90,000
Ending work in process inventory, 100% complete for materials, 60% complete for conversion costs	8,000

The equivalent units of production for conversion costs for the month of August were:

a. 87,300 units.
b. 88,000 units.
c. 92,300 units.
d. 92,700 units.

3. Kimbeth Manufacturing uses a process cost system to manufacture dust density sensors for the mining industry. The following information pertains to operations for the month of May:

	Units
Beginning work in process inventory, May 1	16,000
Started in production during May	100,000
Completed production during May	92,000
Ending work in process inventory, May 31	24,000

The beginning inventory was 60% complete for materials and 20% complete for conversion costs. The ending inventory was 90% complete for materials and 40% complete for conversion costs.

Costs pertaining to the month of May are:
- Beginning inventory costs: materials, $54,560; direct labor, $20,320; and factory overhead, $15,240.
- Costs incurred during May: materials used, $468,000; direct labor, $182,880; and factory overhead, $391,160.

Using the first-in, first-out (FIFO) method, the equivalent units of production for conversion costs are:

a. 101,600 units.
b. 85,600 units.
c. 98,400 units.
d. 88,800 units.

4. A company is using process costing with the first-in, first-out (FIFO) method, and all costs are added evenly throughout the manufacturing process. If there are 5,000 units in beginning work in process inventory (30% complete), 10,000 units in ending work in process inventory (60% complete), and 25,000 units started in process this period, how many equivalent units are there for this period?

a. 22,500 units.
b. 26,000 units.
c. 24,500 units.
d. 25,000 units.

Pathways Challenge



This is Accounting!

Information/Consequences

Since the 10 units are deemed spoiled after 80% of the work is complete, there are 8 equivalent units of spoilage (80% × 10 units).

If the company expects that for every 100 units manufactured there is one spoiled unit, then 1 of the 10 spoiled units would be considered normal spoilage, and the remaining 9 of the 10 spoiled units would be considered abnormal spoilage.

There are 0.8 unit of normal spoilage (80% × 1) and 7.2 equivalent units of abnormal spoilage (80% × 9) for a total of 8 (0.8 + 7.2) equivalent units of spoilage.

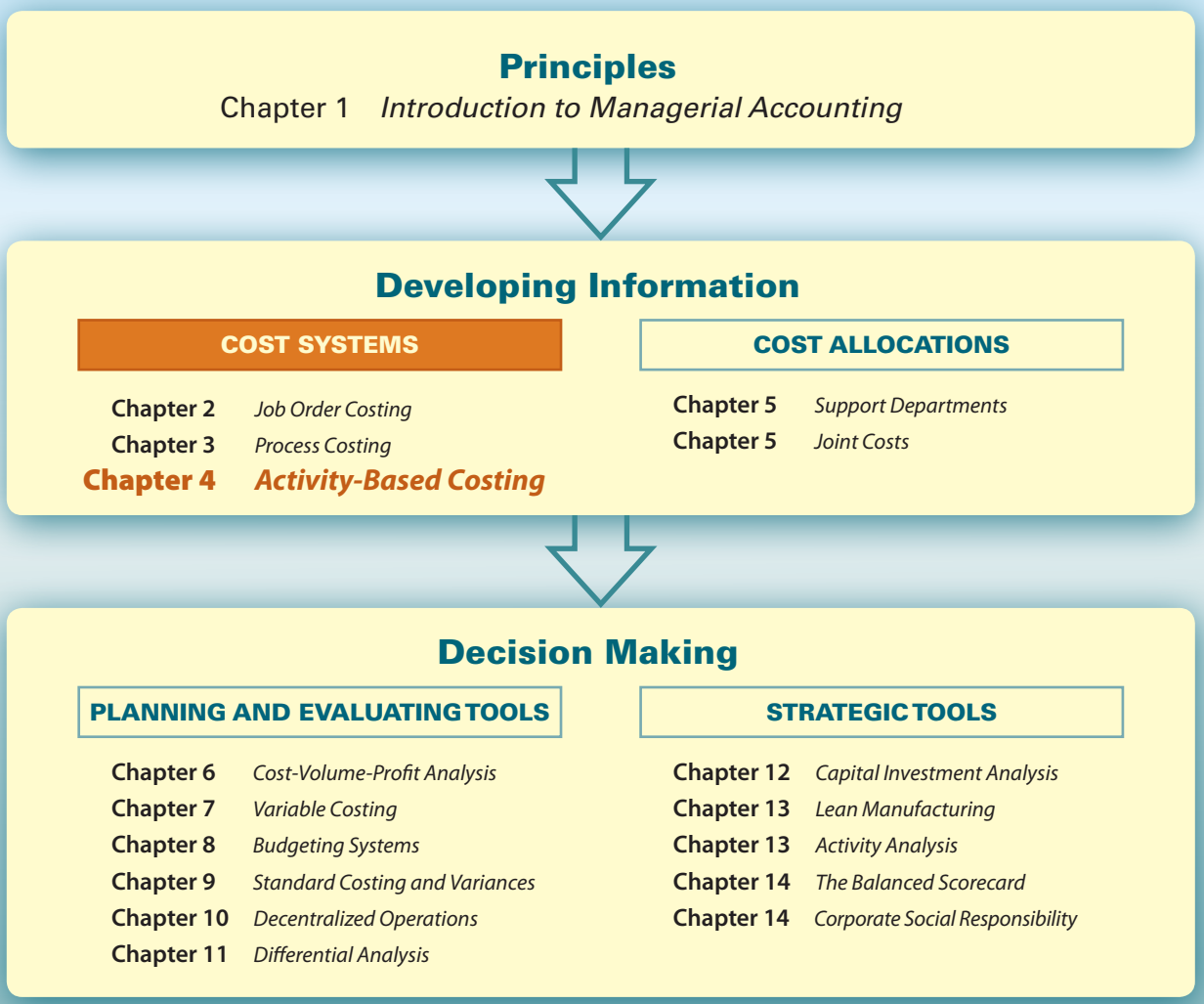
The computation of the cost of spoilage matters because spoilage is a waste of company resources. Managers should carefully monitor spoilage and strive to reduce all spoilage to zero, sometimes referred to as zero defects.

Normal spoilage is considered the cost of doing business. Every manufacturing process has some waste (spoilage). However, abnormal spoilage is waste beyond what is expected and, thus, not a cost of doing business. Abnormal spoilage costs are considered a loss (expense) and are deducted from operating income.

Suggested Answer

Chapter 4

Activity-Based Costing



Cold Stone Creamery

Have you ever had to request service repairs on an appliance at your home? The repair person may arrive and take five minutes to replace a part. Yet, the bill may indicate a minimum charge for more than five minutes of work.

Why might there be a minimum charge for a service call? The answer is that the service person must charge for the time and expense of coming to your house. In a sense, the bill reflects two elements of service: (1) the cost of coming to your house and (2) the cost of the repair. The first portion of the bill reflects the time required to "set up" the job. The second part of the bill reflects the cost of performing the repair. The setup charge will be the same, whether the repairs take five minutes or five hours. In contrast, the actual repair charge will vary with the time on the job.

Like the repair person, companies must be careful that the cost of their products and services accurately reflects the different activities involved in producing the product or service. Otherwise, the cost of products and services may be distorted and lead to improper management decisions.

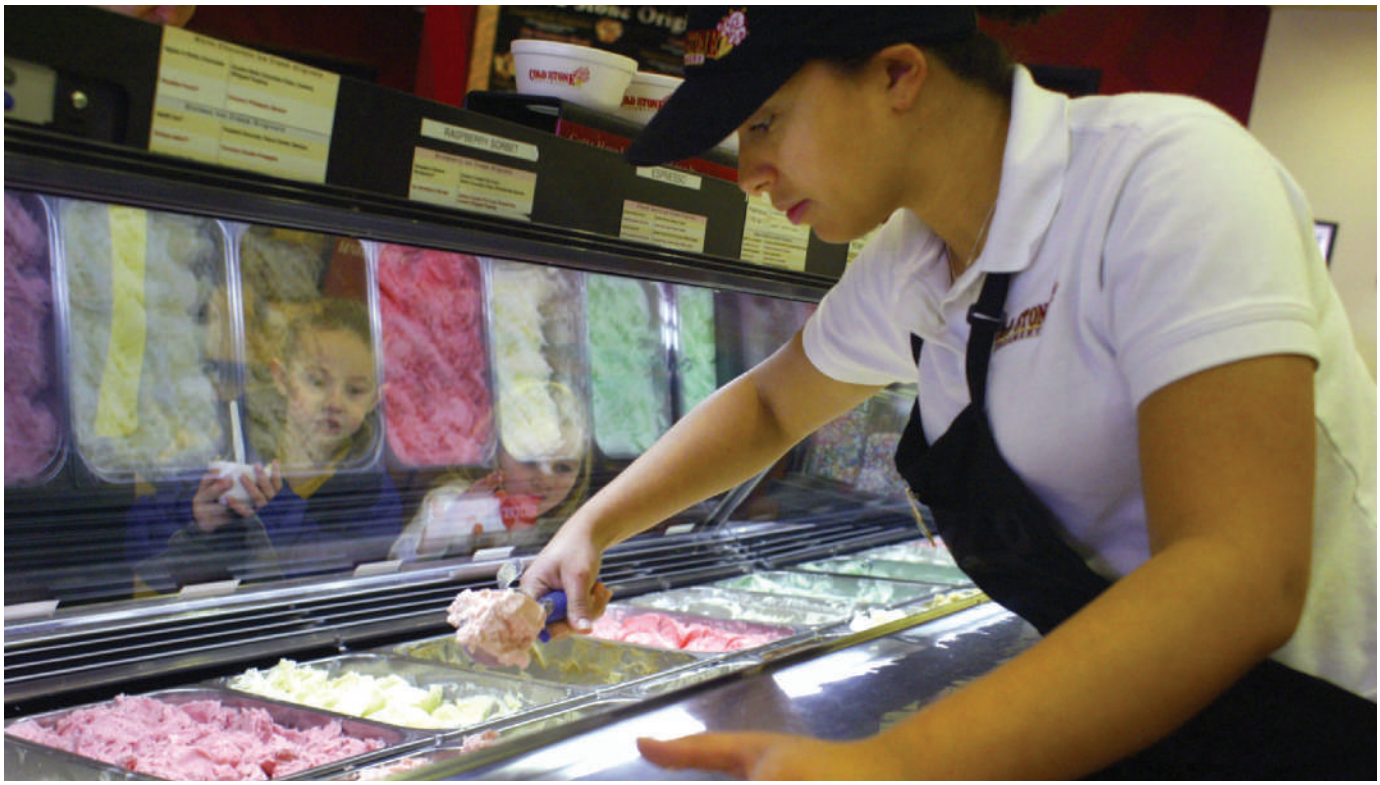
To illustrate, **Cold Stone Creamery**, a chain of super premium ice cream shops, uses activity-based costing to determine the cost of its ice cream products, such as cones, mixings, cakes, frozen yogurt, smoothies, and sorbets. The costs of activities, such as scooping and mixing, are added to the cost of the ingredients to determine the total cost of each product. As stated by Cold Stone's president:

". . . it only makes sense to have the price you pay for the product be reflective of the activities involved in making it for you."*

In this chapter, three different methods of allocating factory overhead to products are described and illustrated. In addition, product cost distortions resulting from improper factory overhead allocations are discussed. The chapter concludes by describing activity-based costing for selling and administrative expenses and its use in service businesses.

*Quote from "Experiencing Accounting Videos," Activity-Based Costing. © Cengage Learning, 2008.

Source: www.coldstonecreamery.com.



TRACY A. WOODWARD/THE WASHINGTON POST/GETTY IMAGES

Link to Cold Stone Creamery . . . . . Pages 153, 154, 160, 166

What's Covered

Activity-Based Costing

Product Costing Allocation Methods
- Product Costing (Obj. 1)
- Single Plantwide Rate (Obj. 2)
- Multiple Department Rates (Obj. 3)

Activity-Based Costing
- Activity Rates (Obj. 4)
- Allocation (Obj. 4)
- Distortion in Product Costs (Obj. 4)
- Dangers of Product Cost Distortion (Obj. 4)

Activity-Based Costing for Nonmanufacturing Uses
- Selling and Administrative Expenses (Obj. 5)
- Service Businesses (Obj. 6)

Learning Objectives

Obj. 1 Describe three methods used for allocating factory overhead costs to products.

Obj. 2 Illustrate the use of a single plantwide factory overhead rate for product costing.

Obj. 3 Use multiple production department factory overhead rates for product costing.

Obj. 4 Use activity-based costing for product costing.

Obj. 5 Use activity-based costing to allocate selling and administrative expenses to products.

Obj. 6 Use activity-based costing in a service business.

Analysis for Decision Making

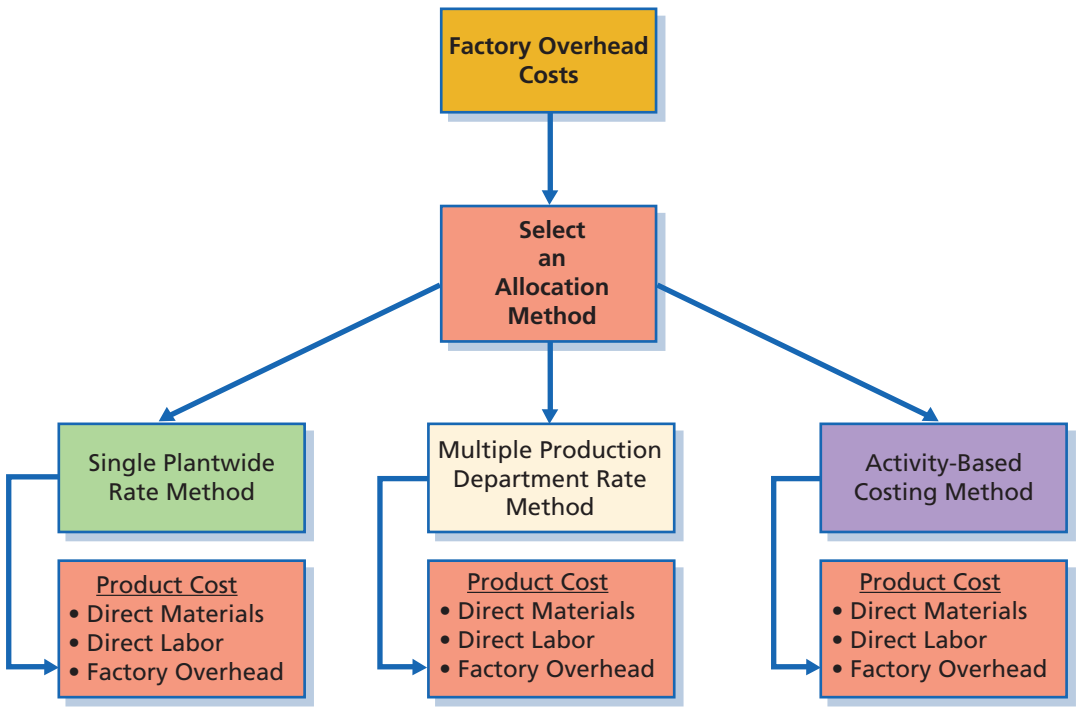
Obj. 7 Describe and illustrate the use of activity-based costing information in decision making.

Objective 1
Describe three methods used for allocating factory overhead costs to products.

Product Costing Allocation Methods

Determining the cost of a product is termed **product costing**. Product costs consist of direct materials, direct labor, and factory overhead. The direct materials and direct labor are direct costs that can be traced to the product. However, factory overhead includes indirect costs that must be allocated to the product as shown in Exhibit 1.

Exhibit 1
Allocation of Factory Overhead Costs



In Chapter 2, the allocation of factory overhead using a predetermined factory overhead rate was illustrated. The most common methods of allocating factory overhead using predetermined factory overhead rates are:

- Single plantwide factory overhead rate method
- Multiple production department factory overhead rate method
- Activity-based costing method

The choice of allocation method is important to managers because the allocation affects the product cost. Managers are concerned about the accuracy of product costs, which are used for decisions such as determining product mix, establishing product price, and determining whether to discontinue a product line.

The first **Cold Stone Creamery** was opened in Tempe, Arizona, by Donald and Susan Sutherland in 1988. *Link to Cold Stone Creamery*

Single Plantwide Factory Overhead Rate Method

Objective 2
Illustrate the use of a single plantwide factory overhead rate for product costing.

A company may use a predetermined factory overhead rate to allocate factory overhead costs to products. Under the **single plantwide factory overhead rate method**, factory overhead costs are allocated to products using only one rate.

To illustrate, assume the following data for **Ruiz Company**, which manufactures snowmobiles and riding mowers in a single factory:

Total budgeted factory overhead costs for the year	$1,600,000
Total budgeted direct labor hours (computed as follows)	20,000 hours

The total budgeted direct labor hours are computed as follows:

	Snowmobiles	Riding Mowers	Total
Planned production for the year	1,000 units	1,000 units	
Direct labor hours per unit	× 10 hours	× 10 hours	
Budgeted direct labor hours	10,000 hours	10,000 hours	20,000 hours

Under the single plantwide factory overhead rate method, the $1,600,000 budgeted factory overhead is applied to all products by using one rate. This rate is computed as follows:

$$\text{Single Plantwide Factory Overhead Rate} = \frac{\text{Total Budgeted Factory Overhead}}{\text{Total Budgeted Plantwide Allocation Base}}$$

The budgeted allocation base is a measure of operating activity in the factory. Common allocation bases would include direct labor hours, direct labor dollars, and machine hours. Ruiz allocates factory overhead using budgeted direct labor hours as the plantwide allocation base. Thus, Ruiz's single plantwide factory overhead rate is $80 per direct labor hour, computed as follows:

$$\text{Single Plantwide Factory Overhead Rate} = \frac{\$1{,}600{,}000}{20{,}000 \text{ direct labor hours}}$$

$$= \$80 \text{ per direct labor hour}$$

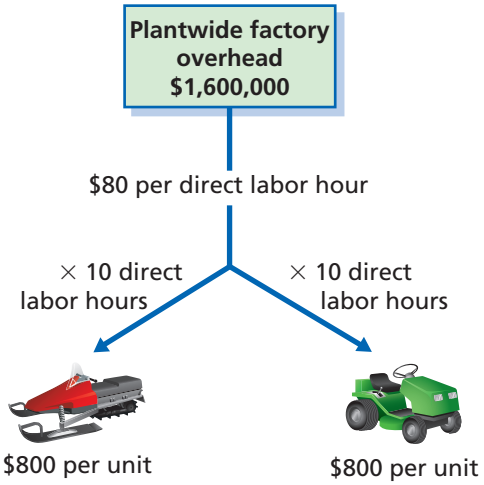
Ruiz uses the plantwide rate of $80 per direct labor hour to allocate factory overhead to snowmobiles and riding mowers, computed as follows:

	Single Plantwide Factory Overhead Rate	×	Direct Labor Hours per Unit	=	Factory Overhead Cost per Unit
Snowmobile	$80 per direct labor hour	×	10 direct labor hours	=	$800
Riding mower	$80 per direct labor hour	×	10 direct labor hours	=	$800

The factory overhead allocated to each product is $800. This is because each product uses the same number of direct labor hours.

The effects of Ruiz Company using the single plantwide factory overhead rate method are summarized in Exhibit 2.

Exhibit 2
Single Plantwide Factory Overhead Rate Method—Ruiz Company



The primary advantage of using the single plantwide overhead rate method is that it is simple and inexpensive to use. However, the single plantwide rate assumes that the factory overhead costs are consumed in the same way by all products. For example, in the preceding illustration Ruiz assumes that factory overhead costs are consumed as each direct labor hour is incurred.

The preceding assumption may be valid for companies that manufacture one or a few products. However, if a company manufactures products that consume factory overhead costs in different ways, a single plantwide rate may not accurately allocate factory overhead costs to the products.

Link to Cold Stone Creamery

At **Cold Stone Creamery**, each serving of ice cream is blended on a frozen granite stone using a mixture of fruits, nuts, candy, cookies, and brownies. Each serving is unique to the customer and is called a "creation."

Check Up Corner 4-1 Single Plantwide Factory Overhead Rate

Lifestyle Furniture Company manufactures home furniture products. The total factory overhead for the company is budgeted at $600,000 for the year. The company manufactures two products: a computer desk and a designer table, each of which requires 4 direct labor hours (dlh) to make. Production for the year is budgeted for 5,000 units of each product.

Determine the:

a. Total number of budgeted direct labor hours for the year.
b. Single plantwide factory overhead rate.
c. Factory overhead allocated per unit for each product, using the single plantwide factory overhead rate.

Solution:

		Desks	Tables	Total
a.	Planned production for the year	5,000 units	5,000 units	
	Direct labor hours per unit	× 4 hours	× 4 hours	
	Budgeted direct labor hours	20,000 hours	20,000 hours	40,000 hours

Lifestyle allocates factory overhead using budgeted direct labor hours.

The budgeted allocation base is a measure of operating activity in the factory.

b. Single Plantwide Factory Overhead Rate = Total Budgeted Factory Overhead / Total Budgeted Direct Labor Hours

A single rate assumes that the factory overhead costs are consumed in the same way by all products.

The plantwide allocation base in this example is direct labor hours.

Single Plantwide Factory Overhead Rate = $600,000 / 40,000 = $15

The budgeted overhead is applied to all products using a single rate.

c.

	Single Plantwide Factory Overhead Rate	×	Direct Labor Hours per Unit	=	Factory Overhead Cost per Unit
Desk	$15 per direct labor hour	×	4 hours	=	$60
Table	$15 per direct labor hour	×	4 hours	=	$60

Each desk and each table uses 4 hours of direct labor.

Check Up Corner

Multiple Production Department Factory Overhead Rate Method

Objective 3
Use multiple production department factory overhead rates for product costing.

When production departments *differ significantly* in their manufacturing processes, factory overhead costs are normally incurred differently in each department. In such cases, factory overhead costs may be more accurately allocated using multiple production department factory overhead rates.

The **multiple production department factory overhead rate method** uses different rates for each production department to allocate factory overhead costs to products. In contrast, the single plantwide rate method uses only one rate to allocate factory overhead costs. Exhibit 3 illustrates how these two methods differ.

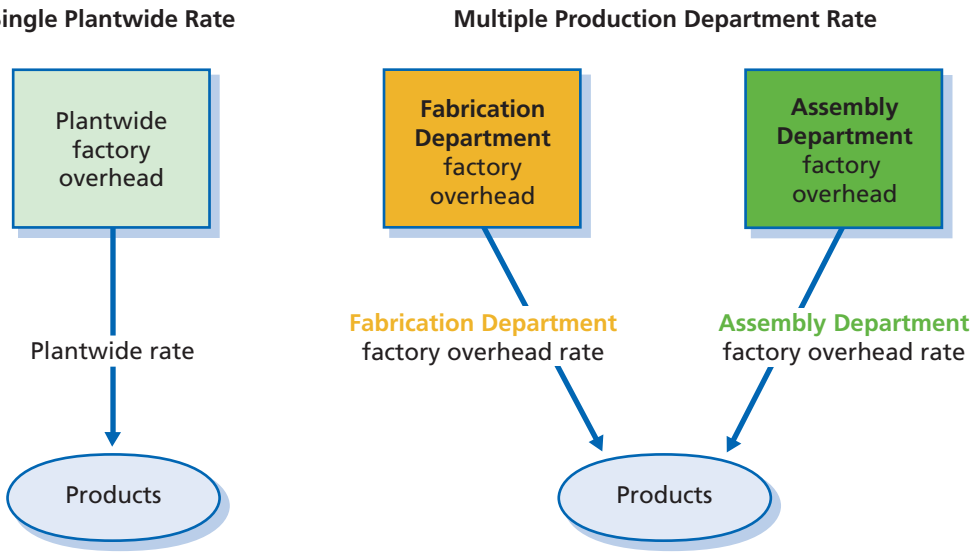


Exhibit 3
Comparison of Single Plantwide Rate and Multiple Production Department Rate Methods

To illustrate the multiple production department factory overhead rate method, the prior illustration for **Ruiz Company** is used. In doing so, assume that Ruiz uses the following two production departments in the manufacture of snowmobiles and riding mowers:

- Fabrication Department, which cuts metal to the shape of the product.
- Assembly Department, which manually assembles machined pieces into a final product.

The total budgeted factory overhead for Ruiz is $1,600,000 divided into the Fabrication and Assembly departments as follows:[1]

	Budgeted Factory Overhead Costs
Fabrication Department	$1,030,000
Assembly Department	570,000
Total budgeted factory overhead costs	$1,600,000

As illustrated, the Fabrication Department incurs nearly twice the factory overhead of the Assembly Department. This is because the Fabrication Department has more machinery and equipment that uses more power, incurs more equipment depreciation, and uses more factory supplies.

Department Overhead Rates and Allocation

Each **production department factory overhead rate** is computed as follows:

$$\text{Production Department Factory Overhead Rate} = \frac{\text{Budgeted Department Factory Overhead}}{\text{Budgeted Department Allocation Base}}$$

To illustrate, assume that **Ruiz Company** uses direct labor hours as the allocation base for the Fabrication and Assembly departments.[2] Each department uses 10,000 direct labor hours. Thus, the factory overhead rates are as follows:

$$\text{Fabrication Department Factory Overhead Rate} = \frac{\$1,030,000}{10,000 \text{ direct labor hours}} = \$103 \text{ per direct labor hour}$$

$$\text{Assembly Department Factory Overhead Rate} = \frac{\$570,000}{10,000 \text{ direct labor hours}} = \$57 \text{ per direct labor hour}$$

Ten direct labor hours are required for the manufacture of each snowmobile and riding mower. These 10 hours are consumed in the Fabrication and Assembly departments as follows:

	Snowmobile	Riding Mower
Fabrication Department	8 hours	2 hours
Assembly Department	2	8
Direct labor hours per unit	10 hours	10 hours

The factory overhead allocated to each snowmobile and riding mower is shown in Exhibit 4. As shown in Exhibit 4, each snowmobile is allocated $938 of total factory overhead costs. In contrast, each riding mower is allocated $662 of factory overhead costs.

[1] Factory overhead costs are assigned to production departments using methods discussed in advanced cost accounting textbooks.
[2] Departments need not use the same allocation base. The allocation base should be associated with the operating activity of the department.

Exhibit 4 Allocating Factory Overhead to Products—Ruiz Company





	Allocation Base Usage per Unit	×	Production Department Factory Overhead Rate	=	Allocated Factory Overhead per Unit of Product
Snowmobile					
Fabrication Department	8 direct labor hours	×	$103 per dlh	=	$824
Assembly Department	2 direct labor hours	×	$57 per dlh	=	114
Total factory overhead cost per snowmobile					$938
Riding mower					
Fabrication Department	2 direct labor hours	×	$103 per dlh	=	$206
Assembly Department	8 direct labor hours	×	$57 per dlh	=	456
Total factory overhead cost per riding mower					$662

Exhibit 5 summarizes the multiple production department rate allocation method for Ruiz. Exhibit 5 indicates that the Fabrication Department factory overhead rate is $103 per direct labor hour, while the Assembly Department rate is $57 per direct labor hour. Since the snowmobile uses more Fabrication Department direct labor hours than does the riding mower, the total overhead allocated to each snowmobile is $276 greater ($938 – $662) than the amount allocated to each riding mower.

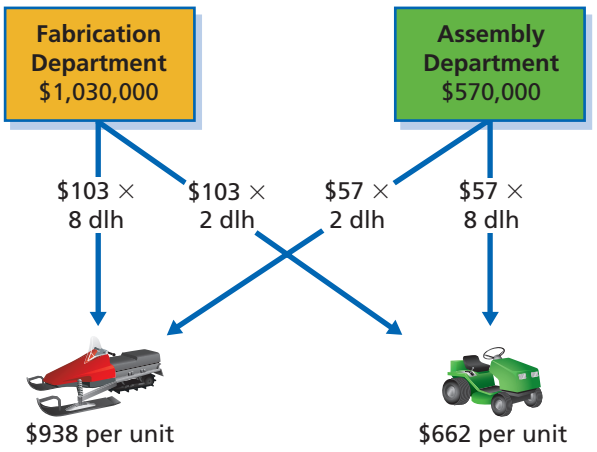


Exhibit 5
Multiple Production Department Rate Method—Ruiz Company

Distortion of Product Costs

The differences in **Ruiz Company**'s factory overhead for each snowmobile and riding mower using the single plantwide and the multiple production department factory overhead rate methods are as follows:

	Factory Overhead Cost per Unit		
	Single Plantwide Method	Multiple Production Department Method	Difference
Snowmobile	$800	$938	$(138)
Riding mower	800	662	138

note:
The single plantwide factory overhead rate distorts product cost by averaging high and low factory overhead costs.

The single plantwide factory overhead rate distorts the product cost of both the snowmobile and riding mower. That is, the snowmobile is not allocated enough cost and, thus, is undercosted by $138. In contrast, the riding mower is allocated too much cost and is overcosted by $138 ($800 – $662).

The preceding cost distortions are caused by averaging the differences between the high factory overhead costs in the Fabrication Department and the low factory overhead costs in the Assembly Department. Using the single plantwide rate, it is assumed that all factory overhead is directly related to a single allocation base for the entire plant. This assumption is not realistic for Ruiz. Thus, using a single plantwide rate distorted the product costs of snowmobiles and riding mowers.

The following conditions indicate that a single plantwide factory overhead rate may cause product cost distortions:

- **Condition 1:** *Differences in production department factory overhead rates.* Some departments have high rates, whereas others have low rates.
- **Condition 2:** *Differences among products in the ratios of allocation base usage within a department and across departments.* Some products have a high ratio of allocation base usage within departments, whereas other products have a low ratio of allocation base usage within the same departments.

To illustrate, Condition 1 exists for Ruiz because the factory overhead rate for the Fabrication Department is $103 per direct labor hour, whereas the rate for the Assembly Department is only $57 per direct labor hour. However, this condition by itself will not cause product cost distortions.

Condition 2 also exists for Ruiz. The snowmobile consumes 8 direct labor hours in the Fabrication Department, whereas the riding mower consumes only 2 direct labor hours. Thus, the ratio of allocation base usage is 4:1 in the Fabrication Department, computed as follows:[3]

$$\text{Ratio of Allocation Base Usage in the Fabrication Department} = \frac{\text{Direct Labor Hours for Snowmobiles}}{\text{Direct Labor Hours for Riding Mowers}} = \frac{8 \text{ hours}}{2 \text{ hours}} = 4{:}1$$

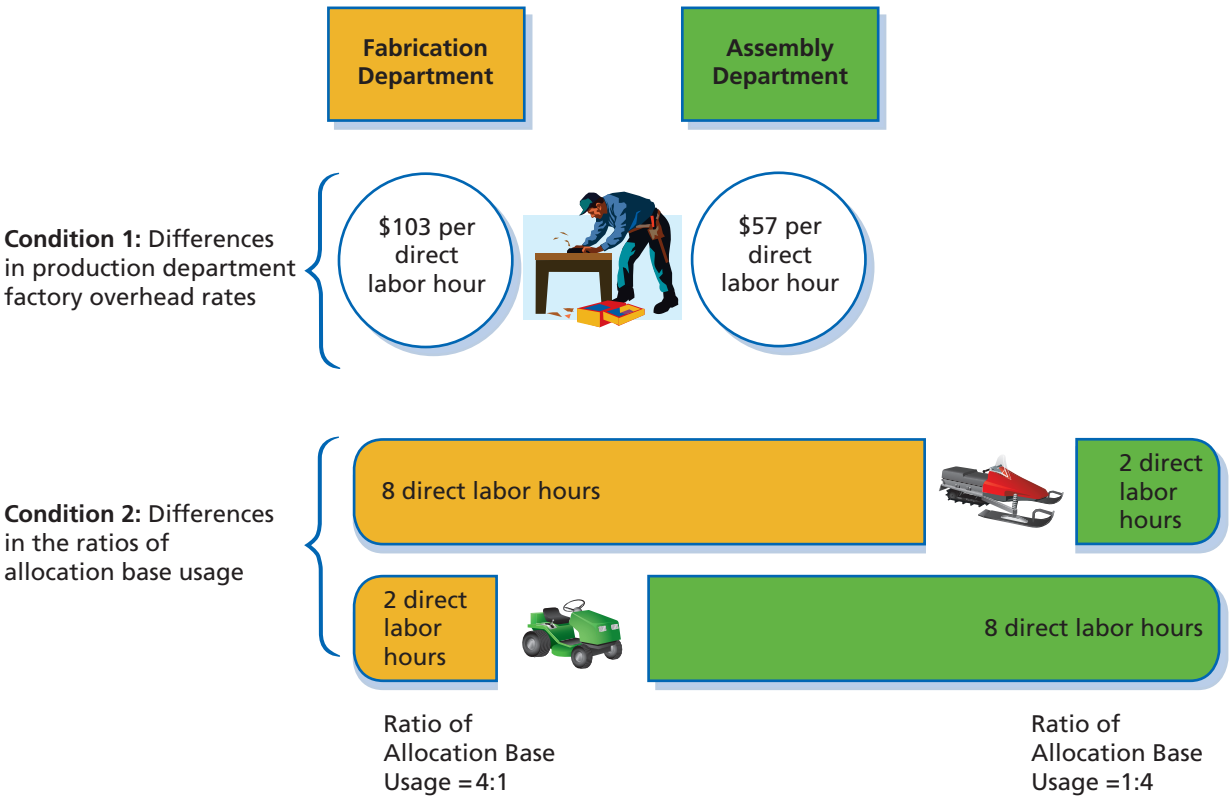
In contrast, the ratio of allocation base usage is 1:4 in the Assembly Department, computed as follows:

$$\text{Ratio of Allocation Base Usage in the Assembly Department} = \frac{\text{Direct Labor Hours for Snowmobiles}}{\text{Direct Labor Hours for Riding Mowers}} = \frac{2 \text{ hours}}{8 \text{ hours}} = 1{:}4$$

Because both conditions exist for Ruiz, the product costs from using the single plantwide factory overhead rate are distorted. The preceding conditions and the resulting product cost distortions are summarized in Exhibit 6.

[3] The numerator and denominator could be switched as long as the ratio is computed the same for each department. This is because the objective is to compare whether differences exist in the ratio of allocation base usage across products and departments.

Exhibit 6 Conditions for Product Cost Distortion—Ruiz Company



Check Up Corner 4-2 Multiple Production Department Overhead Rates

The total factory overhead for Lifestyle Furniture Company is budgeted at $600,000 for the year, divided between two departments: Fabrication, $420,000, and Assembly, $180,000. Lifestyle manufactures two products: a computer desk and a designer table. Each desk requires 1 direct labor hour (dlh) in Fabrication and 3 direct labor hours in Assembly. Each table requires 3 direct labor hours in Fabrication and 1 direct labor hour in Assembly. Production for the year is budgeted for 5,000 units of each product.

Determine the:

a Total number of budgeted direct labor hours for the year in each department.

b. Departmental factory overhead rate for each department.

c. Factory overhead allocated per unit for each product, using the departmental factory overhead rates.

Solution:

a.

	Direct Labor Hours per Unit	×	Number of Units	=	Toal Direct Labor Hours
Fabrication Department					
Desks	1 dlh	×	5,000	=	5,000
Tables	3 dlh	×	5,000	=	15,000
Total budgeted direct labor hours					20,000
Assembly Department					
Desks	3 dlh	×	5,000	=	15,000
Tables	1 dlh	×	5,000	=	5,000
Total budgeted direct labor hours					20,000

The budgeted allocation base is a measure of operating activity in each department.

(Continued)

b.

Fabrication Department Factory Overhead Rate	=	$420,000 / 20,000	=	$21.00
Assembly Department Factory Overhead Rate	=	$180,000 / 20,000	=	$9.00

The multiple production department factory overhead rate method uses a different rate for each production department to allocate factory overhead costs to products.

Each table uses 3 direct labor hours in Fabrication and 1 direct labor hour in Assembly.

c.

	Allocation Base Usage per Unit	×	Production Department Factory Overhead Rate	=	Allocated Factory Overhead	
Table						
Fabrication Department	3 dlh	×	$21.00	=	$63.00	Each table is allocated $72 of factory overhead: $63 from Fabrication and $9 from Assembly.
Assembly Department	1 dlh	×	$9.00	=	9.00	
Total factory overhead cost per table					$72.00	
Desk						
Fabrication Department	1 dlh	×	$21.00	=	$21.00	Each desk is allocated $48 of factory overhead: $21 from Fabrication and $27 from Assembly.
Assembly Department	3 dlh	×	$9.00	=	27.00	
Total factory overhead cost per desk					$48.00	

Each desk uses 1 direct labor hour in Fabrication and 3 direct labor hours in Assembly.

Check Up Corner

Objective 4
Use activity-based costing for product costing.

Activity-Based Costing Method

As illustrated in the preceding section, product costs may be distorted when a single plantwide factory overhead rate is used. However, product costs may also be distorted when multiple production department factory overhead rates are used. Activity-based costing further reduces the possibility of product cost distortions.

The **activity-based costing (ABC) method** provides an alternative approach for allocating factory overhead that uses multiple factory overhead rates based on different activities. **Activities** are the types of work, or actions, involved in a manufacturing or service process. For example, the assembly, inspection, and engineering design functions are activities that might be used to allocate overhead.

Link to Cold Stone Creamery

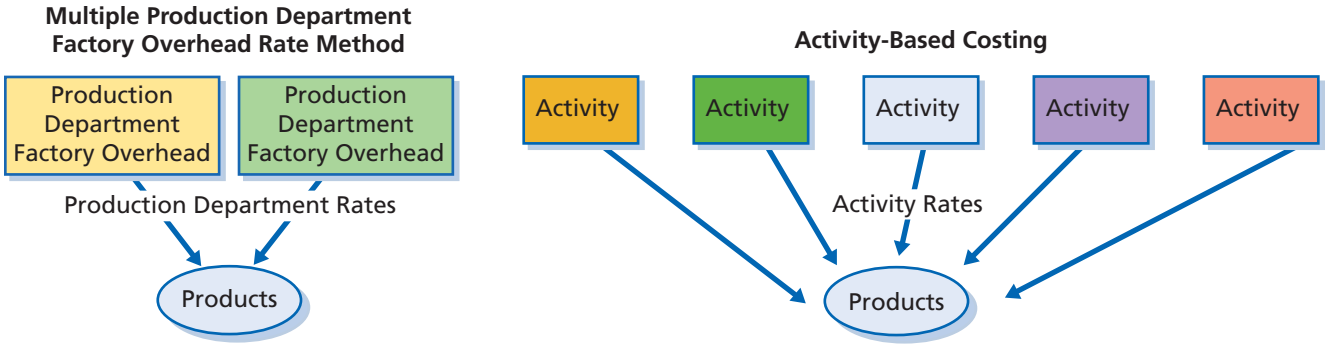
Cold Stone Creamery uses the principles of activity-based costing.

Under activity-based costing, factory overhead costs are initially budgeted for activities, sometimes called *activity cost pools*, such as machine usage, inspections, moving, production setups, and engineering activities.[4] In contrast, when multiple production department factory overhead rates are used, factory overhead costs are first accounted for in production departments.

[4] The activity rate is based on budgeted activity costs. Activity-based budgeting and the reconciliation of budgeted activity costs to actual costs are topics covered in advanced texts.

Exhibit 7 illustrates how activity-based costing differs from the multiple production department method.

Exhibit 7 Multiple Production Department Factory Overhead Rate Method vs. Activity-Based Costing



To illustrate the activity-based costing method, the prior illustration for **Ruiz Company** is used. Assume that the following activities have been identified for producing snowmobiles and riding mowers:

- *Fabrication*, which consists of cutting metal to shape the product. This activity is machine-intensive.
- *Assembly*, which consists of manually assembling machined pieces into a final product. This activity is labor-intensive.
- *Setup*, which consists of changing tooling in machines in preparation for making a new product. Each production run requires a **setup**.
- *Quality-control inspections*, which consist of inspecting the product for conformance to specifications. Inspection requires product tear down and reassembly.
- *Engineering changes*, which consist of processing changes in design or process specifications for a product. The document that initiates changing a product or process is called an **engineering change order (ECO)**.

Why It Matters CONCEPT CLIP

Activity-Based Costing in the Public Sector

Activity-based costing is used by some municipal, state, and federal entities to guide decision making. In these cases, the costs of activities are used to analyze the efficiency of services, set fees for services, and choose among alternative service providers. Examples of activities, activity costs, and decision making in the municipal environment are as follows:

Municipal Activity	Activity Cost	Decision Example
Voter registration	Cost per voter registered	How many people will be needed to staff voter registration?
Road plowing	Cost per lane mile	How much should be budgeted for winter road plowing?
Police protection	Cost per incident type	Is police overtime required to support incident levels?
Street repair	Cost per square yard of street repaired	How much should be paid to a third-party contractor for street repair?
Tax billing	Cost per tax bill	Is the Tax Department efficient in billing property taxes?
Immunization	Cost per immunization	What fee should be charged for immunization?

Source: *Costing Municipal Services*, Massachusetts Department of Revenue, Division of Local Services, March 2005.

Fabrication and assembly are now identified as *activities* rather than *departments*. As a result, the setup, quality-control inspections, and engineering change functions that were previously allocated to the Fabrication and Assembly departments are now classified as separate activities.

The budgeted cost for each activity is as follows:

Activity	Budgeted Activity Cost
Fabrication	$ 530,000
Assembly	70,000
Setup	480,000
Quality-control inspections	312,000
Engineering changes	208,000
Total budgeted activity costs	$1,600,000

The costs for the fabrication and assembly activities are less than the costs shown in the preceding section where these activities were identified as production departments. This is because the costs of setup, quality-control inspections, and engineering changes, which total $1,000,000 ($480,000 + $312,000 + $208,000), have now been separated into their own activity cost pools.

Activity Rates

The budgeted activity costs are assigned to products using factory overhead rates for each activity. These rates are called **activity rates** because they are related to activities. Activity rates are computed as follows:

$$\text{Activity Rate} = \frac{\text{Budgeted Activity Cost}}{\text{Total Activity-Base Usage}}$$

note: Activity rates are computed by dividing the budgeted activity cost pool by the total estimated activity-base usage.

The term **activity base**, rather than *allocation base*, is used because the base is related to an activity.

To illustrate, assume that snowmobiles are a new product for **Ruiz Company**, and engineers are still making minor design changes. Ruiz has produced riding mowers for many years. Activity-base usage for the two products is as follows:

	Snowmobile	Riding Mower
Estimated units of total production	1,000 units	1,000 units
Estimated setups	100 setups	20 setups
Quality-control inspections	100 inspections (10%)	4 inspections (0.4%)
Estimated engineering change orders	12 change orders	4 change orders

The number of direct labor hours used by each product is 10,000 hours, computed as follows:

	Direct Labor Hours per Unit	Number of Units of Production	Total Direct Labor Hours
Snowmobile:			
Fabrication Department	8 hours	1,000 units	8,000 hours
Assembly Department	2 hours	1,000 units	2,000 hours
Total			10,000 hours
Riding Mower:			
Fabrication Department	2 hours	1,000 units	2,000 hours
Assembly Department	8 hours	1,000 units	8,000 hours
Total			10,000 hours

Exhibit 8 summarizes the activity-base usage quantities for each product.

Exhibit 8 Activity Bases—Ruiz Company

	Activity-Base Usage				
Products	**Fabrication**	**Assembly**	**Setup**	**Quality-Control Inspections**	**Engineering Changes**
Snowmobile	8,000 dlh	2,000 dlh	100 setups	100 inspections	12 ECOs
Riding mower	2,000	8,000	20	4	4
Total activity-base usage	10,000 dlh	10,000 dlh	120 setups	104 inspections	16 ECOs

The activity rates for Ruiz are shown in Exhibit 9.

Exhibit 9 Activity Rates—Ruiz Company

Activity	**Budgeted Activity Cost**	÷	**Total Activity-Base Usage**	=	**Activity Rate**
Fabrication	$530,000	÷	10,000 direct labor hours	=	$53 per direct labor hour
Assembly	$70,000	÷	10,000 direct labor hours	=	$7 per direct labor hour
Setup	$480,000	÷	120 setups	=	$4,000 per setup
Quality-control inspections	$312,000	÷	104 inspections	=	$3,000 per inspection
Engineering changes	$208,000	÷	16 engineering changes	=	$13,000 per engineering change order

Allocating Costs

Overhead costs of each activity are allocated to a product by multiplying the product's activity-base usage by the activity rate, as follows:

$$\text{Activity Overhead Allocated} = \text{Activity-Base Usage} \times \text{Activity Rate}$$

The estimated total factory overhead cost for a product is the sum of the product's individual activity allocations. The factory overhead cost per unit is computed by dividing the product's total factory overhead cost by the total units of estimated production, as follows:

$$\text{Factory Overhead Cost per Unit} = \frac{\text{Total Factory Overhead Cost}}{\text{Total Units of Estimated Production}}$$

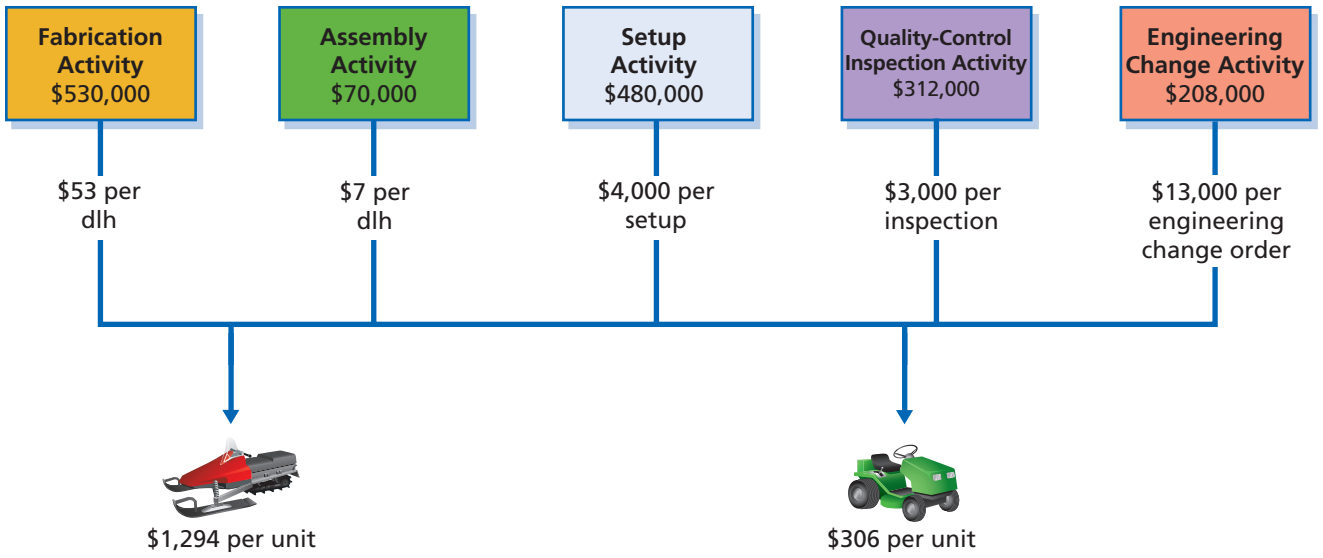
These computations for Ruiz's snowmobile and riding mower are shown in Exhibit 10.

Exhibit 10 Activity-Based Product Cost Calculations

	A	B	C	D	E	F	G	H	I	J	K	L
1		Snowmobile						Riding Mower				
2		Activity-Base		Activity		Activity		Activity-Base		Activity		Activity
3	Activity	Usage	×	Rate	=	Cost		Usage	×	Rate	=	Cost
4												
5	Fabrication	8,000 dlh		$53 per dlh		$ 424,000		2,000 dlh		$53 per dlh		$106,000
6	Assembly	2,000 dlh		$7 per dlh		14,000		8,000 dlh		$7 per dlh		56,000
7	Setup	100 setups		$4,000 per setup		400,000		20 setups		$4,000 per setup		80,000
8	Quality-control											
9	inspections	100 inspections		$3,000 per insp.		300,000		4 inspections		$3,000 per insp.		12,000
10	Engineering											
11	changes	12 ECOs		$13,000 per ECO		156,000		4 ECOs		$13,000 per ECO		52,000
12	Total factory											
13	overhead cost					$1,294,000						$306,000
14	Estimated units											
15	of production					÷ 1,000						÷ 1,000
16	Factory overhead											
17	cost per unit					$ 1,294						$ 306
18												

The activity-based costing method for Ruiz is summarized in Exhibit 11.

Exhibit 11 Activity Bases—Ruiz Company



Why It Matters

$600 Hammer

An old story is one of an ordinary hammer purchased under a government contract costing the government $600. This is actually not a story about waste, but a story about cost allocation distortion. The actual story involves a hammer procured as part of a bundle of many different spare parts. When the engineering costs were allocated among the individual spare parts, every part was treated the same. Thus, a $15 hammer was allocated the same amount of relative engineering cost as were highly technical components. Thus, the hammer received as much relative overhead as did an engine. The allocation method did not trace engineering cost on the basis of engineering effort required by the product, but rather the cost was spread proportionally across all the products. In this way, the engine would end up under-allocated and the hammer over-allocated engineering cost. Today, this type of distortion is minimized through better cost allocation practices. This is accomplished through the Office of Federal Procurement Policy Cost Accounting Standards Board, which operates as part of the U.S. government for purposes of prescribing standard cost accounting practices for U.S. government contracts.

Source: Sydney J. Freedberg, "The Myth of the $600 Hammer," *Government Executive*, December 7, 1998.

Distortion in Product Costs

The factory overhead costs per unit for **Ruiz Company** using the three allocation methods are shown in Exhibit 12.

Exhibit 12 Overhead Cost Allocation Methods: Ruiz Company

	Factory Overhead Cost per Unit—Three Cost Allocation Methods		
	Single Plantwide Rate	**Multiple Production Department Rates**	**Activity-Based Costing**
Snowmobile	$800	$938	$1,294
Riding mower	800	662	306

The activity-based costing method produces different factory overhead costs per unit (product costs) than the multiple department factory overhead rate method. This difference is caused by how the $1,000,000 of setup, quality control, and engineering change activities are allocated.

Under the multiple production department factory overhead rate method, setup, quality control, and engineering change costs were allocated using departmental rates based on direct labor hours. However, snowmobiles and riding mowers did *not* consume these *activities* in proportion to direct labor hours. That is, each snowmobile consumed a larger portion of the setup, quality-control inspection, and engineering change activities. This was true even though each product consumed 10,000 direct labor hours. As a result, activity-based costing allocated more of the cost of these activities to the snowmobile. Only under the activity-based approach were these differences reflected in the factory overhead cost allocations and thus in the product costs.

Dangers of Product Cost Distortion

If **Ruiz Company** used the $800 factory overhead cost allocation (single plantwide rate) instead of activity-based costing for pricing snowmobiles and riding mowers, the following would likely result:

- The snowmobile would be *underpriced* because its factory overhead cost would be understated by $494 ($1,294 − $800).
- The riding mower would be *overpriced* because its factory overhead cost would be overstated by $494 ($800 − $306).

As a result, Ruiz would likely lose sales of riding mowers because they are overpriced. In contrast, sales of snowmobiles would increase because they are underpriced. Due to these pricing errors, Ruiz might incorrectly decide to expand production of snowmobiles and discontinue making riding mowers.

If Ruiz uses the activity-based costing method, its product costs would be more accurate. Thus, Ruiz would have a better starting point for making proper pricing decisions. Although the product cost distortions are not as great, similar results would occur if Ruiz had used the multiple production department rate method.

Check Up Corner 4-3 Activity-Based Costing

The total factory overhead for Lifestyle Furniture Company is budgeted at $600,000 for the year, divided among four activities: fabrication, $300,000; assembly, $120,000; setup, $100,000; and materials handling, $80,000. Lifestyle manufactures two designer furniture products: a wingback chair (chair) and a computer desk (desk). The activity-base usage quantities for each product by each activity are estimated as follows:

	Fabrication	Assembly	Setup	Materials Handling
Chair	5,000 dlh	15,000 dlh	30 setups	50 moves
Desk	15,000	5,000	220	350
Total activity-base usage	20,000 dlh	20,000 dlh	250 setups	400 moves

Production for the year is budgeted for 5,000 chairs and 5,000 desks.

Determine the:

a. Activity rate for each activity.

b. Activity-based factory overhead per unit for each product.

Solution:

a.

Fabrication	Assembly	Setup	Materials Handling
$300,000	$ 120,000	$100,000	$80,000
÷ 20,000 dlh	÷ 20,000 dlh	÷ 250 setups	÷ 400 moves
$ 15 per dlh	$ 6 per dlh	$ 400 per setup	$ 200 per move

The budgeted activity costs are assigned to products using a different rate for each activity.

$$\text{Activity Rate} = \frac{\text{Budgeted Activity Cost}}{\text{Total Activity-Base Usage}}$$

The activity rate for each department is multiplied by the department's activity-base usage for each product.

b.

	A	B	C	D	E	F	G	H	I	J	K	L
1				Chair						Desk		
2		Activity-Base		Activity		Activity		Activity-Base		Activity		Activity
3	Activity	Usage	×	Rate	=	Cost		Usage	×	Rate	=	Cost
4												
5	Fabrication	5,000 dlh		$15 per dlh		$ 75,000		15,000 dlh		$15 per dlh		$225,000
6	Assembly	15,000 dlh		$6 per dlh		90,000		5,000 dlh		$6 per dlh		30,000
7	Setup	30 setups		$400 per setup		12,000		220 setups		$400 per setup		88,000
8	Materials handling	50 moves		$200 per move		10,000		350 moves		$200 per move		70,000
9	Total factory overhead cost					$187,000						$413,000
10	Estimated units of											
11	production					÷ 5,000						÷ 5,000
12	Factory overhead											
13	cost per unit					$ 37.40						$ 82.60
14												

The factory overhead cost per unit is determined by dividing the factory overhead assigned to each product by the estimated number of units.

Check Up Corner

Link to Cold Stone Creamery

Anyone can apply for and open a **Cold Stone Creamery** franchise. The company provides help in picking a location, constructing or leasing a building, and training employees. The initial franchise fee is $27,000, and it costs $250,000 to $400,000 to build and equip a store. The company receives a royalty fee of 6% and an advertising fee of 3% of gross sales.

Ethics: Do It!

Fraud Against You and Me

The U.S. government makes a wide variety of purchases. Two of the largest are health care purchases under Medicare and military equipment. The purchase price for these and other items is often determined by the cost plus some profit. The cost is often the sum of direct costs plus allocated overhead. Due to the complexity of determining cost, government agencies review the amount charged for products and services. In the event of disagreement between the contractor and the government, the U.S. government may sue the contractor under the False Claims Act, which provides for three times the government's damages plus civil penalties. The U.S. Department of Justice has recovered billions from the False Claims Act. Most of the cases were the result of allegations by private citizens under the act's whistleblower provision.

Source: The False Claims Act Legal Center of the TAF Education Fund, www.taf.org.

Activity-Based Costing for Selling and Administrative Expenses

Objective 5
Use activity-based costing to allocate selling and administrative expenses to products.

Generally accepted accounting principles (GAAP) require that selling and administrative expenses be reported as period expenses on the income statement. However, selling and administrative expenses may be allocated to products for managerial decision making. For example, selling and administrative expenses may be allocated for analyzing product profitability.

One method of allocating selling and administrative expenses to the products is based on sales volumes. However, products may consume activities in ways that are unrelated to their sales volumes. When this occurs, activity-based costing may be a more accurate method of allocation.

To illustrate, assume that Abacus Company has two products, Ipso and Facto. Both products have the same total sales volume. However, Ipso and Facto consume selling and administrative activities differently, as shown in Exhibit 13.

Exhibit 13 Selling and Administrative Activity Product Differences

Selling and Administrative Activities	Ipso	Facto
Post-sale technical support	Product is easy for the customer to use.	Product requires specialized training in order for the customer to use it.
Order writing	Product requires no technical information from the customer.	Product requires detailed technical information from the customer.
Promotional support	Product requires no promotional effort.	Product requires extensive promotional effort.
Order entry	Product is purchased in large volumes per order.	Product is purchased in small volumes per order.
Customer return processing	Product has few customer returns.	Product has many customer returns.
Shipping document preparation	Product is shipped domestically.	Product is shipped internationally, requiring customs and export documents.
Shipping and handling	Product is not hazardous.	Product is hazardous, requiring specialized shipping and handling.
Field service	Product has few warranty claims.	Product has many warranty claims.

If Abacus's selling and administrative expenses are allocated on the basis of sales volumes, the same amount of expense would be allocated to Ipso and Facto. This is because Ipso and Facto have the same sales volume. However, as Exhibit 13 implies, such an allocation would be misleading.

The activity-based costing method can be used to allocate the selling and administrative activities to Ipso and Facto. Activity-based costing allocates selling and administrative expenses based on how each product consumes activities.

To illustrate, assume that Abacus's field warranty service activity has a budgeted cost of $150,000. Additionally, assume that 100 warranty claims are estimated for the period. Using warranty claims as an activity base, the warranty claim activity rate is $1,500, computed as follows:

$$\text{Activity Rate} = \frac{\text{Budgeted Activity Cost}}{\text{Total Activity-Base Usage}}$$

$$\text{Warranty Claim Activity Rate} = \frac{\text{Budgeted Warranty Claim Expenses}}{\text{Total Estimated Warranty Claims}}$$

$$= \frac{\$150{,}000}{100 \text{ claims}} = \$1{,}500 \text{ per warranty claim}$$

Assuming that Ipso had 10 warranty claims and Facto had 90 warranty claims, the field service activity expenses would be allocated to each product as follows:

Ipso: 10 warranty claims × $1,500 per warranty claim = $15,000
Facto: 90 warranty claims × $1,500 per warranty claim = $135,000

The remaining selling and administrative activities could be allocated to Ipso and Facto in a similar manner.

In some cases, selling and administrative expenses may be more related to *customer* behaviors than to differences in products. That is, some customers may demand more service and selling activities than other customers. In such cases, activity-based costing would allocate selling and administrative expenses to customers.

Objective 6
Use activity-based costing in a service business.

Activity-Based Costing in Service Businesses

Service companies need to determine the cost of their services so that they can make pricing, promoting, and other decisions. The use of single and multiple department overhead rate methods may lead to distortions similar to those of manufacturing firms. Thus, many service companies use activity-based costing for determining the cost of services.

To illustrate, assume that Hopewell Hospital uses activity-based costing to allocate hospital overhead to patients. Hopewell applies activity-based costing as follows:

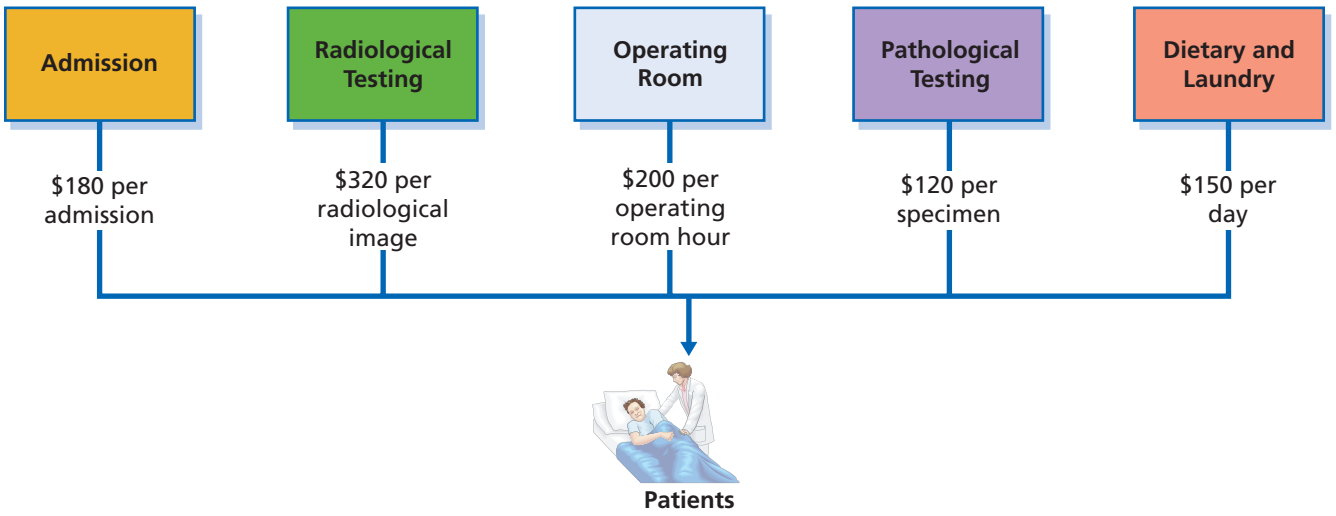
- Step 1. Identifying activities.
- Step 2. Determining activity rates for each activity.
- Step 3. Allocating overhead costs to patients based upon activity-base usage.

Hopewell has identified the following activities:

- Admission
- Radiological testing
- Operating room
- Pathological testing
- Dietary and laundry

Each activity has an estimated patient activity-base usage. Based on the budgeted costs for each activity and related estimated activity-base usage, the activity rates shown in Exhibit 14 were developed.

Exhibit 14 Activity-Based Costing Method—Hopewell Hospital



To illustrate, assume the following data for radiological testing:

Budgeted costs	$960,000
Total estimated activity-base usage	3,000 images

The activity rate of $320 per radiological image is computed as follows:

$$\text{Activity Rate} = \frac{\text{Budgeted Activity Cost}}{\text{Total Activity-Base Usage}}$$

$$\text{Radiological Testing Activity Rate} = \frac{\text{Budgeted Radiological Testing Costs}}{\text{Total Estimated Images}}$$

$$= \frac{\$960{,}000}{3{,}000 \text{ images}} = \$320 \text{ per image}$$

The activity rates for the other activities are determined in a similar manner. These activity rates along with the patient activity-base usage are used to allocate costs to patients as follows:

$$\text{Activity Cost Allocated to Patient} = \text{Patient Activity-Base Usage} \times \text{Activity Rate}$$

To illustrate, assume that Mia Wilson was a patient of the hospital. The hospital overhead services (activities) performed for Mia Wilson were as follows:

	Patient (Mia Wilson) Activity-Base Usage
Admission	1 admission
Radiological testing	2 images
Operating room	4 hours
Pathological testing	1 specimen
Dietary and laundry	7 days

Based on the preceding services (activities), the Hopewell Hospital overhead costs allocated to Mia Wilson total $2,790, as computed in Exhibit 15.

Exhibit 15
Hopewell Hospital Overhead Costs Allocated to Mia Wilson

	A	B	C	D	E	F
1	Patient Name: Mia Wilson					
2		Activity-Base		Activity		Activity
3	Activity	Usage	×	Rate	=	Cost
4						
5	Admission	1 admission		$180 per admission		$ 180
6	Radiological testing	2 images		$320 per image		640
7	Operating room	4 hours		$200 per hour		800
8	Pathological testing	1 specimen		$120 per specimen		120
9	Dietary and laundry	7 days		$150 per day		1,050
10	Total					$2,790
11						

The patient activity costs can be combined with the direct costs, such as drugs and supplies. These costs and the related revenues can be reported for each patient in a patient (customer) profitability report. A partial patient profitability report for Hopewell is shown in Exhibit 16.

Exhibit 16
Customer Profitability Report—Hopewell Hospital

Hopewell Hospital
Patient (Customer) Profitability Report
For the Period Ending December 31

	Adcock, Aesha	Birini, Sergey	Diaz, Mateo	Wilson, Mia
Revenues	$ 9,500	$ 21,400	$ 5,050	$ 3,300
Patient costs:				
Drugs and supplies	$ (400)	$ (1,000)	$ (300)	$ (200)
Admission	(180)	(180)	(180)	(180)
Radiological testing	(1,280)	(2,560)	(1,280)	(640)
Operating room	(2,400)	(6,400)	(1,600)	(800)
Pathological testing	(240)	(600)	(120)	(120)
Dietary and laundry	(4,200)	(14,700)	(1,050)	(1,050)
Total patient costs	$(8,700)	$(25,440)	$(4,530)	$(2,990)
Operating income	$ 800	$ (4,040)	$ 520	$ 310

Exhibit 16 can be used by hospital administrators for decisions on pricing or services. For example, there was a large loss on services provided to Sergey Birini. Investigation might reveal that some of the services provided to Birini were not reimbursed by insurance. As a result, Hopewell might lobby the insurance company to reimburse these services or request higher insurance reimbursement on other services.

Why It Matters

Learning Your ABCs

Students at Harvard's **Kennedy School of Government** joined with the city of Somerville, Massachusetts, in building an activity-based cost system for the city. The students volunteered several hours a week in four-person teams, interviewing city officials within 18 departments. The students were able to determine activity costs, such as the cost to fill a pothole, processing a building permit, or responding to a four-alarm fire. Their study was used by the city in forming the city budget. As stated by some of the students participating on this project: "It makes sense to use the resources of the university for community building. . . . Real-world experience is a tremendous thing to have in your back pocket. We learned from the mayor and the fire chief, who are seasoned professionals in their own right."

Source: *Kennedy School Bulletin*, Spring 2005, "Easy as A-B-C: Students Take on the Somerville Budget Overhaul."

Pathways Challenge



This is Accounting!

Economic Activity

Activity-based costing does far more than provide accurate product costs. **Owens and Minor, Inc. (OMI)**, is a medical supply distributor that used activity-based costing to determine the cost of serving its clients. Different clients demanded different services from Owens and Minor. For example, some hospitals wanted frequent deliveries of supplies throughout the day—sometimes right to the operating room! Others would buy less frequently and in bulk.

After determining the cost of various customers, management at Owens and Minor determined that some customers were becoming too costly to serve. However, rather than simply drop these customers, the company developed an *activity-based pricing* system, whereby it began charging customers for the activities they demanded. Owens and Minor even provided internal cost data from its activity-based costing system to customers, so customers could see how their ordering behavior impacted the costs at Owens and Minor (justifying differing charges). With this new information in hand, customers worked together with Owens and Minor to keep costs (and prices) down, while still meeting the needs of their companies.

Critical Thinking/Judgment

Owens and Minor had a tremendous competitive advantage when it implemented its activity-based pricing system. Why do you think competitors were not able to implement activity-based pricing immediately to keep pace with Owens and Minor? What was the key ingredient to activity-based management (the adjustable pricing model) at Owens and Minor?

Can you think of other companies that adjust their prices based on the activities demanded by customers?

Suggested answer at end of chapter.

Check Up Corner 4-4 Activity-Based Costing for a Service Business

Metro University uses activity-based costing to assign indirect costs to academic departments, using four activities. The activity base, budgeted activity cost, and estimated activity-base usage for each activity are identified as follows:

Activity	Activity Base	Budgeted Activity Cost	Activity-Base Usage
Academic support	Number of departments	$ 400,000	40 departments (dept.)
Facilities	Square feet	1,800,000	200,000 square feet (sq. ft.)
Instruction	Number of course sections	2,000,000	1,000 sections (sec.)
Student services	Number of students	360,000	4,500 students (stdt.)

The activity-base usage associated with the Chemistry Department and History Department is as follows:

	Academic Support	Facilities	Instruction	Student Services
Chemistry	1 department	9,000 square feet	15 sections	80 students
History	1 department	3,200 square feet	30 sections	175 students

Determine the:

a. Activity rate for each activity.

b. Total activity cost for the Chemistry Department and the History Department.

Solution:

a.

Academic Support	Facilities	Instruction	Student Services
$400,000	$1,800,000	$2,000,000	$360,000
÷ 40 dept.	÷ 200,000 sq. ft.	÷ 1,000 sec.	÷ 4,500 stdt.
$ 10,000 per dept.	$ 9 per sq. ft.	$ 2,000 per sec.	$ 80 per stdt.

The budgeted activity costs are assigned to departments using a different rate for each activity. These rates are called activity rates.

$$\text{Activity Rate} = \frac{\text{Budgeted Activity Cost}}{\text{Total Activity-Base Usage}}$$

Activity rates for each activity are multiplied by the activity-base usage in each department.

b.

	Chemistry Department					History Department				
Activity	Activity-Base Usage	×	Activity Rate	=	Activity Cost	Activity-Base Usage	×	Activity Rate	=	Activity Cost
Academic support	1 dept.	×	$10,000 per dept.	=	$ 10,000	1 dept.	×	$10,000 per dept.	=	$ 10,000
Facilities	9,000 sq. ft.	×	$9 per sq. ft.	=	81,000	3,200 sq. ft.	×	$9 per sq. ft.	=	28,800
Instruction	15 sec.	×	$2,000 per sec.	=	30,000	30 sec.	×	$2,000 per sec.	=	60,000
Student services	80 stdt.	×	$80 per stdt.	=	6,400	175 stdt.	×	$80 per stdt.	=	14,000
Total activity cost					$127,400					$112,800

The total activity cost assigned to each department

Check Up Corner

Analysis for Decision Making

Using ABC Product Cost Information to Reduce Costs

Objective 7
Describe and illustrate the use of activity-based costing information in decision making.

Activity-based costing (ABC) can be used to improve the cost of a product. For example, Lee Corporation assembles LCD monitors. The following activity information is available for its 40-inch monitor:

Activity	Activity-Base Usage (hrs. per unit)	×	Activity Rate per Hour	=	Activity Cost
Assembly	0.80		$14		$11.20
Setup	0.30		20		6.00
Production control	0.15		32		4.80
Materials control	0.10		32		3.20
Moving	0.40		12		4.80
Testing	0.25		24		6.00
Activity cost per unit					$36.00

All of the activity cost is related to labor. The activity information can be used to isolate cost improvement opportunities. Management is seeking to remove $3.00 of activity cost from the product in order to remain price competitive. The activity cost reduction can be accomplished in two basic ways:

1. Improve operations so that the activity-base usage per unit is either reduced or eliminated.
2. Change the classification of employees doing an activity and thereby decrease the activity rate. Higher-classified employees are more expensive but more skilled than lower-classified employees.

Assume the process was improved so that the setup activity required one-third less time to complete per unit. In addition, the moving distance was cut in half. Would these improvements be sufficient to remove $3.00 of activity cost from the product? The activity information under the improvements would be as follows:

Activity	Activity-Base Usage (hrs. per unit)	×	Activity Rate per Hour	=	Activity Cost
Assembly	0.80		$14		$11.20
Setup	0.20		20		4.00
Production control	0.15		32		4.80
Materials control	0.10		32		3.20
Moving	0.20		12		2.40
Testing	0.25		24		6.00
Activity cost per unit					$31.60

The shaded areas show the improvements. Setup was reduced from 0.3 hour to 0.2 hour. The moving distance was cut from 0.4 hour to 0.2 hour. These changes reduced the activity cost of each monitor from $36.00 to $31.60, or $4.40, thus exceeding the $3.00 target.

Make a Decision Using ABC Product Cost Information to Reduce Costs

Analyze Life Force Fitness, Inc. (MAD 4-1)

Analyze Gourmet Master, Inc. (MAD 4-2)

Analyze Skidmore Electronics (MAD 4-3)

Analyze Littlejohn, Inc. (MAD 4-4)

Analyze Lancaster County Hospital (MAD 4-5)

Make a Decision

Let's Review

Chapter Summary

1. Three cost allocation methods used for determining product costs are the (1) single plantwide factory overhead rate method, (2) multiple production department rate method, and (3) activity-based costing method.
2. A single plantwide factory overhead rate can be used to allocate all plant overhead to all products. The single plantwide factory overhead rate is simple to apply, but can lead to product cost distortions.
3. Product costing using multiple production department factory overhead rates requires identifying the factory overhead by each production department. Using these rates can result in greater accuracy than using single plantwide factory overhead rates when: (a) There are significant differences in the factory overhead rates across different production departments. (b) The products require different ratios of allocation-base usage in each production department.
4. Activity-based costing requires factory overhead to be budgeted to activities. The budgeted activity costs are allocated to products by multiplying activity rates by the activity-base quantity consumed for each product. Activity-based costing is more accurate when products consume activities in proportions unrelated to plantwide or departmental allocation bases.
5. Selling and administrative expenses can be allocated to products for management profit reporting, using activity-based costing. Activity-based costing would be preferred when the products use selling and administrative activities in ratios that are unrelated to their sales volumes.
6. Activity-based costing may be applied in service businesses to determine the cost of individual services offered. Service costs are determined by multiplying activity rates by the activity-base quantities consumed by the customer.
7. Activity-based costing systems provide more accurate cost information to management. Management can use this information to adjust prices and evaluate performance. Management can also use the information to adjust the production process by identifying activities that add little value relative to the cost they incur. They can then work to eliminate or reduce these activities.

Key Terms

activities (160)
activity base (162)
activity rates (162)
activity-based costing (ABC) method (160)
engineering change order (ECO) (161)
multiple production department factory overhead rate method (155)
product costing (152)
production department factory overhead rate (156)
setup (161)
single plantwide factory overhead rate method (153)

Practice

Multiple-Choice Questions

1. Which of the following statements is most accurate?
   a. The single plantwide factory overhead rate method will usually provide management with accurate product costs.
   b. Activity-based costing can be used by management to determine accurate profitability for each product.
   c. The multiple production department factory overhead rate method will usually result in more product cost distortion than the single plantwide factory overhead rate method.
   d. Generally accepted accounting principles require activity-based costing methods for inventory valuation.
2. San Madeo Company had the following factory overhead costs:

Power	$120,000
Indirect labor	60,000
Equipment depreciation	500,000

The factory budgeted to work 20,000 direct labor hours in the upcoming period. San Madeo uses a single plantwide factory overhead rate based on direct labor hours. What is the overhead cost per unit associated with Product M, if Product M uses 6 direct labor hours per unit in the factory?

a. $34
b. $54
c. $204
d. $150

3. Which of the following activity bases would best be used to allocate setup activity to products?

a. Number of inspections
b. Direct labor hours
c. Direct machine hours
d. Number of production runs

4. Production Department 1 (PD1) and Production Department 2 (PD2) had factory overhead budgets of $26,000 and $48,000, respectively. Each department was budgeted for 5,000 direct labor hours of production activity. Product T required 5 direct labor hours in PD1 and 2 direct labor hours in PD2. What is the factory overhead cost associated with Product T, assuming that factory overhead is allocated using the multiple production rate method?

a. $26.00
b. $40.40
c. $45.20
d. $58.40

5. The following activity rates are associated with moving rail cars by train: $4 per gross ton mile; $50 per rail car switch; $200 per rail car. A train with 20 rail cars traveled 100 miles. Each rail car carried 10 tons of product. Each rail car was switched two times. What is the total cost of moving this train?

a. $5,400
b. $10,000
c. $44,100
d. $86,000

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Single plantwide factory overhead rate — Obj. 2

The total factory overhead for Diva-nation Inc. is budgeted for the year at $180,000. Diva-nation manufactures two types of men's pants: jeans and khakis. The jeans and khakis each require 0.10 direct labor hour for manufacture. Each product is budgeted for 20,000 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year, (b) the single plantwide factory overhead rate, and (c) the factory overhead allocated per unit for each product using the single plantwide factory overhead rate.

2. Multiple production department factory overhead rates — Obj. 3

The total factory overhead for Diva-nation is budgeted for the year at $180,000, divided into two departments: Cutting, $60,000, and Sewing, $120,000. Diva-nation manufactures two types of men's pants: jeans and khakis. The jeans require 0.04 direct labor hour in Cutting and 0.06 direct labor hour in Sewing. The khakis require 0.06 direct labor hour in Cutting and 0.04 direct labor hour in Sewing. Each product is budgeted for 20,000 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year in each department, (b) the departmental factory overhead rates for both departments, and (c) the factory overhead allocated per unit for each product using the department factory overhead allocation rates.

3. Activity-based costing: factory overhead costs — Obj. 4

The total factory overhead for Diva-nation is budgeted for the year at $180,000, divided into four activities: cutting, $18,000; sewing, $36,000; setup, $96,000; and inspection, $30,000. Diva-nation manufactures two types of men's pants: jeans and khakis. The activity-base usage quantities for each product by each activity are as follows:

	Cutting	Sewing	Setup	Inspection
Jeans	800 dlh	1,200 dlh	1,400 setups	3,000 inspections
Khakis	1,200	800	1,000	2,000
	2,000 dlh	2,000 dlh	2,400 setups	5,000 inspections

Each product is budgeted for 20,000 units of production for the year. Determine (a) the activity rates for each activity and (b) the activity-based factory overhead per unit for each product.

4. Activity-based costing: selling and administrative expenses — Obj. 5

Fancy Feet Company manufactures and sells shoes. Fancy Feet uses activity-based costing to determine the cost of the sales order processing and the shipping activity. The sales order processing activity has an activity rate of $12 per sales order, and the shipping activity has an activity rate of $20 per shipment. Fancy Feet sold 27,500 units of walking shoes, which consisted of 5,000 orders and 1,400 shipments. Determine (a) the total activity cost and (b) the per-unit sales order processing and shipping activity cost for walking shoes.

5. Activity-based costing for a service business — Obj. 6

Draper Bank uses activity-based costing to determine the cost of servicing customers. There are three activity pools: teller transaction processing, check processing, and ATM transaction processing. The activity rates associated with each activity pool are $3.50 per teller transaction, $0.12 per canceled check, and $0.10 per ATM transaction. Draper Bank had 12 teller transactions, 100 canceled checks, and 20 ATM transactions during the month. Determine the total monthly activity-based cost for Draper Bank during the month.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Hammer Company plans to use activity-based costing to determine its product costs. It presently uses a single plantwide factory overhead rate for allocating factory overhead to products, based on direct labor hours. The total factory overhead cost is as follows:

Department	Factory Overhead
Production Support	$1,225,000
Production (factory overhead only)	175,000
Total cost	$1,400,000

The company determined that it performed four major activities in the Production Support Department. These activities, along with their budgeted activity costs, are as follows:

Production Support Activities	Budgeted Activity Cost
Setup	$ 428,750
Production control	245,000
Quality control	183,750
Materials management	367,500
Total	$1,225,000

Hammer estimated the following activity-base usage and units produced for each of its three products:

Products	Number of Units	Direct Labor Hrs.	Setups	Production Orders	Inspections	Material Requisitions
LCD TV	10,000	25,000	80	80	35	320
Tablet	2,000	10,000	40	40	40	400
Smartphone	50,000	140,000	5	5	0	30
Total cost	62,000	175,000	125	125	75	750

Instructions

1. Determine the factory overhead cost per unit for the LCD TV, tablet, and smartphone under the single plantwide factory overhead rate method. Use direct labor hours as the activity base.
2. Determine the factory overhead cost per unit for the LCD TV tablet, and smartphone under activity-based costing. Round to two decimal places.
3. Which method provides more accurate product costing? Why?

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **b** Activity-based costing provides accurate product costs, which can be used for strategic product profitability analysis. The single plantwide factory overhead rate method (answer a) can distort the individual product costs under a variety of reasonable conditions. The multiple production department factory overhead rate method will lead to less (not more) distortion than the single plantwide factory overhead rate method (answer c). Generally accepted accounting principles do not require activity-based costing methods for inventory valuation (answer d).

2. **c** The single plantwide factory overhead rate is $34 per hour (answer a), determined as $680,000 ÷ 20,000 hours. This rate is multiplied by 6 direct labor hours per unit of Product M to determine the correct overhead per unit of $204 (answer c). The total overhead should be used in the numerator in determining the overhead rate, not just power and indirect labor (answer b) or equipment depreciation (answer d).

3. **d** The number of production runs best relates the activity cost of setup to the products. Number of inspections (answer a), direct labor hours (answer b), and direct machine hours (answer c) will likely have very little logical association with the costs incurred in setting up production runs.

4. **c** PD1 rate: $26,000 ÷ 5,000 dlh = $5.20 per dlh
PD2 rate: $48,000 ÷ 5,000 dlh = $9.60 per dlh
Product T: (5 dlh × $5.20) + (2 dlh × $9.60) = $45.20

5. **d** (100 miles × 20 cars × 10 tons × $4) + ($200 × 20 cars) + (20 cars × 2 switches × $50) = $80,000 + $4,000 + $2,000 = $86,000

Exercises

1. a. Jeans: 20,000 units × 0.10 direct labor hour = 2,000 direct labor hours
Khakis: 20,000 units × 0.10 direct labor hour = 2,000
4,000 direct labor hours

   b. Single plantwide factory overhead rate: $180,000 ÷ 4,000 dlh = $45 per dlh

   c. Jeans: $45 per direct labor hour × 0.10 dlh per unit = $4.50 per unit
Khakis: $45 per direct labor hour × 0.10 dlh per unit = $4.50 per unit

2. a. Cutting: (20,000 jeans × 0.04 dlh) + (20,000 khakis × 0.06 dlh)
= 2,000 direct labor hours
Sewing: (20,000 jeans × 0.06 dlh) + (20,000 khakis × 0.04 dlh)
= 2,000 direct labor hours

   b. Cutting Department rate: $60,000 ÷ 2,000 dlh = $30 per dlh
Sewing Department rate: $120,000 ÷ 2,000 dlh = $60 per dlh

   c.

Jeans:	Cutting Department 0.04 dlh × $30 =	$1.20
	Sewing Department 0.06 dlh × $60 =	3.60
	Total factory overhead per pair of jeans	$4.80
Khakis:	Cutting Department 0.06 dlh × $30 =	$1.80
	Sewing Department 0.04 dlh × $60 =	2.40
	Total factory overhead per pair of khakis	$4.20

3. a. Cutting: $18,000 ÷ 2,000 direct labor hours = $9.00 per dlh
Sewing: $36,000 ÷ 2,000 direct labor hours = $18.00 per dlh
Setup: $96,000 ÷ 2,400 setups = $40.00 per setup
Inspection: $30,000 ÷ 5,000 inspections = $6.00 per inspection

(Continued)

b.

	Jeans				Khakis			
Activity	**Activity-Base Usage**	× **Activity Rate**	=	**Activity Cost**	**Activity-Base Usage**	× **Activity Rate**	=	**Activity Cost**
Cutting	800 dlh	$9.00 per dlh		$ 7,200	1,200 dlh	$9.00 per dlh		$10,800
Sewing	1,200 dlh	$18.00 per dlh		21,600	800 dlh	$18.00 per dlh		14,400
Setup	1,400 setups	$40.00 per setup		56,000	1,000 setups	$40.00 per setup		40,000
Inspections	3,000 insp.	$6.00 per insp.		18,000	2,000 insp.	$6.00 per insp.		12,000
Total				$102,800				$77,200
÷ Budgeted items				÷ 20,000				÷20,000
Factory overhead per unit				$ 5.14				$ 3.86

4. a. Sales order processing activity: 5,000 orders × $12 per order = $60,000
   Shipping activity: 1,400 shipments × $20 per shipment = 28,000
   Total activity cost $88,000
   b. $3.20 per unit ($88,000 ÷ 27,500 units)

5. Teller transaction processing ..... $42.00 (12 transactions × $3.50)
   Check processing ..... 12.00 (100 checks × $0.12)
   ATM transaction processing ..... 2.00 (20 transactions × $0.10)
   Total activity cost $56.00

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1. Single Plantwide Factory Overhead Rate $= \dfrac{\$1{,}400{,}000}{175{,}000 \text{ direct labor hours}}$

$= \$8$ per direct labor hour

Factory overhead cost per unit:

	LCD TV	**Tablet**	**Smartphone**
Number of direct labor hours	25,000	10,000	140,000
Single plantwide factory overhead rate	× $8 per dlh	× $8 per dlh	× $8 per dlh
Total factory overhead	$ 200,000	$ 80,000	$ 1,120,000
Number of units	÷ 10,000	÷ 2,000	÷ 50,000
Factory overhead cost per unit	$ 20.00	$ 40.00	$ 22.40

2. Under activity-based costing, an activity rate must be determined for each activity pool:

Activity	**Budgeted Activity Cost**	÷	**Total Activity-Base Usage**	=	**Activity Rate**
Setup	$428,750	÷	125 setups	=	$3,430 per setup
Production control	$245,000	÷	125 production orders	=	$1,960 per production order
Quality control	$183,750	÷	75 inspections	=	$2,450 per inspection
Materials management	$367,500	÷	750 requisitions	=	$490 per requisition
Production	$175,000	÷	175,000 direct labor hours	=	$1 per direct labor hour

These activity rates can be used to determine the activity-based factory overhead cost per unit as follows:

LCD TV

Activity	Activity-Base Usage	×	Activity Rate	=	Activity Cost
Setup	80 setups	×	$3,430	=	$274,400
Production control	80 production orders	×	1,960	=	156,800
Quality control	35 inspections	×	2,450	=	85,750
Materials management	320 requisitions	×	490	=	156,800
Production	25,000 direct labor hrs.	×	1	=	25,000
Total factory overhead					$698,750
Unit volume					÷ 10,000
Factory overhead cost per unit					$ 69.88

Tablet

Activity	Activity-Base Usage	×	Activity Rate	=	Activity Cost
Setup	40 setups	×	$3,430	=	$137,200
Production control	40 production orders	×	1,960	=	78,400
Quality control	40 inspections	×	2,450	=	98,000
Materials management	400 requisitions	×	490	=	196,000
Production	10,000 direct labor hrs.	×	1	=	10,000
Total factory overhead					$519,600
Unit volume					÷ 2,000
Factory overhead cost per unit					$ 259.80

Smartphone

Activity	Activity-Base Usage	×	Activity Rate	=	Activity Cost
Setup	5 setups	×	$3,430	=	$ 17,150
Production control	5 production orders	×	1,960	=	9,800
Quality control	0 inspections	×	2,450	=	0
Materials management	30 requisitions	×	490	=	14,700
Production	140,000 direct labor hrs.	×	1	=	140,000
Total factory overhead					$181,650
Unit volume					÷ 50,000
Factory overhead cost per unit					$ 3.63

3. Activity-based costing is more accurate, compared to the single plantwide factory overhead rate method. Activity-based costing properly shows that the smartphone is actually less expensive to make, while the other two products are more expensive to make. The reason is that the single plantwide factory overhead rate method fails to account for activity costs correctly. The setup, production control, quality control, and materials management activities are all performed on products in amounts that are proportionately different than their volumes. For example, the tablet requires many of these activities relative to its actual unit volume. The tablet requires 40 setups over a volume of 2,000 units (average production run size = 50 units), while the smartphone has only 5 setups over 50,000 units (average production run size = 10,000 units). Thus, the tablet requires greater support costs relative to the smartphone.

   The smartphone requires minimum activity support because it is scheduled in large batches and requires no inspections (has high quality) and few requisitions. The other two products exhibit the opposite characteristics.

Discussion Questions

1. Why would management be concerned about the accuracy of product costs?
2. Why would a manufacturing company with multiple production departments still prefer to use a single plantwide overhead rate?
3. How do the multiple production department and the single plantwide factory overhead rate methods differ?
4. Under what two conditions would the multiple production department factory overhead rate method provide more accurate product costs than the single plantwide factory overhead rate method?
5. How does activity-based costing differ from the multiple production department factory overhead rate method?
6. Shipping, selling, marketing, sales order processing, return processing, and advertising activities can be related to products by using activity-based costing. Would allocating these activities to products for financial statement reporting be acceptable according to GAAP?
7. What would happen to net income if the activities noted in Discussion Question 6 were allocated to products for financial statement reporting and the inventory increased?
8. Under what circumstances might the activity-based costing method provide more accurate product costs than the multiple production department factory overhead rate method?
9. When might activity-based costing be preferred over using a relative amount of product sales in allocating selling and administrative expenses to products?
10. How can activity-based costing be used in service companies?

Basic Exercises


SHOW ME HOW

BE 4-1 Single plantwide factory overhead rate — Obj. 2

The total factory overhead for Bardot Marine Company is budgeted for the year at $600,000. Bardot Marine manufactures two types of boats: speedboats and bass boats. The speedboat and bass boat each require 12 direct labor hours for manufacture. Each product is budgeted for 250 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year, (b) the single plantwide factory overhead rate, and (c) the factory overhead allocated per unit for each product using the single plantwide factory overhead rate.


SHOW ME HOW

BE 4-2 Multiple production department factory overhead rates — Obj. 3

The total factory overhead for Bardot Marine Company is budgeted for the year at $600,000 divided into two departments: Fabrication, $420,000, and Assembly, $180,000. Bardot Marine manufactures two types of boats: speedboats and bass boats. The speedboats require 8 direct labor hours in Fabrication and 4 direct labor hours in Assembly. The bass boats require 4 direct labor hours in Fabrication and 8 direct labor hours in Assembly. Each product is budgeted for 250 units of production for the year. Determine (a) the total number of budgeted direct labor hours for the year in each department, (b) the departmental factory overhead rates for both departments, and (c) the factory overhead allocated per unit for each product using the department factory overhead allocation rates.


SHOW ME HOW

BE 4-3 Activity-based costing: factory overhead costs — Obj. 4

The total factory overhead for Bardot Marine Company is budgeted for the year at $600,000, divided into four activities: fabrication, $204,000; assembly, $105,000; setup, $156,000; and inspection, $135,000. Bardot Marine manufactures two types of boats: speedboats and bass boats. The activity-base usage quantities for each product by each activity are as follows:

	Fabrication	Assembly	Setup	Inspection
Speedboat	2,000 dlh	1,000 dlh	300 setups	1,100 inspections
Bass boat	1,000	2,000	100	400
	3,000 dlh	3,000 dlh	400 setups	1,500 inspections

Each product is budgeted for 250 units of production for the year. Determine (a) the activity rates for each activity and (b) the activity-based factory overhead per unit for each product.



BE 4-4 Activity-based costing: selling and administrative expenses — Obj. 5

Jungle Junior Company manufactures and sells outdoor play equipment. Jungle Junior uses activity-based costing to determine the cost of the sales order processing and the customer return activity. The sales order processing activity has an activity rate of $20 per sales order, and the customer return activity has an activity rate of $100 per return. Jungle Junior sold 2,500 swing sets, which consisted of 750 orders and 80 returns. Determine (a) the total and (b) the per-unit sales order processing and customer return activity cost for swing sets.



BE 4-5 Activity-based costing for a service business — Obj. 6

Sterling Hotel uses activity-based costing to determine the cost of servicing customers. There are three activity pools: guest check-in, room cleaning, and meal service. The activity rates associated with each activity pool are $8 per guest check-in, $25 per room cleaning, and $4 per served meal (not including food). Ginny Campbell visited the hotel for a three-night stay. Campbell had three meals in the hotel during her visit. Determine the total activity-based cost for Campbell's visit.

Exercises

EX 4-1 Single plantwide factory overhead rate — Obj. 2

Kennedy Appliance Inc.'s Machining Department incurred $450,000 of factory overhead cost in producing hoses and valves. The two products consumed a total of 9,000 direct machine hours. Of that amount, hoses consumed 4,250 direct machine hours.

Determine the total amount of factory overhead that should be allocated to hoses using machine hours as the allocation base.

EX 4-2 Single plantwide factory overhead rate — Obj. 2

✔ a. $265 per direct labor hour

Bach Instruments Inc. makes three musical instruments: flutes, clarinets, and oboes. The budgeted factory overhead cost is $2,948,125. Overhead is allocated to the three products on the basis of direct labor hours. The products have the following budgeted production volume and direct labor hours per unit:

	Budgeted Production Volume	Direct Labor Hours per Unit
Flutes	2,000 units	2.0
Clarinets	1,500	3.0
Oboes	1,750	1.5

a. Determine the single plantwide overhead rate.

b. Use the overhead rate in (a) to determine the amount of total and per-unit overhead allocated to each of the three products, rounded to the nearest dollar.

EX 4-3 Single plantwide factory overhead rate — Obj. 2

✔ a. $65 per processing hour

Scrumptious Snacks Inc. manufactures three types of snack foods: tortilla chips, potato chips, and pretzels. The company has budgeted the following costs for the upcoming period:

Factory depreciation	$ 33,120
Indirect labor	82,800
Factory electricity	8,280
Indirect materials	31,800
Selling expenses	22,000
Administrative expenses	29,000
Total costs	$207,000

(Continued)

Factory overhead is allocated to the three products on the basis of processing hours. The products had the following production budget and processing hours per case:

	Budgeted Volume (Cases)	Processing Hours per Case
Tortilla chips	3,000	0.25
Potato chips	6,000	0.10
Pretzels	3,500	0.30
Total	12,500	

a. Determine the single plantwide factory overhead rate.

b. Use the overhead rate in (a) to determine the amount of total and per-case overhead allocated to each of the three products under generally accepted accounting principles.

EX 4-4 Product costs and product profitability reports, using a single plantwide factory overhead rate — Obj. 2

✔ c. Pistons gross profit, $99,600

SHOW ME HOW EXCEL TEMPLATE

Isaac Engines Inc. produces three products—pistons, valves, and cams—for the heavy equipment industry. Isaac Engines has a very simple production process and product line and uses a single plantwide factory overhead rate to allocate overhead to the three products. The factory overhead rate is based on direct labor hours. Information about the three products for 20Y2 is as follows:

	Budgeted Volume (Units)	Direct Labor Hours per Unit	Price per Unit	Direct Materials per Unit
Pistons	6,000	0.30	$40	$ 9
Valves	13,000	0.50	21	5
Cams	1,000	0.10	55	20

The estimated direct labor rate is $20 per direct labor hour. Beginning and ending inventories are negligible and are, thus, assumed to be zero. The budgeted factory overhead for Isaac Engines is $235,200.

a. Determine the plantwide factory overhead rate.

b. Determine the factory overhead and direct labor cost per unit for each product.

c. Use the information provided to construct a budgeted gross profit report by product line for the year ended December 31, 20Y2. Include the gross profit as a percent of sales in the last line of your report, rounded to one decimal place.

d. What does the report in (c) indicate to you?

EX 4-5 Multiple production department factory overhead rate method — Obj. 3

✔ b. Small glove, $6.10 per unit

SHOW ME HOW EXCEL TEMPLATE

Handy Leather, Inc., produces three sizes of sports gloves: small, medium, and large. A glove pattern is first stenciled onto leather in the Pattern Department. The stenciled patterns are then sent to the Cut and Sew Department, where the glove is cut and sewed together. Handy Leather uses the multiple production department factory overhead rate method of allocating factory overhead costs. Its factory overhead costs were budgeted as follows:

Pattern Department overhead	$294,000
Cut and Sew Department overhead	560,000
Total	$854,000

The direct labor estimated for each production department was as follows:

Pattern Department	42,000 direct labor hours
Cut and Sew Department	56,000
Total	98,000 direct labor hours

Direct labor hours are used to allocate the production department overhead to the products. The direct labor hours per unit for each product for each production department were obtained from the engineering records as follows:

Production Departments	Small Glove	Medium Glove	Large Glove
Pattern Department	0.30	0.20	0.45
Cut and Sew Department	0.40	0.55	0.70
Direct labor hours per unit	0.70	0.75	1.15

a. Determine the two production department factory overhead rates.
b. Use the two production department factory overhead rates to determine the factory overhead per unit for each product.

EX 4-6 Single plantwide and multiple production department factory overhead rate methods and product cost distortion

Obj. 2, 3

✔ b. Residential motor, $450 per unit

Eclipse Motor Company manufactures two types of specialty electric motors, a commercial motor and a residential motor, through two production departments, Assembly and Testing. Presently, the company uses a single plantwide factory overhead rate for allocating factory overhead to the two products. However, management is considering using the multiple production department factory overhead rate method. The following factory overhead was budgeted for Eclipse:

Assembly Department	$ 280,000
Testing Department	800,000
Total	$1,080,000

Direct machine hours were estimated as follows:

Assembly Department	4,000 hours
Testing Department	5,000
Total	9,000 hours

In addition, the direct machine hours (dmh) used to produce a unit of each product in each department were determined from engineering records, as follows:

	Commercial	Residential
Assembly Department	2.0 dmh	3.0 dmh
Testing Department	6.0	1.5
Total machine hours per unit	8.0 dmh	4.5 dmh

a. Determine the per-unit factory overhead allocated to the commercial and residential motors under the single plantwide factory overhead rate method, using direct machine hours as the allocation base.
b. Determine the per-unit factory overhead allocated to the commercial and residential motors under the multiple production department factory overhead rate method, using direct machine hours as the allocation base for each department.
c. Recommend to management a product costing approach, based on your analyses in (a) and (b). Support your recommendation.

EX 4-7 Single plantwide and multiple production department factory overhead rate methods and product cost distortion

Obj. 2, 3

✔ b. Diesel engine, $740 per unit

The management of Nova Industries Inc. manufactures gasoline and diesel engines through two production departments, Fabrication and Assembly. Management needs accurate product cost information in order to guide product strategy. Presently, the company uses a single plantwide factory overhead rate for allocating factory overhead to the two products. However, management is considering the multiple production department factory overhead rate method. The following factory overhead was budgeted for Nova:

Fabrication Department factory overhead	$440,000
Assembly Department factory overhead	200,000
Total	$640,000

Direct labor hours were estimated as follows:

Fabrication Department	4,000 hours
Assembly Department	4,000
Total	8,000 hours

(Continued)

In addition, the direct labor hours (dlh) used to produce a unit of each product in each department were determined from engineering records, as follows:

Production Departments	Gasoline Engine	Diesel Engine
Fabrication Department	6.0 dlh	4.0 dlh
Assembly Department	4.0	6.0
Direct labor hours per unit	10.0 dlh	10.0 dlh

a. Determine the per-unit factory overhead allocated to the gasoline and diesel engines under the single plantwide factory overhead rate method, using direct labor hours as the activity base.

b. Determine the per-unit factory overhead allocated to the gasoline and diesel engines under the multiple production department factory overhead rate method, using direct labor hours as the activity base for each department.

c. Recommend to management a product costing approach, based on your analyses in (a) and (b). Support your recommendation.

EX 4-8 Identifying activity bases in an activity-based cost system

Obj. 4

Comfort Foods Inc. uses activity-based costing to determine product costs. For each activity listed in the left column, match an appropriate activity base from the right column. You may use items in the activity-base list more than once or not at all.

Activity	Activity Base
Cafeteria	Engineering change orders
Customer return processing	Kilowatt hours used
Electric power	Number of customers
Human resources	Number of customer orders
Inventory control	Number of customer returns
Invoice and collecting	Number of employees
Machine depreciation	Number of inspections
Materials handling	Number of inventory transactions
Order shipping	Number of machine hours
Payroll	Number of material moves
Performance reports	Number of payroll checks processed
Production control	Number of performance reports
Production setup	Number of production orders
Purchasing	Number of purchase orders
Quality control	Number of sales orders
Sales order processing	Number of setups

EX 4-9 Product costs using activity rates

Obj. 4

✔ b. $150,000

Nozama.com Inc. sells consumer electronics over the Internet. For the next period, the budgeted cost of the sales order processing activity is $250,000 and 50,000 sales orders are estimated to be processed.

a. Determine the activity rate of the sales order processing activity.

b. Determine the amount of sales order processing cost associated with 30,000 sales orders.

EX 4-10 Product costs using activity rates

Obj. 4

✔ Treadmill activity cost per unit, $75.00



EXCEL TEMPLATE

Hercules Inc. manufactures elliptical exercise machines and treadmills. The products are produced in its Fabrication and Assembly production departments. In addition to production activities, several other activities are required to produce the two products. These activities and their associated activity rates are as follows:

Activity	Activity Rate
Fabrication	$30 per machine hour
Assembly	$35 per direct labor hour
Setup	$90 per setup
Inspecting	$20 per inspection
Production scheduling	$19 per production order
Purchasing	$5 per purchase order

The activity-base usage quantities and units produced for each product were as follows:

Activity Base	Elliptical Machines	Treadmills
Machine hours	600	400
Direct labor hours	190	223
Setups	30	30
Inspections	15	25
Production orders	40	30
Purchase orders	318	85
Units produced	500	320

Use the activity rate and usage information to determine the total activity cost and activity cost per unit for each product.

EX 4-11 Activity rates and product costs using activity-based costing

Obj. 4

✔ b. Dining room lighting fixtures, $155.50 per unit



EXCEL TEMPLATE

Lonsdale Inc. manufactures entry and dining room lighting fixtures. Five activities are used in manufacturing the fixtures. These activities and their associated budgeted activity costs and activity bases are as follows:

Activity	Budgeted Activity Cost	Activity Base
Casting	$570,000	Machine hours
Assembly	80,000	Direct labor hours
Inspecting	42,000	Number of inspections
Setup	38,000	Number of setups
Materials handling	23,750	Number of loads

Corporate records were obtained to estimate the amount of activity to be used by the two products. The estimated activity-base usage quantities and units produced follow:

Activity Base	Entry	Dining	Total
Machine hours	6,000	13,000	19,000
Direct labor hours	3,000	2,000	5,000
Number of inspections	600	400	1,000
Number of setups	300	200	500
Number of loads	450	500	950
Units produced	6,000	3,000	9,000

a. Determine the activity rate for each activity.

b. Use the activity rates in (a) to determine the total and per-unit activity costs associated with each product. Round to the nearest cent.

EX 4-12 Activity cost pools, activity rates, and product costs using activity-based costing

Obj. 4

✔ b. Ovens, $93.80 per unit



EXCEL TEMPLATE

Caldwell Home Appliances Inc. is estimating the activity cost associated with producing ovens and refrigerators. The indirect labor can be traced into four separate activity pools, based on time records provided by the employees. The budgeted activity cost and activity-base information are provided as follows:

Activity	Activity Pool Cost	Activity Base
Procurement	$ 12,600	Number of purchase orders
Scheduling	90,000	Number of production orders
Materials handling	11,000	Number of moves
Product development	50,000	Number of engineering changes
Total cost	$163,600	

(Continued)

The estimated activity-base usage and unit information for two product lines was determined as follows:

	Number of Purchase Orders	Number of Production Orders	Number of Moves	Number of Engineering Change Orders	Units
Ovens	400	800	300	80	1,000
Refrigerators	300	400	200	120	500
Totals	700	1,200	500	200	1,500

a. Determine the activity rate for each activity cost pool.
b. Determine the activity-based cost per unit of each product.

EX 4-13 Activity-based costing and product cost distortion — Obj. 2, 4

✔ c. Cell phones, $1.10 per unit



EXCEL TEMPLATE

Handbrain Inc. is considering a change to activity-based product costing. The company produces two products, cell phones and tablet PCs, in a single production department. The production department is estimated to require 2,000 direct labor hours. The total indirect labor is budgeted to be $200,000.

Time records from indirect labor employees revealed that they spent 30% of their time setting up production runs and 70% of their time supporting actual production.

The following information about cell phones and tablet PCs was determined from the corporate records:

	Number of Setups	Direct Labor Hours	Units
Cell phones	1,200	1,000	80,000
Tablet PCs	2,800	1,000	80,000
Total	4,000	2,000	160,000

a. Determine the indirect labor cost per unit allocated to cell phones and tablet PCs under a single plantwide factory overhead rate system using the direct labor hours as the allocation base.
b. Determine the budgeted activity costs and activity rates for the indirect labor under activity-based costing. Assume two activities—one for setup and the other for production support.
c. Determine the activity cost per unit for indirect labor allocated to each product under activity-based costing.
d. Why are the per-unit allocated costs in (a) different from the per-unit activity cost assigned to the products in (c)?

EX 4-14 Multiple production department factory overhead rate method — Obj. 3

✔ b. Blender, $18.20 per unit



EXCEL TEMPLATE

Four Finger Appliance Company manufactures small kitchen appliances. The product line consists of blenders and toaster ovens. Four Finger Appliance presently uses the multiple production department factory overhead rate method. The factory overhead is as follows:

Assembly Department	$186,000
Test and Pack Department	120,000
Total	$306,000

The direct labor information for the production of 7,500 units of each product is as follows:

	Assembly Department	Test and Pack Department
Blender	750 dlh	2,250 dlh
Toaster oven	2,250	750
Total	3,000 dlh	3,000 dlh

Four Finger Appliance used direct labor hours to allocate production department factory overhead to products.

a. Determine the two production department factory overhead rates.

b. Determine the total factory overhead and the factory overhead per unit allocated to each product.

EX 4-15 Activity-based costing and product cost distortion

Obj. 4

✔ b. Blender, $23.60 per unit



EXCEL TEMPLATE

The management of Four Finger Appliance Company in Exercise 14 has asked you to use activity-based costing instead of direct labor hours to allocate factory overhead costs to the two products. You have determined that $81,000 of factory overhead from each of the production departments can be associated with setup activity ($162,000 in total). Company records indicate that blenders required 135 setups, while the toaster ovens required only 45 setups. Each product has a production volume of 7,500 units.

a. Determine the three activity rates (assembly, test and pack, and setup).

b. Determine the total factory overhead and factory overhead per unit allocated to each product using the activity rates in (a).

EX 4-16 Single plantwide rate and activity-based costing

Obj. 2, 4

✔ a. Low, Col. C, 93.5%



REAL WORLD



EXCEL TEMPLATE

Whirlpool Corporation (WHR) conducted an activity-based costing study of its Evansville, Indiana, plant in order to identify its most profitable products. Assume that we select three representative refrigerators (out of 333): one low-, one medium-, and one high-volume refrigerator. Additionally, we assume the following activity-base information for each of the three refrigerators:

Three Representative Refrigerators	Number of Machine Hours	Number of Setups	Number of Sales Orders	Number of Units
Refrigerator—Low Volume	24	14	38	160
Refrigerator—Medium Volume	225	13	88	1,500
Refrigerator—High Volume	900	9	120	6,000

Prior to conducting the study, the factory overhead allocation was based on a single machine hour rate. The machine hour rate was $200 per hour. After conducting the activity-based costing study, assume that three activities were used to allocate the factory overhead. The new activity rate information is assumed to be as follows:

	Machining Activity	Setup Activity	Sales Order Processing Activity
Activity rate	$160	$240	$55

a. Complete the following table, using the single machine hour rate to determine the per-unit factory overhead for each refrigerator (Column A) and the three activity-based rates to determine the activity-based factory overhead per unit (Column B). Finally, compute the percent change in per-unit allocation from the single to activity-based rate methods (Column C). Round per-unit overhead to two decimal places and percents to one decimal place.

Product Volume Class	COLUMN A Single Rate Overhead Allocation per Unit	COLUMN B ABC Overhead Allocation per Unit	COLUMN C Percent Change in Allocation (Col. B – Col. A)/Col. A
Low			
Medium			
High			

b. Why is the traditional overhead rate per machine hour greater under the single-rate method than under the activity-based method?

c. Interpret Column C in your table from part (a).

EX 4-17 Evaluating selling and administrative cost allocations

Obj. 5

Gordon Gecco Furniture Company has two major product lines with the following characteristics:

- Commercial office furniture: Few large orders, little advertising support, shipments in full truckloads, and low handling complexity
- Home office furniture: Many small orders, large advertising support, shipments in partial truckloads, and high handling complexity

The company produced the following profitability report for management:

Gordon Gecco Furniture Company
Product Profitability Report
For the Year Ended December 31

	Commercial Office Furniture	Home Office Furniture	Total
Revenue	$ 5,600,000	$2,800,000	$ 8,400,000
Cost of goods sold	(2,100,000)	(980,000)	(3,080,000)
Gross profit	$ 3,500,000	$1,820,000	$ 5,320,000
Selling and administrative expenses	(1,680,000)	(840,000)	(2,520,000)
Operating income	$ 1,820,000	$ 980,000	$ 2,800,000

The selling and administrative expenses are allocated to the products on the basis of relative sales dollars.

Evaluate the accuracy of this report and recommend an alternative approach.

EX 4-18 Construct and interpret a product profitability report, allocating selling and administrative expenses

Obj. 5

✔ b. Generators operating income-to-sales, 24.29%

SHOW ME HOW

Naper Inc. manufactures power equipment. Naper has two primary products—generators and air compressors. The following report was prepared by the controller for Naper's senior marketing management for the year ended December 31:

	Generators	Air Compressors	Total
Revenue	$ 4,200,000	$ 3,000,000	$ 7,200,000
Cost of goods sold	(2,940,000)	(2,100,000)	(5,040,000)
Gross profit	$ 1,260,000	$ 900,000	$ 2,160,000
Selling and administrative expenses			(610,000)
Operating income			$ 1,550,000

The marketing management team was concerned that the selling and administrative expenses were not traced to the products. Marketing management believed that some products consumed larger amounts of selling and administrative expense than did other products. To verify this, the controller was asked to prepare a complete product profitability report, using activity-based costing.

The controller determined that selling and administrative expenses consisted of two activities: sales order processing and post-sale customer service. The controller was able to determine the activity base and activity rate for each activity, as follows:

Activity	Activity Base	Activity Rate
Sales order processing	Sales orders	$65 per sales order
Post-sale customer service	Service requests	$200 per customer service request

The controller determined the following activity-base usage information about each product:

	Generators	Air Compressors
Number of sales orders	3,000	4,000
Number of service requests	225	550

a. Determine the activity cost of each product for sales order processing and post-sale customer service activities.

b. Use the information in (a) to prepare a complete product profitability report dated for the year ended December 31. Compute the gross profit to sales and the operating income to sales percentages for each product. Round to two decimal places.

c. Interpret the product profitability report. How should management respond to the report?

EX 4-19 Activity-based costing and customer profitability

Obj. 5

✔ a. Customer 1, operating income after customer service activities, $37,870

SHOW ME HOW

Metroid Electric manufactures power distribution equipment for commercial customers, such as hospitals and manufacturers. Activity-based costing was used to determine customer profitability. Customer service activities were assigned to individual customers, using the following assumed customer service activities, activity base, and activity rate:

Customer Service Activity	Activity Base	Activity Rate
Bid preparation	Number of bid requests	$420 per request
Shipment	Number of shipments	$90 per shipment
Support standard items	Number of standard items ordered	$30 per std. item
Support nonstandard items	Number of nonstandard items ordered	$180 per nonstd. item

Assume that the company had the following gross profit information for three representative customers:

	Customer 1	Customer 2	Customer 3
Revenue	$130,000	$ 210,000	$180,000
Cost of goods sold	(81,900)	(113,400)	(90,000)
Gross profit	$ 48,100	$ 96,600	$ 90,000
Gross profit as a percent of sales	37%	46%	50%

The administrative records indicated that the activity-base usage quantities for each customer were as follows:

Activity Base	Customer 1	Customer 2	Customer 3
Number of bid requests	15	40	60
Number of shipments	25	55	50
Number of standard items ordered	20	35	52
Number of nonstandard items ordered	6	65	85

a. Prepare a customer profitability report dated for the year ended December 31, 20Y8, showing (1) the operating income after customer service activities, (2) the gross profit as a percent of sales, and (3) the operating income after customer service activities as a percent of sales. Prepare the report with a column for each customer. Round percentages to the nearest whole percent.

b. Interpret the report in part (a).

EX 4-20 Activity-based costing for a service company

Obj. 6

✔ a. Patient Umit, $6,025

EXCEL TEMPLATE

Crosswinds Hospital plans to use activity-based costing to assign hospital indirect costs to the care of patients. The hospital has identified the following activities and activity rates for the hospital indirect costs:

Activity	Activity Rate
Room and meals	$240 per day
Radiology	$215 per image
Pharmacy	$50 per physician order
Chemistry lab	$80 per test
Operating room	$1,000 per operating room hour

(Continued)

The activity usage information associated with the two patients is as follows:

	Abel Putin	Cheryl Umit
Number of days	6 days	4 days
Number of images	4 images	3 images
Number of physician orders	6 orders	2 orders
Number of tests	5 tests	4 tests
Number of operating room hours	8 hours	4 hours

a. Determine the activity cost associated with each patient.

b. Why is the total activity cost different for the two patients?

EX 4-21 Activity-based costing for a service company

Obj. 5, 6

✔ a. Auto, operating income, $1,117,300


SHOW ME HOW


EXCEL TEMPLATE

Bounce Back Insurance Company carries three major lines of insurance: auto, workers' compensation, and homeowners. The company has prepared the following report:

Bounce Back Insurance Company
Product Profitability Report
For the Year Ended December 31

	Auto	Workers' Compensation	Homeowners
Premium revenue	$ 5,800,000	$ 6,250,000	$ 8,200,000
Estimated claims	(4,060,000)	(4,375,000)	(5,740,000)
Underwriting income	$ 1,740,000	$ 1,875,000	$ 2,460,000
Underwriting income as a percent of premium revenue	30%	30%	30%

Management is concerned that the administrative expenses may make some of the insurance lines unprofitable. However, the administrative expenses have not been allocated to the insurance lines. The controller has suggested that the administrative expenses could be assigned to the insurance lines using activity-based costing. The administrative expenses are comprised of five activities. The activities and their rates are as follows:

Activity	Activity Rates
New policy processing	$110 per new policy
Cancellation processing	$180 per cancellation
Claim audits	$330 per claim audit
Claim disbursements processing	$100 per disbursement
Premium collection processing	$25 per premium collected

Activity-base usage data for each line of insurance were retrieved from the corporate records as follows:

	Auto	Workers' Compensation	Homeowners
Number of new policies	1,330	1,400	4,100
Number of canceled policies	490	300	2,200
Number of audited claims	390	110	950
Number of claim disbursements	470	220	850
Number of premiums collected	8,500	1,900	15,200

a. Complete the product profitability report through the administrative activities. Determine the operating income as a percent of premium revenue, rounded to the nearest whole percent.

b. Interpret the report.

Problems: Series A

PR 4-1A Single plantwide factory overhead rate

Obj. 2

✔ 1. b. $52 per machine hour

Gwinnett County Chrome Company manufactures three chrome-plated products—automobile bumpers, valve covers, and wheels. These products are manufactured in two production departments (Stamping and Plating). The factory overhead for Gwinnett County Chrome is $239,200.

The three products consume both machine hours and direct labor hours in the two production departments as follows:

	Direct Labor Hours	Machine Hours
Stamping Department		
Automobile bumpers	590	810
Valve covers	310	570
Wheels	350	620
	1,250	2,000
Plating Department		
Automobile bumpers	195	1,150
Valve covers	200	700
Wheels	195	750
	590	2,600
Total	1,840	4,600

Instructions

1. Determine the single plantwide factory overhead rate, using each of the following allocation bases: (a) direct labor hours and (b) machine hours.
2. Determine the product factory overhead costs, using (a) the direct labor hour plantwide factory overhead rate and (b) the machine hour plantwide factory overhead rate.

PR 4-2A Multiple production department factory overhead rates

Obj. 3

✔ 2. Wheels, $63,600

The management of Gwinnett County Chrome Company, described in Problem 1A, now plans to use the multiple production department factory overhead rate method. The total factory overhead associated with each department is as follows:

Stamping Department	$120,000
Plating Department	104,000
Total	$224,000

Instructions

1. Determine the multiple production department factory overhead rates, using direct labor hours for the Stamping Department and machine hours for the Plating Department.
2. Determine the product factory overhead costs, using the multiple production department rates in (1).

PR 4-3A Activity-based and department rate product costing and product cost distortions

Obj. 3, 4

✔ 2. Snowboards, $390,000 and $65



Black and Blue Sports Inc. manufactures two products: snowboards and skis. The factory overhead incurred is as follows:

Indirect labor	$507,000
Cutting Department	156,000
Finishing Department	192,000
Total	$855,000

(Continued)

The activity base associated with the two production departments is direct labor hours. The indirect labor can be assigned to two different activities as follows:

Activity	Budgeted Activity Cost	Activity Base
Production control	$237,000	Number of production runs
Materials handling	270,000	Number of moves
Total	$507,000	

The activity-base usage quantities and units produced for the two products follow:

	Number of Production Runs	Number of Moves	Direct Labor Hours—Cutting	Direct Labor Hours—Finishing	Units Produced
Snowboards	430	5,000	4,000	2,000	6,000
Skis	70	2,500	2,000	4,000	6,000
Total	500	7,500	6,000	6,000	12,000

Instructions

1. Determine the factory overhead rates under the multiple production department rate method. Assume that indirect labor is associated with the production departments, so that the total factory overhead is $315,000 and $540,000 for the Cutting and Finishing departments, respectively.
2. Determine the total and per-unit factory overhead costs allocated to each product, using the multiple production department overhead rates in (1).
3. Determine the activity rates, assuming that the indirect labor is associated with activities rather than with the production departments.
4. Determine the total and per-unit cost assigned to each product under activity-based costing.
5. Explain the difference in the per-unit overhead allocated to each product under the multiple production department factory overhead rate and activity-based costing methods.

PR 4-4A Activity-based product costing

Obj. 4

✔ 2. Alpha total activity cost, $179,650

EXCEL TEMPLATE

Mello Manufacturing Company is a diversified manufacturer that manufactures three products (Alpha, Beta, and Omega) in a continuous production process. Senior management has asked the controller to conduct an activity-based costing study. The controller identified the amount of factory overhead required by the critical activities of the organization as follows:

Activity	Activity Cost Pool
Production	$259,200
Setup	55,000
Materials handling	9,750
Inspection	60,000
Product engineering	123,200
Total	$507,150

The activity bases identified for each activity are as follows:

Activity	Activity Base
Production	Machine hours
Setup	Number of setups
Materials handling	Number of parts
Inspection	Number of inspection hours
Product engineering	Number of engineering hours

The activity-base usage quantities and units produced for the three products were determined from corporate records and are as follows:

	Machine Hours	Number of Setups	Number of Parts	Number of Inspection Hours	Number of Engineering Hours	Units
Alpha	1,440	75	65	400	125	1,800
Beta	1,080	165	80	300	175	1,350
Omega	720	310	180	500	140	900
Total	3,240	550	325	1,200	440	4,050

Each product requires 40 minutes per unit of machine time.

Instructions

1. Determine the activity rate for each activity.
2. Determine the total and per-unit activity cost for all three products. Round to nearest cent.
3. Why aren't the activity unit costs equal across all three products since they require the same machine time per unit?

PR 4-5A Allocating selling and administrative expenses using activity-based costing

Obj. 5

✔ 3. The Martin Group operating loss, ($11,300)

SHOW ME HOW EXCEL TEMPLATE

Arctic Air Inc. manufactures cooling units for commercial buildings. The price and cost of goods sold for each unit are as follows:

Price	$ 60,000 per unit
Cost of goods sold	(28,000)
Gross profit	$ 32,000 per unit

In addition, the company incurs selling and administrative expenses of $226,250. The company wishes to assign these costs to its three major customers, Gough Industries, Breen Inc., and The Martin Group. These expenses are related to three major nonmanufacturing activities: customer service, project bidding, and engineering support. The engineering support is in the form of engineering changes that are placed by the customer to change the design of a product. The budgeted activity costs and activity bases associated with these activities are:

Activity	Budgeted Activity Cost	Activity Base
Customer service	$ 31,500	Number of service requests
Project bidding	74,000	Number of bids
Engineering support	120,750	Number of customer design changes
Total costs	$226,250	

Activity-base usage and unit volume information for the three customers is as follows:

	Gough Industries	Breen Inc.	The Martin Group	Total
Number of service requests	36	28	116	180
Number of bids	50	40	95	185
Number of customer design changes	18	35	108	161
Unit volume	30	16	4	50

Instructions

1. Determine the activity rates for each of the three nonmanufacturing activity pools.
2. Determine the activity costs allocated to the three customers, using the activity rates in (1).
3. Construct customer profitability reports for the three customers, dated for the year ended December 31, using the activity costs in (2). The reports should disclose the gross profit and operating income associated with each customer.
4. Provide recommendations to management, based on the profitability reports in (3).

PR 4-6A Product costing and decision analysis for a service company — Obj. 6

✔ 3. Procedure B excess, $597,700



EXCEL TEMPLATE

Pleasant Stay Medical Inc. wishes to determine its product costs. Pleasant Stay offers a variety of medical procedures (operations) that are considered its "products." The overhead has been separated into three major activities. The annual estimated activity costs and activity bases follow:

Activity	Budgeted Activity Cost	Activity Base
Scheduling and admitting	$ 432,000	Number of patients
Housekeeping	4,212,000	Number of patient days
Nursing	5,376,000	Weighted care unit
Total costs	$10,020,000	

Total "patient days" are determined by multiplying the number of patients by the average length of stay in the hospital. A weighted care unit (wcu) is a measure of nursing effort used to care for patients. There were 192,000 weighted care units estimated for the year. In addition, Pleasant Stay estimated 6,000 patients and 27,000 patient days for the year. (The average patient is expected to have a a little more than a four-day stay in the hospital.)

During a portion of the year, Pleasant Stay collected patient information for three selected procedures, as follows:

	Activity-Base Usage
Procedure A	
Number of patients	280
Average length of stay	× 6 days
Patient days	1,680
Weighted care units	19,200
Procedure B	
Number of patients	650
Average length of stay	× 5 days
Patient days	3,250
Weighted care units	6,000
Procedure C	
Number of patients	1,200
Average length of stay	× 4 days
Patient days	4,800
Weighted care units	24,000

Private insurance reimburses the hospital for these activities at a fixed daily rate of $406 per patient day for all three procedures.

Instructions

1. Determine the activity rates.
2. Determine the activity cost for each procedure.
3. Determine the excess or deficiency of reimbursements to activity cost.
4. Interpret your results.

Problems: Series B

PR 4-1B Single plantwide factory overhead rate

Obj. 2

✔ 1. b. $111 per machine hour

Spotted Cow Dairy Company manufactures three products—whole milk, skim milk, and cream—in two production departments, Blending and Packing. The factory overhead for Spotted Cow Dairy is $299,700.

The three products consume both machine hours and direct labor hours in the two production departments as follows:

	Direct Labor Hours	Machine Hours
Blending Department		
Whole milk	260	650
Skim milk	245	710
Cream	215	260
	720	1,620
Packing Department		
Whole milk	470	500
Skim milk	300	415
Cream	130	165
	900	1,080
Total	1,620	2,700

Instructions

1. Determine the single plantwide factory overhead rate, using each of the following allocation bases: (a) direct labor hours and (b) machine hours.
2. Determine the product factory overhead costs, using (a) the direct labor hour plantwide factory overhead rate and (b) the machine hour plantwide factory overhead rate.

PR 4-2B Multiple production department factory overhead rates

Obj. 3

✔ 2. Cream, $46,150

The management of Spotted Cow Dairy Company, described in Problem 1B, now plans to use the multiple production department factory overhead rate method. The total factory overhead associated with each department is as follows:

Blending Department	$178,200
Packing Department	121,500
Total	$299,700

Instructions

1. Determine the multiple production department factory overhead rates, using machine hours for the Blending Department and direct labor hours for the Packing Department.
2. Determine the product factory overhead costs, using the multiple production department rates in (1).

PR 4-3B Activity-based department rate product costing and product cost distortions

Obj. 3, 4

✔ 4. Loudspeakers, $465,430 and $66.49



EXCEL TEMPLATE

Big Sound Inc. manufactures two products: receivers and loudspeakers. The factory overhead incurred is as follows:

Indirect labor	$400,400
Subassembly Department	198,800
Final Assembly Department	114,800
Total	$714,000

(Continued)

The activity base associated with the two production departments is direct labor hours. The indirect labor can be assigned to two different activities as follows:

Activity	Budgeted Activity Cost	Activity Base
Setup	$138,600	Number of setups
Quality control	261,800	Number of inspections
Total	$400,400	

The activity-base usage quantities and units produced for the two products follow:

	Number of Setups	Number of Inspections	Direct Labor Hours—Subassembly	Direct Labor Hours—Final Assembly	Units Produced
Receivers	80	450	875	525	7,000
Loudspeakers	320	1,750	525	875	7,000
Total	400	2,200	1,400	1,400	14,000

Instructions

1. Determine the factory overhead rates under the multiple production department rate method. Assume that indirect labor is associated with the production departments, so that the total factory overhead is $420,000 and $294,000 for the Subassembly and Final Assembly departments, respectively.
2. Determine the total and per-unit factory overhead costs allocated to each product, using the multiple production department overhead rates in (1).
3. Determine the activity rates, assuming that the indirect labor is associated with activities rather than with the production departments.
4. Determine the total and per-unit cost assigned to each product under activity-based costing.
5. Explain the difference in the per-unit overhead allocated to each product under the multiple production department factory overhead rate and activity-based costing methods.

PR 4-4B Activity-based product costing

Obj. 4

✔ 2. Brown sugar total activity cost, $293,600

EXCEL TEMPLATE

Sweet Sugar Company manufactures three products (white sugar, brown sugar, and powdered sugar) in a continuous production process. Senior management has asked the controller to conduct an activity-based costing study. The controller identified the amount of factory overhead required by the critical activities of the organization as follows:

Activity	Budgeted Activity Cost
Production	$500,000
Setup	144,000
Inspection	44,000
Shipping	115,000
Customer service	84,000
Total	$887,000

The activity bases identified for each activity are as follows:

Activity	Activity Base
Production	Machine hours
Setup	Number of setups
Inspection	Number of inspections
Shipping	Number of customer orders
Customer service	Number of customer service requests

The activity-base usage quantities and units produced for the three products were determined from corporate records and are as follows:

	Machine Hours	Number of Setups	Number of Inspections	Number of Customer Orders	Customer Service Requests	Units
White sugar	5,000	85	220	1,150	60	10,000
Brown sugar	2,500	170	330	2,600	350	5,000
Powdered sugar	2,500	195	550	2,000	190	5,000
Total	10,000	450	1,100	5,750	600	20,000

Each product requires 0.5 machine hour per unit.

Instructions

1. Determine the activity rate for each activity.
2. Determine the total and per-unit activity cost for all three products. Round to nearest cent.
3. Why aren't the activity unit costs equal across all three products since they require the same machine time per unit?

PR 4-5B Allocating selling and administrative expenses using activity-based costing

Obj. 5

✔ 3. Supply Universe, operating income, $283,820

SHOW ME HOW EXCEL TEMPLATE

Shrute Inc. manufactures office copiers, which are sold to retailers. The price and cost of goods sold for each copier are as follows:

Price	$1,110 per unit
Cost of goods sold	(682)
Gross profit	$ 428 per unit

In addition, the company incurs selling and administrative expenses of $414,030. The company wishes to assign these costs to its three major retail customers, The Warehouse, Kosmo Co., and Supply Universe. These expenses are related to its three major nonmanufacturing activities: customer service, sales order processing, and advertising support. The advertising support is in the form of advertisements that are placed by Shrute Inc. to support the retailer's sale of Shrute copiers to consumers. The budgeted activity costs and activity bases associated with these activities are:

Activity	Budgeted Activity Cost	Activity Base
Customer service	$ 76,860	Number of service requests
Sales order processing	25,920	Number of sales orders
Advertising support	311,250	Number of ads placed
Total activity cost	$414,030	

Activity-base usage and unit volume information for the three customers is as follows:

	The Warehouse	Kosmo Co.	Supply Universe	Total
Number of service requests	62	340	25	427
Number of sales orders	300	640	140	1,080
Number of ads placed	25	180	44	249
Unit volume	810	810	810	2,430

Instructions

1. Determine the activity rates for each of the three nonmanufacturing activities.
2. Determine the activity costs allocated to the three customers, using the activity rates in (1).
3. Construct customer profitability reports for the three customers, dated for the year ended December 31, using the activity costs in (2). The reports should disclose the gross profit and operating income associated with each customer.
4. Provide recommendations to management, based on the profitability reports in (3).

PR 4-6B Product costing and decision analysis for a service company Obj. 6

✔ 3. Flight 102 operating income, $4,415

EXCEL TEMPLATE

Blue Star Airline provides passenger airline service, using small jets. The airline connects four major cities: Charlotte, Pittsburgh, Detroit, and San Francisco. The company expects to fly 170,000 miles during a month. The following costs are budgeted for a month:

Fuel	$2,120,000
Ground personnel	788,500
Crew salaries	850,000
Depreciation	430,000
Total costs	$4,188,500

Blue Star management wishes to assign these costs to individual flights in order to gauge the profitability of its service offerings. The following activity bases were identified with the budgeted costs:

Airline Cost	Activity Base
Fuel, crew, and depreciation costs	Number of miles flown
Ground personnel	Number of arrivals and departures at an airport

The size of the company's ground operation in each city is determined by the size of the workforce. The following monthly data are available from corporate records for each terminal operation:

Terminal City	Ground Personnel Cost	Number of Arrivals/Departures
Charlotte	$256,000	320
Pittsburgh	97,500	130
Detroit	129,000	150
San Francisco	306,000	340
Total	$788,500	940

Three recent representative flights have been selected for the profitability study. Their characteristics are as follows:

	Description	Miles Flown	Number of Passengers	Ticket Price per Passenger
Flight 101	Charlotte to San Francisco	2,000	80	$695.00
Flight 102	Detroit to Charlotte	800	50	441.50
Flight 103	Charlotte to Pittsburgh	400	20	382.00

Instructions

1. Determine the fuel, crew, and depreciation cost per mile flown.
2. Determine the cost per arrival or departure by terminal city.
3. Use the information in (1) and (2) to construct a profitability report for the three flights. Each flight has a single arrival and departure to its origin and destination city pairs.

Make a Decision
Using ABC Product Cost Information to Reduce Costs

MAD 4-1 Analyze Life Force Fitness, Inc. Obj. 7

Life Force Fitness, Inc., assembles and sells treadmills. Activity-based product information for each treadmill is as follows:

Activity	Activity-Base Usage (hrs. per unit)	×	Activity Rate per Hour	=	Activity Cost
Motor assembly	1.50		$20		$30.00
Final assembly	1.00		18		18.00
Testing	0.25		22		5.50
Rework	0.40		22		8.80
Moving	0.20		15		3.00
Activity cost per unit					$65.30

All of the activity costs are related to labor. Management must remove $2.00 of activity cost from the product in order to remain competitive.

Rework involves disassembling and repairing a unit that fails testing. Not all units require rework, but the average is 0.40 hour per unit. Presently, the testing is done on the completed assembly; but much of the rework has been related to motors, which can be tested independently prior to adding the motor to the treadmill during final assembly. Thus, motor issues can be diagnosed and solved without having to disassemble the complete treadmill. This change will reduce the average rework per unit by one-quarter.

a. Determine the new activity cost per unit under the rework improvement scenario.

b. If management had the choice of doing the rework improvement in (a) or cutting the moving activity in half by improving the product flow, which decision should be implemented? Why?

MAD 4-2 Analyze Gourmet Master, Inc. Obj. 7

Gourmet Master, Inc., uses activity-based costing to determine the cost of its stainless steel ovens. Activity-based product cost information is as follows:

Activity	Activity-Base Usage (hrs. per unit)	×	Activity Rate per Hour	=	Activity Cost
Fabrication	0.75		$24.00		$18.00
Assembly	1.50		20.00		30.00
Inspection	0.30		25.00		7.50
Moving	0.25		12.00		3.00
Total activity cost per unit					$58.50

These activities only include the labor portion of the cost. Fabrication is the cutting and shaping of metal to be used in the assembly of the ovens. If the metal is not fabricated properly, additional time is required during final assembly to trim and adjust the metal pieces to fit properly. This has been a problem in Assembly. Management proposes improvements in Fabrication requiring the fabrication work to be done slower, but more accurately. As a result, the time in fabrication will increase to an hour per unit. However, because of the additional care, the parts are expected to fit better during assembly, thus reducing assembly time to 1.10 hours per unit.

a. Determine the revised activity-based cost per unit under the new fabrication plan.

b. Does this plan reduce the activity cost per unit of the oven?

MAD 4-3 Analyze Skidmore Electronics Obj. 7

Skidmore Electronics manufactures consumer electronic products. The company has three assembly labor classifications, S-1, S-2, and S-3. The three classifications are paid $15, $18, and $22 per hour, respectively. The assembly activity for a new smartphone is as follows:

Activity	Activity-Base Usage (hrs. per unit)	×	Activity Rate per Hour (S-2)	=	Activity Cost
Assembly	0.40		$18.00		$7.20

(Continued)

A product engineer proposes using a higher-rated employee to perform the assembly on the new phone. His analysis has shown that an S-3 employee can perform the assembly in 0.35 hour per unit.

a. Determine the Assembly activity cost using the S-3 labor classification.

b. Is the product engineer's proposal supported?

MAD 4-4 Analyze Littlejohn, Inc. Obj. 7

Littlejohn, Inc., manufactures machined parts for the automotive industry. The activity cost associated with Part XX-10 is as follows:

Activity	Activity-Base Usage	×	Activity Rate	=	Activity Cost
Fabrication	250 dlh		$80 per dlh		$20,000
Setup	10 setups		$80 per setup		800
Production control	10 prod. runs		$30 per prod. run		300
Moving	10 moves		$25 per move		250
Total activity cost per unit					$21,350
Estimated units of production					÷ 500
Activity cost per unit					$ 42.70

Each unit requires 30 minutes of fabrication direct labor. Moreover, Part XX-10 is manufactured in production run sizes of 50 units. Each production run is set up, scheduled (production control), and moved as a batch of 50 units. Management is considering improvements in the setup, production control, and moving activities in order to cut the production run sizes by half. As a result, the number of setups, production runs, and moves will double from 10 to 20. Such improvements are expected to speed the company's ability to respond to customer orders.

- Setup is reengineered so that it takes 60% of the original cost per setup.
- Production control software will allow production control effort and cost per production run to decline by 60%.
- Moving distance was reduced by 40%, thus reducing the cost per move by the same amount.

a. Determine the revised activity cost per unit under the proposed changes.

b. Did these improvements reduce the activity cost per unit?

c. What cost per unit for setup would be required for the solution in (a) to equal the base solution?

MAD 4-5 Analyze Lancaster County Hospital Obj. 7

Lancaster County Hospital uses activity-based costing to determine the cost of serving patients. The hospital identified common treatments and developed the activity-based cost per patient by treatment. The activities and activity rates for a patient receiving coronary bypass surgery are as follows:

Activity	Activity Rate
Admission	$150 per admission
Operating room	$3,000 per hour
Nursing	$50 per nursing care unit
Discharge	$100 per discharge

Nursing care units are measures of time and effort to perform nursing duties, such as providing IV care, checking vital signs, and administering drugs. It is determined that there are an average of 10 nursing care units per patient day in the hospital for a coronary bypass. The average bypass patient is in the hospital for 6 days. The bypass procedure requires an average of 3 hours of operating room time.

a. Determine the activity cost per patient for the coronary bypass treatment.

b. Assume the hospital was able to make improvements such that the average length of stay in the hospital for the bypass was reduced from 6 days to 5 days. Further assume that additional improvements in medical technology reduced the operating room time for a bypass to 2½ hours. Determine the activity cost per patient for the coronary bypass treatment under these revised conditions. What is the cost improvement?

Take It Further

ETHICS

TIF 4-1 Activity-based costing and external reporting

The controller of Tri Con Global Systems Inc. has developed a new costing system that traces the cost of activities to products. The new system is able to measure post-manufacturing activities, such as selling, promotional, and distribution activities, and allocate these activities to products in a manner that provides a more complete view of the company's product costs. This system produces better strategic information about the relative profitability of product lines.

In the course of implementing the new costing system, the controller realized that the company's current-period GAAP net income would increase significantly if the new product cost information were used for inventory valuation on the financial statements. The controller has been under intense pressure to improve the company's net income, and this would be an easy and effective way for her to help meet the company's short-term net income goals. As a result, she has decided to use the new costing system to determine GAAP net income.

a. Why does the company's net income increase when the new costing system is applied?

b. Is the controller acting ethically by using the new costing system for GAAP net income? Explain your answer.

TEAM ACTIVITY REAL WORLD

TIF 4-2 Production activities in different industries

In teams, select a company from one of the following industries: banking, food service, manufacturing, or retail. For this company:

a. Identify the primary activities that the company must perform to provide its product or service.

b. Identify an activity base for each of these activities.

COMMUNICATION

TIF 4-3 Product profitability

The controller of New Wave Sounds Inc. prepared the following product profitability report for management, using activity-based costing methods for allocating both the factory overhead and the marketing expenses. As such, the controller has confidence in the accuracy of this report.

	Home Theater Speakers	Wireless Speakers	Wireless Headphones	Total
Sales	$ 1,500,000	$1,200,000	$ 900,000	$ 3,600,000
Cost of goods sold	(1,050,000)	(720,000)	(810,000)	(2,580,000)
Gross profit	$ 450,000	$ 480,000	$ 90,000	$ 1,020,000
Marketing expenses	(600,000)	(120,000)	(72,000)	(792,000)
Operating income	$ (150,000)	$ 360,000	$ 18,000	$ 228,000

In addition, the controller interviewed the vice president of marketing, who provided the following insight into the company's three products:

- The home theater speakers are an older product that is highly recognized in the marketplace.
- The wireless speakers are a new product that was just recently launched.
- The wireless headphones are a new technology that has no competition in the marketplace, and it is hoped that they will become an important future addition to the company's product portfolio. Initial indications are that the product is well received by customers.

The controller believes that the manufacturing costs for all three products are in line with expectations.

Based on the information provided:

a. Compute the ratio of gross profit to sales and the ratio of operating income to sales for each product.

b. Write a brief (one-page) memo using the product profitability report and the calculations in (a) to make recommendations to management with respect to strategies for the three products.

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Pelder Products Company manufactures two types of engineering diagnostic equipment used in construction. The two products are based upon different technologies, X-ray and ultrasound, but are manufactured in the same factory. Pelder has computed the manufacturing cost of the X-ray and ultrasound products by adding together direct materials, direct labor, and overhead cost applied based on the number of direct labor hours. The factory has three overhead departments that support the single production line that makes both products. Budgeted overhead spending for the departments is as follows:

Department			
Engineering Design	**Materials Handling**	**Setup**	**Total**
$6,000	$5,000	$3,000	$14,000

Pelder's budgeted manufacturing activities and costs for the period are as follows:

	Product	
Activity	**X-Ray**	**Ultrasound**
Units produced and sold	50	100
Direct materials used	$5,000	$8,000
Direct labor hours used	100	300
Direct labor cost	$4,000	$12,000
Number of parts used	400	600
Number of engineering changes	2	1
Number of product setups	8	7

The budgeted cost to manufacture one ultrasound machine using the activity-based costing method is:

a. $225.
b. $264.
c. $293.
d. $305.

2. The Chocolate Baker specializes in chocolate baked goods. The firm has long assessed the profitability of a product line by comparing revenues to the cost of goods sold. However, Barry White, the firm's new accountant, wants to use an activity-based costing system that takes into consideration the cost of the delivery person. Following are activity and cost information relating to two of Chocolate Baker's major products:

	Muffins	**Cheesecake**
Revenue	$53,000	$46,000
Cost of goods sold	26,000	21,000
Delivery activity:		
Number of deliveries	150	85
Average length of delivery	10 minutes	15 minutes
Cost per hour for delivery	$20	$20

Using activity-based costing, which of the following statements is correct?

a. The muffins are $2,000 more profitable.
b. The cheesecakes are $75 more profitable.
c. The muffins are $1,925 more profitable.
d. The muffins have a higher profitability as a percentage of sales and, therefore, are more advantageous.

3. Young Company is beginning operations and is considering three alternatives to allocate manufacturing overhead to individual units produced. Young can use a plantwide rate, departmental rates, or activity-based costing. Young will produce many types of products in its single plant, and not all products will be processed through all departments. In which one of the following independent situations would reported net income for the first year be the same regardless of which overhead allocation method had been selected?
   a. All production costs approach those costs that were budgeted.
   b. The sales mix does not vary from the mix that was budgeted.
   c. All manufacturing overhead is a fixed cost.
   d. All ending inventory balances are zero.

4. Cynthia Rogers, the cost accountant for Sanford Manufacturing, is preparing a management report that must include an allocation of overhead. The budgeted overhead for each department and the data for one job are as follows:

	Department	
	Tooling	**Fabricating**
Supplies	$ 690	$ 80
Supervisor's salaries	1,400	1,800
Indirect labor	1,000	4,000
Depreciation	1,200	5,200
Repairs	4,400	3,000
Total budgeted overhead	$8,690	$14,080
Total direct labor hours	440	640
Direct labor hours on Job 231	10	2

Using the departmental overhead application rates, and allocating overhead on the basis of direct labor hours, overhead applied to Job 231 in the Tooling Department would be:
   a. $44.00.
   b. $197.50.
   c. $241.50.
   d. $501.00.

Pathways Challenge



This is Accounting!

Information/Consequences

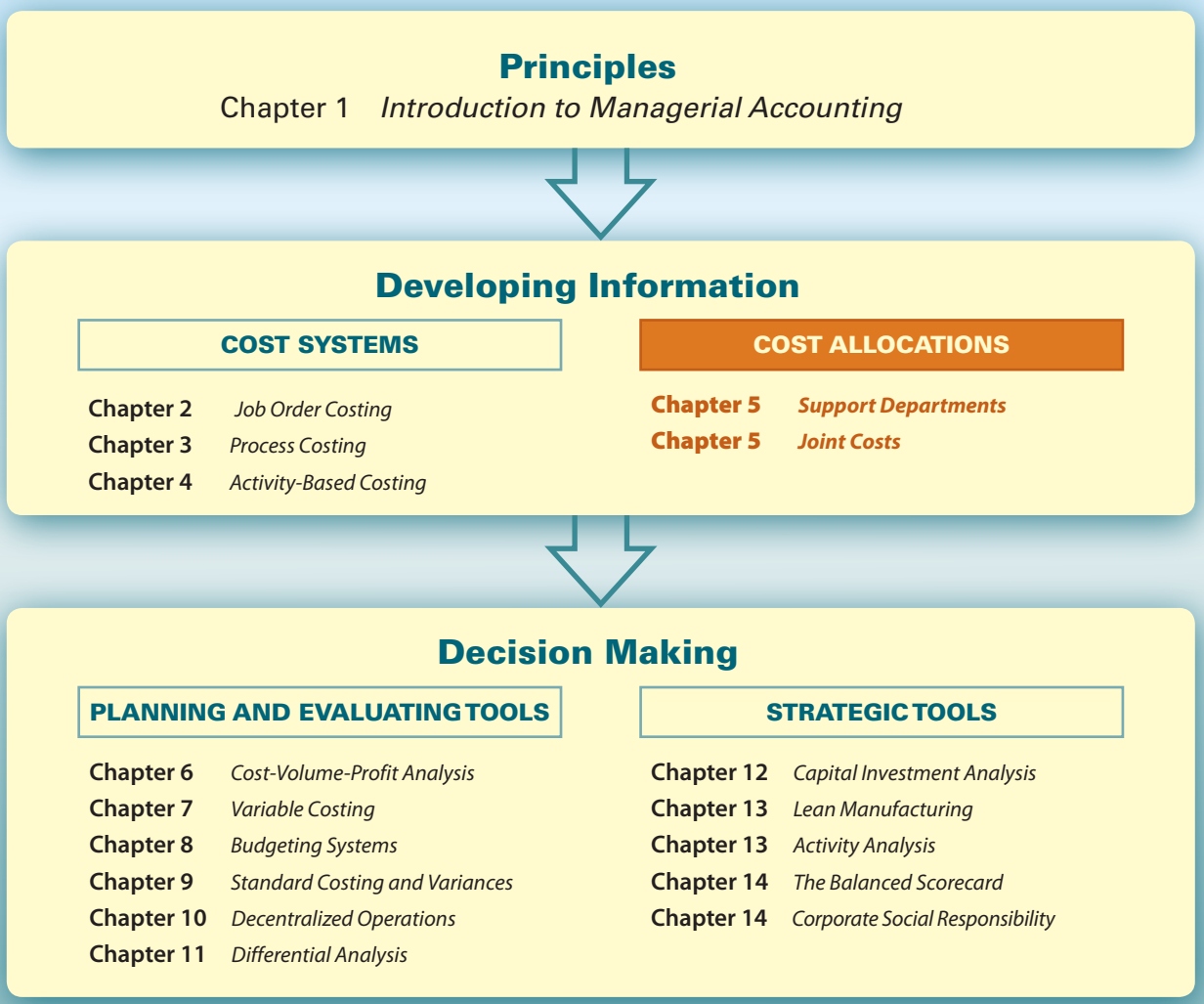
Before a company can implement an activity-based pricing system, it must have an activity-based costing system in place. This was the key ingredient for **Owens and Minor, Inc. (OMI)**. Its activity-based costing system was the foundation of the new activity-based pricing system.

Consider **Amazon.com, Inc. (AMZN)**. Customers with an Amazon Prime membership are offered free shipping on many products. They can pay extra to have their purchases shipped same-day; they pay more because same-day shipping is an expensive activity for Amazon.com. Interestingly, customers can also opt to have shipping *delayed* by several days. Amazon.com sometimes offers customers an incentive to choose this option. For example, Amazon.com often offers a one-dollar coupon redeemable on the purchase of digital items, such as movie rentals and Kindle books. Accountants at Amazon.com have determined, using Amazon's activity-based costing system, that the lost revenue associated with the coupons is recouped via the savings from the delayed shipments.

Suggested Answer

Chapter 5

Support Department and Joint Cost Allocation



Brigham Young University

Have you ever considered how colleges and universities determine the cost of their academic programs? Understanding program costs is essential, because colleges perform cost/benefit analyses when determining which academic programs to offer. Over time, these decisions allow schools to become known for their expertise in certain disciplines. For example, **Harvard University (HU)** is known for its law school, whereas the **University of Southern California (USC)** is one of the top film schools in the nation.

Brigham Young University (BYU) is a private university in Provo, Utah, that was faced with a decision of whether or not to offer a master's degree in accounting. Given the demand for accounting professionals, there were benefits for BYU to offer a Master of Accountancy degree. But what would it cost?

BYU's decision would be influenced by direct costs that can be directly traced to the master's degree, such as the salaries of new staff and faculty. However, direct costs would make up only a small fraction of the total costs for the new program. For example, the **Marriott School of Business (MSB)**, the Office of Teaching and Learning, and the Honors Department would incur additional costs that would be difficult to directly trace to the new degree.

Like BYU, many costs related to producing products or providing services are *not* directly traceable to the product or service. These costs are often related to support departments. This chapter describes and illustrates methods of allocating support department costs to a product or service. In addition, the methods of allocating joint costs to products are described and illustrated.



iStock.com/Wolterk

Link to BYU . . . . . Pages 206, 209, 216, 222

What's Covered

Support Department and Joint Cost Allocation

Support Department Costs
- Support Departments (Obj. 1)
- Costs (Obj. 1)

Support Department Cost Allocation
- Single Plantwide Rate (Obj. 2)
- Multiple Department Rates (Obj. 2)
- Activity-Based Costing (Obj. 2)
- Direct Method (Obj. 3)
- Sequential Method (Obj. 3)
- Reciprocal Services Method (Obj. 3)

Joint Costs
- Joint Products (Obj. 4)
- Costs (Obj. 4)
- Split-Off Point (Obj. 4)
- Inseparable Costs (Obj. 4)

Joint Cost Allocation
- Physical Units Method (Obj. 5)
- Weighted Average Method (Obj. 5)
- Market Value at Split-Off Method (Obj. 5)
- Net Realizable Value Method (Obj. 5)
- By-Products (Obj. 5)

Learning Objectives

Obj. 1 Describe support departments and support department costs.

Obj. 2 Describe the allocation of support department costs using a single plantwide rate, multiple department rates, and activity-based costing.

Obj. 3 Allocate support department costs to production departments using the direct method, sequential method, and reciprocal services method.

Obj. 4 Describe joint products and joint costs.

Obj. 5 Allocate joint costs using the physical units, weighted average, market value at split-off, and net realizable value methods.

Analysis for Decision Making

Obj. 6 Describe and illustrate the use of support department and joint cost allocations to evaluate the performance of production managers.

Objective 1
Describe support departments and support department costs.

Support Departments

A **support department** provides a necessary service to produce a product, but is not directly involved in the production process. For example, Janitorial and Maintenance departments are necessary for production, but are not directly involved in production. Support departments are sometimes called **service departments** because they provide services to other departments.

Support departments are normally accounted for as a cost (responsibility) center. All direct costs of the support department are accumulated in the center. For example, maintenance employee wages and salaries are accumulated in the Maintenance Department. In addition, some general factory overhead, such as depreciation, may be assigned to a support department.

Because support department costs are only *indirectly* related to production, they are difficult to apply to products. For example, Janitorial services are necessary for safe and efficient production. However, it is difficult, if not impossible, to find an appropriate cost driver for applying these costs to a product. For example, applying Janitorial activity costs to products based on units produced, machine hours, batches run, or the number of product lines is questionable.

Some companies consider Janitorial and other support department costs to be facility-level costs and do not apply them to products. However, this approach ignores the fact that support department services may be used more heavily by some products than others, which can result in inaccurate product costs. For this reason, this chapter provides guidance for incorporating **support department cost allocation** into a product costing system.

Link to BYU

The study of accounting at **Brigham Young University (BYU)** began with the university's founding in 1875. But at that time, accounting was referred to as "bookkeeping" or "commercial arithmetic."

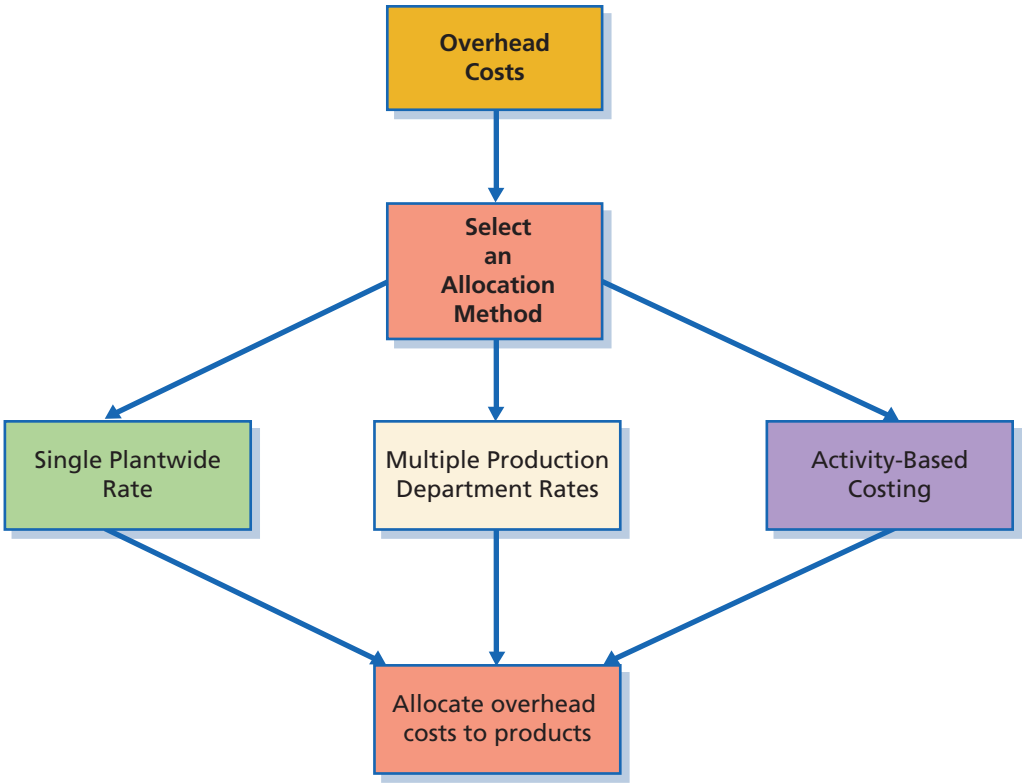
Support Department Cost Allocation

Objective 2
Describe the allocation of support department costs using a single plantwide rate, multiple department rates, and activity-based costing.

Because support department costs are indirectly related to production, they are applied to products as part of overhead. As shown in Exhibit 1, overhead can be applied to products using one of the following methods:

- Single plantwide rate
- Multiple production department rates
- Activity-based costing

Exhibit 1
Allocation of Overhead Costs



Why It Matters

CONCEPT CLIP

Support Department Cost Allocation at Emory University

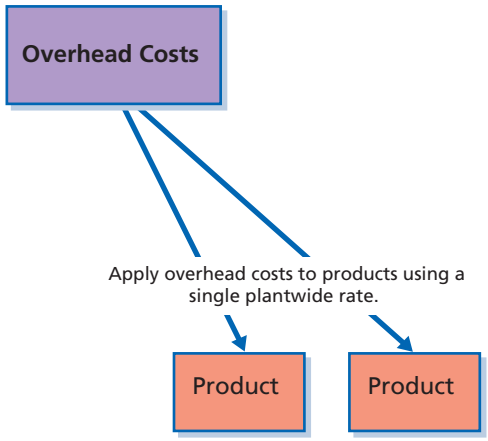
Service businesses like colleges and universities use support department allocation methods to cost their various departments. Some departments, like individual schools within a university, have profit and loss statements and are expected to at least make enough revenue to cover their own costs (break even) each year. Other departments do not generate revenues from tuition, but incur costs to serve the revenue-generating schools. Thus, the costs from these support departments are allocated to the schools within the university.

At **Emory University**, a private research university in Atlanta, Georgia, costs from university-wide departments, such as Campus Services and the WorkLife Resource Center, are allocated to individual schools within the university, such as the Goizueta Business School. Among other things, Campus Services provides building maintenance, custodial services, and interior design assistance to the university. Because much of these costs are difficult to directly trace to individual schools, the costs are instead allocated using support department cost allocation methods.

Single Plantwide Rate

When a **single plantwide overhead rate** is used to apply overhead to products, support department costs are simply combined with all other overhead costs. The total overhead cost is then applied to the products using a single cost driver, as shown in Exhibit 2.

Exhibit 2
Allocating Overhead Costs Using a Single Plantwide Rate

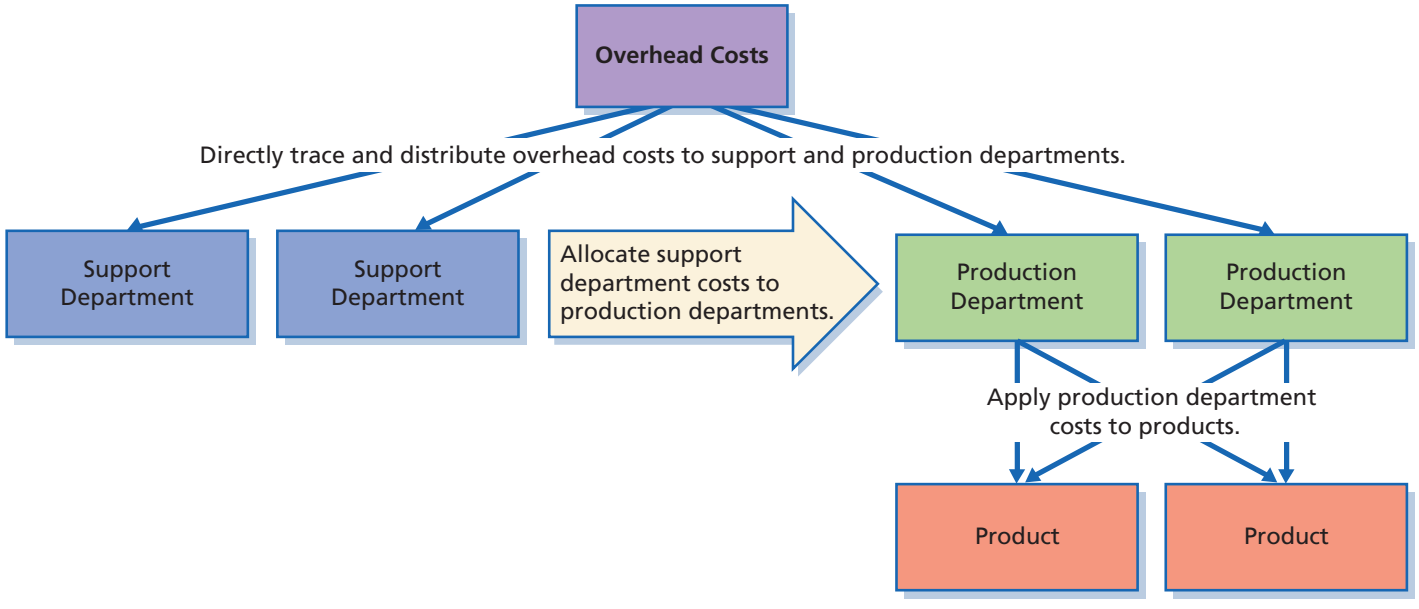


Because a single driver is used for *all* overhead costs, it is unlikely that the driver selected is appropriate for every type of overhead. Further, this method ignores the fact that the processes used in manufacturing a product may differ from those used for other products. For example, some processes require more support activities than others and thus should be allocated more support department costs. As a result, using a single plantwide rate may result in inaccurate product costs.

Multiple Production Department Rates

When **multiple production department rates** are used to apply overhead to products, overhead costs are first directly traced or distributed to support and production departments. Support department costs are then allocated to production departments based on the amount of support activity used by each production department. After support department costs are allocated to the production departments, production department costs are then applied to the products using cost drivers for each production department. This process is illustrated in Exhibit 3.

Exhibit 3 Allocating Overhead Costs Using Multiple Production Department Rates

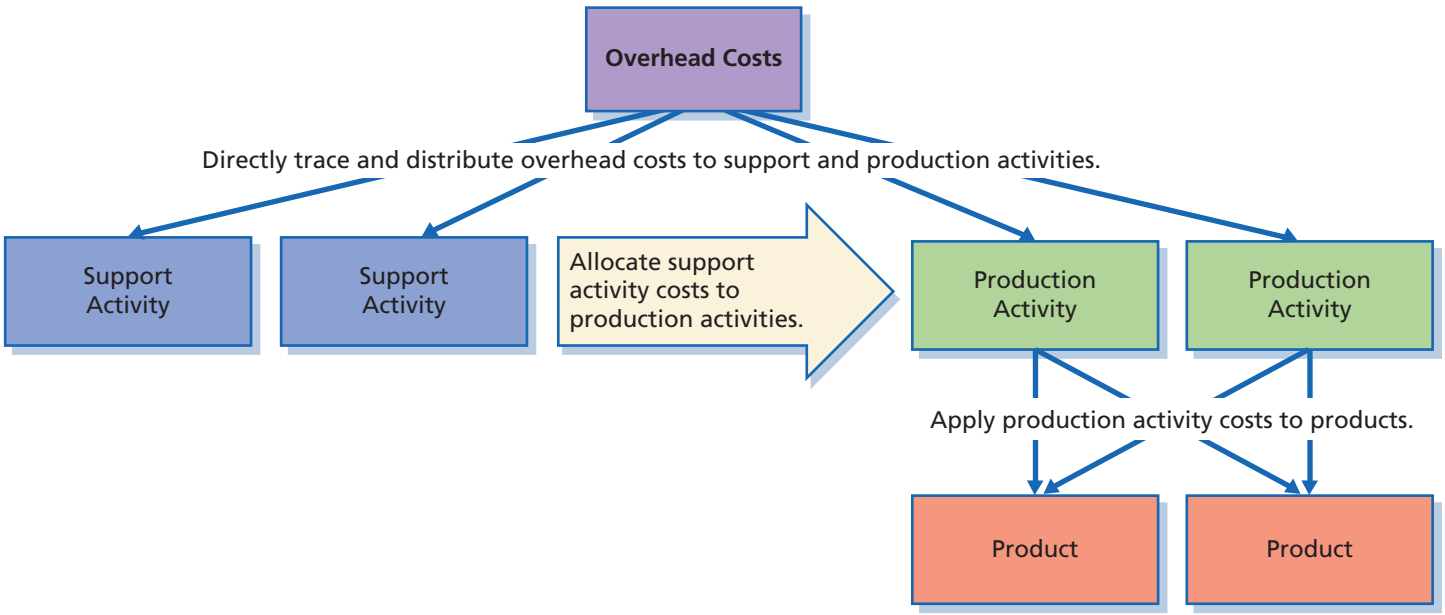


Like all large universities, **BYU** has several departments that provide support to various academic programs, including Academic Advisement, the Office of Information Technology, and the Honors Program. Link to BYU

Activity-Based Costing

When *activity-based costing (ABC)* is used to apply overhead to products, support department costs are referred to as **support *activity* costs**. The process for allocating support activity costs with ABC is similar to that used with multiple production department rates. Overhead costs are first directly traced or distributed to support and production activities, then support activity costs are allocated to production activities based on the amount of support activity used by each production activity. Finally, production activity costs are applied to the products using cost drivers for each production activity. This process is depicted in Exhibit 4.

Exhibit 4 Allocating Overhead Costs Using Activity-Based Costing



In practice, the terms *assign*, *distribute*, *apply*, and *allocate* are often used when referring to manufacturing costs and the transfer of these costs to departments and products. To simplify, transferring overhead costs to support and production departments is referred to as *distributing* overhead costs. Transferring costs to products is referred to as *applying* costs to products or the *application* of costs. Finally, *allocating* costs or *cost allocation* may be used in a variety of ways. For the purposes of discussing support departments, transferring costs among departments is referred to as cost allocation or allocating costs.

In addition to departmental budgets, **BYU** costs are also tracked by activities, including new student orientation, career fairs, and campus scheduling. Link to BYU

Objective 3
Allocate support department costs to production departments using the direct method, sequential method, and reciprocal services method.

Allocating Support Department Costs to Production Departments

There are three commonly used methods for allocating support department costs to production departments. These same methods are used to allocate support *activity* costs to production *activities* when using ABC to allocate overhead. The methods are as follows:

- Direct method
- Sequential method
- Reciprocal services method

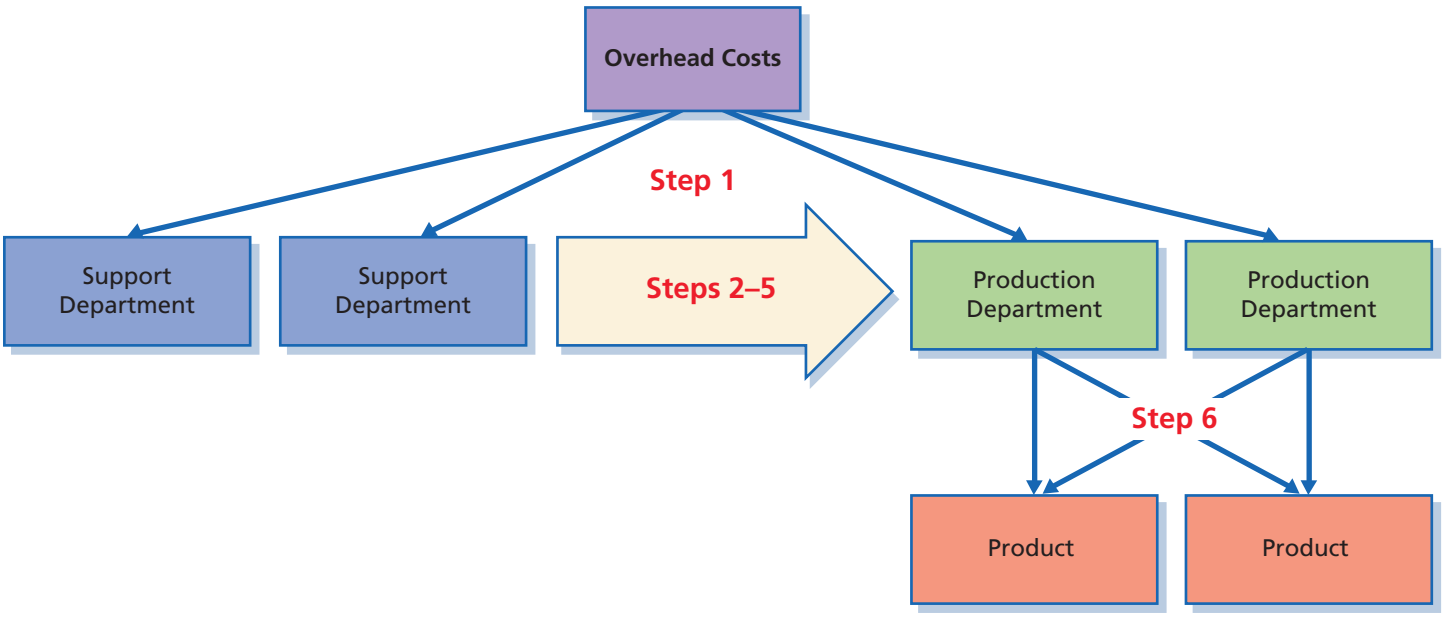
The direct method is the easiest, but least accurate. The reciprocal services method is the most difficult, but most accurate. The sequential method produces allocations that are between the results of the direct and reciprocal methods in terms of difficulty and accuracy.

All three methods use the following six-step process:

- Step 1. Directly trace and distribute overhead costs to support and production departments.
- Step 2. Select a cost driver for each department.
- Step 3. Determine the usage of the support department cost driver by each department.
- Step 4. Determine the percentage (proportional) usage of support department cost drivers by each department.
- Step 5. Allocate support department costs by multiplying the support department costs by the percentage usage of each department.
- Step 6. Apply production department costs to products.

These steps are illustrated in Exhibit 5.

Exhibit 5 Steps of Support Department Cost Allocation



Since Step 6 was described and illustrated in earlier chapters, this chapter focuses on Steps 1–5.[1]

[1]Step 6 is described and illustrated in Chapters 2, 3, and 4.

Direct Method

The **direct method** allocates *all* support department costs directly to production departments. In doing so, the direct method ignores the possibility that some support departments may also serve *other support departments*. In contrast, the sequential and reciprocal methods consider inter-support-department service costs.

To illustrate the direct method, the production facility for **Decker Tables, Inc.**, is used. We assume that Decker Tables has two support departments (Janitorial and Cafeteria) and two production departments (Cutting and Assembly).

Step 1. In Step 1, the costs for each department are determined by first identifying costs that can be traced to a specific department. Next, any remaining overhead costs are distributed to departments using a cost driver.

For example, the cost of janitorial supplies and the wages of janitors are directly traceable to the Janitorial Department. In addition, the Janitorial Department is distributed a portion of the overhead costs that cannot be traced to other departments. For example, heating costs for the production facility are allocated to the various departments based on the cubic feet utilized by each department.

Assume that the following costs have been directly traced and distributed to each of Decker Tables' four departments:

	Janitorial Department	Cafeteria Department	Cutting Department	Assembly Department
Department costs	$310,000	$169,000	$1,504,000	$680,000

Step 2. In Step 2, an appropriate cost driver must be determined for each support department. A good cost driver for Janitorial costs is the square footage that needs to be cleaned. In other words, the more square footage that needs to be cleaned, the higher the Janitorial costs. For the Cafeteria costs, the physical size of the department is less relevant. However, the number of employees in each production department is a good cost driver of Cafeteria costs. In other words, the more employees there are, the higher the Cafeteria costs. Thus, assume that Decker Tables uses the following cost drivers for Janitorial and Cafeteria costs:

Support Department	Cost Driver
Janitorial Department	Square footage to be serviced
Cafeteria Department	Number of employees

Step 3. In Step 3, the usage of the support department cost drivers by each department is determined. Assume that the cost driver usages by each of Decker Tables' four departments are as follows:

Cost Driver	Janitorial Department	Cafeteria Department	Cutting Department	Assembly Department
Square feet	50	5,000	1,000	4,000
Number of employees	10	3	30	10

Under the direct method, any inter-support-department usages are ignored. For example, the fact that the Janitorial Department has 10 employees that use the cafeteria is not considered. Likewise, the fact that the Janitorial Department cleans 5,000 square feet of the cafeteria is also not considered.

Step 4. In Step 4, the percentage (proportional) usage of support department cost drivers by the production departments is determined. Based on the square footage, the Cutting Department uses 20% of the Janitorial services while the Assembly Department uses 80%, computed as follows:

Cutting Department:

$$\frac{1{,}000}{1{,}000 + 4{,}000} = 20\% \text{ of Janitorial services}$$

Assembly Department:

$$\frac{4{,}000}{1{,}000 + 4{,}000} = 80\% \text{ of Janitorial services}$$

Based upon the number of employees, the Cutting Department uses 75% of the Cafeteria costs, while the Assembly Department uses 25%, computed as follows:

Cutting Department:

$$\frac{30}{30 + 10} = 75\% \text{ of Cafeteria services}$$

Assembly Department:

$$\frac{10}{30 + 10} = 25\% \text{ of Cafeteria services}$$

The denominators in the preceding computations are 5,000 (1,000 + 4,000) square feet for Janitorial costs and 40 (30 + 10) employees for Cafeteria costs, which are the total of the cost driver usages for the production departments.

Step 5. In Step 5, support department costs are allocated to the production departments by multiplying the percentage usage of each production department by the total support department costs. For example, the Janitorial costs of $310,000 are allocated $62,000 to the Cutting Department and $248,000 to the Assembly Department, as follows:

	Janitorial Department Costs
Cutting Department	$ 62,000 ($310,000 × 20%)
Assembly Department	248,000 ($310,000 × 80%)
Total	$310,000

Likewise, the Cafeteria costs of $169,000 are allocated $126,750 to the Cutting Department and $42,250 to the Assembly Department, as follows:

	Cafeteria Department Costs
Cutting Department	$126,750 ($169,000 × 75%)
Assembly Department	42,250 ($169,000 × 25%)
Total	$169,000

The support department costs are added to any costs that were directly traced or distributed to the production departments in Step 1. Thus, the total costs of the Cutting and Assembly departments are as follows:

Cutting Department: $1,504,000 (from Step 1) + $62,000 (from Step 5) + $126,750 (from Step 5) = $1,692,750

Assembly Department: $680,000 (from Step 1) + $248,000 (from Step 5) + $42,250 (from Step 5) = $970,250

The support department cost allocations using the direct method for Decker Tables are summarized in Exhibit 6.

Exhibit 6
Summary of Support Department Cost Allocations Using the Direct Method

	Support Departments		Production Departments	
	Janitorial	Cafeteria	Cutting	Assembly
Square feet	50	5,000	1,000	4,000
Number of employees	10	3	30	10
Department costs	$ 310,000	$ 169,000	$1,504,000	$680,000
Janitorial cost allocation	(310,000)	0	62,000	248,000
Cafeteria cost allocation	0	(169,000)	126,750	42,250
Total department costs	$ 0	$ 0	$1,692,750	$970,250

As shown in Exhibit 6, after the support department costs have been allocated, the support departments have no costs remaining. Since all costs have been allocated to the production departments, management can now apply the production department costs to products.

Check Up Corner 5-1 Direct Method of Support Department Cost Allocation

Support Department 1 has $200,000 in costs distributed to it. Costs from Support Department 1 will be allocated to other departments based on labor hours. Support Department 2 uses 50 labor hours from Support Department 1, Production Department 1 uses 75 labor hours from Support Department 1, and Production Department 2 uses 25 labor hours from Support Department 1.

a. Using the direct method for support department cost allocation, how much of Support Department 1's costs will be allocated to Support Department 2?

b. Using the direct method for support department cost allocation, how much of Support Department 1's costs will be allocated to Production Department 1?

c. Using the direct method for support department cost allocation, how much of Support Department 1's costs will be allocated to Production Department 2?

Solution:

a. Because the direct method is used, all support department costs are allocated directly to the production departments. None of Support Department 1's costs are allocated to Support Department 2.

b. Note that, because no costs are allocated from Support Department 1 to Support Department 2, the number of Support Department 1 labor hours used by Support Department 2 is irrelevant.

Production Department 1 uses 75% of Support Department 1's labor hours (only considering the usage among departments to which Support Department 1's costs will be allocated), computed as follows:

$$\frac{75}{75+25} = 75\%$$

Costs are allocated from Support Department 1 to Production Department 1 by multiplying the $200,000 Support Department 1 costs by Production Department 1's proportional usage of Support Department 1 labor hours. Thus, allocated costs are $200,000 × 75% = $150,000.

c. Production Department 2 uses 25% of Support Department 1's labor hours (only considering the usage among departments to which Support Department 1's costs will be allocated), computed as follows:

$$\frac{25}{75+25} = 25\%$$

Costs are allocated from Support Department 1 to Production Department 2 by multiplying the $200,000 Support Department 1 costs by Production Department 2's proportional usage of Support Department 1 labor hours. Thus, allocated costs are $200,000 × 25% = $50,000.

Check Up Corner

The Sequential Method

The direct method assumes that support departments serve only production departments and thus ignores that some support departments may also serve *other support departments*. Although this simplifying assumption makes support department cost allocations easier, it generates less accurate product costs.

The **sequential method** (also known as the **step-down method**) considers some inter-support-department services. It does this by first allocating the costs from one support department to the other support departments and to the production departments. A second support department is then selected and its costs are allocated to the remaining support departments (but not to the first service department) and to the production departments. This process continues until all support department costs have been allocated to the production departments.

Under the sequential method, support department costs are never allocated *back* to a support department whose costs have already been allocated. As a result, the sequential method captures some, but not all, of the inter-support-department services.

The order in which support department costs are allocated under the sequential method is important. Management normally determines this order based on the following:

- Departments with higher costs are allocated earlier.
- Departments serving a large number of support departments are allocated earlier.
- Departments with more accurate cost drivers are allocated earlier.

The preceding factors may conflict. For example, the support department with the highest costs may serve the fewest number of other support departments. As a result, managers often make subjective assessments about the order of allocating support departments.

To illustrate, assume that **Decker Tables, Inc.**, uses the sequential method. Using the prior data for Decker Tables, the five-step process shown in Exhibit 3 is used.

Steps 1–3. Steps 1–3 of the sequential method are the same as for the direct method, which generated the following data:

	Support Departments		Production Departments	
	Janitorial	Cafeteria	Cutting	Assembly
Square feet	50	5,000	1,000	4,000
Number of employees	10	3	30	10
Department costs	$310,000	$169,000	$1,504,000	$680,000

Step 4. In Step 4, the proportional usage of each support department's cost driver by the other departments *to which its costs are to be allocated* is determined. Assume that Decker Tables decides to allocate Janitorial costs first, followed by Cafeteria costs.

The proportional usage of Janitorial services by the Cafeteria, Cutting, and Assembly departments is as follows:

Janitorial Department Usage

Department	Square Feet	Usage Percent
Cafeteria	5,000	50%
Cutting	1,000	10
Assembly	4,000	40
Totals	10,000	100%

The proportional usage of Cafeteria services by the Cutting and Assembly departments is as follows:

Cafeteria Department Usage

Department	Number of Employees	Usage Percent
Cutting	30	75%
Assembly	10	25
Totals	40	100%

Note that the usage of the Cafeteria Department by the Janitorial Department is not considered. This is because the Cafeteria Department costs are allocated after the Janitorial Department. Once a support department's costs are allocated under the sequential method, it is not allocated any additional costs.

Step 5. In Step 5, each support department's costs are allocated to other departments by multiplying the support department's *total* costs by the proportional usage of the departments to which costs are allocated. Under the sequential method, the total support department costs to be allocated will also include any costs that were allocated to that support department from other support departments. This is a major difference between the sequential method and the direct method.

To illustrate, the Janitorial Department's costs of $310,000 are allocated to the Cafeteria, Cutting, and Assembly departments by multiplying $310,000 by each department's proportional usage, as follows:

	Janitorial Department Costs		Usage Percent		Allocated Cost
Cafeteria Department	$310,000	×	50%	=	$155,000
Cutting Department	310,000	×	10	=	31,000
Assembly Department	310,000	×	40	=	124,000
Totals			100%		$310,000

Next, the total Cafeteria Department costs of $324,000 ($169,000 + $155,000) are allocated to the Cutting and Assembly departments as follows:

	Cafeteria Department Costs		Usage Percent		Allocated Cost
Cutting Department	$324,000	×	75%	=	$243,000
Assembly Department	324,000	×	25	=	81,000
Totals			100%		$324,000

The support department cost allocations using the sequential method for Decker Tables are summarized in Exhibit 7.

Exhibit 7
Summary of Support Department Cost Allocations Using the Sequential Method

	Support Departments		Production Departments	
	Janitorial	Cafeteria	Cutting	Assembly
Square feet	50	5,000	1,000	4,000
Number of employees	10	3	30	10
Department cost	$ 310,000	$ 169,000	$1,504,000	$680,000
Janitorial cost allocation	(310,000)	155,000	31,000	124,000
Cafeteria cost allocation	0	(324,000)	243,000	81,000
Final department costs	$ 0	$ 0	$1,778,000	$885,000

As shown in Exhibit 7, after the support department costs have been allocated, the support departments have no costs remaining. Since all costs have been allocated to the production departments, management can apply the production department costs to products.

Check Up Corner 5-2 Sequential Method of Support Department Cost Allocation

Jupiter Enterprises LLC has two support departments and two production departments. Support Department 1 has $500,000 in costs distributed to it. Costs from Support Department 1 will be allocated to other departments based on machine hours. Support Department 2 has $250,000 in costs distributed to it. Costs from Support Department 2 will be allocated to other departments based on square feet. Production Departments 1 and 2 have $1,000,000 and $1,200,000 in costs distributed to them, respectively. Costs are allocated using the sequential method, allocating Support Department 1 costs first.

Departmental usage of cost drivers is summarized as follows:

	Support Department 1	Support Department 2	Production Department 1	Production Department 2
Machines hours	200	1,000	10,000	14,000
Square feet	800	650	1,000	4,000
Department cost	$500,000	$250,000	$1,000,000	$1,200,000

a. How much of Support Department 1's costs will be allocated to Support Department 2?
b. How much of Support Department 1's costs will be allocated to Production Department 1?
c. How much of Support Department 1's costs will be allocated to Production Department 2?
d. How much of Support Department 2's costs will be allocated to Production Department 1?
e. How much of Support Department 2's costs will be allocated to Production Department 2?

(Continued)

Solution:

a. Support Department 2 uses 4% of Support Department 1's machine hours, computed as follows:

$$\frac{1{,}000}{1{,}000 + 10{,}000 + 14{,}000} = 4\%$$

Costs are allocated from Support Department 1 to Support Department 2 by multiplying the $500,000 Support Department 1 costs by Support Department 2's proportional usage of Support Department 1's machine hours. Thus, allocated costs are $500,000 × 4% = $20,000.

b. Production Department 1 uses 40% of Support Department 1's machine hours, computed as follows:

$$\frac{10{,}000}{1{,}000 + 10{,}000 + 14{,}000} = 40\%$$

Costs are allocated from Support Department 1 to Production Department 1 by multiplying the $500,000 Support Department 1 costs by Production Department 1's proportional usage of Support Department 1's machine hours. Thus, allocated costs are $500,000 × 40% = $200,000.

c. Production Department 2 uses 56% of Support Department 1's machine hours, computed as follows:

$$\frac{14{,}000}{1{,}000 + 10{,}000 + 14{,}000} = 56\%$$

Costs are allocated from Support Department 1 to Production Department 2 by multiplying the $500,000 Support Department 1 costs by Production Department 2's proportional usage of Support Department 1's machine hours. Thus, allocated costs are $500,000 × 56% = $280,000.

d. Production Department 1 uses 20% of Support Department 2's driver (square feet), computed as follows:

$$\frac{1{,}000}{1{,}000 + 4{,}000} = 20\%$$

Costs to be allocated from Support Department 2 equal $270,000, determined by adding the costs originally distributed to Support Department 2 ($250,000) to the costs allocated to Support Department 2 from Support Department 1 ($20,000) in part a.

Costs are allocated from Support Department 2 to Production Department 1 by multiplying the $270,000 Support Department 2 costs by Production Department 1's proportional usage of Support Department 2's driver (square feet). Thus, allocated costs are $270,000 × 20% = $54,000.

e. Production Department 2 uses 80% of Support Department 2's driver (square feet), computed as follows:

$$\frac{4{,}000}{1{,}000 + 4{,}000} = 80\%$$

Costs are allocated from Support Department 2 to Production Department 2 by multiplying the $270,000 Support Department 2 costs by Production Department 2's proportional usage of Support Department 2's driver (square feet). Thus, allocated costs are $270,000 × 80% = $216,000.

Check Up Corner

Link to BYU

Brigham Young University has four main campuses: BYU Provo, BYU Idaho, BYU Hawaii, and BYU Jerusalem, plus two electronic campuses: BYU Pathway Worldwide and BYU Independent Study. Adding to the complexity of cost management at BYU is the interaction of these six closely related organizations.

The Reciprocal Services Method

The sequential method considers *some* inter-support-department services. In contrast, the **reciprocal services method** considers *all* inter-support-department services, and thus is the most accurate of the three support department allocation methods. However, the reciprocal method is the most difficult to implement, especially when a large number of departments is involved.

To illustrate, assume that **Decker Tables, Inc.**, uses the reciprocal method to allocate support department costs. Using the prior data for Decker Tables, the reciprocal method uses the six-step process shown in Exhibit 5.

Steps 1–3. Steps 1–3 of the reciprocal method are the same as for the direct and sequential methods, which generated the following data:

	Janitorial	Cafeteria	Cutting	Assembly
Square feet	50	5,000	1,000	4,000
Number of employees	10	3	30	10
Department cost	$310,000	$169,000	$1,504,000	$680,000

Support departments never allocate their own costs to themselves. To do so would defeat the purpose of support department cost allocation, which is to allocate all overhead costs to the production departments. Accordingly, the two cells shaded in the preceding table are not needed. These drivers represent services the support departments used within their departments. For example, even though the Janitorial Department cleans its own space, no costs are allocated to it for doing so. Likewise, even though the Cafeteria Department employees use the cafeteria, no costs are allocated to it for their use.

Step 4. In Step 4, the proportional usage of each support department's cost driver by the other departments *to which its costs are to be allocated* is determined. For Decker Tables, the proportional usage of the Janitorial and Cafeteria departments by the other departments is as follows:

Janitorial Department Usage

Department	Square Feet	Usage Percent
Cafeteria	5,000	50%
Cutting	1,000	10
Assembly	4,000	40
Totals	10,000	100%

Cafeteria Department Usage

Department	Number of Employees	Usage Percent
Janitorial	10	20%
Cutting	30	60
Assembly	10	20
Totals	50	100%

The proportional usages of Janitorial services are the same as those indicated with the sequential method. However, the proportional usages of Cafeteria services are different, because the cost of Cafeteria services rendered to the Janitorial Department are also allocated under the reciprocal method.

Step 5. In Step 5, support department costs are allocated simultaneously among the departments. This is done by using multiple algebraic equations with variables for unknown quantities.

To illustrate, costs are allocated from Janitorial to Cafeteria, Cutting, and Assembly by multiplying the total Janitorial costs by the proportional usage of the other departments. The total Janitorial costs, however, include an unknown amount for costs related to its employees' use of the cafeteria. Thus, the total of the Janitorial costs is expressed by the unknown, J.

Costs are allocated from Cafeteria to Janitorial, Cutting, and Assembly by multiplying the total Cafeteria costs by the proportional usage of the other departments. But again, the total Cafeteria costs will include an unknown amount for costs related to the Cafeteria Department's use of the Janitorial Department's services. Thus, the total of the Cafeteria costs is expressed by the unknown, C.

The total costs of the Janitorial Department will include 20% of the Cafeteria Department's costs, which is the percent usage of the cafeteria by the Janitorial Department. Since C represents the total Cafeteria Department costs, the total Janitorial costs can be expressed by the following equation:

$$J = \$310{,}000 + (0.20 \times C)$$

The total costs of the Cafeteria Department will include 50% of the Janitorial Department's costs, which is the percent usage of Janitorial services by the Cafeteria Department. Since C represents the total Cafeteria Department costs, the total Cafeteria costs can be expressed by the following equation:

$$C = \$169{,}000 + (0.50 \times J)$$

The preceding yields two equations with two unknowns, as follows:

Equation 1: $J = \$310{,}000 + (0.20 \times C)$

Equation 2: $C = \$169{,}000 + (0.50 \times J)$

Equation 2 can be rewritten in terms of J, as follows:

$$C = \$169{,}000 + (0.50 \times J)$$
$$C - \$169{,}000 = 0.50 \times J$$
$$\frac{C - \$169{,}000}{0.50} = J$$

The J in Equation 1 can then be replaced by $\frac{C - \$169{,}000}{0.50}$, resulting in the following equation:

Equation 3: $\frac{C - \$169{,}000}{0.50} = \$310{,}000 + (0.20 \times C)$

Solving Equation 3 for C yields the following:

$$\frac{C - \$169{,}000}{0.50} = \$310{,}000 + (0.20 \times C)$$
$$C - \$169{,}000 = (0.50 \times \$310{,}000) + (0.50 \times 0.20 \times C)$$
$$C = \$169{,}000 + (0.50 \times \$310{,}000) + (0.50 \times 0.20 \times C)$$
$$C = \$169{,}000 + \$155{,}000 + (0.10 \times C)$$
$$C - (0.10 \times C) = \$169{,}000 + \$155{,}000$$
$$0.90 \times C = \$324{,}000$$
$$C = \frac{\$324{,}000}{0.90}$$
$$C = \$360{,}000$$

Now that C is known, it can be plugged into Equation 1 to find J, as follows:

$$J = \$310{,}000 + (0.20 \times C)$$
$$= \$310{,}000 + (0.20 \times \$360{,}000)$$
$$= \$310{,}000 + \$72{,}000$$
$$= \$382{,}000$$

Since the total Janitorial Department cost of $382,000 has been determined, it can be allocated to Cafeteria, Cutting, and Assembly by multiplying it by the percentage usages, as follows:

	Janitorial Department Costs		Usage Percent		Allocated Cost
Cafeteria Department	$382,000	×	50%	=	$191,000
Cutting Department	382,000	×	10	=	38,200
Assembly Department	382,000	×	40	=	152,800
Totals			100%		$382,000

Since the total Cafeteria Department cost of $360,000 has been determined, it can be allocated to Janitorial, Cutting, and Assembly by multiplying it by the percentage usages, as follows:

	Cafeteria Department Costs		Usage Percent		Allocated Cost
Janitorial Department	$360,000	×	20%	=	$ 72,000
Cutting Department	360,000	×	60	=	216,000
Assembly Department	360,000	×	20	=	72,000
Totals			100%		$360,000

The support department cost allocations using the reciprocal services method for Decker Tables are summarized in Exhibit 8.

Exhibit 8
Summary of Support Department Cost Allocations Using the Reciprocal Services Method

	Support Departments		Production Departments	
	Janitorial	Cafeteria	Cutting	Assembly
Square feet	50	5,000	1,000	4,000
Number of employees	10	3	30	10
Department cost	$ 310,000	$ 169,000	$1,504,000	$680,000
Janitorial cost allocation	(382,000)	191,000	38,200	152,800
Cafeteria cost allocation	72,000	(360,000)	216,000	72,000
Final department costs	$ 0	$ 0	$1,758,200	$904,800

As shown in Exhibit 8, after the support department costs have been allocated, the support departments have no costs remaining. Since all costs have been allocated to the production departments, management can apply the production department costs to products.

Check Up Corner 5-3 Reciprocal Services Method of Support Department Cost Allocation

Maeser Productions, a film production company, allocates support activity costs to production activities using the reciprocal services method. Specifically, the costs from two support activities, security and meals, are allocated to the production activities of filming and makeup. Costs distributed to each department are provided in the following table, as are driver levels for each of the two support activities. Note that the security costs will be allocated based on asset value, and meal costs will be allocated based on headcount.

	Security	Meals	Filming	Makeup
Asset value	$8,000	$100,000	$850,000	$50,000
Headcount	10	5	25	15
Department cost	$250,000	$465,000	$750,000	$67,000

(Continued)

a. What is the total cost to be allocated from Meals to the other three departments after all support department cost allocations are made?
b. What is the total cost to be allocated from Security to the other three departments after all support department cost allocations are made?

Solution:

a. Let X = the total cost to be allocated from Security, and let Y = the total cost to be allocated from Meals.

The total costs of the Security Department will include 10 ÷ (10 + 25 + 15) = 20% of the meals costs.

The total costs of the Meals Department will include $100,000 ÷ ($100,000 + $850,000 + $50,000) = 10% of the security costs.

Thus,

Equation 1: $X = \$250,000 + (0.20 \times Y)$

Equation 2: $Y = \$465,000 + (0.10 \times X)$

Equation 2 can be rewritten in terms of X, as follows:

$$Y = \$465,000 + (0.10 \times X)$$
$$Y - \$465,000 = 0.10 \times X$$
$$\frac{Y - \$465,000}{0.10} = X$$

Next, replace the X in Equation 1 with $\frac{Y - \$465,000}{0.10}$, since this value equals X.

The resulting equation is: $\frac{Y - \$465,000}{0.10} = \$250,000 + (0.20 \times Y)$

Solving this equation for Y yields the following:

$$\frac{Y - \$465,000}{0.10} = \$250,000 + (0.20 \times Y)$$
$$Y - \$465,000 = (0.10 \times \$250,000) + [(0.10 \times 0.20) \times Y]$$
$$= \$465,000 + (0.10 \times \$250,000) + [(0.10 \times 0.20) \times Y]$$
$$Y = \$465,000 + \$25,000 + (0.02 \times Y)$$
$$Y - (0.02 \times Y) = \$465,000 + \$25,000$$
$$0.98 \times Y = \$490,000$$
$$Y = \frac{\$490,000}{0.98}$$
$$Y = \underline{\underline{\$500,000}}$$

b. Now that Y is known, it can be plugged into Equation 1 to find X, as follows:

$$X = \$250,000 + (0.20 \times Y)$$
$$= \$250,000 + (0.20 \times \$500,000)$$
$$= \$250,000 + \$100,000$$
$$= \underline{\underline{\$350,000}}$$

Check Up Corner

Pathways Challenge



This is Accounting!

Economic Activity

The direct method of support department cost allocation was the norm until the mid-1970s when the Cost Accounting Standards Board (CASB) issued Cost Accounting Standard (CAS) 418, which prescribed usage of the reciprocal services method. In response to this requirement, many companies complained that they lacked the expertise and computational resources to implement this more complex method. Thus, the final version of CAS 418 allowed usage of "the sequential method, or another method the results of which approximate that achieved by [the reciprocal services or sequential methods]."

Critical Thinking/Judgment

Was the CASB wise to back down from its initial requirement that companies use the most accurate method for support department cost allocation?
The initial complaint was that companies lacked the expertise and resources to use the reciprocal method. If a company has both the technical expertise and computational resources to use the more accurate (reciprocal services) method, should it do so?

Suggested answer at end of chapter.

Source: David Christensen, CMA, and Paul Schneider, "Allocating Service Department Costs with Excel," *Strategic Finance*, May 1, 2017.

Comparison of Support Department Cost Allocation Methods

The total costs allocated to the Cutting and Assembly departments are different depending on which of the three support department allocation methods is used, as shown in Exhibit 9 for **Decker Tables, Inc.**

	Support Department Allocation Method		
	Direct	Sequential	Reciprocal
Cutting Department	$1,692,750	$1,778,000	$1,758,200
Assembly Department	970,250	885,000	904,800
Total costs	$2,663,000	$2,663,000	$2,663,000

Exhibit 9
Comparison of Direct, Sequential, and Reciprocal Services Methods

The reciprocal method yields the most accurate allocations of $1,758,200 for the Cutting Department and $904,800 for the Assembly Department. The direct method's allocations of $1,692,750 for the Cutting Department and $970,250 for the Assembly Department do not consider inter-support-department services, but are much easier to compute. The sequential method's allocations can be viewed as a compromise on accuracy and difficulty, because it considers some, though not all, inter-support-department services, and is easier to compute than the reciprocal services method.

Why It Matters CONCEPT CLIP

Reciprocal Service Method at Emory University

The larger the company, the more likely the company is to use a more precise cost allocation method like the reciprocal services method. This is because the larger the company, the more likely it is that cost allocation methods will yield significantly different results. Thus, the cost of utilizing a more accurate cost allocation method is justified.

Emory University used the reciprocal services method when allocating inter-support-department service costs to schools within the university. After careful analysis, university leaders decided to simplify the allocation process by using the direct method. The direct method yielded costs similar to the reciprocal method and was easier to communicate to support departments and schools.

Emory University also focused on identifying unique cost drivers for allocating costs rather than using department-wide cost drivers. For example, Wi-Fi networking costs (part of the Libraries and Information Technology Department) could be allocated based on the number of square feet a school occupies, while telephone costs could be allocated based on the number of phones in use in the school.

Objective 4
Describe joint products and joint costs.

Joint Costs

When a single manufacturing process generates multiple outputs, it is called a **joint manufacturing process**. The costs incurred in a joint manufacturing process are called **joint costs**. The outputs generated from the joint manufacturing process are called **joint products**. The cost of joint products must be estimated for a variety of decisions, including determining selling prices.

Joint costs are inseparable before the split-off point. The **split-off point** is that point in the production process where the joint products become separable. For example, the costs of drilling, pumping, and delivering crude oil to a refinery are *joint costs* incurred in the *joint production process* to manufacture the *joint products* of gasoline and kerosene. Before the split-off point, the costs are not traced to either gasoline or kerosene because the costs are needed for both products. However, once the crude oil is distilled, the outputs of gasoline and kerosene reach a *split-off point* and are now separable. Any new costs incurred to purify the two products can be traced to one product or the other.

Companies producing joint products often allocate joint product costs to individual products to better estimate the total cost of each product. Because joint costs are by definition inseparable, managers must be careful when analyzing and interpreting product costs that include joint costs. Methods for allocating joint costs are described and illustrated next.

Objective 5
Allocate joint costs using the physical units, weighted average, market value at split-off, and net realizable value methods.

Joint Cost Allocation

The four common methods for allocating joint costs are as follows:

- Physical units method
- Weighted average method
- Market value at split-off method
- Net realizable value method

Because each of these methods allocates costs that are, by definition, inseparable, none of the methods will consistently allocate joint costs more accurately than another. However, depending on the production process, one method may be more appropriate than another.

Link to BYU

The "product" of a university can be viewed in many ways. Most faculty at **Brigham Young University**, like faculty at most colleges and universities, consider their product to be their students.

The Physical Units Method

The **physical units method** allocates joint costs using a physical measure of the products at the split-off point, such as pounds, gallons, or inches. To illustrate, assume that **Davis Pharmaceuticals** manufactures three luxury beauty products: a skin care cream, a shampoo, and liquid hand soap. The cream, shampoo, and soap go through a joint production process where mud from the Dead Sea in Israel is refined and combined with other chemicals to form the basis of all three products.

The joint costs per batch of mud are as follows:

Direct materials	$ 17,750
Direct labor	2,300
Overhead	213,790
Total costs	$233,840

Assume that at the split-off point, there are the following quantities of products:

Skin cream	200 lbs.
Shampoo	150
Soap	150
Total	500 lbs.

Using the physical units method, the total joint costs of $233,840 are allocated using the pounds of products at the split-off point. For example, the skin cream is allocated $93,536 [$233,840 × (200 lbs. ÷ 500 lbs.)]. The joint cost allocations for each product are as follows:

Product	Split-Off Quantity	Percent at Split-Off		Joint Cost		Joint Cost Allocation
Skin cream	200 lbs.	40%	×	$233,840	=	$ 93,536
Shampoo	150	30	×	233,840	=	70,152
Soap	150	30	×	233,840	=	70,152
Totals	500 lbs.	100%				$233,840

The Weighted Average Method

The **weighted average method** allocates joint costs based on **weight factors** for each product. The weight factors are multiplied by physical units to arrive at weighted physical units. These weighted physical units are then used to allocate the joint costs to the products. The weight factors can be based on a variety of factors, such as the type of labor needed for each product, the difficulty of producing each product, and the estimated wear and tear on machines caused by each product.

To illustrate, assume that **Davis Pharmaceuticals** allocates joint costs based on the mixing times of each product. The mixing speed for shampoo is three times that of cream and soap. Thus, management applies a weighting factor of 3 to shampoo and a weighting factor of 1 to skin cream and soap. The weighted pounds for shampoo is 450 lbs. (150 lbs. × 3), the weighted pounds for skin cream is 200 lbs. (200 lbs. × 1), and the weighted pounds for soap is 150 lbs. (150 lbs. × 1).

Using the weighted average method, the skin cream is allocated $58,460 [$233,840 × (200 lbs. ÷ 800 lbs.)] of joint costs. The joint cost allocations for all three products are as follows:

Product	Split-Off Quantity	Mixing Time Weight Factor	Weighted Pounds of Mixing Time	Weighted Percent of Mixing Time		Joint Cost		Joint Cost Allocation
Skin cream	200 lbs.	1	200 lbs.	25.00%	×	$233,840	=	$ 58,460
Shampoo	150	3	450	56.25	×	233,840	=	131,535
Soap	150	1	150	18.75	×	233,840	=	43,845
Totals	500 lbs.	5	800 lbs.	100.00%				$233,840

The Market Value at Split-Off Method

The **market value at split-off method** allocates joint costs using each product's total market value at the split-off point. Products that have a higher market value are allocated more joint costs.

To use the market value at split-off method, an estimate of the market value at split-off must be available. If a product is sold at the split-off point, its actual sales price is used. Since most products are processed further after the split-off point, estimating market value may be difficult.

Why It Matters

Joint Cost Allocation at Operation Underground Railroad

Joint cost allocation is also important for not-for-profit (NFP) service organizations. For example, donors and government agencies often monitor costs incurred by NFP programs relative to their administrative and fundraising costs. Some costs of events and materials, however, are necessary for administration and fundraising as well as for programs and thus are joint costs.

To illustrate, **Operation Underground Railroad** is a NFP that fights child trafficking worldwide. Operation Underground Railroad reports that 59% of its funding is used for activities directly related to rescue missions targeting child trafficking, 11% is used for training of local authorities, 8% is used for marketing, and 22% is used for legal fees, salaries, office costs, and so on. However, some rescue mission activities also provide materials used for marketing so they are joint costs. For example, in 2016, Operation Underground Railroad released a feature film, *The Abolitionists*, showing actual rescue activities. The costs incurred in producing the film not only included the direct costs of editing the film but also the joint costs of the rescue missions themselves.

To illustrate, assume that Davis Pharmaceuticals can sell skin care cream and shampoo at the split-off point. However, soap must be processed further before being sold. Skin care cream sells for $540 per pound and shampoo sells for $480 per pound at the split-off point. Although soap requires additional processing to be sold, management estimates a market value of $400 per pound for soap at the split-off point. Thus, the total market value of the three products at the split-off point is as follows:

Skin cream ($540 × 200 lbs.)	$108,000
Shampoo ($480 × 150 lbs.)	72,000
Soap ($400 × 150 lbs.)	60,000
Total market value	$240,000

Using the market value at split-off method, the joint cost allocations for all three products are as follows:

Product	Split-Off Quantity		Estimated Selling Price per lb. at Split-Off		Total Market Value at Split-Off	Pecent of Total Maket Value at Split-Off		Joint Cost		Joint Cost Allocation
Skin cream	200 lbs.	×	$ 540	=	$108,000	45%	×	$233,840	=	$105,228
Shampoo	150	×	480	=	72,000	30	×	233,840	=	70,152
Soap	150	×	400	=	60,000	25	×	233,840	=	58,460
Totals	500 lbs.		$1,420		$240,000	100%				$233,840

The Net Realizable Value Method

The net realizable value method allocates joint costs using each product's estimated net realizable value after it is fully processed. Products that have a higher net realizable value are allocated more joint costs.

Some products can be sold at the split-off point *or* be processed further and sold for a higher price. **Net realizable value** is the estimated selling price of a product less any costs necessary to further process the product beyond the split-off point. For products processed beyond the split-off point, net realizable value is computed as follows:

Net Realizable Value = (Final Selling Price × Quantity) – Additional Processing Costs

For products not processed beyond the split-off point, the net realizable value is computed as follows:

Net Realizable Value = Selling Price at Split-Off × Quantity

To illustrate, assume the following for **Davis Pharmaceuticals**' three products:

	Selling Price at Split-Off Point	Additional Processing Costs	Selling Price After Further Processing
Skin cream	$540	$2,000 per batch	$730
Shampoo	480	$4,000 per batch	425
Soap	None	$6,000 per batch	520

Given the preceding data, Davis Pharmaceuticals must decide which products to process further and which to sell at split-off. The net realizable values of the products sold at the split-off point and after additional processing are shown in Exhibit 10.

For skin cream and soap, the net realizable values from additional processing are higher than when selling the products at the split-off point. Thus, Davis Pharmaceuticals decides to process skin cream and soap further. The net realizable value for shampoo, however, is higher at the split-off point without further processing. As a result, Davis Pharmaceuticals decides not to process shampoo further.

Product	Quantity		Selling Price		Total Sales		Additonal Processing Costs		Net Realizable Value
Skin cream at split-off	200 lbs.	×	$540	=	$108,000	–	$ 0	=	$108,000
Skin cream processed further	200	×	730	=	146,000	–	2,000	=	144,000
Shampoo at split-off	150	×	480	=	72,000	–	0	=	72,000
Shampoo processed further	150	×	425	=	63,750	–	4,000	=	59,750
Soap at split-off	150	×	0	=	0	–	0	=	0
Soap processed further	150	×	520	=	78,000	–	6,000	=	72,000

Exhibit 10
Net Realizable Values at Split-Off and After Further Processing

Given the preceding decisions on further processing, the percentages of total net realizable value of the three products are as follows:

Product	Net Realizable Value	Pecent of Total Net Realizable Value
Skin cream	$144,000	50%
Shampoo	72,000	25
Soap	72,000	25
Totals	$288,000	100%

Using the net realizable value method, the joint costs of $233,840 are allocated as follows:

Product	Pecent of Total Net Realizable Value		Joint Cost		Joint Cost Allocation
Skin cream	50%	×	$233,840	=	$116,920
Shampoo	25	×	233,840	=	58,460
Soap	25	×	233,840	=	58,460
Totals	100%				$233,840

Comparison of Joint Cost Allocation Methods

The joint cost allocations for skin cream, shampoo, and soap are different depending on which of the four joint cost allocation methods is used, as shown in Exhibit 11.

	Joint Cost Allocation Method			
Product	Physical Units	Weighted Average	Market Value at Split-Off	Net Realizable Value
Skin cream	$ 93,536	$ 58,460	$105,228	$116,920
Shampoo	70,152	131,535	70,152	58,460
Soap	70,152	43,845	58,460	58,460
Totals	$233,840	$233,840	$233,840	$233,840

Exhibit 11
Comparison of Joint Cost Allocations with Physical Units, Weighted Average, Market Value at Split-Off, and Net Realizable Values at Split-Off Methods

None of the four methods is more accurate than any other method because they all allocate costs that are, by definition, inseparable. Thus, a subjective determination must be made as to the most appropriate method to use. The physical units method is the easiest to use and allocates more costs to skin cream than to shampoo and soap because more pounds of skin cream were produced in the joint process. The weighted average method allocates significantly more costs to shampoo because it takes into consideration the fact that shampoo requires a considerably higher mixing speed than the other two products. The market value at split-off and the net realizable value methods allocate the highest costs to skin cream due to the high value of this product at split-off and after full processing. Under the market value at split-off method, shampoo receives the next

highest allocation of costs, followed by soap. However, under the net realizable value method, soap receives the same allocation as shampoo. This reversal reflects the fact that soap has a lower market value than shampoo at split-off, but the same market value as shampoo when it is fully processed.

If management wants joint cost allocations to reflect the difficulty with which products are made, the weighted average method is most appropriate. But if management wants joint cost allocations to reflect the final market value of products, the net realizable value method is ideal. In this case, more joint costs would be allocated to the products that are better able to cover those costs.

Check Up Corner 5-4 Joint Cost Allocation

Guybrush Enterprises produces two types of particle board: high and low density. Both types of wood go through a joint production process where wood chips are milled and mixed with resin, wax, water, and glue. The joint process costs a total of $150 per batch. After the split-off point, high-density wood goes through an additional compression process, whereas low-density wood is immediately sold for $2 per square foot. One batch produces 200 square feet of low-density wood and 120 square feet of high-density wood. The additional processing of the high-density wood costs $135 per batch, and the high-density wood is then sold for $3 per square foot.

a. Determine the joint production cost to be allocated to the low- and high-density wood using the physical units method.

b. Determine the joint production cost to be allocated to the low- and high-density wood using the net realizable value method.

c. Which method provides more accurate costing of the low- and high-density wood?

Solution:

a. The total joint costs of $150 are allocated to each of the two types of wood proportionally, based on the feet of wood produced in the joint production process. Because there are 320 feet of wood total (200 + 120), low density receives 62.5% (200 ÷ 320) of the $150 cost, or $94 (62.5% × $150). High density receives 37.5% (120 ÷ 320) of the $150 cost, or $56 (37.5% × $150). The joint cost allocations are summarized in the following table:

Joint Product	Square Feet	Proportion	Allocation
Low-density wood	200	62.5%	$ 94
High-density wood	120	37.5%	56
Totals	320		$150

b. Because high-density wood requires additional processing, the net realizable value for high-density wood will be computed as the total revenue for high-density wood minus the additional processing costs for high-density wood.

The net realizable value for the 200 feet of low-density wood that comes out of the joint production process is $400 (200 × $2), since there are no additional processing costs for low-density wood and low-density wood sells for $2 per square foot.

Because the 120 feet of high-density wood that comes out of the joint production process sells for $3 per foot but requires an additional $135 per batch to process, the net realizable value for high-density wood is $225 [(120 × $3) – $135].

Thus, the total net realizable value is $625 ($400 + $225). Low-density wood receives 64% ($400 ÷ $625) of the $150 cost, or $96 (64% × $150). High-density wood receives 36% ($225 ÷ $625) of the $150 cost, or $54 (36% × $150). The joint cost allocations are summarized in the following table:

Joint Product	Feet	Market Price	Market Value	Added Cost	Net Realizable Value	Proportion	Allocation
Low-density wood	200	$2	$400	$ 0	$400	64%	$ 96
High-density wood	120	3	360	135	225	36%	54
Totals	320				$625		$150

c. While the net realizable value method may be intuitively more satisfying because the product line that generates more revenue carries a greater share of the joint costs, neither method is more accurate. Joint costs are, by definition, inseparable, so any separation is based on inaccurate assumptions. However, allocating joint costs to joint products can still be useful for decision making, performance measurement, and external reporting.

Check Up Corner

Ethics: Do It!

Allocating joint costs is a subjective process that impacts product pricing, process evaluation, and employee compensation. In addition, joint cost allocations can also have legal and external reporting implications.

For example, in highly regulated industries, such as not-for-profits (NFP) and government contractors, appropriate joint cost allocations are essential. The AICPA and FASB have both issued guidance on appropriate methods for NFP and government contractor joint cost allocation.

For internal decision making, joint cost allocation choices may be made based upon management preferences. However, managers should be careful to understand and avoid biases in allocations. This is particularly important when individuals are affected differently by the joint cost allocation method chosen.

Source: Jospeh W. Cruitt, CPA, CGMA, "How NFPs Should Allocate Joint Costs," *Journal of Accountancy,* October 1, 2014.

By-Products

By-products are goods of low value that are produced from a joint production process. Because of their low value, it is not worth the effort to develop separate product costs for by-products. Instead, the revenues from by-products are often used to offset the cost of the joint production process. Alternatively, the sale of by-products is sometimes reported as other revenue on the income statement with no related cost of goods sold.

To illustrate, assume that an early step in the joint production of skin cream, shampoo, and soap for **Davis Pharmaceuticals** is the removal of small amounts of mercury from the mud. Rather than incur the costs of further processing the mercury or disposing of it in an environmentally safe manner, Davis Pharmaceuticals sells it to Knight Manufacturing. Each batch produces $320 worth of mercury by-product. Davis Pharmaceuticals subtracts the $320 of mercury revenues from the joint production overhead costs for each batch to arrive at the net overhead to be allocated to its three main product lines.

Analysis for Decision Making

Using Support Department and Joint Cost Allocations for Performance Evaluation

Objective 6
Describe and illustrate the use of support department and joint cost allocations to evaluate the performance of production managers.

Allocating support department costs and joint costs has important implications for product costing. Some product costs are easy to identify and trace directly to the products. For example, it is easy to identify and trace direct materials in a product that is *not* a joint product, or to identify and trace direct materials for a joint product after the split-off point. Other costs, like the wages paid to a janitor who sweeps the production floor or the costs of processing milk further into several different products, are more challenging.

Adding to the complexity and impact of these costing allocations is the fact that production employee performance is often evaluated based on product costs. For example, production manager bonuses may be tied to decreasing product costs. Production managers who keep costs down are more likely to keep their jobs and be promoted. Thus, cost allocations matter to production employees and managers.

To illustrate, consider the following performance report of three general managers (GMs) who oversee three separate chemical lines: Olifax (Jeff Williams), Drison (Jenn Tolley), and Jestel (McKenna Strongly). Each product line is assigned direct costs, support department (allocated) costs, and a portion of the joint product costs.

(Continued)

	Jeff Williams, GM of Olifax			Jenn Tolley, GM of Drison			McKenna Strongly, GM of Jestel		
	Actual	Target	Over (Under) Target	Actual	Target	Over (Under) Target	Actual	Target	Over (Under) Target
Direct materials	$ 943,250	$ 945,000	$ (1,750)	$150,500	$154,000	$ (3,500)	$ 63,000	$ 27,000	$36,000
Direct labor	180,900	178,700	2,200	85,700	86,000	(300)	120,350	122,000	(1,650)
Allocated support costs (based on square feet and number of employees)	672,250	525,000	147,250	42,400	40,000	2,400	81,000	75,000	6,000
Allocated joint costs (based on the net realizable value of chemical produced)	77,000	76,000	1,000	450,000	325,000	125,000	93,000	91,000	2,000
Total production costs	$1,873,400	$1,724,700	$148,700	$728,600	$605,000	$123,600	$357,350	$315,000	$42,350

All three GMs were over their cost targets. However, ranking the managers based on total costs, McKenna performed closest to her targets (over by $42,350), followed by Jenn (over by $123,600) and Jeff (over by $148,700). Thus, the company president may believe that McKenna is the strongest GM of the group. But closer examination reveals a more complex story.

McKenna missed her target primarily because her direct materials costs were too high. This could be because of wasted materials in the production process or some other cause.

Jeff missed his performance target primarily because of a higher-than-expected allocation of support costs. This could be due to overuse of support activities. But since these costs are allocated based on square feet and number of employees, Jeff may not be responsible for the higher costs. For example, Jeff may not be able to control the square footage of his production facility or the number of employees that are assigned to him.

Jenn missed her performance target primarily because of the allocation of joint product costs. These costs are allocated based on the net realizable value of the chemical produced, Drison. Drison generates significantly higher margins than the other two lines. As a result, Jenn's product line received a much higher allocation of joint costs. Jenn, however, has no oversight over the joint production process and is not responsible for the higher costs. Her product line is assigned higher joint costs simply because Drison makes more money for the company.

The preceding analysis suggests that more information is needed to properly evaluate the three GMs. Preliminary analysis indicates McKenna is the top performer because she is closest to target, followed by Jeff and then Jenn. However, it is likely that this ordering may switch to Jenn, Jeff, and McKenna after further investigation and analysis.

Make a Decision

Using Support Department and Joint Cost Allocations for Performance Evaluation

Analyze Milkrageous, Inc. (MAD 5-1)

Analyze Horsepower Hookup, Inc. (MAD 5-2)

Analyze Joyous Julius, Inc. (MAD 5-3)

Analyze William's Ball & Jersey Shop (MAD 5-4)

Make a Decision

Let's Review

Chapter Summary

1. Support departments are not directly involved in the production process, but provide services necessary for making products. All of the direct costs of a support department are traced to the department, and indirect general factory overhead is distributed to the support department. Both direct and indirect support department costs are considered indirect costs (manufacturing overhead) of production, and these costs are subsequently allocated to the production departments.
2. Support department costs are applied directly to products using a single plantwide rate, or are allocated to production departments using multiple production department rates or activity-based costing. Allocation using a single plantwide rate is relatively simple. Allocation using production department rates or activity-based costing is more complex but more accurate. These methods require distributing overhead costs to all departments (or activities), then allocating the support department costs to the production departments (or activities), and finally, applying costs to products.
3. The three commonly used methods for allocating support department costs to production departments, or support activity costs to production activities, are the direct method, the sequential method, and the reciprocal services method. The direct method moves support costs directly to production departments (or activities) without recognizing any inter-support-department service costs. The sequential method takes into account some, but not all, inter-support-department service costs. The reciprocal services method accounts for all inter-support-department service costs.
4. When a single manufacturing process generates multiple outputs, these outputs are called joint products. The costs incurred in the manufacturing process are called joint costs. The costs of joint products are estimated for a variety of decisions, including for determining selling prices. Once products reach the split-off point in the manufacturing process, new costs incurred in manufacturing are no longer considered joint costs.
5. The four methods for allocating joint costs are physical units, weighted average, market value at split-off, and net realizable value. Because each of these methods allocates costs that are inseparable, none of the methods can provide a perfect representation of the *true* cost of an individual joint product. By-products are goods of low value that are produced from a joint production process.
6. The allocation of support department costs and joint costs has important implications for performance evaluation. For some companies, compensation and promotions are determined in part by employees' ability to decrease costs.

Key Terms

by-products (227)
direct method (211)
joint costs (222)
joint manufacturing process (222)
joint products (222)
market value at split-off method (223)
multiple production department rates (208)
net realizable value (224)
physical units method (222)
reciprocal services method (217)
sequential method (213)
service departments (206)
single plantwide overhead rate (208)
split-off point (222)
step-down method (213)
support activity costs (209)
support department (206)
support department cost allocation (206)
weight factors (223)
weighted average method (223)

Practice

Multiple-Choice Questions

1. Which of the following is the most accurate method of support department cost allocation?
   a. The direct method
   b. The indirect method
   c. The sequential method
   d. The reciprocal services method

2. Which of the following is ***not*** true of the sequential method of support department cost allocation?
   a. The sequential method is more complex than the direct method.
   b. The sequence used for allocating support department costs in the sequential method does not matter.
   c. The sequential method is usually easier to use than the reciprocal services method.
   d. Costs are never allocated back to a department from which they have already been allocated when using the sequential method.

3. Three products result from a joint production process. There are 50 units of product B158, 100 units of product B159, and 50 units of product B160. Using the physical units method, what percent of the joint costs will be allocated to product B159?
   a. 50%
   b. 25%
   c. 75%
   d. 33%

4. Based on the following table, and using the direct method, what percent of Support Department 2 costs will be allocated to Production Department 2?

	Support Department 1	Support Department 2	Production Department 1	Production Department 2
Support Department 1 cost driver	800	2,000	3,000	5,000
Support Department 2 cost driver	48	2	90	10

   a. 38%
   b. 62%
   c. 90%
   d. 10%

5. Based on the data presented in Question 4, and using the sequential method, what percent of Support Department 2 costs will be allocated to Production Department 2 (assume Support Department 1 costs are allocated first)?
   a. 38%
   b. 62%
   c. 90%
   d. 10%

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Support department cost allocation—direct method — Obj. 3

Blizzle, Inc., produces three kinds of ice cream: cookies n' cream, mint brownie, and strawberry. The ice cream is produced in the Mixing and Freezing departments. The production of ice cream is supported by the Janitorial and Maintenance departments. Janitorial Department costs are allocated to the production departments based on square feet. Maintenance Department costs are allocated based on machine hours. Department information is summarized in the following table:

	Janitorial Department	Maintenance Department	Mixing Department	Freezing Department
Square feet	500	1,000	3,000	7,000
Machine hours	100	200	1,900	1,900
Department cost	$7,000	$5,400	$21,000	$16,300

Using the direct method, allocate all support department costs to the production departments to determine the total cost of the Mixing Department and the total cost of the Freezing Department.

2. Support department cost allocation—sequential method — Obj. 3

Sharon's Bakery produces three kinds of homemade bread: whole wheat, honey quinoa, and sourdough. The bread is produced in the Mixing and Baking departments. Other indirect or supportive costs of production include Janitorial and Maintenance services. Janitorial and Maintenance costs are allocated to the Mixing and Baking departments based on square feet and machine hours,

respectively. Sharon has noted that the area where maintenance equipment is stored is about 1,000 square feet, and that the size of the Mixing and Baking departments is about 2,300 and 1,700 square feet, respectively. Sharon knows that the recorded machine hours for the Mixing and Baking departments combined was 5,000 hours, and that the Mixing Department ran machines about 200 hours more than the Baking Department. The total costs of each department were as follows:

Janitorial Department	$ 4,000
Maintenance Department	3,300
Mixing Department	17,700
Baking Department	14,000

Determine the total cost of each production department after allocating all support department costs using the sequential method.

---

3. Support department cost allocation—reciprocal services method **Obj. 3**

Jolly Roger Rafa, Inc., produces tennis racquets. The tennis racquets are produced in the Cutting and Assembly departments. The production of the tennis racquets is supported by the Janitorial and Cafeteria departments. Janitorial Department costs are allocated to the production departments based on square feet. The Cafeteria Department costs are allocated based on number of employees. Department information is summarized in the following table:

	Janitorial Department	Cafeteria Department	Cutting Department	Assembly Department
Square feet	200	500	1,000	1,000
Number of employees	10	5	30	60
Department cost	$3,030	$4,000	$25,000	$19,000

Using the reciprocal services method, find the total cost to be allocated from the Cafeteria Department to the other three departments after all support department cost allocations are made, and the total cost to be allocated from the Janitorial Department to the other three departments after all support department cost allocations are made.

---

4. Joint cost allocation—weighted average method **Obj. 5**

Calf Smile, Inc., produces milk, yogurt, and buttercream. The joint cost of producing these three products is $15,000. At split-off, the quantities of each product are 6,000 gallons of milk, 1,000 gallons of yogurt, and 4,000 gallons of buttercream. The company allocates joint costs based on the mixing speeds needed for each product. The mixing speed for yogurt is 3 times that of milk. The mixing speed of buttercream is 1.5 times that of milk. Determine the amount of the total joint cost to be allocated to each product using the weighted average method.

---

5. Joint cost allocation—market value at split-off method **Obj. 5**

Hal, Dal, & Stal Dairy Farmers, Inc., produces whole milk, 2% milk, and cream. The joint cost of producing these three products is $4,000. The split-off quantities of each product are 3,500 gallons of whole milk, 1,500 gallons of 2% milk, and 500 gallons of cream. The company can sell whole milk and cream at the split-off point, but 2% milk must be processed further before being sold. Whole milk and cream sell for $2.00 per gallon and $3.00 per gallon, respectively, at the split-off point. Although 2% milk requires further processing to be sold, management estimates a market value of $1.00 per gallon for 2% milk at the split-off point. Using the market value at split-off method, determine the amount of the total joint cost to be allocated to each product.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Buzzy Bee, Inc., produces three types of honey: pure, maple cinnamon, and peach almond. All three types of honey go through a joint production process that costs a total of $240 per batch. After the split-off point, both maple cinnamon and peach almond honey go through an additional flavoring production process, whereas pure honey is immediately sold for $3 per jar. One batch produces 100 jars of pure honey, 60 jars of maple cinnamon honey, and 40 jars of peach almond honey. The additional processing of the maple cinnamon honey costs $30 per batch after which it is sold for $3.75 per jar. The additional processing of the peach almond honey costs $40 per batch, after which it is sold for $4.25 per jar.

Instructions

1. Determine the joint production cost to be allocated to each type of honey using the physical units method.
2. Determine the joint production cost to be allocated to each type of honey using the net realizable value method.
3. Which of the two methods provides more accurate costing of the different types of honey?

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **d** The reciprocal services method is the most accurate support department cost allocation method. It is also the most difficult method.
2. **b** The sequence used in the sequential services method will impact the amounts allocated. That is not true of the direct or reciprocal services methods, where sequence is irrelevant.
3. **a** Using the physical units method, B159 will be allocated 50% of the joint production costs, computed as follows:

$$\frac{100}{50 + 100 + 50} = 50\%$$

4. **d** Using the direct method, 10% of Support Department 2 costs will be allocated to Production Department 2, computed as follows:

$$\frac{10}{90 + 10} = 10\%$$

5. **d** Using the sequential method, Support Department 1 costs are allocated first, and no costs from Support Department 2 are allocated back to Support Department 1. Thus, the calculation is the same as the direct method used in Question 4, and 10% of Support Department 2 costs will be allocated to Production Department 2, computed as follows:

$$\frac{10}{90 + 10} = 10\%$$

Exercises

1. Mixing Department:

3,000 ÷ (3,000 + 7,000) = 30% of Janitorial Department services
1,900 ÷ (1,900 + 1,900) = 50% of Maintenance Department services
Allocated Janitorial Department costs: $7,000 × 0.30 = $2,100
Allocated Maintenance Department costs: $5,400 × 0.50 = $2,700
Total costs: $2,100 + $2,700 + $21,000 = $25,800

Freezing Department:

7,000 ÷ (3,000 + 7,000) = 70% of Janitorial Department services
1,900 ÷ (1,900 + 1,900) = 50% of Maintenance Department services
Allocated Janitorial Department costs: $7,000 × 0.70 = $4,900
Allocated Maintenance Department costs: $5,400 × 0.50 = $2,700
Total costs: $4,900 + $2,700 + $16,300 = $23,900

2. First, allocate the Janitorial Department costs:

Janitorial Department Cost Allocation

Department	Square Feet	Usage Percent		Janitorial Costs		Allocated Janitorial Costs
Maintenance	1,000	20%	×	$4,000	=	$ 800
Mixing	2,300	46	×	4,000	=	1,840
Baking	1,700	34	×	4,000	=	1,360
Totals	5,000	100%				$4,000

Then, allocate the resulting total Maintenance Department costs ($3,300 + $800 = $4,100):

Note that total machine hours across Mixing and Baking equals 5,000, and Mixing used 200 more hours than Baking. Thus, if X = Baking hours, then X + 200 = Mixing hours, and X + (X + 200) = 5,000, or 2X + 200 = 5,000. Solve for X to find Baking hours = 2,400 and Mixing hours = 2,600.

Maintenance Department Cost Allocation

Department	Machine Hours	Usage Percent		Maintenance Costs		Allocated Maintenance Costs
Mixing	2,600	52%	×	$4,100	=	$2,132
Baking	2,400	48	×	4,100	=	1,968
Totals	5,000	100%				$4,100

Finally, total the Mixing and Baking department costs:

Mixing Department: $1,840 + $2,132 + $17,700 = $21,672

Baking Department: $1,360 + $1,968 + $14,000 = $17,328

3. Let X = the total cost to be allocated from the Janitorial Department, and let Y = the total cost to be allocated from the Cafeteria Department.

The total costs of the Janitorial Department will include 10 ÷ (10 + 30 + 60) = 10% of the Cafeteria Department's costs. The total costs of the Cafeteria Department will include 500 ÷ (500 + 1,000 + 1,000) = 20% of the Janitorial Department's costs.

Thus,

Equation 1: $X = \$3{,}030 + (0.1 \times Y)$

Equation 2: $Y = \$4{,}000 + (0.2 \times X)$

Equation 2 can be rewritten in terms of X, as follows:

$$Y = \$4{,}000 + (0.2 \times X)$$
$$Y - \$4{,}000 = 0.2 \times X$$
$$\frac{Y - \$4{,}000}{0.2} = X$$

Replace the X in Equation 1 with $\frac{Y - \$4{,}000}{0.2}$, since this value equals X.

The resulting equation is: $\frac{Y - \$4{,}000}{0.2} = \$3{,}030 + (0.1 \times Y)$

Solving this equation for Y yields the following:

$$\frac{Y - \$4{,}000}{0.2} = \$3{,}030 + (0.1 \times Y)$$
$$Y - \$4{,}000 = (0.2 \times \$3{,}030) + [(0.2 \times 0.1) \times Y]$$
$$= \$4{,}000 + (0.2 \times \$3{,}030) + [(0.2 \times 0.1) \times Y]$$
$$Y = \$4{,}000 + \$606 + (0.02 \times Y)$$
$$Y - (0.02 \times Y) = \$4{,}000 + \$606$$
$$0.98 \times Y = \$4{,}606$$
$$Y = \frac{\$4{,}606}{0.98}$$
$$Y = \$4{,}700$$

Now that Y is known, it can be plugged into Equation 1 to find X, as follows:

$$X = \$3{,}030 + (0.1 \times Y)$$
$$= \$3{,}030 + (0.1 \times \$4{,}700)$$
$$= \$3{,}030 + \$470$$
$$X = \$3{,}500$$

4.

Product	Split-Off Quantity (gallons)		Mixing Time Weight Factor		Weighted Gallons of Mixing Time	Weighted Percent of Mixing Time		Joint Cost		Joint Cost Allocation
Milk	6,000	×	1.0	=	6,000	40%	×	$15,000	=	$ 6,000
Yogurt	1,000	×	3.0	=	3,000	20	×	15,000	=	3,000
Buttercream	4,000	×	1.5	=	6,000	40	×	15,000	=	6,000
Totals	11,000				15,000	100%				$15,000

5.

Product	Split-Off Quantity (gallons)		Estimated Selling Price per Gallon at Split-Off		Total Market Value at Split-Off	Percent of Total Market Value at Split-Off		Joint Cost		Joint Cost Allocation
Whole milk	3,500	×	$2.00	=	$ 7,000	70%	×	$4,000	=	$2,800
2% milk	1,500	×	1.00	=	1,500	15	×	4,000	=	600
Cream	500	×	3.00	=	1,500	15	×	4,000	=	600
Totals	5,500				$10,000	100%				$4,000

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1. There are 200 jars of honey total (100 + 60 + 40). Pure honey receives 50% (100 ÷ 200) of the $240 cost, or $120 (50% × $240). Maple cinnamon honey receives 30% (60 ÷ 200) of the $240 cost, or $72 (30% × $240). Peach almond honey receives 20% (40 ÷ 200) of the $240 cost, or $48 (20% × $240). The joint cost allocations are summarized in the following table:

Joint Product	Jars	Proportion	Joint Costs	Allocation
Pure honey	100	50%	$240	$120
Maple cinnamon honey	60	30	240	72
Peach almond honey	40	20	240	48
Totals	200			$240

2. The net realizable value of the 100 jars of pure honey that come out of the joint production process is $300 (100 × $3), because there are no additional processing costs for pure honey and pure honey sells for $3 per jar.

   The 60 jars of maple cinnamon honey that come out of the joint production process sell for $3.75 per jar but require an additional $30 per batch to process, so the net realizable value of maple cinnamon honey is $195 [(60 × $3.75) − $30].

   The 40 jars of peach almond honey that come out of the joint production process sell for $4.25 per jar but require an additional $40 per batch to process, so the net realizable value of peach almond honey is $130 [(40 × $4.25) − $40].

   Thus, total net realizable value is $625 ($300 + $195 + $130). Pure honey receives 48% ($300 ÷ $625) of the $240 cost, or $115.20 (0.48 × $240). Maple cinnamon honey receives 31.2% ($195 ÷ $625) of the $240 cost, or $74.88 (0.312 × $240). Peach almond honey receives 20.8% ($130 ÷ $625) of the $240 cost, or $49.92 (0.208 × $240). The joint cost allocations are summarized in the following table:

Joint Product	Jars	Market Price	Market Value	Added Cost	Net Realizable Value	Proportion	Joint Costs	Allocation
Pure honey	100	$3.00	$300	$ 0	$300	48.0%	$240	$115.20
Maple cinnamon	60	3.75	225	30	195	31.2	240	74.88
Peach almond	40	4.25	170	40	130	20.8	240	49.92
Totals	200				$625			$240.00

3. Neither method is more accurate. Joint costs are, by definition, inseparable, so any separation is based on inaccurate assumptions. However, allocating joint costs to joint products can still be useful for decision making, performance measurement, and external reporting.

Discussion Questions

1. Why are support department costs difficult to apply to products?
2. Why does support department cost allocation matter to service businesses (such as colleges and universities)?
3. What are some drawbacks of applying support department costs using a single plantwide rate?
4. Why is the direct method of support department cost allocation less accurate than the sequential and reciprocal services methods?
5. How does management determine the order in which support department costs are allocated under the sequential method?
6. Are large or small companies more likely to use the reciprocal services method to allocate support department costs to production departments? Why?
7. What is the main difference between the physical units and weighted average methods of joint cost allocation?
8. When would management most likely use the net realizable value method of joint cost allocation?
9. What are the two most often used ways of accounting for revenue from by-products?
10. How can support department and joint cost allocation affect production employee performance evaluations?

Basic Exercises



BE 5-1 Support department cost allocation—direct method **Obj. 3**

Charlie's Wood Works produces wood products (e.g., cabinets, tables, picture frames, and so on). Production departments include Cutting and Assembly. The Janitorial and Security departments support the Cutting and Assembly departments. The Assembly Department spans about 46,400 square feet and holds assets valued at about $60,000. The Cutting Department spans about 33,600 square feet and holds assets valued at about $140,000. Charlie's Wood Works allocates support department costs using the direct method. If costs from the Janitorial Department are allocated based on square feet and costs from the Security Department are allocated based on asset value, determine (a) the percentage of Janitorial costs that should be allocated to the Assembly Department and (b) the percentage of Security costs that should be allocated to the Cutting Department.



BE 5-2 Support department cost allocation—sequential method **Obj. 3**

Bucknum Boys, Inc., produces hunting gear for buck hunting. The company's main production departments are Molding and Finishing. Production of the hunting gear cannot be accomplished without the supporting tasks of Materials Management and meals for production employees provided by the Cafeteria. Cafeteria costs are always higher than Materials Management costs. The company believes that the number of employees in each department is the best driver of Cafeteria costs. The number of employees in each department is as follows:

Molding Department	27
Finishing Department	30
Materials Management Department	3
Cafeteria Department	6

The company also believes that the value of support materials used in each department is the best driver for Materials Management costs. The support materials used in the Molding and Finishing departments are valued at $1,800 and $2,700, respectively. Using the sequential method for support department cost allocation (allocating Cafeteria costs first), determine (a) the percentage of Cafeteria costs that should be allocated to the Molding Department and (b) the percentage of Materials Management costs that should be allocated to the Finishing Department.



BE 5-3 Support department cost allocation—reciprocal services method **Obj. 3**

Brewster Toymakers Inc. produces toys for children. The toys are produced in the Molding and Assembly departments. The Janitorial and Security departments support the production of the toys. Costs from the Janitorial Department are allocated based on square feet. Costs from the Security

(Continued)

Department are allocated based on asset value. Relevant department information is provided in the following table:

	Janitorial Department	Security Department	Molding Department	Assembly Department
Square feet	650	1,600	1,600	4,800
Asset value	$200	$220	$1,800	$2,000
Department cost	$2,000	$1,600	$10,800	$12,200

Using the reciprocal services method of support department cost allocation, determine (a) the percentage of Janitorial costs that should be allocated to the Security Department and (b) the percentage of Security costs that should be allocated to the Janitorial Department.

SHOW ME HOW

BE 5-4 Joint cost allocation—physical units method **Obj. 5**

Blake's Blacksmith Co. produces two types of shotguns, a 12-gauge and 20-gauge. The shotguns are made through a joint production process that ultimately produces 30 12-gauge shotguns and 20 20-gauge shotguns and costs a total of $4,000 per batch. After the split-off point, each type of shotgun goes through an additional crafting process before it is sold. The additional production process of the 12-gauge shotgun costs $30 per gun, after which it is sold for $180 per gun. The additional production process of the 20-gauge shotgun costs $25 per gun, after which it is sold for $150 per gun. Determine the amount of joint production costs allocated to each type of shotgun using the physical units method.

SHOW ME HOW

BE 5-5 Joint cost allocation—weighted average method **Obj. 5**

Gary's Grooves Co. produces two types of carving knives, one with a handle made of a polymer that looks like walnut wood and another with a handle made with a polymer that looks like red oak. The knives are made through a joint production molding process that produces 330 knife blades for red oak handle knives and 220 knife blades for walnut handle knives at the split-off point. The polymer for the red oak handle knife blades requires twice as much cooling time as the polymer for the walnut handle knife blades, although all knives are removed from the joint molding process at the same time (i.e., once the cooling for the red oak handle knives is complete). The joint production process costs a total of $6,500. Assuming the company allocates joint costs using the weighted average method based on the required cooling time of the two joint products, determine the amount of joint production costs allocated to each type of knife using the weighted average method.

SHOW ME HOW

BE 5-6 Joint cost allocation—market value at split-off method **Obj. 5**

Man O'Fort Inc. produces two different styles of door handles, standard and curved. The door handles go through a joint production molding process costing $29,000 per batch and producing 2,000 standard door handles and 1,000 curved door handles at the split-off point. Both door handles undergo additional production processes after the split-off point, but could be sold at that point: the standard style for $4 per door handle and the curved style for $2 per door handle. Determine the amount of joint production costs allocated to each style of door handle using the market value at split-off method.

Exercises

EX 5-1 Support department cost allocation—direct method **Obj. 3**

✔ Production Department 2, 5%

Yo-Down Inc. produces yogurt. Information related to the company's yogurt production follows:

	Production Department 1	Production Department 2	Production Department 3
Support Department 1 cost driver	1,400	100	500

SHOW ME HOW

Support Department 1's costs total $142,000. Using the direct method of support department cost allocation, determine the costs from Support Department 1 that should be allocated to each production department.

EX 5-2 Support department cost allocation—sequential method Obj. 3

✔ Production Department 2, 36%

Snowy River Stallion Inc. produces horse and rancher equipment. Costs from Support Department 1 are allocated based on the number of employees. Costs from Support Department 2 are allocated based on asset value. Relevant department information is provided in the following table:

	Support Department 1	Support Department 2	Production Department 1	Production Department 2
Number of employees	9	7	25	18
Asset value	$1,150	$670	$6,230	$5,100
Department cost	$20,000	$15,500	$99,000	$79,000

Using the sequential method of support department cost allocation, determine the total costs from Support Department 1 (assuming they are allocated first) that should be allocated to Support Department 2 and to each of the production departments.

EX 5-3 Support department cost allocation—reciprocal services method Obj. 3

Blue Africa Inc. produces laptops and desktop computers. The company's production activities mainly occur in what the company calls its Laser and Forming departments. The Cafeteria and Security departments support the company's production activities and allocate costs based on the number of employees and square feet, respectively. The total cost of the Security Department is $273,000. The total cost of the Cafeteria Department is $180,000. The number of employees and the square footage in each department are as follows:

	Employees	Square Feet
Security Department	10	590
Cafeteria Department	24	2,400
Laser Department	40	4,000
Forming Department	50	1,600

Using the reciprocal services method of support department cost allocation, determine the total costs from the Security Department that should be allocated to the Cafeteria Department and to each of the production departments.

EX 5-4 Support department cost allocation—direct method Obj. 3

✔ Total cost of Pruning Department, $15,530

Christmas Timber, Inc., produces Christmas trees. The trees are produced through a cutting and pruning process. Machine maintenance and janitorial labors are performed throughout the production process by nonproduction employees. Maintenance and janitorial costs are allocated based on machine hours used and the number of trees in each department, respectively. The company estimates that the cutting and pruning areas typically have about 20 and 60 trees, respectively, in them at one time. The company also estimates that the cutting process requires about 9 times as many machine hours as the pruning process. The total costs of each department are as follows:

Maintenance Department	$ 7,800
Janitorial Department	5,000
Cutting Department	54,500
Pruning Department	11,000

Using the direct method of support department cost allocation, determine the total cost of each production department after allocating all support costs to the production departments.

EX 5-5 Support department cost allocation—sequential method Obj. 3

✔ Total cost of Cutting Department, $21,840



Crystal Scarves & Co. produces winter scarves. The scarves are produced in the Cutting and Sewing departments. The Maintenance and Security departments support these production departments, and allocate costs based on machine hours and square feet, respectively. Information about each department is provided in the following table:

Department	Total Cost	Number of Employees	Machine Hours	Square Feet
Maintenance Department	$ 2,300	6	57	800
Security Department	3,000	4	0	600
Cutting Department	19,600	20	3,700	3,200
Sewing Department	20,800	18	5,550	4,000

(Continued)

Using the sequential method and allocating the support department with the highest costs first, allocate all support department costs to the production departments. Then compute the total cost of each production department.

EX 5-6 Support department cost allocation—reciprocal services method Obj. 3

✔Total cost allocated from Security Department, $20,000



Davis Snowflake & Co. produces Christmas stockings in its Cutting and Sewing departments. The Maintenance and Security departments support the production of the stockings. Costs from the Maintenance Department are allocated based on machine hours, and costs from the Security Department are allocated based on asset value. Information about each department is provided in the following table:

	Maintenance Department	Security Department	Cutting Department	Sewing Department
Machine hours	800	2,000	7,200	10,800
Asset value	$2,000	$1,670	$2,500	$5,500
Department cost	$36,000	$16,000	$64,000	$82,000

Determine the total cost of each production department after allocating all support department costs to the production departments using the reciprocal services method.

EX 5-7 Support department cost allocation—direct method Obj. 3



Becker Tabletops has two support departments (Janitorial and Cafeteria) and two production departments (Cutting and Assembly). Relevant details for these departments are as follows:

Support Department	Cost Driver
Janitorial Department	Square footage to be serviced
Cafeteria Department	Number of employees

	Janitorial Department	Cafeteria Department	Cutting Department	Assembly Department
Department costs	$310,000	$169,000	$1,504,000	$680,000
Square feet	50	5,000	1,000	4,000
Number of employees	10	3	30	10

Allocate the support department costs to the production departments using the direct method.

EX 5-8 Support department cost allocation—sequential method Obj. 3



Refer to the information provided for Becker Tabletops in Exercise 7. Allocate the support department costs to the production departments using the sequential method. Allocate the support department with the highest department cost first.

EX 5-9 Support department cost allocation—reciprocal services method Obj. 3



✔Total cost allocated from Janitorial Dept., $382,000

Refer to the information provided for Becker Tabletops in Exercise 7. Allocate the support department costs to the production departments using the reciprocal services method.

EX 5-10 Support department cost allocation—comparison Obj. 3

Refer to your answers to Exercises 7–9. Compare the total support department costs allocated to each production department under each cost allocation method. Which production department is allocated the most support department costs (a) under the direct method, (b) under the sequential method, and (c) under the reciprocal services method?

EX 5-11 Joint cost allocation—physical units method Obj. 5

✔Washed wood, $319.50



Board-It, Inc., produces the following types of 2 × 4 × 10 wood boards: washed, stained, and pressure treated. These products are produced jointly until they are cut. One batch produces 45 washed boards, 35 stained boards, and 20 pressure treated boards. The joint production process costs a total of $710 per batch. Using the physical units method, allocate the joint production cost to each product.

EX 5-12 Joint cost allocation—weighted average method Obj. 5

✔ Wood chips, $12,840

SHOW ME HOW

Carving Creations jointly produces wood chips and sawdust used in agriculture. The wood chips and sawdust are actually by-products of the company's core operations, but Carving Creations accounts for them just like normally produced goods because of their large volumes. One jointly produced batch yields 3,000 cubic yards of wood chips and 10,000 cubic yards of sawdust, and the estimated cost per batch is $21,400. However, the joint production of each good is not equally weighted. Management at Carving Creations estimates that for the time it takes to produce 10 cubic yards of wood chips in the joint production process, only 2 cubic yards of sawdust are produced. Given this information, allocate the joint costs of production to each product using the weighted average method.

EX 5-13 Joint cost allocation—market value at split-off method Obj. 5

✔ Granulated sugar, $738

EXCEL TEMPLATE

Sugar Sweetheart, Inc., jointly produces raw sugar, granulated sugar, and caster sugar. After the split-off point, raw sugar is immediately sold for $0.20 per pound, while granulated and caster sugar are processed further. The market value of the granulated sugar and caster sugar is estimated to both be $0.25 at the split-off point. One batch of joint production costs $1,640 and yields 3,000 pounds of raw sugar, 3,600 pounds of granulated sugar, and 2,000 pounds of caster sugar at the split-off point. Allocate the joint costs of production to each product using the market value at split-off method.

EX 5-14 Joint cost allocation—net realizable value method Obj. 5

Nature's Garden Inc. produces wood chips, wood pulp, and mulch. These products are produced through harvesting trees and sending the logs through a wood chipper machine. One batch of logs produces 20,304 cubic yards of wood chips, 14,100 cubic yards of mulch, and 9,024 cubic yards of wood pulp. The joint production process costs a total of $32,000 per batch. After the split-off point, wood chips are immediately sold for $25 per cubic yard while wood pulp and mulch are processed further. The market value of the wood pulp and mulch at the split-off point is estimated to be $22 and $24 per cubic yard, respectively. The additional production process of the wood pulp costs $5 per cubic yard, after which it is sold for $30 per cubic yard. The additional production process of the mulch costs $4 per cubic yard, after which it is sold for $32 per cubic yard. Allocate the joint costs of production to each product using the net realizable value method.

EX 5-15 Joint cost allocation—physical units method Obj. 5

Big Al's Inc. produces and sells various cuts of steak, including sirloin, ribeye, and T-bone. The cuts of steak are produced jointly until Big Al's cattle are butchered. Big Al estimates that, at the split-off point, 10 cows yield 99 pounds of sirloin cuts, 55 pounds of ribeye cuts, and 66 pounds of T-bone cuts. Given Big Al's estimate that the joint cost of producing 10 cows' worth of steak cuts is $1,500, use the physical units method to allocate the joint costs of production to each product.

EX 5-16 Joint cost allocation—weighted average method Obj. 5

EXCEL TEMPLATE

Gordon's Smoothie Stand makes three types of smoothies: blueberry lemon, orange swirl, and triple berry. Before all flavors are added, the smoothies go through a joint mixing process that costs a total of $43 per batch. One batch produces 21.75 cups of blueberry lemon smoothies, 29 cups of orange swirl smoothies, and 36.25 cups of triple berry smoothies. In addition, Gordon has studiously noted that the mixing process necessary for triple berry and blueberry lemon smoothies takes twice as long as it does for orange swirl smoothies. Allocate the joint costs of production to each product using the weighted average method.

EX 5-17 Joint cost allocation—market value at split-off method Obj. 5

SHOW ME HOW

Toil & Oil processes crude oil to jointly produce gasoline, diesel, and kerosene. One batch produces 3,415 gallons of gasoline, 2,732 gallons of diesel, and 1,366 gallons of kerosene at a joint cost of $12,000. After the split-off point, all products are processed further, but the estimated market price for each product at the split-off point is as follows:

Gasoline	$2 per gallon
Diesel	1 per gallon
Kerosene	3 per gallon

Using the market value at split-off method, allocate the $12,000 joint cost of production to each product.

EX 5-18 Joint cost allocation—net realizable value method

Obj. 5

✔ Strawberry lemonade, $9

SHOW ME HOW EXCEL TEMPLATE

Lily's Lemonade Stand makes three types of lemonade: pure, raspberry, and strawberry. The lemonade is produced through a joint mixing process that costs a total of $30 per batch. One batch produces 32 cups of pure lemonade, 21 cups of strawberry lemonade, and 21 cups of raspberry lemonade. After the split-off point, all three lemonades can be sold for $0.80 per cup, but strawberry and raspberry lemonade can be processed further by adding artificial coloring and flavoring and sold for $0.95 and $1.00 per cup, respectively. It is estimated that these additional processing costs are $0.75 and $1.80 per batch for strawberry and raspberry lemonade, respectively. Allocate the joint costs of production to each product using the net realizable value method.

Problems: Series A

PR 5-1A Support department cost allocation

Obj. 3

Blue Mountain Masterpieces produces pictures, paintings, and other home decor. The Printing and Framing production departments are supported by the Janitorial and Security departments. Janitorial costs are allocated to the production departments based on square feet, and security costs are allocated based on asset value. Information about these departments is detailed in the following table:

	Janitorial Department	Security Department	Printing Department	Framing Department
Square feet	760	1,040	4,230	4,770
Asset value	$900	$1,240	$12,390	$8,610
Department cost	$5,200	$6,600	$33,000	$29,000

Management has experimented with different support department cost allocation methods in the past. The different allocation methods did not yield large differences of cost allocation to the production departments.

Instructions

1. Determine which support department cost allocation method Blue Mountain Masterpieces would most likely use to allocate its support department costs to the production departments.
2. Determine the total costs allocated from each support department to each production department using the method you determined in part (1).
3. Without doing calculations, consider and answer the following: If Blue Mountain Masterpieces decided to use square feet instead of asset value as the cost driver for security services, how would this change the allocation of Security Department costs?

PR 5-2A Support activity cost allocation

Obj. 3

✔ 2. Total cost of Mining Department, $201,250

Jake's Gems mines and produces diamonds, rubies, and other gems. The gems are produced by way of the Mining and Cutting activities. These production activities are supported by the Maintenance and Security activities. Security costs are allocated to the production activities based on asset value. Maintenance costs are normally allocated based on machine hours. However, Maintenance costs typically correlate more with the number of service calls. Information regarding the activities is provided in the following table:

	Maintenance	Security	Mining	Cutting
Number of service calls	17	20	60	20
Machine hours	89	88	182	176
Asset value	$200,000	$80,000	$120,000	$480,000
Department cost	$25,000	$42,500	$160,000	$95,000

Instructions

1. Should Maintenance costs continue to be allocated based on machine hours? Why would a different driver be more appropriate?

2. Based on your response to part (1), determine the total costs allocated from each support activity to the other activities using the reciprocal services method and the most appropriate cost driver for Maintenance.
3. Jake's Gems is considering cutting costs by switching to a simpler support activity cost allocation method. Using the information provided and given your response to part (2), determine if switching to the direct method would significantly alter the production activity costs.

PR 5-3A Joint cost allocation

Obj. 5

✔ 3. Body lotion, $110

EXCEL TEMPLATE

Lovely Lotion Inc. produces three different lotions: hand, body, and foot. The lotions are produced jointly in a mixing process that costs a total of $250 per batch. At the split-off point, one batch produces 80, 40, and 25 bottles of hand, body, and foot lotion, respectively. After the split-off point, hand lotion is sold immediately for $2.50 per bottle. Body lotion is processed further at an additional cost of $0.25 per bottle and then sold for $5.75 per bottle. Foot lotion is processed further at an additional cost of $0.85 per bottle and then sold for $4.00 per bottle. Assume that body and foot lotion could be sold at the split-off point for $3.00 and $3.20 per bottle, respectively.

Instructions

1. Using the market value at split-off method, allocate the joint costs of production to each product.
2. Based on the information provided and your answer to part (1), should Lovely Lotion Inc. continue processing body and foot lotion after the split-off point?
3. Allocate the joint costs of production to each product using the net realizable value method.

PR 5-4A Joint cost allocation

Obj. 5

SHOW ME HOW EXCEL TEMPLATE

Florissa's Flowers jointly produces three varieties of flowers in the same garden: tulips, lilies, and daisies. The flowers are all watered via the same irrigation system and all receive the same amount of water; daisies require three times as much as lilies, and the water required for tulips is about halfway between the amounts needed for daisies and lilies. Although the lilies and tulips receive more water than they need due to the joint irrigation process, they are not hurt by the overwatering. The joint production cost of the three varieties of flowers is about $30 per harvest. Every harvest yields 10 tulips, 20 lilies, and 20 daisies.

Instructions

1. Allocate the joint costs of production to each product using the physical units method. Which products receive the largest portion of the joint costs?
2. Allocate the joint costs of production to each product using the weighted average method. Now which product receives the largest portion of the joint costs?
3. Why would it be important to consider whether the amount of watering is an appropriate weight factor?

Problems: Series B

SHOW ME HOW

PR 5-1B Support department cost allocation

Obj. 3

Hooligan Adventure Supply produces and sells various outdoor equipment. The Molding and Assembly production departments are supported by the Personnel and Maintenance departments. Personnel costs are allocated to the production departments based on the number of employees, and Maintenance costs are allocated based on number of service calls. Information about these departments is detailed in the following table:

	Personnel Department	Maintenance Department	Molding Department	Assembly Department
Number of employees	28	10	41	49
Number of service calls	57	41	168	112
Department cost	$15,000	$11,400	$72,000	$69,000

(Continued)

Instructions

1. Assuming that Hooligan Adventure Supply uses the sequential method to allocate its support department costs, which support department does it most likely allocate first?
2. Based on your response in part (1), determine the total costs allocated from each support department to each production department using the sequential method.
3. If Hooligan Adventure Supply wanted to use a more accurate support department cost allocation method, which method should it choose? What might discourage the company from using this method?

PR 5-2B Support activity cost allocation **Obj. 3**

✔ 2. Total cost allocated from Maintenance Department, $5,000

Kizzle's Crepes Co. produces world famous crepes. The company's crepes are produced via its Mixing and Cooking activities, which both rely on the Janitorial and Maintenance activities. Kizzle's management knows the most practical driver of Janitorial costs is square feet, but is uncertain whether to allocate Maintenance costs based on asset value of production equipment, number of service calls, or machine hours. Kizzle's management estimates that the Cooking and Mixing activities each require about twice as much space as the Maintenance activity.

Instructions

1. What factors should Kizzle's management consider in choosing the driver to use for the allocation of Maintenance costs? Of the three potential drivers mentioned in the problem, which one(s) should Kizzle's most likely not use?
2. Assume that Kizzle's management allocates Maintenance costs based on the number of service calls. Further assume that in a given period, the Janitorial, Mixing, and Cooking activities incur 16, 40, and 24 service calls, respectively, and that the Janitorial and Maintenance costs of that period are $3,000 and $4,200, respectively. Determine the total costs allocated from each support activity to the other three activities using the reciprocal services method.
3. Kizzle's Crepes Co. is expanding rapidly due to its exponentially growing sales and popularity. Kizzle's management is worried that as the company expands, its current method of support activity cost allocation, the reciprocal services method, may become too burdensome. Is this true? If so, what alternative method should Kizzle's Crepes Co. use as it expands?

PR 5-3B Joint cost allocation **Obj. 5**

✔ 1. Morning glory hand soap, $11,100

EXCEL TEMPLATE

McKenzie's Soap Sensations, Inc., produces hand soaps with three different scents: morning glory, snowflake sparkle, and sea breeze. The soap is produced through a joint production process that costs $30,000 per batch. Each batch produces 14,800 bottles of morning glory hand soap, 12,000 bottles of snowflake sparkle hand soap, and 10,000 bottles of sea breeze hand soap at the split-off point. Each product is processed further after the split-off point, but the market value of a bottle of any of the flavors at this point is estimated to be $1.25 per bottle. The additional processing costs of morning glory, snowflake sparkle, and sea breeze hand soap are $0.50, $0.55, and $0.60 per bottle, respectively. Morning glory, snowflake sparkle, and sea breeze hand soap are then sold for $2.00, $2.20, and $2.40 per bottle, respectively.

Instructions

1. Using the net realizable value method, allocate the joint costs of production to each product.
2. Explain why McKenzie's Soap Sensations, Inc., always chooses to process each variety of hand soap beyond the split-off point.
3. If demand for all products was the same, which product should McKenzie's Soap Sensations, Inc., produce in the highest quantity?

PR 5-4B Joint cost allocation **Obj. 5**

EXCEL TEMPLATE

Rosie's Roses produces three colors of roses: red, white, and peach. The roses are produced jointly in the same garden, and aggregately cost a total of $110 per harvest. One harvest produces 80 red roses, 70 white roses, and 50 peach roses. Rosie also noted that the peach roses require a fertilizer

that is twice as expensive as the fertilizer required by the white and red roses. However, due to the structure of the shared garden space, the more expensive fertilizer is used for all flower types in a joint production process.

Instructions

1. Using the physical units method, allocate the joint costs of production to each product.
2. Using the weighted average method, allocate the joint costs of production to each product.
3. Is the cost of the type of fertilizer required by each type of rose a good weight factor?

Make a Decision
Using Support Department and Joint Cost Allocations for Performance Evaluation

MAD 5-1 Analyze Milkrageous, Inc. Obj. 6

Milkrageous, Inc., a large, private dairy products company, is determining cost allocations for performance evaluation purposes. Company bonuses are based on cost containment, so accurate costing numbers are imperative.

The general managers (GMs) over the cheese and yogurt divisions are being evaluated. Support department costs include Janitorial ($150,700) and Maintenance ($300,200). The Janitorial costs remain relatively fixed from quarter to quarter. Maintenance costs, however, vary with respect to the number of service calls made each quarter. The joint cost of processing milk before the split-off point for yogurt and cheese is $755,000 for the quarter. Yogurt sells at higher margins than cheese (at split-off as well as after further processing), but is equally difficult to produce as cheese.

a. Which support department allocation method (direct, sequential, or reciprocal services) should be used to allocate support department costs for the GMs' performance evaluation?

b. What cost driver would be best for allocating Janitorial costs?

c. What cost driver would be best for allocating Maintenance costs?

d. Should Janitorial and Maintenance costs be considered when evaluating the general managers over cheese and yogurt?

e. What joint cost allocation method should be used for performance evaluation purposes?

f. Regardless of the correct answer to part (e), use the physical units method to allocate joint costs to yogurt and cheese assuming 198,000 pounds of yogurt and 102,000 pounds of cheese were produced during the quarter.

MAD 5-2 Analyze Horsepower Hookup, Inc. Obj. 6

Horsepower Hookup, Inc., is a large automobile company that specializes in the production of high-powered trucks. The company is determining cost allocations for purposes of performance evaluation. A portion of company bonuses depends on divisions achieving cost management goals. This necessitates highly accurate support department cost allocation. Management has also stated that it has the means to implement as complex a method as necessary.

The general manager over the Mid-Size D wants to get a good idea of what factors are driving the costs of the support departments in order to make accurate cost allocations, so finding accurate support department cost drivers is important. Support department costs include Janitorial ($163,100) and Security ($285,400). The Janitorial costs vary depending on the number of vehicles produced, increasing with larger production volumes. Security costs are fixed based on the size of the lot, and do not change with respect to how many vehicles are in the lot or warehouse. Joint costs involved in producing the trucks before the split-off point where the various makes, models, and colors are produced are $946,000 for the period. All makes, models, and

(Continued)

colors sell at relatively similar margins, but the sports models and metallic colors are normally more difficult to produce during the joint production process.

a. Which support department cost allocation method (direct, sequential, or reciprocal services) should be used to allocate support department cost?

b. What driver would be best for allocating Janitorial costs?

c. What driver would be best for allocating Security costs?

d. If Janitorial costs were to be allocated based on square footage, and Security costs based on asset value, what percentage of each support department's costs would be allocated to each production department using the sequential method (allocating Security costs first) given the following:

	Square Footage	Asset Value
Janitorial Department	3,000	$ 10,000
Security Department	2,000	2,300
Production Department 1	54,000	450,000
Production Department 2	36,000	540,000

e. Should Janitorial and Security costs be considered when evaluating the performance of cost management employees?

f. What joint cost allocation method should be used for performance evaluation purposes?

MAD 5-3 Analyze Joyous Julius, Inc. Obj. 6

Joyous Julius, Inc., is a large retail chain that has grown quickly thanks to its successful leveraging of homemade-style orange julius. The company would like to narrow down the number of flavors it offers to three.

Joyous Julius, Inc., currently produces six different flavors of orange julius: pure orange, raspberry orange, mango orange, strawberry orange, tropical orange, and coconut orange. The orange julius flavors are produced jointly in a mixing process that costs a total of $2,500 per batch. At the end of each joint production batch, 900 cups of pure orange Julius are produced. Another 1,180 cups of various Julius flavors are processed further. Information about the production of each batch is summarized in the following table:

Orange Julius Flavor	Cups per Batch	Market Value per Cup at Split-Off	Market Price per Cup After Further Processing	Added Cost per Cup
Pure orange	900	$3.00	$3.00	$0.00
Raspberry orange	500	3.00	3.35	0.15
Mango orange	300	3.00	3.30	0.10
Strawberry orange	150	3.00	3.30	0.20
Tropical orange	130	3.00	3.10	0.40
Coconut orange	100	3.00	3.25	0.65

One of the by-products of the production of the orange julius is orange peels. Joyous Julius, Inc., has found a company that produces nutritional smoothies that would be willing to buy Joyous Julius's orange peels for $40 per batch. Joyous Julius, Inc., is interested in the deal but doesn't know how to account for these additional revenues.

a. Ignoring the company's strategy to narrow down the number of flavors it offers, are there any flavors that Joyous Julius, Inc., should discontinue processing after the split-off point (based on margin alone)?

b. Assuming Joyous Julius, Inc., keeps pure orange as a flavor, what other two flavors should the company keep as a flavor?

c. Assume that Joyous Julius, Inc., keeps pure orange and the two other flavors you identified in part (b) and that additional cups of the pure orange flavor replace all discontinued flavors in the joint production process. Using the net realizable value method, determine the amount of joint production costs that should be allocated to each of the remaining three products.

d. How could Joyous Julius account for the additional revenues from the sale of orange peels?

MAD 5-4 Analyze William's Ball & Jersey Shop — Obj. 6

William's Ball & Jersey Shop is a small athletic products company currently trying to determine cost allocations. Accurate costing numbers are important but not crucial; no employee bonuses depend on them, and the company wants to keep the cost allocation process simple and cost-effective.

The company produces and sells footballs, basketballs, baseballs, and jerseys for each of those sports. The jerseys of each sport go through a joint production process before they are dyed, embroidered, and printed with the appropriate colors and logos for whatever team they are to represent. William Lind, the owner, believes an adjustment might need to be made to the company's current physical units method of joint cost allocation. Presently, youth- and adult-size jerseys go through the same joint production process, but the adult-size jerseys require more material, cutting, and sewing than youth-size jerseys. William is also considering the addition of a toddler-size jersey to his baseball jersey joint product line. The market value at the split-off point of the toddler-size jersey is expected to be barely less than its share of the joint production cost (based on the company's current joint cost allocation method), but it will only incur a $3 per jersey additional production process cost.

a. Which support department cost allocation method should be used to allocate support department cost?

b. What adjustment could be made to improve the company's current joint cost allocation method?

c. What other information does William need to consider before deciding whether to add the toddler-size jersey to his product line?

d. If the market value at split-off of the toddler-size jersey is $10, and its market price after further processing is estimated to be $17.99, should William add the jersey?

e. Suppose William provides the following information:

	Production Department 1	Production Department 2
Support Department 1 cost driver	22	18
Support Department 2 cost driver	2,280	1,720

What percentage of each support department's cost should be allocated to each production department using the direct method?

Take It Further

ETHICS

TIF 5-1 Joint cost allocation and performance evaluation

Gigabody, Inc., a nutritional supplement manufacturer, produces five lines of protein supplements. Each product line is managed separately by a senior-level product engineer who is evaluated, in part, based on his or her ability to keep costs low. The five product lines are produced in a joint production process. After splitting off from the joint production process, all five lines are processed further before resale.

Traditionally, joint product costs have been allocated to the five product lines using the physical units method. Recently, however, one of the line managers has complained that the supplement she oversees, the Turbo Capsule, is subsidizing the production of the Power Shake. As she puts it, "The powder for the Power Shake requires a higher temperature in the early refining process than the powder in my capsules, so it should carry more of the joint costs!" However, the line manager does *not* point out that in terms of the powder used, the Power Shakes sell for a fraction of the Turbo Capsules, such that Turbo Capsules have much higher margins than Power Shakes. This provides a reasonable argument for Turbo Capsules to carry even *more* of the joint costs than they currently carry.

(Continued)

a. Did the line manager behave ethically by not disclosing the facts that go against her argument?

b. What factors should be considered when determining the allocation of joint costs?



TIF 5-2 Comparing support department cost allocation methods

Quetzal Inc. is a manufacturer of after-market parts for automobiles. The company has 23 support departments that provide services for 55 production departments. Quetzal management is looking to revamp the company's outdated cost accounting system and is trying to decide between using the direct method, sequential method, or reciprocal services method for support department cost allocation.

Liam, Rose, and Miranda are financial analysts working in the office of the CFO. They have been tasked with determining which allocation method should be used at Quetzal. Each manager has agreed to research and come prepared to debate the pros and cons of each of the three methods under consideration. Liam will discuss the direct method, Rose the sequential method, and Miranda the reciprocal services method.

Select three members of your team to role-play as members of the financial analyst team. Have each team member defend the selection of one of the three allocation methods.



TIF 5-3 Subjectivity in joint cost allocation

Timpanogos Clinical Laboratories Inc. manufactures two products: Mackalite and Jemmerite. These two products go through a joint production process costing $260,000 in materials, labor, and overhead. Though the production process is inseparable for both products, the production of Mackalite is only possible by heating the joint product (before the split-off point) to 600 degrees Fahrenheit. Jemmerite only needs to be heated to 300 degrees, but higher temperatures do not hurt Jemmerite production. Following the joint production process, 500 gallons of Mackalite are available, and 200 gallons of Jemmerite are available. No further processing is necessary for either product, and both products sell for $60 per gallon.

The production manager for the Mackalite product line argues that, since the two products come from an inseparable process, Mackalite and Jemmerite should both share 50% of the $260,000 in joint costs.

Without providing actual calculations, write a brief memo to the CFO of Timpanogos Clinical Laboratories explaining why you agree or disagree with the Mackalite production manager's argument.

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Logo Inc. has two data services departments (Systems and Facilities) that provide support to the company's three production departments (Machining, Assembly, and Finishing). The overhead costs of the Systems Department are allocated to other departments on the basis of computer usage hours. The overhead costs of the Facilities Department are allocated based on square feet occupied (in thousands). Other information pertaining to Logo is as follows.

Department	Overhead	Computer Usage Hours	Square Feet Occupied
Systems	$200,000	300	1,000
Facilities	100,000	900	600
Machining	400,000	3,600	2,000
Assembly	550,000	1,800	3,000
Finishing	620,000	2,700	5,000
Totals		9,300	11,600

If Logo employs the direct method of allocating service department costs, the overhead of the Systems Department would be allocated by dividing the overhead amount by:

a. 1,200 hours.
b. 8,100 hours.
c. 9,000 hours.
d. 9,300 hours.

2. Adam Corporation manufactures computer tables and has the following budgeted indirect manufacturing cost information for the next year:

	Support Departments		Operating Departments		
	Maintenance	**Systems**	**Machining**	**Fabrication**	**Total**
Budgeted overhead	$350,000	$95,000	$200,000	$300,000	$945,000
Support work furnished:					
From Maintenance		10%	50%	40%	100%
From Systems	20%		20%	60%	100%

If Adam uses the step-down (sequential) method, beginning with the Maintenance Department, to allocate support department costs to production departments, the total overhead (rounded to the nearest dollar) for the Machining Department to allocate to its products would be:

a. $407,500.
b. $422,750.
c. $442,053.
d. $445,000.

3. Breegle Company produces three products (B-40, J-60, and H-102) from a single process. Breegle uses the physical volume method to allocate joint costs of $22,500 per batch to the products. Based on the following information, which product(s) should Breegle continue to process after the split-off point in order to maximize profit?

	B-40	**J-60**	**H-102**
Physical units produced per batch	1,500	2,000	3,200
Market value per unit at split-off	$10.00	$4.00	$7.25
Cost per unit of further processing after split-off	$3.05	$1.00	$2.50
Market value per unit after further processing	$12.25	$5.70	$9.75

a. B-40 only
b. J-60 only
c. H-102 only
d. B-40 and H-102 only

4. Tucariz Company processes Duo into two joint products, Big and Mini. Duo is purchased in 1,000-gallon drums for $2,000. Processing costs are $3,000 to process the 1,000 gallons of Duo into 800 gallons of Big and 200 gallons of Mini. The selling price is $9 per gallon for Big and $4 per gallon for Mini. If the physical units method is used to allocate joint costs to the final products, the total cost allocated to produce Mini is:

a. $500.
b. $1,000.
c. $4,000.
d. $4,500.

Pathways Challenge



This is Accounting!

Information/Consequences

The CASB was wise to listen to feedback from those most affected by the guidance provided in CAS 418. The expertise required for the reciprocal services method is substantial. But perhaps more relevant are the computational resources. With two or three support departments, computing allocations using algebraic functions can be quite challenging. With 20 to 30 support departments, this allocation would be nearly impossible without access to substantial computing power. These resources are readily available today, but were more scarce in the 1970s.

Just because a company *can* use the more accurate reciprocal services method does not mean it *should* use this method. Method choice is a subjective judgment that must be made based on the costs and benefits of each option. If the cost of additional cost allocation accuracy outweighs the benefits, a less costly (and less accurate) method should be considered. The direct and sequential methods are still the most commonly used methods.

Suggested Answer

Chapter 6

Cost-Volume-Profit Analysis

Principles

Chapter 1 *Introduction to Managerial Accounting*

Developing Information

COST SYSTEMS

Chapter 2 *Job Order Costing*
Chapter 3 *Process Costing*
Chapter 4 *Activity-Based Costing*

COST ALLOCATIONS

Chapter 5 *Support Departments*
Chapter 5 *Joint Costs*

Decision Making

PLANNING AND EVALUATING TOOLS

Chapter 6 ***Cost-Volume-Profit Analysis***
Chapter 7 *Variable Costing*
Chapter 8 *Budgeting Systems*
Chapter 9 *Standard Costing and Variances*
Chapter 10 *Decentralized Operations*
Chapter 11 *Differential Analysis*

STRATEGIC TOOLS

Chapter 12 *Capital Investment Analysis*
Chapter 13 *Lean Manufacturing*
Chapter 13 *Activity Analysis*
Chapter 14 *The Balanced Scorecard*
Chapter 14 *Corporate Social Responsibility*

Ford Motor Company

Making a profit isn't easy for U.S. auto manufacturers like **Ford Motor Company (F)**. The cost of materials, labor, equipment, and advertising makes it very expensive to produce cars and trucks.

How many cars does Ford need to produce and sell to break even? The answer depends on the relationship between Ford's sales revenue and costs. Some of Ford's costs, like direct labor and materials, will change in direct proportion to the number of vehicles that are built. Other costs, such as the costs of manufacturing equipment, are fixed and do not change with the number of vehicles that are produced. Ford will break even when it generates enough sales revenue to cover both its fixed and variable costs.

During the depths of the 2009 recession, Ford renegotiated labor contracts with its employees. These renegotiations reduced the direct labor cost incurred to build each car, which lowered the number of cars that the company needed to sell to break even by 45%.

As with Ford, understanding how costs behave, and the relationship between costs, profits, and volume, is important for all businesses. This chapter discusses commonly used methods for classifying costs according to how they change and techniques for determining how many units must be sold for a company to break even. Techniques that management can use to evaluate costs in order to make sound business decisions are also discussed.

Source: J. Booton, "Moody's Upgrades Ford's Credit Rating, Returns Blue Oval Trademark," *Fox Business*, May 22, 2012.



CHATCHAI SOMWAT/SHUTTERSTOCK.COM

Link to Ford Motor Company . . . . . Pages 250, 252, 253, 256, 262, 273, 275

What's Covered

Cost-Volume-Profit Analysis

Cost Behavior
- Variable Costs (Obj. 1)
- Fixed Costs (Obj. 1)
- Mixed Costs (Obj. 1)

Cost-Volume-Profit Relationships
- Contribution Margin (Obj. 2)
- Contribution Margin Ratio (Obj. 2)
- Unit Contribution Margin (Obj. 2)

Cost-Volume-Profit Analysis
- Break-Even Point (Obj. 3)
- Target Profit (Obj. 3)
- Cost-Volume-Profit Chart (Obj. 4)
- Profit-Volume Chart (Obj. 4)
- Assumptions (Obj. 4)

Special Relationships and Analyses
- Sales Mix (Obj. 5)
- Operating Leverage (Obj. 5)
- Margin of Safety (Obj. 5)

Learning Objectives

Obj. 1 Classify costs as variable costs, fixed costs, or mixed costs.

Obj. 2 Compute the contribution margin, the contribution margin ratio, and the unit contribution margin.

Obj. 3 Determine the break-even point and sales necessary to achieve a target profit.

Obj. 4 Using a cost-volume-profit chart and a profit-volume chart, determine the break-even point and sales necessary to achieve a target profit.

Obj. 5 Compute the break-even point for a company selling more than one product, the operating leverage, and the margin of safety.

Analysis for Decision Making

Obj. 6 Describe and illustrate the use of cost-volume-profit analysis for decision making in a service business.

Objective 1
Classify costs as variable costs, fixed costs, or mixed costs.

Cost Behavior

Cost behavior is the manner in which a cost changes as a related activity changes. The behavior of costs is useful to managers for a variety of reasons. For example, knowing how costs behave allows managers to predict profits as sales and production volumes change. Knowing how costs behave is also useful for estimating costs, which affects a variety of decisions such as whether to replace a machine.

Understanding the behavior of a cost depends on the following:

- Identifying the activities that cause the cost to change. These activities are called **activity bases** (or *activity drivers*).
- Specifying the range of activity over which the changes in the cost are of interest. This range of activity is called the **relevant range**.

To illustrate, assume that a hospital is concerned about planning and controlling patient food costs. A good activity base is the number of patients who *stay* overnight in the hospital. The number of patients who are *treated* is not as good an activity base because some patients are outpatients and, thus, do not consume food. Once an activity base is identified, food costs can then be analyzed over the range of the number of patients who normally stay in the hospital (the relevant range).

Costs are normally classified as variable costs, fixed costs, or mixed costs.

Link to Ford Motor Company

The first vehicle built by Henry Ford in 1896 was a Quadricycle that consisted of four bicycle wheels powered by a four-horsepower engine. The first Ford Model A was sold by **Ford Motor Company** in 1903. In 1908, the Ford Model T was introduced, which had sales of 15 million before its production was halted in 1927.

Source: www.corporate.ford.com.

Variable Costs

Variable costs are costs that vary in proportion to changes in the activity base. When the activity base is units produced, direct materials and direct labor costs are normally classified as variable costs.

To illustrate, assume that Jason Sound Inc. produces stereo systems. The parts for the stereo systems are purchased from suppliers for $10 per unit and are assembled by Jason Sound. For Model JS-12, the direct materials costs for the relevant range of 5,000 to 30,000 units of production are as follows:

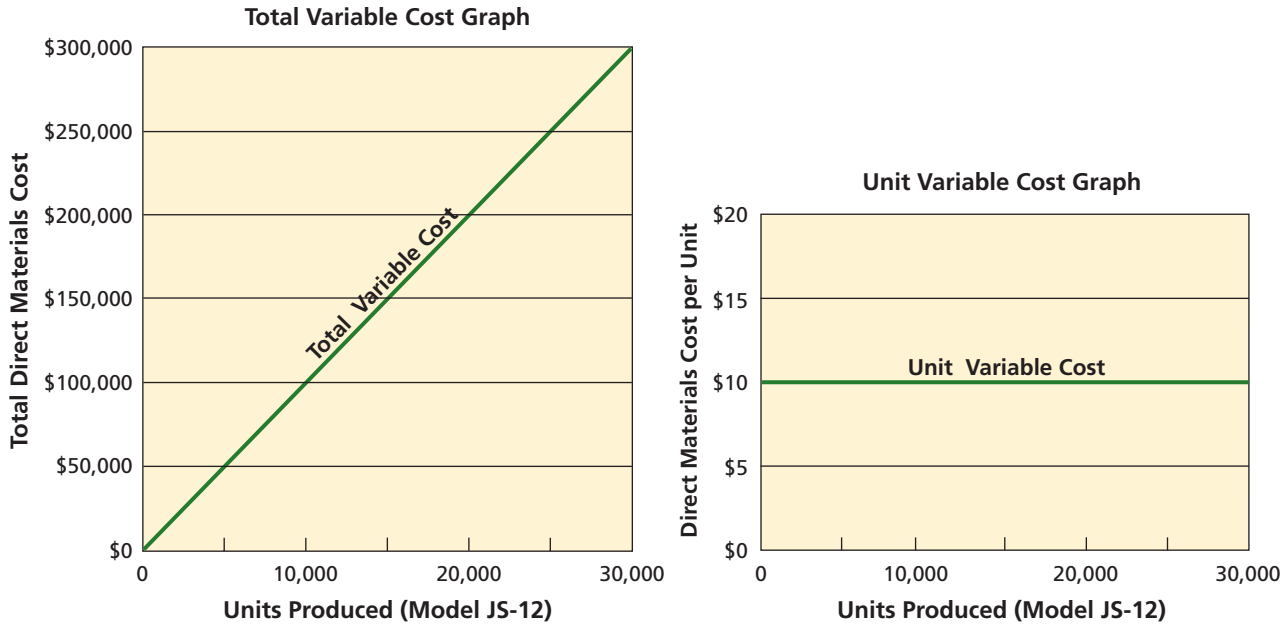
Number of Units of Model JS-12 Produced	Direct Materials Cost per Unit	Total Direct Materials Cost
5,000 units	$10	$ 50,000
10,000	10	100,000
15,000	10	150,000
20,000	10	200,000
25,000	10	250,000
30,000	10	300,000

As shown, variable costs have the following characteristics:

- *Cost per unit* remains the same regardless of changes in the activity base. For Jason Sound, units produced is the activity base. For Model JS-12, the cost per unit is $10.
- *Total cost* changes in proportion to changes in the activity base. For Model JS-12, the direct materials cost for 10,000 units ($100,000) is twice the direct materials cost for 5,000 units ($50,000).

Exhibit 1 illustrates how the variable costs for direct materials for Model JS-12 behave in total and on a per-unit basis as production changes.

Exhibit 1 Variable Cost Graphs



Some examples of variable costs and their related activity bases for various types of businesses are shown in Exhibit 2.

Exhibit 2
Variable Costs and Their Activity Bases

Type of Business	Cost	Activity Base
University	Instructor salaries	Number of classes
Passenger airline	Fuel	Number of miles flown
Manufacturing	Direct materials	Number of units produced
Hospital	Nurse wages	Number of patients
Hotel	Housekeeping wages	Number of guests
Bank	Teller wages	Number of banking transactions

Link to Ford Motor Company

Changing emission, fuel economy, and safety standards increase the variable cost of each vehicle manufactured by **Ford Motor Company**.

Fixed Costs

Fixed costs are costs that remain the same in total dollar amount as the activity base changes. When the activity base is units produced, many factory overhead costs such as straight-line depreciation are classified as fixed costs.

To illustrate, assume that Minton Inc. manufactures, bottles, and distributes perfume. The production supervisor is Jane Sovissi, who is paid a salary of $75,000 per year. For the relevant range of 50,000 to 300,000 bottles of perfume, the total fixed cost of $75,000 does not vary as production increases. As a result, the fixed cost per bottle decreases as the units produced increase. This is because the fixed cost is spread over a larger number of bottles, as follows:

Number of Bottles of Perfume Produced	Total Salary for Jane Sovissi	Salary per Bottle of Perfume Produced
50,000 bottles	$75,000	$1.500
100,000	75,000	0.750
150,000	75,000	0.500
200,000	75,000	0.375
250,000	75,000	0.300
300,000	75,000	0.250

Why It Matters

Variable Cost for Home and Business

Variable costs are important to our individual lives. For example, an important variable cost for many of us is the cost of gasoline. The cost of gasoline is variable to the number of miles driven and the gas efficiency of our vehicles. Thus, when the price of gasoline increases, the demand for smaller, fuel-efficient vehicles rises. Moreover, during periods of high gasoline prices, there is an incentive to drive less, even to the point of living closer to work or school. When the cost of gasoline falls, fuel efficiency and driving preferences become less important. This is seen with the slope of the variable cost line on the total variable cost graph. The slope is the variable cost per unit, as was shown in Exhibit 1. The slope of the variable cost line will influence the importance of the underlying activity base for decision making. Thus, a steep slope increases importance, while a gradual slope lessens importance.

As shown, fixed costs have the following characteristics:

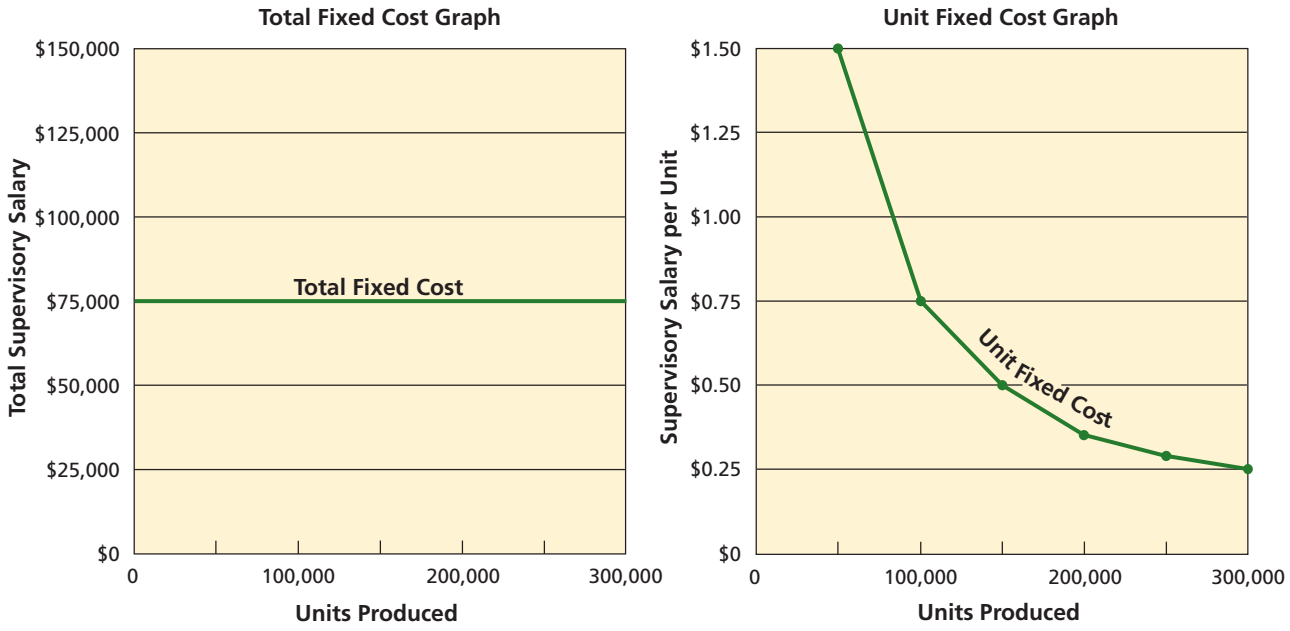
- *Cost per unit* decreases as the activity level increases and increases as the activity level decreases. For Jane Sovissi's salary, the cost per unit decreased from $1.50 for 50,000 bottles produced to $0.25 for 300,000 bottles produced.
- *Total cost* remains the same regardless of changes in the activity base. Jane Sovissi's salary of $75,000 remained the same regardless of whether 50,000 bottles or 300,000 bottles were produced.

Exhibit 3 illustrates how Jane Sovissi's salary (fixed cost) behaves in total and on a per-unit basis as production changes.

A high proportion of **Ford Motor Company**'s costs are fixed in nature.
Source: Ford Motor Company, *Form 10-K for Year Ended December 31, 2014.*

Link to Ford Motor Company

Exhibit 3 Fixed Cost Graphs



Some examples of fixed costs and their related activity bases for various types of businesses are shown in Exhibit 4.

Exhibit 4
Fixed Costs and Their Activity Bases

Type of Business	Fixed Cost	Activity Base
University	Building (straight-line) depreciation	Number of students
Passenger airline	Airplane (straight-line) depreciation	Number of miles flown
Manufacturing	Plant manager salary	Number of units produced
Hospital	Property insurance	Number of patients
Hotel	Property taxes	Number of guests
Bank	Branch manager salary	Number of customer accounts

note:
A salesperson's compensation can be a mixed cost comprised of a salary (fixed portion) plus a commission as a percent of sales (variable portion).

Mixed Costs

Mixed costs are costs that have characteristics of both a variable and a fixed cost. Mixed costs are sometimes called *semivariable* or *semifixed costs*.

To illustrate, assume that Simpson Inc. manufactures sails, using rented machinery. The rental charges are as follows:

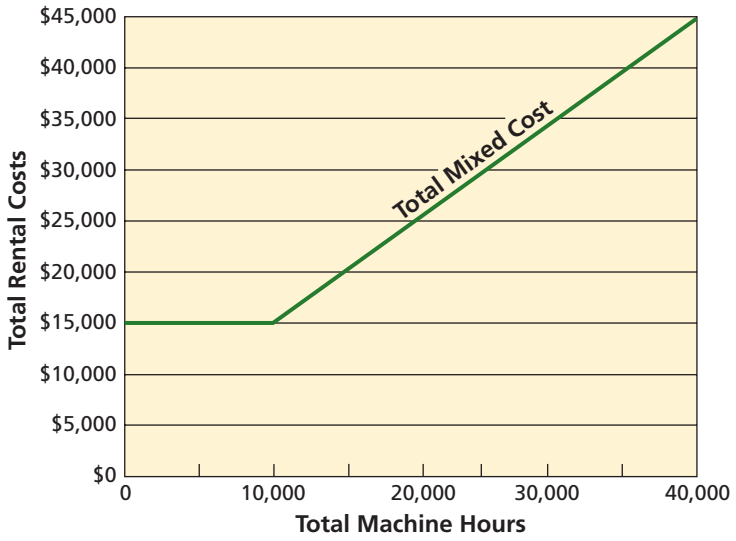
Rental Charge = $15,000 per year + $1 for each hour used in excess of 10,000 hours

The rental charges for various hours used within the relevant range of 8,000 hours to 40,000 hours are as follows:

Hours Used	Rental Charge
8,000 hours	$15,000
12,000	$17,000 {$15,000 + [(12,000 hrs. – 10,000 hrs.) × $1]}
20,000	$25,000 {$15,000 + [(20,000 hrs. – 10,000 hrs.) × $1]}
40,000	$45,000 {$15,000 + [(40,000 hrs. – 10,000 hrs.) × $1]}

Exhibit 5 illustrates the preceding mixed cost behavior.

Exhibit 5
Mixed Costs



Why It Matters

CONCEPT CLIP

Booking Fees

A major fixed cost for a concert promoter is the booking fee for the act. The booking fee is the amount to be paid to the act for a single show at a venue. **Degy Entertainment**, a booking agency, provided a list of asking prices for several popular acts. The following is a sampling from the list.

Taylor Swift	$1,000,000+
Justin Timberlake	$1,000,000+
Rihanna	$500K–$750K
Katy Perry	$500K
Keith Urban	$400K–$600K
Maroon 5	$400K–$600K
Kanye West	$400K–$600K
Carrie Underwood	$400K–$500K
Alicia Keys	$350K–$500K
Bruno Mars	$200K–$400K
Pitbull	$200K–$300K
Ke$ha	$150K–$200K
The Script	$125K–$175K

The promoter must cover these fixed costs with ticket revenues; thus, the size of the booking fee is necessarily related to the popularity of the act represented by the number of potential tickets sold and the ticket price.

Source: Zachery Crockett, "How Much Does It Cost to Book Your Favorite Band?" *Priceconomics.com*, May 16, 2014.

For purposes of analysis, mixed costs are usually separated into their fixed and variable components. The **high-low method** is a cost estimation method that may be used for this purpose.[1] The high-low method uses the highest and lowest activity levels and their related costs to estimate the variable cost per unit and the fixed cost.

To illustrate, assume that the Equipment Maintenance Department of Kason Inc. incurred the following costs during the past five months:

	Units Produced	Total Cost
June	1,000 units	$45,550
July	1,500	52,000
August	2,100	61,500
September	1,800	57,500
October	750	41,250

The number of units produced is the activity base, and the relevant range is the units produced between June and October. For Kason, the differences between the units produced and the total costs at the highest and lowest levels of production are as follows:

	Units Produced	Total Cost
Highest level	2,100 units	$ 61,500
Lowest level	(750)	(41,250)
Difference	1,350 units	$ 20,250

The total fixed cost does not change with changes in production. Thus, the $20,250 difference in the total cost is the change in the total variable cost. Dividing this difference of $20,250 by the difference in production is an estimate of the variable cost per unit. For Kason, this estimate is $15, computed as follows:

$$\text{Variable Cost per Unit} = \frac{\text{Difference in Total Cost}}{\text{Difference in Units Produced}}$$

$$= \frac{\$20{,}250}{1{,}350 \text{ units}} = \$15 \text{ per unit}$$

The fixed cost is estimated by subtracting the total variable costs from the total costs for the units produced, as follows:

$$\text{Fixed Cost} = \text{Total Costs} - (\text{Variable Cost per Unit} \times \text{Units Produced})$$

The fixed cost is the same at the highest and the lowest levels of production, as follows for Kason:

Highest level (2,100 units):

$$\begin{aligned}\text{Fixed Cost} &= \text{Total Costs} - (\text{Variable Cost per Unit} \times \text{Units Produced})\\ &= \$61{,}500 - (\$15 \times 2{,}100 \text{ units})\\ &= \$61{,}500 - \$31{,}500\\ &= \$30{,}000\end{aligned}$$

Lowest level (750 units):

$$\begin{aligned}\text{Fixed Cost} &= \text{Total Costs} - (\text{Variable Cost per Unit} \times \text{Units Produced})\\ &= \$41{,}250 - (\$15 \times 750 \text{ units})\\ &= \$41{,}250 - \$11{,}250\\ &= \$30{,}000\end{aligned}$$

Using the variable cost per unit and the fixed cost, the total equipment maintenance cost for Kason can be computed for various levels of production as follows:

$$\begin{aligned}\text{Total Cost} &= (\text{Variable Cost per Unit} \times \text{Units Produced}) + \text{Fixed Costs}\\ &= (\$15 \times \text{Units Produced}) + \$30{,}000\end{aligned}$$

[1] Other methods of estimating costs, such as the scattergraph method and the least squares method, are discussed in cost accounting textbooks.

To illustrate, the estimated total cost of 2,000 units of production is $60,000, computed as follows:

$$\begin{aligned}\text{Total Cost} &= (\$15 \times \text{Units Produced}) + \$30{,}000\\ &= (\$15 \times 2{,}000 \text{ units}) + \$30{,}000\\ &= \$30{,}000 + \$30{,}000\\ &= \$60{,}000\end{aligned}$$

Link to Ford Motor Company

Ford Motor Company entered into a collective bargaining agreement with the United Auto Workers union that provides for lump-sum payments in lieu of general wage increases. This has the effect of making wages more like a mixed cost.

Summary of Cost Behavior Concepts

The cost behavior of variable costs and fixed costs is summarized in Exhibit 6.

Exhibit 6
Variable and Fixed Cost Behavior

EFFECT OF CHANGING ACTIVITY LEVEL		
Cost	**Total Amount**	**Per-Unit Amount**
Variable	Increases and decreases proportionately with activity level.	Remains the same regardless of activity level.
Fixed	Remains the same regardless of activity level.	Increases and decreases inversely with activity level.

Mixed costs contain a fixed cost component that is incurred even if nothing is produced. For analysis, the fixed and variable cost components of mixed costs are separated using the high-low method.

Exhibit 7 provides some examples of variable, fixed, and mixed costs for the activity base of *units produced*.

Pathways Challenge



This is Accounting!

Economic Activity

Accounting often uses principles from other disciplines, such as economics and mathematics, and applies them to solve business problems. For example, you may recognize the equation for total costs from your math classes. Sometimes the total cost equation is called the *linear* cost equation, because the costs can be plotted as a line (see Exhibits 1, 3, and 5). The mathematical equation of a line is $y = mx + b$. The y is the value along the y-axis, m is the slope of the line, x is the value on the x-axis, and b is the point at which the line crosses the y-axis (when x equals zero). Translating this into accounting terminology, y is the total cost, m is the variable cost per unit, x is the number of units, and b is the fixed cost (the total cost when the number of units equals zero as follows:

$$\text{Total Cost} = (\text{Variable Cost per Unit} \times \text{Units Produced}) + \text{Fixed Cost}$$

Critical Thinking/Judgment

Consider the mathematic equation for computing the slope of a line: $m = \frac{y_1 - y_2}{x_1 - x_2}$. How does this equation relate to the computation of the variable cost when using the high-low method?

When computing the fixed cost using the high-low method, what assumption is made about the nature of the relationship between the units produced and total costs?

Suggested answer at end of chapter.

Variable Costs	Fixed Costs	Mixed Costs
■ Direct materials	■ Straight-line depreciation	■ Quality Control Department salaries
■ Direct labor	■ Property taxes	■ Purchasing Department salaries
■ Electricity expense	■ Production supervisor salaries	■ Maintenance expenses
■ Supplies	■ Insurance expense	■ Warehouse expenses

Exhibit 7
Variable, Fixed, and Mixed Costs

Check Up Corner 6-1 Cost Behavior

O&W Metal Company makes designer emblems for luxury vehicles. Each emblem is handcrafted out of titanium to the customer's design specifications. O&W's artisans are paid an hourly wage and work between 30 and 60 hours a week. O&W uses the straight-line method of depreciation. To ensure that each emblem conforms to the customer's specifications, O&W has each emblem inspected by an independent company. The inspection company charges a set price per month, plus an additional amount for each item inspected. After inspection, each emblem is shipped in a crush-resistant shipping container.

a. Which of O&W's costs (titanium, artisan wages, equipment depreciation, inspection, shipping containers) is a mixed cost?

b. Data on total mixed costs and total production for O&W's five months of operations are as follows:

	Units Produced	Total Cost
August	1,000 units	$ 80,000
September	1,200	86,000
October	1,600	98,000
November	2,500	125,000
December	2,200	116,000

Using the high-low method, determine the (1) variable cost per unit and (2) total fixed costs.

c. O&W estimates that it will produce 2,000 units during January. Using your answer to (b), estimate the (1) total variable costs and (2) fixed cost per unit for January.

Solution:

a. The inspection cost is a mixed cost because it includes a fixed cost (the set price per month) and a variable cost (an amount for each item inspected).

b. 1.

	Total Cost	Units Produced
Highest level (November)	$125,000	2,500
Lowest level (August)	(80,000)	(1,000)
Difference	$ 45,000	1,500

$$\text{Variable Cost per Unit} = \frac{\text{Difference in Total Cost}}{\text{Difference in Units Produced}}$$

$$= \frac{\$45{,}000}{1{,}500} = \$30.00 \text{ per unit}$$

2. Fixed Costs = Total Costs − (Variable Cost per Unit × Units Produced)

Highest level (2,500 units):

Fixed Costs = $125,000 – ($30 × 2,500 units)
= $125,000 – $75,000
= $50,000

Lowest level (1,000 units):

Fixed Costs = $80,000 – ($30 × 1,000 units)
= $80,000 – $30,000
= $50,000

c. 1. Total Variable Costs = $30 per unit × 2,000 units = $60,000

2. Fixed Cost per Unit = Total Fixed Costs ÷ Units Produced
= $50,000 ÷ 2,000 units
= $25.00

Mixed costs have characteristics of both variable and fixed costs.

The high-low method separates mixed costs into their fixed and variable components.

The variable cost per unit is determined by dividing the difference between the highest and lowest cost by the difference between the highest and lowest activity level.

The variable cost per unit is the same for all activity levels.

The total fixed costs computed are the same, using either the high or low activity level.

Total variable costs increase as the activity level increases.

The fixed cost per unit decreases as the activity level increases.

Check Up Corner

Objective 2
Compute the contribution margin, the contribution margin ratio, and the unit contribution margin.

Cost-Volume-Profit Relationships

Cost-volume-profit analysis is the examination of the relationships among selling prices, sales and production volume, costs, expenses, and profits. Cost-volume-profit analysis is useful for managerial decision making. Some of the ways cost-volume-profit analysis may be used include the following:

- Analyzing the effects of changes in selling prices on profits
- Analyzing the effects of changes in costs on profits
- Analyzing the effects of changes in volume on profits
- Setting selling prices
- Selecting the mix of products to sell
- Choosing among marketing strategies

Contribution Margin

Contribution margin is especially useful because it provides insight into the profit potential of a company. **Contribution margin** is the excess of sales over variable costs, computed as follows:

$$\text{Contribution Margin} = \text{Sales} - \text{Variable Costs}$$

To illustrate, assume the following data for Lambert Inc.:

Sales	50,000 units
Sales price per unit	$20 per unit
Variable cost per unit	$12 per unit
Fixed costs	$300,000

Exhibit 8 illustrates an income statement for Lambert prepared in a contribution margin format.

Exhibit 8
Contribution Margin Income Statement Format

Sales (50,000 units × $20)	$1,000,000
Variable costs (50,000 units × $12)	(600,000)
Contribution margin (50,000 units × $8)	$ 400,000
Fixed costs	(300,000)
Operating income	$ 100,000

Lambert's contribution margin of $400,000 is available to cover the fixed costs of $300,000. Once the fixed costs are covered, any additional contribution margin increases operating income.

Contribution Margin Ratio

Contribution margin can also be expressed as a percentage. The **contribution margin ratio**, sometimes called the *profit-volume ratio*, indicates the percentage of each sales dollar available to cover fixed costs and to provide operating income. The contribution margin ratio is computed as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin}}{\text{Sales}}$$

The contribution margin ratio is 40% for Lambert Inc., computed as follows:

$$\text{Contribution Margin Ratio} = \frac{\$400{,}000}{\$1{,}000{,}000} = 40\%$$

The contribution margin ratio is most useful when the increase or decrease in sales volume is measured in sales *dollars*. In this case, the change in sales dollars multiplied by the contribution margin ratio equals the change in operating income, computed as follows:

Change in Operating Income = Change in Sales Dollars × Contribution Margin Ratio

To illustrate, if Lambert adds $80,000 in sales from the sale of an additional 4,000 units, its operating income will increase by $32,000, computed as follows:

Change in Operating Income = Change in Sales Dollars × Contribution Margin Ratio
Change in Operating Income = $80,000 × 40% = $32,000

The preceding analysis is confirmed by Lambert's contribution margin income statement that follows:

Sales (54,000 units × $20)	$1,080,000
Variable costs (54,000 units × $12)	(648,000)*
Contribution margin (54,000 units × $8)	$ 432,000**
Fixed costs	(300,000)
Operating income	$ 132,000

*$1,080,000 × 60%
**$1,080,000 × 40%

Operating income increased from $100,000 to $132,000 when sales increased from $1,000,000 to $1,080,000. Variable costs as a percentage of sales are equal to 100% minus the contribution margin ratio. Thus, in the preceding income statement, the variable costs are 60% (100% – 40%) of sales, or $648,000 ($1,080,000 × 60%). The total contribution margin, $432,000, can also be computed directly by multiplying the total sales by the contribution margin ratio ($1,080,000 × 40%).

In the preceding analysis, factors other than sales volume, such as variable cost per unit and sales price, are assumed to remain constant. If such factors change, their effect must also be considered.

The contribution margin ratio is also useful in developing business strategies. For example, assume that a company has a high contribution margin ratio and is producing below 100% of capacity. In this case, a large increase in operating income can be expected from an increase in sales volume. Therefore, the company might consider implementing a special sales campaign to increase sales. In contrast, a company with a small contribution margin ratio will probably want to give more attention to reducing costs before attempting to promote sales.

Unit Contribution Margin

The unit contribution margin is also useful for analyzing the profit potential of proposed decisions. The **unit contribution margin** is computed as follows:

Unit Contribution Margin = Sales Price per Unit – Variable Cost per Unit

To illustrate, if Lambert Inc.'s unit selling price is $20 and its variable cost per unit is $12, the unit contribution margin is $8, computed as follows:

Unit Contribution Margin = Sales Price per Unit – Variable Cost per Unit
Unit Contribution Margin = $20 – $12 = $8

The unit contribution margin is most useful when the increase or decrease in sales volume is measured in sales *units* (quantities). In this case, the change in sales volume (units) multiplied by the unit contribution margin equals the change in operating income, computed as follows:

Change in Operating Income = Change in Sales Units × Unit Contribution Margin

To illustrate, assume that Lambert's sales could be increased by 15,000 units, from 50,000 units to 65,000 units. Lambert's operating income would increase by $120,000 (15,000 units × $8), computed as follows:

Change in Operating Income = Change in Sales Units × Unit Contribution Margin
Change in Operating Income = 15,000 units × $8 = $120,000

The preceding analysis is confirmed by Lambert's contribution margin income statement that follows, which shows that income increased to $220,000 when 65,000 units are sold. The income statement in Exhibit 8 indicates income of $100,000 when 50,000 units are sold. Thus, selling an additional 15,000 units increases income by $120,000 ($220,000 – $100,000).

Sales (65,000 units × $20)	$1,300,000
Variable costs (65,000 units × $12)	(780,000)
Contribution margin (65,000 units × $8)	$ 520,000
Fixed costs	(300,000)
Operating income	$ 220,000

Unit contribution margin analysis is useful information for managers. For example, in the preceding illustration, Lambert could spend up to $120,000 for special advertising or other product promotions to increase sales by 15,000 units and still increase income by $100,000, the $220,000 increase in sales minus the $120,000 cost of special advertising.

Check Up Corner 6-2 Contribution Margin

Toussant Company sells 20,000 units at $120 per unit. Variable costs are $90 per unit, and fixed costs are $250,000.

a. Prepare an income statement for Toussant in contribution margin format.
b. Determine Toussant's (1) contribution margin ratio and (2) unit contribution margin.
c. How much would operating income change if Toussant's sales increased by 3,000 units?

Solution:

a.

Sales	$ 2,400,000
Variable costs	(1,800,000)
Contribution margin	$ 600,000
Fixed costs	(250,000)
Operating income	$ 350,000

20,000 units × $120 sales price per unit

20,000 units × $90 variable cost per unit

Contribution margin is the excess of sales over variable costs.

Toussant's contribution margin is available to cover its fixed costs of $250,000.

Once fixed costs are covered, increases in contribution margin directly increase operating income.

b. 1. $$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin}}{\text{Sales}}$$

$$\text{Contribution Margin Ratio} = \frac{\$600{,}000}{\$2{,}400{,}000} = 25\%$$

The contribution margin ratio indicates the percentage of each sales dollar available to cover fixed costs and provide operating income.

2. $$\text{Unit Contribution Margin} = \text{Sales Price per Unit} - \text{Variable Cost per Unit}$$

$$\text{Unit Contribution Margin} = \$120 - \$90 = \$30$$

The unit contribution margin measures the dollar amount of contribution margin generated from each unit sold.

Both the contribution margin ratio and unit contribution margin can be used to determine how changes in sales volume (units) impact operating income.

c. *Using Contribution Margin Ratio:*

Change in sales dollars	$ 360,000
Contribution margin ratio	× 25%
Change in operating income	$ 90,000

3,000 unit increase × $120 selling price per unit

Using Unit Contribution Margin:

Change in sales units	3,000
Unit contribution margin	× $30
Change in operating income	$ 90,000

Both methods yield the same result.

Check Up Corner

Mathematical Approach to Cost-Volume-Profit Analysis

Objective 3
Determine the break-even point and sales necessary to achieve a target profit.

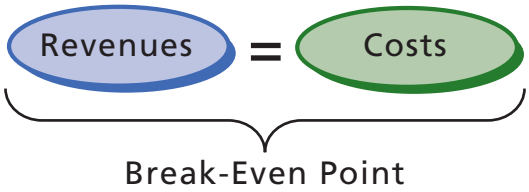
The mathematical approach to cost-volume-profit analysis uses equations to determine the following:

- Sales necessary to break even
- Sales necessary to make a target or desired profit

Break-Even Point

The **break-even point** is the level of operations at which a company's revenues and expenses are equal, as shown in Exhibit 9. At break-even, a company reports neither an operating income nor an operating loss.

Exhibit 9
Break-Even Point



The break-even point in *sales units* is computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

To illustrate, assume the following data for Baker Corporation:

Fixed costs	$90,000
Unit selling price	$ 25
Unit variable cost	(15)
Unit contribution margin	$ 10

The break-even point for Baker is 9,000 units, computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$90{,}000}{\$10} = 9{,}000 \text{ units}$$

The following income statement for Baker verifies the break-even point of 9,000 units:

Sales (9,000 units × $25)	$ 225,000
Variable costs (9,000 units × $15)	(135,000)
Contribution margin	$ 90,000
Fixed costs	(90,000)
Operating income	$ 0

As shown in Baker's income statement, the break-even point is $225,000 (9,000 units × $25) of sales. The break-even point in *sales dollars* can be determined directly as follows:

$$\text{Break-Even Sales (dollars)} = \frac{\text{Fixed Costs}}{\text{Contribution Margin Ratio}}$$

The contribution margin ratio can be computed using the unit contribution margin and unit selling price as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Unit Contribution Margin}}{\text{Unit Selling Price}}$$

The contribution margin ratio for Baker is 40%, computed as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Unit Contribution Margin}}{\text{Unit Selling Price}} = \frac{\$10}{\$25} = 40\%$$

Thus, the break-even sales dollars for Baker of $225,000 can be computed directly as follows:

$$\text{Break-Even Sales (dollars)} = \frac{\text{Fixed Costs}}{\text{Contribution Margin Ratio}} = \frac{\$90{,}000}{40\%} = \$225{,}000$$

The break-even point is affected by changes in the fixed costs, unit variable costs, and unit selling price.

Link to Ford Motor Company

Ford Motor Company reported that its 2014 operations in the Middle East and Africa were at break-even.

Source: Ford Motor Company, *Form 10-K for Year Ended December 31, 2014.*

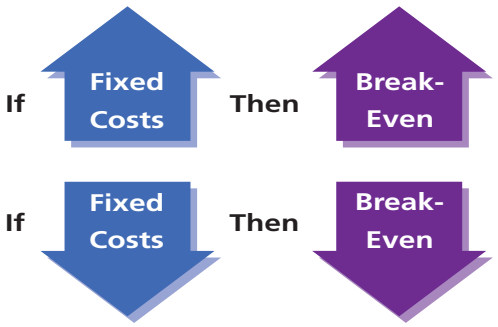
Effect of Changes in Fixed Costs Fixed costs do not change in total with changes in the level of activity. However, fixed costs may change because of other factors such as advertising campaigns, changes in property tax rates, or changes in factory supervisors' salaries.

Changes in fixed costs affect the break-even point as follows:

- Increases in fixed costs increase the break-even point.
- Decreases in fixed costs decrease the break-even point.

This relationship is illustrated in Exhibit 10.

Exhibit 10
Effect of Change in Fixed Costs on Break-Even Point



To illustrate, assume that Bishop Co. is evaluating a proposal to budget an additional $100,000 for advertising. The data for Bishop follow:

	Current	Proposed
Unit selling price	$ 90	$ 90
Unit variable cost	(70)	(70)
Unit contribution margin	$ 20	$ 20
Fixed costs	$600,000	$700,000

Bishop's break-even point *before* the additional advertising expense of $100,000 is 30,000 units, computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$600{,}000}{\$20} = 30{,}000 \text{ units}$$

Bishop's break-even point *after* the additional advertising expense of $100,000 is 35,000 units, computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$700{,}000}{\$20} = 35{,}000 \text{ units}$$

As shown for Bishop, the $100,000 increase in advertising (fixed costs) requires an additional 5,000 units (35,000 – 30,000) of sales to break even.[2] In other words, an increase in sales of

[2] The increase of 5,000 units can also be computed by dividing the increase in fixed costs of $100,000 by the unit contribution margin, $20, as follows: 5,000 units = $100,000 ÷ $20.

5,000 units is required in order to generate an additional $100,000 of total contribution margin (5,000 units × $20) to cover the increased fixed costs.

Effect of Changes in Unit Variable Costs Unit variable costs do not change with changes in the level of activity. However, unit variable costs may be affected by other factors such as changes in the cost per unit of direct materials, changes in the wage rate for direct labor, or changes in the sales commission paid to salespeople.

Changes in unit variable costs affect the break-even point as follows:

- Increases in unit variable costs increase the break-even point.
- Decreases in unit variable costs decrease the break-even point.

This relationship is illustrated in Exhibit 11.

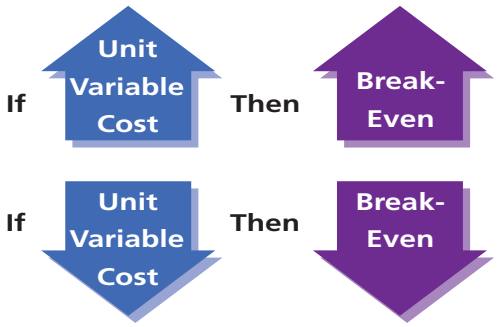


Exhibit 11
Effect of Change in Unit Variable Cost on Break-Even Point

To illustrate, assume that Park Co. is evaluating a proposal to pay an additional 2% commission on sales to its salespeople as an incentive to increase sales. The data for Park follow:

	Current	Proposed
Unit selling price	$ 250	$ 250
Unit variable cost	(145)	(150)*
Unit contribution margin	$ 105	$ 100
Fixed costs	$840,000	$840,000

*$150 = $145 + (2% × $250 unit selling price)

Why It Matters

Airline Industry Break-Even

Airlines measure revenues and costs by available seat miles. An available seat mile is one seat (empty or filled) flying one mile. Thus, the average revenue earned per available seat mile is termed the RASM, and the average cost per available seat mile is termed the CASM. The operating break-even occurs when the RASM equals the CASM. Since airlines have high aircraft fixed costs, filling passenger seats is an important contributor to exceeding break-even. This is measured by the average proportion of seats filled across all flights, which is termed the load factor. In addition, important variable costs such as labor and fuel impact the break-even performance. Thus, airlines monitor employee productivity and fuel costs to maintain profitability. The RASM, CASM, and load factor for a recent year for major airlines are as follows:

	American Airlines	United Airlines	Delta Air Lines	Southwest Airlines	US Airways
RASM	$ 0.129	$ 0.124	$ 0.132	$ 0.135	$ 0.125
CASM	(0.082)	(0.079)	(0.089)	(0.075)	(0.077)
RASM – CASM	$ 0.047	$ 0.045	$ 0.043	$ 0.060	$ 0.048
Load factor	82%	84%	85%	82%	83%

As can be seen, all the major airlines are operating above their break-even points, with **Southwest Airlines (LUV)** demonstrating the best profit performance by these metrics. The load factors are all more than 80%, indicating that the airlines are using their aircraft efficiently.

Source: MIT Airline Data Project.

Park's break-even point *before* the additional 2% commission is 8,000 units, computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$840{,}000}{\$105} = 8{,}000 \text{ units}$$

If the 2% sales commission proposal is adopted, unit variable costs will increase by $5 ($250 × 2%), from $145 to $150 per unit. This increase in unit variable costs will decrease the unit contribution margin from $105 to $100 ($250 – $150). Thus, Park's break-even point *after* the additional 2% commission is 8,400 units, computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$840{,}000}{\$100} = 8{,}400 \text{ units}$$

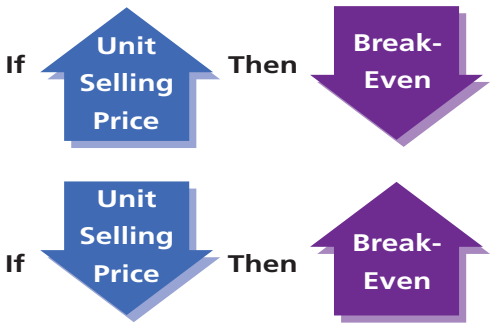
As shown for Park, an additional 400 units of sales will be required in order to break even. This is because if 8,000 units are sold, the new unit contribution margin of $100 provides only $800,000 (8,000 units × $100) of contribution margin. Thus, $40,000 more contribution margin is necessary to cover the total fixed costs of $840,000. This additional $40,000 of contribution margin is provided by selling 400 more units (400 units × $100).

Effect of Changes in Unit Selling Price Changes in the unit selling price affect the unit contribution margin and, thus, the break-even point. Specifically, changes in the unit selling price affect the break-even point as follows:

- Increases in the unit selling price decrease the break-even point.
- Decreases in the unit selling price increase the break-even point.

This relationship is illustrated in Exhibit 12.

Exhibit 12
Effect of Change in Unit Selling Price on Break-Even Point



To illustrate, assume that Graham Co. is evaluating a proposal to increase the unit selling price of its product from $50 to $60. The data for Graham follow:

	Current	Proposed
Unit selling price	$ 50	$ 60
Unit variable cost	(30)	(30)
Unit contribution margin	$ 20	$ 30
Fixed costs	$600,000	$600,000

Graham's break-even point *before* the price increase is 30,000 units, computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$600{,}000}{\$20} = 30{,}000 \text{ units}$$

The increase of $10 per unit in the selling price increases the unit contribution margin by $10. Thus, Graham's break-even point *after* the price increase is 20,000 units, computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$600{,}000}{\$30} = 20{,}000 \text{ units}$$

As shown for Graham, the price increase of $10 increased the unit contribution margin by $10, which decreased the break-even point by 10,000 units (30,000 units – 20,000 units).

Summary of Effects of Changes on Break-Even Point The break-even point in sales changes in the same direction as changes in the variable cost per unit and fixed costs. In contrast, the break-even point in sales changes in the opposite direction as changes in the unit selling price. These changes on the break-even point in sales are summarized in Exhibit 13.

Exhibit 13
Effects of Changes in Selling Price and Costs on Break-Even Point

Type of Change	Direction of Change	Effect of Change on Break-Even Sales
Fixed cost	↑ ↓	↑ ↓
Unit variable cost	↑ ↓	↑ ↓
Unit selling price	↑ ↓	↓ ↑

Target Profit

At the break-even point, sales and costs are exactly equal. However, the goal of most companies is to make a profit.

By modifying the break-even equation, the sales required to earn a target or desired amount of profit may be computed. For this purpose, target profit is added to the break-even equation, as follows:

$$\text{Sales (units)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}}$$

To illustrate, assume the following data for Waltham Co.:

Fixed costs	$200,000
Target profit	100,000
Unit selling price	$ 75
Unit variable cost	(45)
Unit contribution margin	$ 30

The sales necessary for Waltham to earn the target profit of $100,000 would be 10,000 units, computed as follows:

$$\text{Sales (units)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}} = \frac{\$200{,}000 + \$100{,}000}{\$30} = 10{,}000 \text{ units}$$

The following income statement for Waltham verifies this computation:

Sales (10,000 units × $75)	$ 750,000	
Variable costs (10,000 units × $45)	(450,000)	
Contribution margin (10,000 units × $30)	$ 300,000	
Fixed costs	(200,000)	
Operating income	$ 100,000	← Target profit

As shown in the income statement for Waltham, sales of $750,000 (10,000 units × $75) are necessary to earn the target profit of $100,000. The sales of $750,000 needed to earn the target profit of $100,000 can be computed directly using the contribution margin ratio as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Unit Contribution Margin}}{\text{Unit Selling Price}} = \frac{\$30}{\$75} = 40\%$$

$$\text{Sales (dollars)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Contribution Margin Ratio}}$$

$$= \frac{\$200{,}000 + \$100{,}000}{40\%} = \frac{\$300{,}000}{40\%} = \$750{,}000$$



Ethics: Do It!

Orphan Drugs

Each year, pharmaceutical companies develop new drugs that cure a variety of physical conditions. In order to be profitable, drug companies must sell enough of a product at a reasonable price to exceed break-even. Break-even points, however, create a problem for drugs, called "orphan drugs," targeted at rare diseases. These drugs are typically expensive to develop and have low sales volumes, making it impossible to achieve break-even. To ensure that orphan drugs are not overlooked, Congress passed the Orphan Drug Act, which provides incentives for pharmaceutical companies to develop drugs for rare diseases that might not generate enough sales to reach break-even. The program has been a great success. Since 1982, more than 200 orphan drugs have come to market, including **Jacobus Pharmaceutical Company Inc.**'s drug for the treatment of tuberculosis and **Novartis International AG**'s **(NVS)** drug for the treatment of Paget's disease.

Objective 4
Using a cost-volume-profit chart and a profit-volume chart, determine the break-even point and sales necessary to achieve a target profit.

Graphic Approach to Cost-Volume-Profit Analysis

Cost-volume-profit analysis can be presented graphically as well as in equation form. Many managers prefer the graphic form because the operating profit or loss for different levels can be easily seen.

Cost-Volume-Profit (Break-Even) Chart

A **cost-volume-profit chart**, sometimes called a *break-even chart*, graphically shows sales, costs, and the related profit or loss for various levels of units sold. It assists in understanding the relationship among sales, costs, and operating profit or loss.

To illustrate, the cost-volume-profit chart in Exhibit 14 is based on the following data for Munoz Co.:

Total fixed costs	$100,000
Unit selling price	$ 50
Unit variable cost	(30)
Unit contribution margin	$ 20

The cost-volume-profit chart in Exhibit 14 is constructed using the following steps:

- Step 1. Volume in units of sales is indicated along the horizontal axis. The range of volume shown is the relevant range in which the company expects to operate. Dollar amounts of total sales and total costs are indicated along the vertical axis.
- Step 2. A total sales line is plotted by connecting the point at zero on the left corner of the graph to a second point on the chart. The second point is determined by multiplying

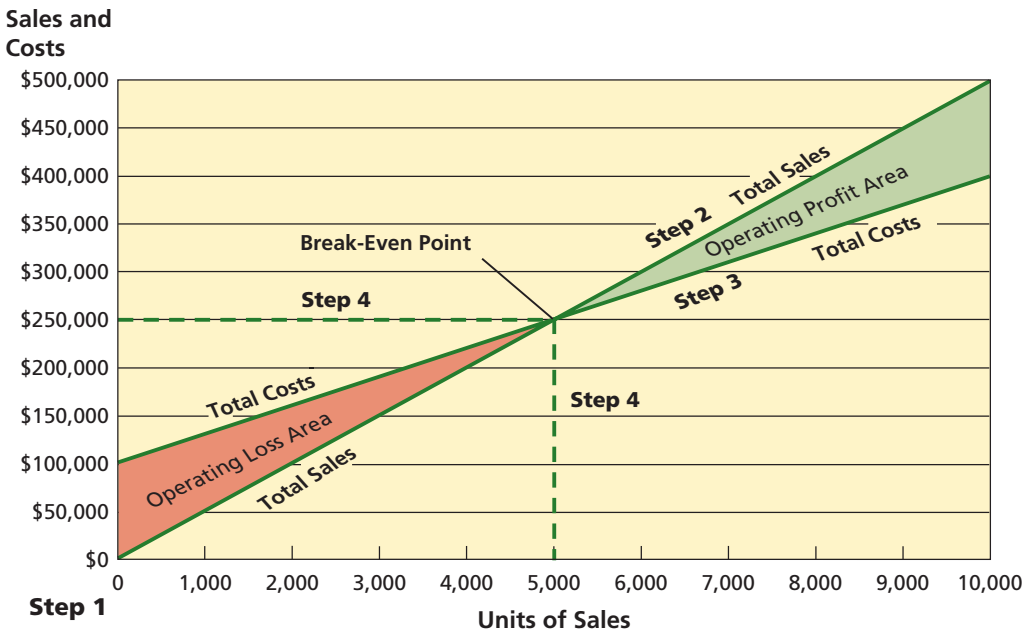


Exhibit 14
Cost-Volume-Profit Chart

the maximum number of units in the relevant range, which is found on the far right of the horizontal axis, by the unit sales price. A line is then drawn through both of these points. This is the total sales line. For Munoz, the maximum number of units in the relevant range is 10,000. The second point on the line is determined by multiplying the 10,000 units by the $50 unit selling price to get the second point for the total sales line of $500,000 (10,000 units × $50). The sales line is drawn upward to the right from zero through the $500,000 point at the end of the relevant range.

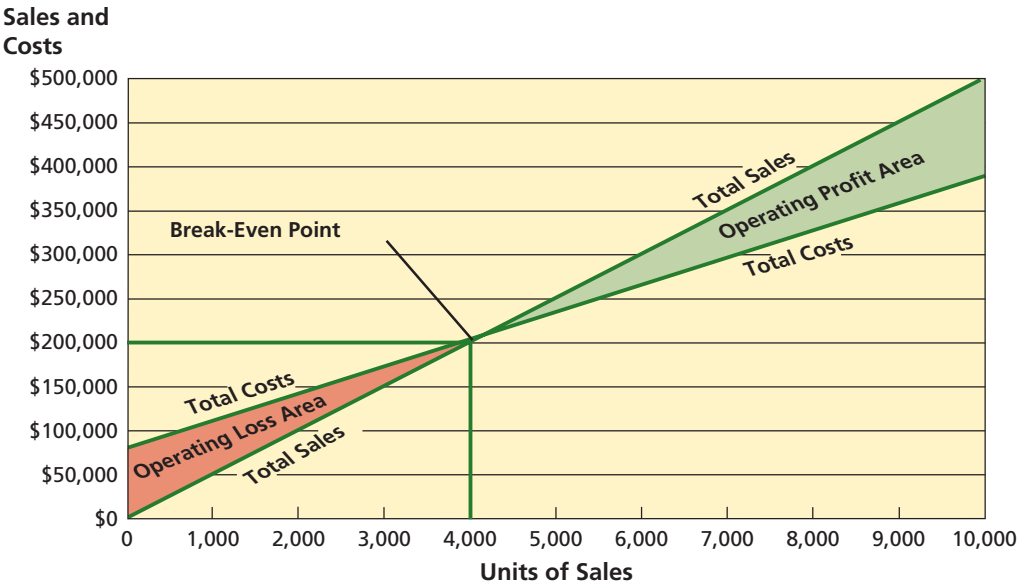
- Step 3. A total cost line is plotted by beginning with total fixed costs on the vertical axis. A second point is determined by multiplying the maximum number of units in the relevant range, which is found on the far right of the horizontal axis, by the unit variable costs and adding the total fixed costs. A line is then drawn through both of these points. This is the total cost line. For Munoz, the maximum number of units in the relevant range is 10,000. The second point on the line is determined by multiplying the 10,000 units by the $30 unit variable cost and then adding the $100,000 total fixed costs to get the second point for the total estimated costs of $400,000 [(10,000 units × $30) + $100,000]. The cost line is drawn upward to the right from $100,000 on the vertical axis through the $400,000 point at the end of the relevant range.
- Step 4. The break-even point is the intersection point of the total sales and total cost lines. A vertical dotted line drawn downward at the intersection point indicates the units of sales at the break-even point. A horizontal dotted line drawn to the left at the intersection point indicates the sales dollars and costs at the break-even point.

In Exhibit 14, the break-even point for Munoz is $250,000 of sales, which represents sales of 5,000 units. Operating profits will be earned when sales levels are to the right of the break-even point (*operating profit area*). Operating losses will be incurred when sales levels are to the left of the break-even point (*operating loss area*).

Changes in the unit selling price, total fixed costs, and unit variable costs can be analyzed by using a cost-volume-profit chart. Using the data in Exhibit 14, assume that Munoz is evaluating a proposal to reduce fixed costs by $20,000. In this case, the total fixed costs would be $80,000 ($100,000 – $20,000).

Under this scenario, the total sales line is not changed, but the total cost line will change. As shown in Exhibit 15, the total cost line is redrawn, starting at the $80,000 point (total fixed costs) on the vertical axis. The second point is determined by multiplying the maximum number of units in the

Exhibit 15
Revised Cost-Volume-Profit Chart



relevant range, which is found on the far right of the horizontal axis, by the unit variable costs and adding the fixed costs. For Munoz, this is the total estimated cost for 10,000 units, which is $380,000 [(10,000 units × $30) + $80,000]. The cost line is drawn upward to the right from $80,000 on the vertical axis through the $380,000 point. The revised cost-volume-profit chart in Exhibit 15 indicates that the break-even point for Munoz decreases to $200,000 and 4,000 units of sales.

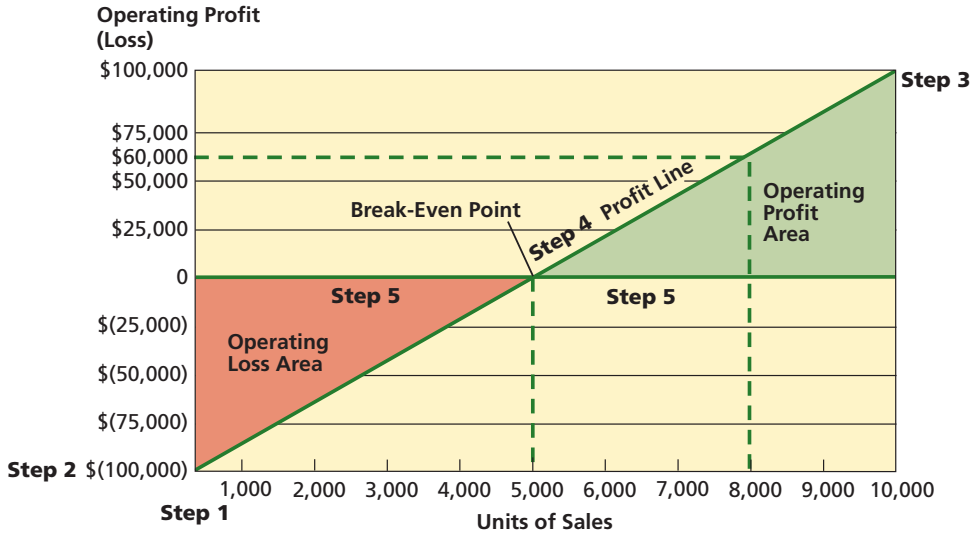
Profit-Volume Chart

Another graphic approach to cost-volume-profit analysis is the profit-volume chart. The **profit-volume chart** plots only the difference between total sales and total costs (or profits). In this way, the profit-volume chart allows managers to determine the operating profit (or loss) for various levels of units sold.

To illustrate, the profit-volume chart for Munoz Co. in Exhibit 16 is based on the same data as used in Exhibit 14. These data are as follows:

Total fixed costs	$100,000
Unit selling price	$ 50
Unit variable cost	(30)
Unit contribution margin	$ 20

Exhibit 16
Profit-Volume Chart



The maximum operating loss is equal to the fixed costs of $100,000. Assuming that the maximum units that can be sold within the relevant range is 10,000 units, the maximum operating profit is $100,000, computed as follows:

Sales (10,000 units × $50)	$ 500,000
Variable costs (10,000 units × $30)	(300,000)
Contribution margin (10,000 units × $20)	$ 200,000
Fixed costs	(100,000)
Operating profit	$ 100,000 ← Maximum profit

The profit-volume chart in Exhibit 16 is constructed using the following steps:

- Step 1. Volume in units of sales is indicated along the horizontal axis. The range of volume shown is the relevant range in which the company expects to operate. In Exhibit 16, the maximum units of sales is 10,000 units. Dollar amounts indicating operating profits and losses are shown along the vertical axis.
- Step 2. A point representing the maximum operating loss is plotted on the vertical axis at the left. This loss is equal to the total fixed costs at the zero level of sales. Thus, the maximum operating loss is equal to the fixed costs of $100,000.
- Step 3. A point representing the maximum operating profit within the relevant range is plotted on the right. Assuming that the maximum unit sales within the relevant range is 10,000 units, the maximum operating profit is $100,000.
- Step 4. A diagonal profit line is drawn connecting the maximum operating loss point with the maximum operating profit point.
- Step 5. The profit line intersects the horizontal zero operating profit line at the break-even point in units of sales. The area indicating an operating profit is identified to the right of the intersection, and the area indicating an operating loss is identified to the left of the intersection.

In Exhibit 16, the break-even point for Munoz is 5,000 units of sales, which is equal to total sales of $250,000 (5,000 units × $50). Operating profit will be earned when sales levels are to the right of the break-even point (*operating profit area*). Operating losses will be incurred when sales levels are to the left of the break-even point (*operating loss area*). For example, at sales of 8,000 units, an operating profit of $60,000 will be earned, as shown in Exhibit 16.

The effect of changes in the unit selling price, total fixed costs, and unit variable costs on profit can be analyzed using a profit-volume chart. Using the data in Exhibit 16, consider the effect that a $20,000 increase in fixed costs will have on profit. In this case, the total fixed costs will increase to $120,000 ($100,000 + $20,000), and the maximum operating loss will also increase to $120,000. At the maximum sales of 10,000 units, the maximum operating profit would be $80,000, computed as follows:

Sales (10,000 units × $50)	$ 500,000
Variable costs (10,000 units × $30)	(300,000)
Contribution margin (10,000 units × $20)	$ 200,000
Fixed costs	(120,000)
Operating profit	$ 80,000 ← Revised maximum profit

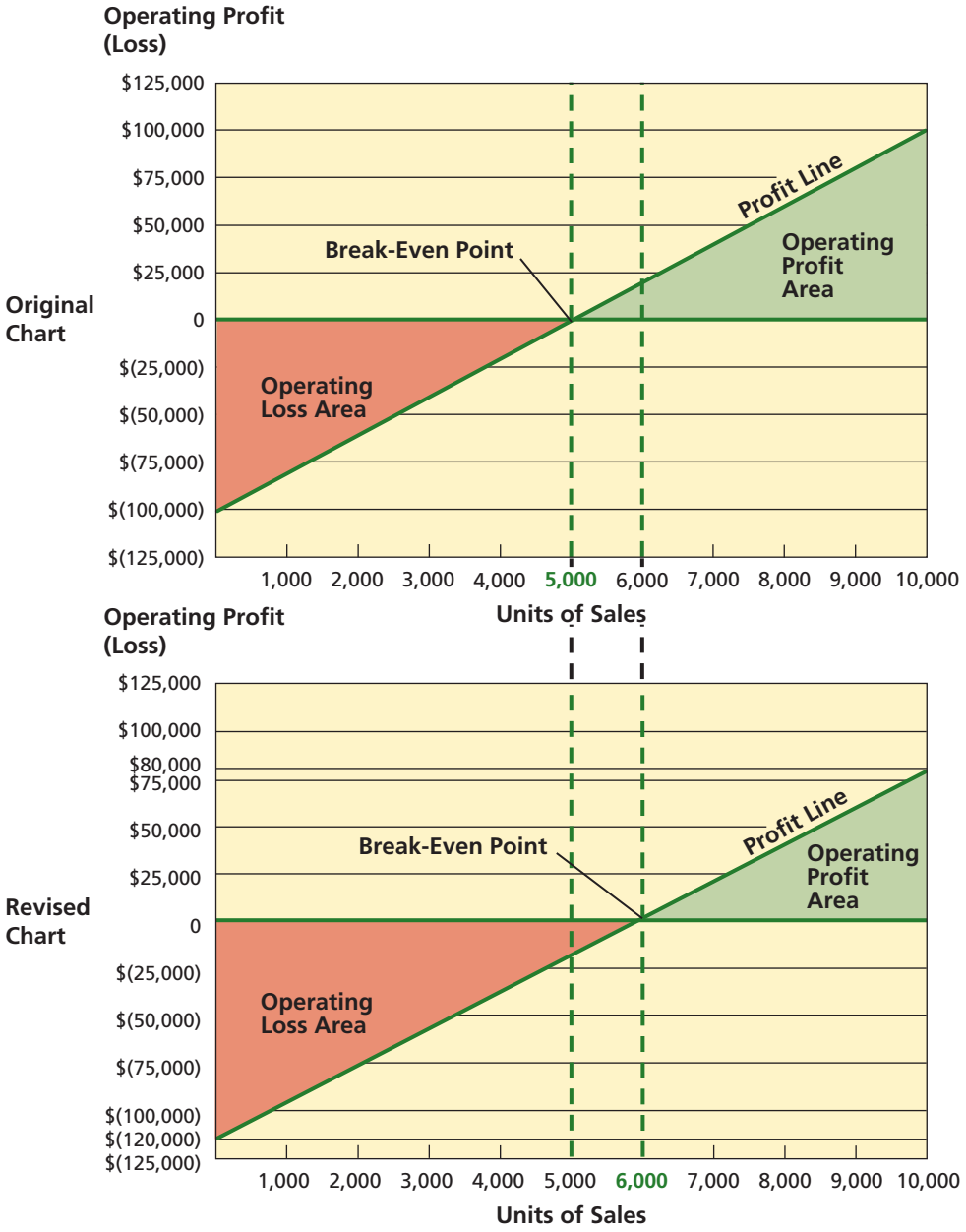
A revised profit-volume chart is constructed by plotting the maximum operating loss and maximum operating profit points and drawing the revised profit line. The original and the revised profit-volume charts for Munoz are shown in Exhibit 17.

The revised profit-volume chart indicates that the break-even point for Munoz is 6,000 units of sales. This is equal to total sales of $300,000 (6,000 units × $50). The operating loss area of the chart has increased, while the operating profit area has decreased.

Use of Spreadsheets in Cost-Volume-Profit Analysis

With spreadsheets, the graphic approach and the mathematical approach to cost-volume-profit analysis are easy to use. Managers can vary assumptions regarding selling prices, costs, and

Exhibit 17
Original Profit-Volume Chart and Revised Profit-Volume Chart



volume and can observe the effects of each change on the break-even point and profit. Such an analysis is called a *"what if"* analysis or *sensitivity* analysis.

Assumptions of Cost-Volume-Profit Analysis

Cost-volume-profit analysis depends on several assumptions. The primary assumptions are as follows:

- Total sales and total costs can be represented by straight lines.
- Within the relevant range of operating activity, the efficiency of operations does not change.
- Costs can be divided into fixed and variable components.
- The sales mix is constant.
- There is no change in the inventory quantities during the period.

These assumptions simplify cost-volume-profit analysis. Because they are often valid for the relevant range of operations, cost-volume-profit analysis is useful for decision making.[3]

[3] The impact of violating these assumptions is discussed in advanced accounting texts.

Check Up Corner 6-3 Break-Even Sales and Target Profit

DeHan Company, a sporting goods manufacturer, sells binoculars for $140 per unit. The variable cost is $100 per unit, while the fixed costs are $1,200,000.

a. Compute:
   1. The anticipated break-even sales (units) for binoculars.
   2. The sales (units) for binoculars required to realize target operating income of $400,000.

b. Construct a cost-volume-profit chart for the anticipated break-even sales for binoculars.

Solution:

a. 1.

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

Unit selling price	$ 140
Unit variable cost	(100)
Unit contribution margin	$ 40

$$\text{Break-Even Sales (units)} = \frac{\$1{,}200{,}000}{\$40}$$

$$= 30{,}000 \text{ units}$$

The break-even point is the level of operations at which a company's revenues and expenses are equal.

A company's revenues will equal costs when:
(Unit contribution margin × Units sold) = Fixed costs

Sales (30,000 units × $140)	$ 4,200,000
Variable costs (30,000 units × $100)	(3,000,000)
Contribution margin (30,000 units × $40)	$ 1,200,000
Fixed costs	(1,200,000)
Operating income	$ 0

2.

$$\text{Sales (units)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}}$$

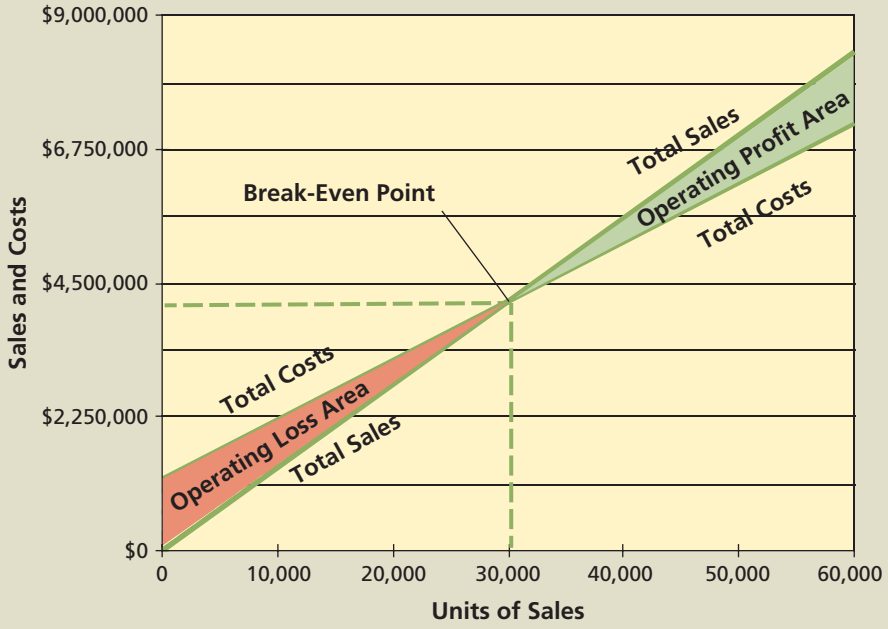
$$\text{Sales (units)} = \frac{\$1{,}200{,}000 + \$400{,}000}{\$40}$$

$$= 40{,}000 \text{ units}$$

The sales required to earn a target or desired amount of profit may be computed by adding the amount of the target profit to fixed costs in the numerator of the break-even equation.

Sales (40,000 units × $140)	$ 5,600,000
Variable costs (40,000 units × $100)	(4,000,000)
Contribution margin (40,000 units × $40)	$ 1,600,000
Fixed costs	(1,200,000)
Operating income	$ 400,000

b.



Check Up Corner

Objective 5

Compute the break-even point for a company selling more than one product, the operating leverage, and the margin of safety.

Special Cost-Volume-Profit Relationships

Cost-volume-profit analysis can also be used when a company sells several products with different costs and prices. In addition, operating leverage and the margin of safety are useful in analyzing cost-volume-profit relationships.

Sales Mix Considerations

Many companies sell more than one product at different selling prices. In addition, the products normally have different unit variable costs and, thus, different unit contribution margins. In such cases, break-even analysis can still be performed by considering the sales mix. The **sales mix** is the relative distribution of sales among the products sold by a company.

To illustrate, assume that Cascade Company sold Products A and B during the past year, as follows:

Total fixed costs	$200,000	
	Product A	**Product B**
Unit selling price	$ 90	$140
Unit variable cost	(70)	(95)
Unit contribution margin	$ 20	$ 45
Units sold	8,000	2,000
Sales mix	80%	20%

The sales mix for Products A and B is expressed as a percentage of total units sold. For Cascade, a total of 10,000 (8,000 + 2,000) units were sold during the year. Therefore, the sales mix is 80% (8,000 ÷ 10,000) for Product A and 20% for Product B (2,000 ÷ 10,000), as shown in Exhibit 18. The sales mix could also be expressed as the ratio 80:20.

Why It Matters

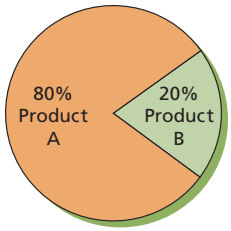
Profit, Loss, and Break-Even in Major League Baseball

Major League Baseball is a tough game and a tough business. Ticket prices (unit selling price), player salaries and stadium fees (fixed costs), game day personnel (variable costs), and attendance (volume) converge to make it difficult for teams to make a profit, or at least break even. So, which major league baseball team was the most profitable in 2013? Well, it wasn't the World Champion Boston Red Sox. Nor was it the star-studded New York Yankees. Then, it had to be the recently turned around Los Angeles Angels, right? Not even close. It was actually the worst team in baseball—the Houston Astros.

Just how profitable were the Astros? They earned $99 million in 2013, which was more than the combined 2013 profits of the six most recent World Series champions. How could the team with the worst record in baseball since 2005 have one of the most profitable years in baseball history? By paying careful attention to costs and volume. Between 2011 and 2013, the Astros cut their player payroll from $56 million to less than $13 million. That's right, all of the players on the Houston Astros baseball team, combined, made less in 2013 than Alex Rodriguez (New York Yankees), Cliff Lee (Philadelphia Phillies), Prince Fielder (Detroit Tigers), and Tim Lincecum (San Francisco Giants) made individually. While attendance at Astros games has dropped by around 20% since 2011, the cost reductions from reduced player salaries have far outpaced the drop in attendance, making the 2013 Astros the most profitable team in baseball history. While no one likes losing baseball games, the Houston Astros have shown that focusing on the relationship between cost and volume can yield a hefty profit, even when they aren't winning.

Source: D. Alexander, "2013 Houston Astros: Baseball's Worst Team Is the Most Profitable in History," *Forbes*, August 26, 2013.

Exhibit 18
Multiple Product Sales Mix



Sales Mix

For break-even analysis, it is useful to think of Products A and B as components of one overall enterprise product called E. The unit selling price of E equals the sum of the unit selling prices of each product multiplied by its sales mix percentage. Likewise, the unit variable cost and unit contribution margin of E equal the sum of the unit variable costs and unit contribution margins of each product multiplied by its sales mix percentage.

For Cascade, the unit selling price, unit variable cost, and unit contribution margin for E are computed as follows:

Product E		**Product A**	**Product B**
Unit selling price of E	$100 =	($90 × 0.8) +	($140 × 0.2)
Unit variable cost of E	(75) =	($70 × 0.8) +	($95 × 0.2)
Unit contribution margin of E	$ 25 =	($20 × 0.8) +	($45 × 0.2)

Cascade has total fixed costs of $200,000. The break-even point of 8,000 units of E can be determined as follows using the unit selling price, unit variable cost, and unit contribution margin of E:

$$\text{Break-Even Sales (units) for E} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}} = \frac{\$200{,}000}{\$25} = 8{,}000 \text{ units}$$

Because the sales mix for Products A and B is 80% and 20% respectively, the break-even quantity of A is 6,400 units (8,000 units × 80%) and B is 1,600 units (8,000 units × 20%) which is verified in Exhibit 19.

Exhibit 19
Break-Even Sales: Multiple Products

	Product A	**Product B**	**Total**	
Sales:				
6,400 units × $90	$ 576,000		$ 576,000	
1,600 units × $140		$ 224,000	224,000	
Total sales	$ 576,000	$ 224,000	$ 800,000	
Variable costs:				
6,400 units × $70	$(448,000)		$(448,000)	
1,600 units × $95		$(152,000)	(152,000)	
Total variable costs	$(448,000)	$(152,000)	$(600,000)	
Contribution margin	$ 128,000	$ 72,000	$ 200,000	
Fixed costs			(200,000)	
Operating income			$ 0	← Break-even point

The effects of changes in the sales mix on the break-even point can be determined by assuming a different sales mix. The break-even point of E can then be recomputed.

The sales mix of Ford and Lincoln vehicles sold has a major impact on **Ford Motor Company**'s overall profitability.

Link to Ford Motor Company

Operating Leverage

The relationship between a company's contribution margin and operating income is measured by **operating leverage**. A company's operating leverage is computed as follows:

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Operating Income}}$$

The difference between contribution margin and operating income is fixed costs. Thus, companies with high fixed costs will normally have high operating leverage. Examples of such companies include airline and automotive companies, like **Ford Motor Company**. Low operating leverage is normal for companies that are labor intensive, such as professional service companies, which have low fixed costs.

To illustrate operating leverage, assume the following data for Jones Inc. and Wilson Inc.:

	Jones Inc.	Wilson Inc.
Sales	$ 400,000	$ 400,000
Variable costs	(300,000)	(300,000)
Contribution margin	$ 100,000	$ 100,000
Fixed costs	(80,000)	(50,000)
Operating income	$ 20,000	$ 50,000

As shown, Jones and Wilson have the same sales, the same variable costs, and the same contribution margin. However, Jones has larger fixed costs than Wilson and, thus, a higher operating leverage. The operating leverage for each company is computed as follows:

Jones Inc.

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Operating Income}} = \frac{\$100{,}000}{\$20{,}000} = 5$$

Wilson Inc.

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Operating Income}} = \frac{\$100{,}000}{\$50{,}000} = 2$$

Operating leverage can be used to measure the impact of changes in sales on operating income. Using operating leverage, the effect of changes in sales on operating income is computed as follows:

$$\text{Percent Change in Operating Income} = \text{Percent Change in Sales} \times \text{Operating Leverage}$$

To illustrate, assume that sales increased by 10%, or $40,000 ($400,000 × 10%), for Jones and Wilson. The percent increase in operating income for Jones and Wilson is computed as follows:

Jones Inc.

$$\text{Percent Change in Operating Income} = \text{Percent Change in Sales} \times \text{Operating Leverage}$$
$$= 10\% \times 5 = 50\%$$

Wilson Inc.

$$\text{Percent Change in Operating Income} = \text{Percent Change in Sales} \times \text{Operating Leverage}$$
$$= 10\% \times 2 = 20\%$$

As shown, Jones's operating income increases by 50%, while Wilson's operating income increases by only 20%. The validity of this analysis is shown in the following income statements for Jones and Wilson based on the 10% increase in sales:

	Jones Inc.	Wilson Inc.
Sales	$ 440,000	$ 440,000
Variable costs	(330,000)	(330,000)
Contribution margin	$ 110,000	$ 110,000
Fixed costs	(80,000)	(50,000)
Operating income	$ 30,000	$ 60,000

The preceding income statements indicate that Jones's operating income increased from $20,000 to $30,000, a 50% increase ($10,000 ÷ $20,000). In contrast, Wilson's operating income increased from $50,000 to $60,000, a 20% increase ($10,000 ÷ $50,000).

Because even a small increase in sales will generate a large percentage increase in operating income, Jones might consider ways to increase sales. Such actions could include special advertising or sales promotions. In contrast, Wilson might consider ways to increase operating leverage by reducing variable costs.

The impact of a change in sales on operating income for companies with high and low operating leverage is summarized in Exhibit 20.

Exhibit 20
Effect of Operating Leverage on Operating Income

Operating Leverage	Percentage Impact on Operating Income from a Change in Sales
High	Large
Low	Small

Ford Motor Company has a high proportion of fixed costs with the result that small changes in units sold can significantly affect its overall profitability.

Source: Ford Motor Company, *Form 10-K for Year Ended December 31, 2014.*

Link to Ford Motor Company

Margin of Safety

The **margin of safety** indicates the possible decrease in sales that may occur before an operating loss results. Thus, if the margin of safety is low, even a small decline in sales revenue may result in an operating loss.

The margin of safety may be expressed in the following ways:

- Dollars of sales
- Units of sales
- Percent of current sales

To illustrate, assume the following data:

Sales	$250,000
Sales at the break-even point	200,000
Unit selling price	25

The margin of safety in dollars of sales is $50,000 ($250,000 – $200,000). The margin of safety in units is 2,000 units ($50,000 ÷ $25). The margin of safety expressed as a percent of current sales is 20%, computed as follows:

$$\text{Margin of Safety} = \frac{\text{Sales} - \text{Sales at Break-Even Point}}{\text{Sales}}$$

$$= \frac{\$250{,}000 - \$200{,}000}{\$250{,}000} = \frac{\$50{,}000}{\$250{,}000} = 20\%$$

Therefore, the current sales may decline $50,000, 2,000 units, or 20% before an operating loss occurs.

Check Up Corner 6-4 Special Cost-Volume-Profit Relationships

Blueberry Inc., a consumer electronics company, manufactures and sells two products, smartphones and tablet computers. The unit selling price, unit variable cost, and sales mix for each product are as follows:

Products	Unit Selling Price	Unit Variable Cost	Sales Mix
Smartphone	$650	$560	60%
Tablet	550	475	40%

The company's fixed costs are $4,200,000.

a. How many units of each product would be sold at the break-even point?

b. Assume Blueberry sells 37,500 smartphones and 25,000 tablets during a recent year. Compute the company's (1) operating leverage and (2) margin of safety.

Solution:

a.

Product E			Smartphone		Tablet
Unit selling price of E	$ 610	=	($650 × 0.6)	+	($550 × 0.4)
Unit variable cost of E	(526)	=	($560 × 0.6)	+	($475 × 0.4)
Unit contribution margin of E	$ 84	=	($90 × 0.6)	+	($75 × 0.4)

In break-even analysis for multiple products, it is useful to think of the individual product as components of one overall product called Product E.

The unit selling price of E equals the sum of the unit selling price of each product multiplied by its sales mix percentage.

The unit variable cost of E equals the sum of the unit variable cost of each product multiplied by its sales mix percentage.

$$\text{Break-Even Sales of E (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

$$\text{Break-Even Sales of E (units)} = \frac{\$4{,}200{,}000}{\$84}$$

$$= 50{,}000 \text{ units}$$

The break-even number of units of E is determined by dividing the company's total fixed costs by the unit contribution margin of E.

	Smartphones	Tablets
Break-even sales of E (units)	50,000	50,000
Sales mix	× 60%	× 40%
Break-even sales of product	30,000	20,000

The break-even quantity of each product is determined by multiplying the sales mix percentage of each product by the break-even units of product E.

b. 1.

37,500 units × $650 per unit

25,000 units × $550 per unit

	Smartphones	Tablets	Total
Sales	$ 24,375,000	$ 13,750,000	$ 38,125,000
Variable costs	(21,000,000)	(11,875,000)	(32,875,000)
Contribution margin	$ 3,375,000	$ 1,875,000	$ 5,250,000
Fixed costs			(4,200,000)
Operating income			$ 1,050,000

37,500 units × $560 per unit

25,000 units × $475 per unit

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Operating Income}}$$

$$\text{Operating Leverage} = \frac{\$5{,}250{,}000}{\$1{,}050{,}000}$$

$$= 5.0$$

The relationship between a company's contribution margin and operating income is called operating leverage.

2.

$$\text{Margin of Safety} = \frac{\text{Sales} - \text{Sales at Break-Even Point}}{\text{Sales}}$$

The margin of safety indicates the possible decrease in sales that may occur before an operating loss results.

$$\text{Margin of Safety} = \frac{\$38{,}125{,}000 - \$30{,}500{,}000}{\$38{,}125{,}000}$$

(30,000 smartphones × $650 sales price) + (20,000 tablets × $550 sales price)

$$= 20\%$$

Current sales may decline by 20% before an operating loss results.

Check Up Corner

Analysis for Decision Making

Cost-Volume-Profit Analysis for Service Companies

Objective 6
Describe and illustrate the use of cost-volume-profit analysis for decision making in a service business.

The break-even point is as relevant in a service company as it is in a manufacturing company. Services are delivered to customers, such as patients, or to other items, such as invested funds. Thus, cost-volume-profit relationships in a service company are measured with respect to customers and activities, rather than units of product. Examples are as follows:

Service	Break-Even Analysis
Education	Break-even number of students per course
Air transportation	Break-even number of passengers per flight
Health care	Break-even number of patients per outpatient facility
Hotel	Break-even number of guests per time period (day, month, etc.)
Freight transportation	Break-even number of tons per train
Theme park	Break-even number of guests per time period (day, month, etc.)
Financial services	Break-even number of invested funds (dollars) under management
Subscription services	Break-even number of subscribers

Break-even analysis for a service company involves identifying the correct unit of analysis and the correct measure of activity for that unit. For example, the unit of analysis for an educational institution could be a course, a major, a college, or the university as a whole. For a specific course, the measure of activity would be the number of students enrolled in the course. Each student is the same in his or her demand for course-level services. Thus, a break-even analysis would discover the number of students required for the course to break even.

At other units of analysis, the measure of activity may change. For example, the break-even for a college would likely be measured in number of student credit hours, not number of students. Not all students are equal in their demand for college services, because some students are part-time and some are full-time. However, each student credit hour is nearly the same.

Moreover, the unit of analysis can influence whether costs are defined as fixed or variable. For example, the instructor's salary is a fixed cost for a specific course, but can be a variable cost to the number of sections taught at the college level.

To illustrate, consider the break-even number of students for a noncredit course in pottery. The course tuition is $500.

The costs consist of the following:

Variable costs per student:	
Pottery supplies	$ 300
Enrollment costs	20
Fixed costs for the course:	
Instructor's salary	$3,000
Rental cost of the classroom	1,500

The break-even point is computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

$$\text{Break-Even Sales (units)} = \frac{\$4{,}500}{\$500 - \$320} = 25 \text{ students}$$

Thus, the course would need to enroll 25 students to break even.

Make a Decision Cost-Volume-Profit Analysis for Service Companies

Analyze Global Air's cost-volume-profit relationships (MAD 6-1)
Analyze Ocean Escape Cruise Lines' cost-volume-profit relationships (MAD 6-2)
Analyze Star Stream's cost-volume-profit relationships (MAD 6-3)
Analyze MusicLand Theme Park's cost-volume-profit relationships (MAD 6-4)

Make a Decision

Let's Review

Chapter Summary

1. Variable costs vary in proportion to changes in the level of activity. Fixed costs remain the same in total dollar amount as the level of activity changes. Mixed costs are comprised of both fixed and variable costs.
2. Contribution margin is the excess of sales revenue over variable costs and can be expressed as a ratio (contribution margin ratio) or a dollar amount (unit contribution margin).
3. The break-even point is the point at which a business's revenues exactly equal costs. The mathematical approach to cost-volume-profit analysis uses the unit contribution margin concept and mathematical equations to determine the break-even point and the volume necessary to achieve a target profit.
4. Graphical methods can be used to determine the break-even point and the volume necessary to achieve a target profit. A cost-volume-profit chart focuses on the relationship among costs, sales, and operating profit or loss. The profit-volume chart focuses on profits rather than on revenues and costs.
5. Cost-volume-profit relationships can be used for analyzing the effects of sales mix on the break-even point and profits. Operating leverage can be used to analyze the effects of changes in sales on operating income. The margin of safety indicates how much sales must decrease before an operating loss occurs.
6. The break-even point is as relevant in a service company as it is in a manufacturing company. Services are delivered to clients, patients, or other companies. The cost-volume-profit relationships in a service company are measured with respect to customers and activities, rather than units of product. Thus, break-even analysis for a service company involves identifying the correct unit of analysis and activity for that unit, such as classes and student credit hours for a college.

Key Terms

activity bases (drivers) (250)
break-even point (261)
contribution margin (258)
contribution margin ratio (258)
cost behavior (250)
cost-volume-profit analysis (258)
cost-volume-profit chart (266)
fixed costs (252)
high-low method (255)
margin of safety (275)
mixed costs (254)
operating leverage (274)
profit-volume chart (268)
relevant range (250)
sales mix (272)
unit contribution margin (259)
variable costs (251)

Practice

Multiple-Choice Questions

1. Which of the following describes variable costs?
   a. Costs that vary on a per-unit basis as the level of activity changes
   b. Costs that vary in total in direct proportion to changes in the level of activity
   c. Costs that remain the same in total dollar amount as the level of activity changes
   d. Costs that vary on a per-unit basis, but remain the same in total as the level of activity changes

2. If sales are $500,000, variable costs are $200,000, and fixed costs are $240,000, what is the contribution margin ratio?
   a. 40%
   b. 48%
   c. 52%
   d. 60%

3. If the unit selling price is $16, the unit variable cost is $12, and fixed costs are $160,000, what is the break-even sales (units)?
   a. 5,714 units
   b. 10,000 units
   c. 13,333 units
   d. 40,000 units

4. Based on the data presented in Question 3, how many units of sales would be required to realize operating income of $20,000?
   a. 11,250 units
   b. 5,000 units
   c. 40,000 units
   d. 45,000 units

5. Based on the following operating data, what is the operating leverage?

Sales	$ 600,000
Variable costs	(240,000)
Contribution margin	$ 360,000
Fixed costs	(160,000)
Operating income	$ 200,000

   a. 0.8
   b. 1.2
   c. 1.8
   d. 4.0

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. High-low method — Obj. 1

The manufacturing costs of Lightfoot Industries for three months of the year follow:

	Total Costs	Units Produced
January	$640,000	30,000 units
February	900,000	40,000
March	350,000	12,500

Using the high-low method, determine (a) the variable cost per unit and (b) the total fixed cost.

2. Contribution margin — Obj. 2

Michigan Company sells 10,000 units at $100 per unit. Variable costs are $75 per unit, and fixed costs are $125,000. Determine (a) the contribution margin ratio, (b) the unit contribution margin, and (c) operating income.

3. Break-even point — Obj. 3

Santana sells a product for $115 per unit. The variable cost is $75 per unit, while fixed costs are $65,000. Determine (a) the break-even point in sales units and (b) the break-even point if the selling price were increased to $125 per unit.

4. Target profit — Obj. 3

Versa Inc. sells a product for $100 per unit. The variable cost is $75 per unit, and fixed costs are $45,000. Determine (a) the break-even point in sales units and (b) the sales units required for the company to achieve a target profit of $25,000.

5. Sales mix and break-even analysis — Obj. 5

Wide Open Industries Inc. has fixed costs of $475,000. The unit selling price, variable cost per unit, and contribution margin per unit for the company's two products follow:

Product	Selling Price	Variable Cost per Unit	Contribution Margin per Unit
AA	$145	$105	$40
BB	110	75	35

The sales mix for Products AA and BB is 60% and 40%, respectively. Determine the break-even point in units of AA and BB.

6. Operating leverage — Obj. 5

SungSam Enterprises reports the following data:

Sales	$ 340,000
Variable costs	(180,000)
Contribution margin	$ 160,000
Fixed costs	(80,000)
Operating income	$ 80,000

Determine SungSam Enterprises's operating leverage.

7. Margin of safety — Obj. 5

Melton Inc. has sales of $1,750,000, and the break-even point in sales dollars is $875,000. Determine the company's margin of safety as a percent of current sales.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Wyatt Inc. expects to maintain the same inventories at the end of the year as at the beginning of the year. The estimated fixed costs for the year are $288,000, and the estimated variable costs per unit are $14. It is expected that 60,000 units will be sold at a price of $20 per unit. Maximum sales within the relevant range are 70,000 units.

Instructions

1. What is (a) the contribution margin ratio and (b) the unit contribution margin?
2. Determine the break-even point in units.
3. Construct a cost-volume-profit chart, indicating the break-even point.
4. Construct a profit-volume chart, indicating the break-even point.
5. What is the margin of safety?

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **b** Variable costs vary in total in direct proportion to changes in the level of activity (answer b). Costs that vary on a per-unit basis as the level of activity changes (answer a) or remain constant in total dollar amount as the level of activity changes (answer c), or both (answer d), are fixed costs.

2. **d** The contribution margin ratio indicates the percentage of each sales dollar available to cover the fixed costs and provide operating income and is determined as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Sales} - \text{Variable Costs}}{\text{Sales}}$$

$$\text{Contribution Margin Ratio} = \frac{\$500{,}000 - \$200{,}000}{\$500{,}000}$$

$$= 60\%$$

3. **d** The break-even sales of 40,000 units (answer d) is computed as follows:

$$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

$$\text{Break-Even Sales (units)} = \frac{\$160{,}000}{\$4} = 40{,}000 \text{ units}$$

4. **d** Sales of 45,000 (answer d) units are required to realize operating income of $20,000, computed as follows:

$$\text{Sales (units)} = \frac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}}$$

$$\text{Sales (units)} = \frac{\$160{,}000 + \$20{,}000}{\$4} = 45{,}000 \text{ units}$$

5. **c** The operating leverage is 1.8 (answer c), computed as follows:

$$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Operating Income}}$$

$$\text{Operating Leverage} = \frac{\$360{,}000}{\$200{,}000} = 1.8$$

Exercises

1. a. $20 per unit = ($900,000 – $350,000) ÷ (40,000 units – 12,500 units)
   b. $100,000 = $900,000 – ($20 × 40,000 units), or $350,000 – ($20 × 12,500 units)

2. a. 25.0% = ($100 – $75) ÷ $100, or ($1,000,000 – $750,000) ÷ $1,000,000
   b. $25 per unit = $100 – $75
   c.

Sales	$1,000,000	(10,000 units × $100 per unit)
Variable costs	(750,000)	(10,000 units × $75 per unit)
Contribution margin	$ 250,000	(10,000 units × $25 per unit)
Fixed costs	(125,000)	
Operating income	$ 125,000	

3. a. 1,625 units = $65,000 ÷ ($115 – $75)
   b. 1,300 units = $65,000 ÷ ($125 – $75)

4. a. 1,800 units = $45,000 ÷ ($100 – $75)
   b. 2,800 units = ($45,000 + $25,000) ÷ ($100 – $75)

5. Unit selling price of E [($145 × 0.60) + ($110 × 0.40)] $131.00
   Unit variable cost of E [($105 × 0.60) + ($75 × 0.40)] (93.00)
   Unit contribution margin of E $ 38.00

   Break-Even Sales (units) = $475,000 ÷ $38.00 = 12,500 units

   Break-Even Sales (units) for AA = 12,500 units of E × 60% = 7,500 units of Product AA
   Break-Even Sales (units) for BB = 12,500 units of E × 40% = 5,000 units of Product BB

6. $$\text{Operating Leverage} = \frac{\text{Contribution Margin}}{\text{Operating Income}} = \frac{\$160,000}{\$80,000} = 2$$

7. $$\text{Margin of Safety} = \frac{\text{Sales} - \text{Sales at Break-Even Point}}{\text{Sales}}$$

   $$= (\$1,750,000 - \$875,000) \div \$1,750,000 = 50\%$$

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1. a. $$\text{Contribution Margin Ratio} = \frac{\text{Sales} - \text{Variable Costs}}{\text{Sales}}$$

   $$= \frac{(60,000 \text{ units} \times \$20) - (60,000 \text{ units} \times \$14)}{(60,000 \text{ units} \times \$20)}$$

   $$= \frac{\$1,200,000 - \$840,000}{\$1,200,000} = \frac{\$360,000}{\$1,200,000}$$

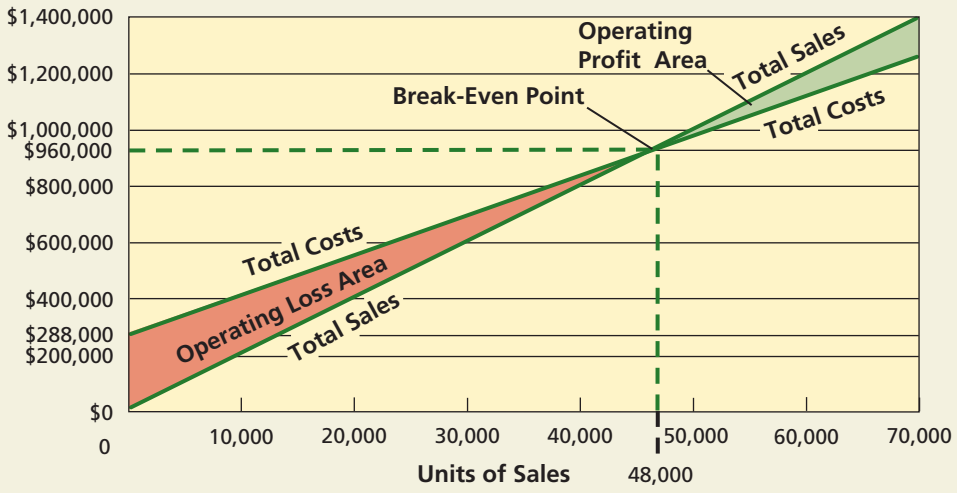
   $$= 30\%$$

   b. Unit Contribution Margin = Unit Selling Price − Unit Variable Costs
   = $20 − $14 = $6

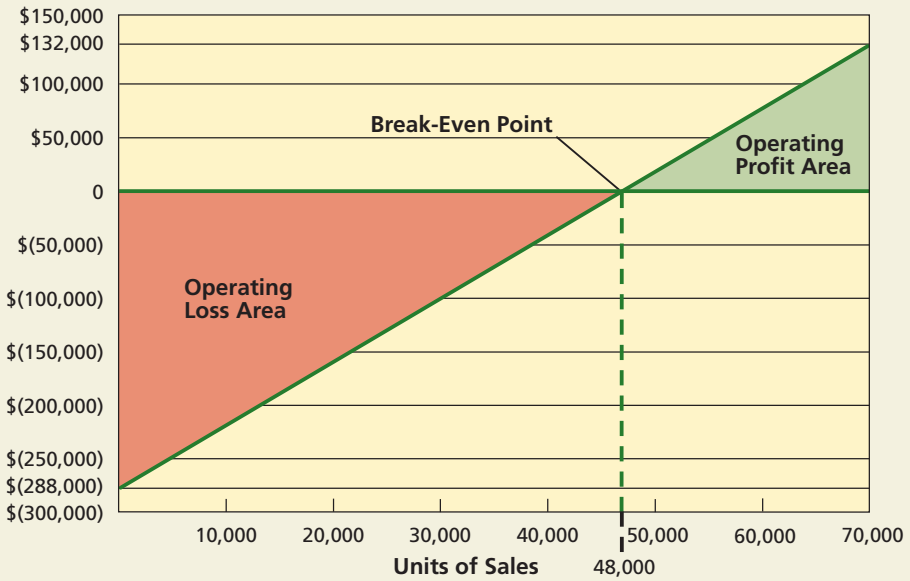
2. $$\text{Break-Even Sales (units)} = \frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$$

   $$= \frac{\$288,000}{\$6} = 48,000 \text{ units}$$

3. **Sales and Costs**



4. **Operating Profit (Loss)**



5. Margin of safety:

Expected sales (60,000 units × $20)	$1,200,000
Break-even point (48,000 units × $20)	(960,000)
Margin of safety	$ 240,000

or

$$\text{Margin of Safety (units)} = \frac{\text{Margin of Safety (dollars)}}{\text{Unit Selling Price}}$$

$$= \frac{\$240{,}000}{\$20} = 12{,}000 \text{ units}$$

or

$$\text{Margin of Safety} = \frac{\text{Sales} - \text{Sales at Break-Even Point}}{\text{Sales}}$$

$$= \frac{\$240{,}000}{\$1{,}200{,}000} = 20\%$$

Discussion Questions

1. Describe how total variable costs and unit variable costs behave with changes in the level of activity.
2. Which of the following costs would be classified as variable and which would be classified as fixed, if units produced is the activity base?
   a. Direct materials costs
   b. Electricity costs of $0.35 per kilowatt-hour
3. Describe how total fixed costs and unit fixed costs behave with changes in the level of activity.
4. In applying the high-low method of cost estimation to mixed costs, how is the total fixed cost estimated?
5. If fixed costs increase, what would be the impact on the (a) contribution margin? (b) operating income?
6. An examination of the accounting records of Clowney Company disclosed a high contribution margin ratio and production at a level below maximum capacity. Based on this information, suggest a likely means of improving operating income. Explain.
7. If the unit cost of direct materials is decreased, what effect will this change have on the break-even point?

(Continued)

8. Both Austin Company and Hill Company had the same unit sales, total costs, and operating income for the current fiscal year; yet, Austin Company had a lower break-even point than Hill Company. Explain the reason for this difference in break-even points.
9. How does the sales mix affect the computation of the break-even point?
10. What does operating leverage measure, and how is it computed?

Basic Exercises



BE 6-1 High-low method — Obj. 1

The manufacturing costs of Rosenthal Industries for the first three months of the year follow:

	Total Costs	Units Produced
January	$1,890,000	22,500 units
February	2,800,000	35,000
March	4,230,000	55,000

Using the high-low method, determine (a) the variable cost per unit and (b) the total fixed cost.



BE 6-2 Contribution margin — Obj. 2

Waite Company sells 250,000 units at $120 per unit. Variable costs are $78 per unit, and fixed costs are $8,175,000. Determine (a) the contribution margin ratio, (b) the unit contribution margin, and (c) operating income.



BE 6-3 Break-even point — Obj. 3

Freese Inc. sells a product for $650 per unit. The variable cost is $455 per unit, while fixed costs are $4,290,000. Determine (a) the break-even point in sales units and (b) the break-even point if the selling price were increased to $655 per unit.



BE 6-4 Target profit — Obj. 3

Beard Company sells a product for $15 per unit. The variable cost is $10 per unit, and fixed costs are $1,750,000. Determine (a) the break-even point in sales units and (b) the sales units required for the company to achieve a target profit of $400,000.



BE 6-5 Sales mix and break-even analysis — Obj. 5

Conley Company has fixed costs of $17,802,000. The unit selling price, variable cost per unit, and contribution margin per unit for the company's two products follow:

Product Model	Selling Price	Variable Cost per Unit	Contribution Margin per Unit
Yankee	$180	$ 99	$81
Zoro	225	135	90

The sales mix for products Yankee and Zoro is 80% and 20%, respectively. Determine the break-even point in units of Yankee and Zoro.



BE 6-6 Operating leverage — Obj. 5

Haywood Co. reports the following data:

Sales	$ 6,160,000
Variable costs	(4,620,000)
Contribution margin	$ 1,540,000
Fixed costs	(440,000)
Operating income	$ 1,100,000

Determine Haywood Co.'s operating leverage.



BE 6-7 Margin of safety — Obj. 5

Jorgensen Company has sales of $380,000,000, and the break-even point in sales dollars is $323,000,000. Determine Jorgensen Company's margin of safety as a percent of current sales.

Exercises

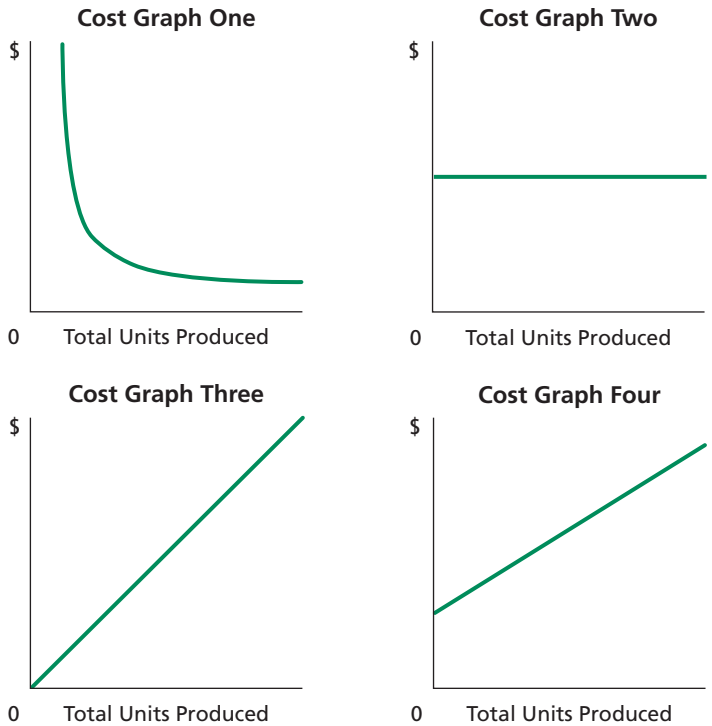
EX 6-1 Classify costs — Obj. 1

Following is a list of various costs incurred in producing replacement automobile parts. With respect to the production and sale of these auto parts, classify each cost as either variable, fixed, or mixed.

1. Oil used in manufacturing equipment
2. Plastic
3. Property taxes, $165,000 per year on factory building and equipment
4. Salary of plant manager
5. Cost of labor for hourly workers
6. Packaging
7. Factory cleaning costs, $6,000 per month
8. Metal
9. Rent on warehouse, $10,000 per month plus $25 per square foot of storage used
10. Property insurance premiums, $3,600 per month plus $0.01 for each dollar of property over $1,200,000
11. Straight-line depreciation on the production equipment
12. Hourly wages of machine operators
13. Electricity costs, $0.20 per kilowatt-hour
14. Computer chip (purchased from a vendor)
15. Pension cost, $1.00 per employee hour on the job

EX 6-2 Identify cost graphs — Obj. 1

The following cost graphs illustrate various types of cost behavior:



For each of the following costs, identify the cost graph that best illustrates its cost behavior as the number of units produced increases:

a. Total direct materials cost

b. Electricity costs of $1,000 per month plus $0.10 per kilowatt-hour

c. Per-unit cost of straight-line depreciation on factory equipment

d. Salary of quality control supervisor, $20,000 per month

e. Per-unit direct labor cost

EX 6-3 Identify activity bases — Obj. 1

For a major university, match each cost in the following table with the activity base most appropriate to it. An activity base may be used more than once or not used at all.

Cost:	Activity Base:
1. Financial aid office salaries	a. Number of enrollment applications
2. Office supplies	b. Number of students
3. Instructor salaries	c. Student credit hours
4. Housing personnel wages	d. Number of enrolled students and alumni
5. Employee wages for maintaining student records	e. Number of financial aid applications
6. Admissions office salaries	f. Number of students living on campus

EX 6-4 Identify activity bases — Obj. 1

From the following list of activity bases for an automobile dealership, select the base that would be most appropriate for each of these costs: (1) preparation costs (cleaning, oil, and gasoline costs) for each car received, (2) salespersons' commission of 5% of the sales price for each car sold, and (3) administrative costs for ordering cars.

a. Number of cars sold
b. Dollar amount of cars ordered
c. Number of cars ordered
d. Number of cars on hand
e. Number of cars received
f. Dollar amount of cars sold
g. Dollar amount of cars received
h. Dollar amount of cars on hand

EX 6-5 Identify fixed and variable costs — Obj. 1

REAL WORLD

Intuit Inc. (INTU) develops and sells software products for the personal finance market, including popular titles such as Quickbooks® and TurboTax®. Classify each of the following costs and expenses for this company as either variable or fixed to the number of units produced and sold:

a. Packaging costs
b. Sales commissions
c. Property taxes on general offices
d. Shipping expenses
e. Straight-line depreciation of computer equipment
f. President's salary
g. Salaries of software developers
h. Salaries of human resources personnel
i. Wages of telephone order assistants
j. Costs of providing online support
k. Users' guides

EX 6-6 Relevant range and fixed and variable costs — Obj. 1

✔ a. $18.00

SHOW ME HOW

Child Play Inc. manufactures electronic toys within a relevant range of 20,000 to 150,000 toys per year. Within this range, the following partially completed manufacturing cost schedule has been prepared:

Toys produced	40,000	80,000	120,000
Total costs:			
Total variable costs	$ 720,000	(d)	(j)
Total fixed costs	600,000	(e)	(k)
Total costs	$1,320,000	(f)	(l)
Cost per unit:			
Variable cost per unit	(a)	(g)	(m)
Fixed cost per unit	(b)	(h)	(n)
Total cost per unit	(c)	(i)	(o)

Complete the cost schedule, identifying each cost by the appropriate letter (a) through (o).

EX 6-7 High-low method **Obj. 1**

✔ a. $175.50 variable cost per unit

SHOW ME HOW EXCEL TEMPLATE

Ziegler Inc. has decided to use the high-low method to estimate the total cost and the fixed and variable cost components of the total cost. The data for various levels of production are as follows:

Units Produced	Total Costs
80,000	$25,100,000
92,000	27,206,000
120,000	32,120,000

a. Determine the variable cost per unit and the total fixed cost.

b. Based on part (a), estimate the total cost for 115,000 units of production.

EX 6-8 High-low method for a service company **Obj. 1**

✔ Fixed cost, $18,000,000

SHOW ME HOW

Continental Railroad decided to use the high-low method and operating data from the past six months to estimate the fixed and variable components of transportation costs. The activity base used by Continental Railroad is a measure of railroad operating activity, termed "gross-ton miles," which is the total number of tons multiplied by the miles moved.

	Transportation Costs	Gross-Ton Miles
January	$24,500,000	3,000,000
February	22,375,000	2,500,000
March	29,000,000	6,300,000
April	34,800,000	9,500,000
May	40,312,500	12,750,000
June	35,500,000	10,000,000

Determine the variable cost per gross-ton mile and the total fixed cost.

EX 6-9 Contribution margin ratio **Obj. 2**

✔ a. 41%

SHOW ME HOW

a. Young Company budgets sales of $112,900,000, fixed costs of $25,000,000, and variable costs of $66,611,000. What is the contribution margin ratio for Young Company?

b. If the contribution margin ratio for Martinez Company is 40%, sales were $34,800,000, and fixed costs were $1,500,000, what was the operating income?

EX 6-10 Contribution margin and contribution margin ratio **Obj. 2**

✔ b. 34.7%

SHOW ME HOW REAL WORLD

For a recent year, **McDonald's (MCD)** company-owned restaurants had the following sales and expenses (in millions):

Sales	$ 15,295.0
Food and packaging	$ (4,896.9)
Payroll	(4,134.2)
Occupancy (rent, depreciation, etc.)	(3,667.7)
General, selling, and administrative expenses	(2,384.5)
	$(15,083.3)
Operating income	$ 211.7

Assume that the variable costs consist of food and packaging, payroll, and 40% of the general, selling, and administrative expenses.

a. What is McDonald's contribution margin? Round to the nearest tenth of a million (one decimal place).

b. What is McDonald's contribution margin ratio? Round to one decimal place.

c. How much would operating income increase if same-store sales increased by $800 million for the coming year, with no change in the contribution margin ratio or fixed costs? Round your answer to the nearest tenth of a million (one decimal place).

EX 6-11 Break-even sales and sales to realize operating income **Obj. 3**

✔ b. 95,000 units

SHOW ME HOW

For the current year ended March 31, Cosgrove Company expects fixed costs of $27,600,000, a unit variable cost of $805, and a unit selling price of $1,150.

a. Compute the anticipated break-even sales (units).

b. Compute the sales (units) required to realize operating income of $5,175,000.

EX 6-12 Break-even sales

Obj. 3

✔ a. 233.9 million barrels



Anheuser-Busch InBev SA/NV (BUD) reported the following operating information for a recent year (in millions):

Sales		$ 45,517
Cost of goods sold	$17,803	
Selling, general, and administrative expenses	14,439	(32,242)
Operating income		$ 13,275*
*Before special items		

In addition, assume that Anheuser-Busch InBev sold 500 million barrels of beer during the year. Assume that variable costs were 75% of the cost of goods sold and 50% of selling, general, and administrative expenses. Assume that the remaining costs are fixed. For the following year, assume that Anheuser-Busch InBev expects pricing, variable costs per barrel, and fixed costs to remain constant, except that new distribution and general office facilities are expected to increase fixed costs by $400 million.

a. Compute the break-even number of barrels for the current year. In computing variable and fixed costs and per-barrel amounts, round to two decimal places. Round the break-even number of barrels to one decimal place.

b. Compute the anticipated break-even number of barrels for the following year. Round to one decimal place in millions of barrels.

EX 6-13 Break-even sales

Obj. 3

✔ a. 7,500 units



Currently, the unit selling price of a product is $7,520, the unit variable cost is $4,400, and the total fixed costs are $23,400,000. A proposal is being evaluated to increase the unit selling price to $8,000.

a. Compute the current break-even sales (units).

b. Compute the anticipated break-even sales (units), assuming that the unit selling price is increased and all costs remain constant.

EX 6-14 Break-even analysis

Obj. 3

The Parents for Better Schools of Fresno, California, collected recipes from members and published a cookbook entitled *Food for Everyone*. The book will sell for $20 per copy. The chairwoman of the cookbook development committee estimated that the club needed to sell 800 books to break even on its $3,600 investment. What is the variable cost per unit assumed in the Parents for Better Schools' analysis?

EX 6-15 Break-even analysis

Obj. 3



Media outlets such as **ESPN** and **FOX Sports** often have websites that provide in-depth coverage of news and events. Portions of these websites are restricted to members who pay a monthly subscription to gain access to exclusive news and commentary. These websites typically offer a free trial period to introduce viewers to the websites. Assume that during a recent fiscal year, ESPN.com spent $4,200,000 on a promotional campaign for the ESPN.com websites that offered two free months of service for new subscribers. In addition, assume the following information:

Number of months an average new customer stays with the service (including the two free months)	14 months
Revenue per month per customer subscription	$10.00
Variable cost per month per customer subscription	$5.00

Determine the number of new customer accounts needed to break even on the cost of the promotional campaign. In forming your answer, (1) treat the cost of the promotional campaign as a fixed cost, and (2) treat the revenue less variable cost per account for the subscription period as the unit contribution margin.

EXCEL TEMPLATE REAL WORLD

EX 6-16 Break-even analysis for a service company — Obj. 3

Sprint Corporation (S) is one of the largest digital wireless service providers in the United States. In a recent year, it had approximately 60 million direct subscribers (accounts) that generated revenue of $33,347 million. Costs and expenses for the year were as follows (in millions):

Cost of revenue	$14,958
Selling, general, and administrative expenses	7,994
Depreciation and amortization	8,150

Assume that 30% of the cost of revenue and 70% of the selling, general, and administrative expenses are fixed to the number of direct subscribers (accounts).

a. What is Sprint's break-even number of accounts, using the data and assumptions given? Round to one decimal place.

b. How much revenue per account would be sufficient for Sprint to break even if the number of accounts remained constant? Round to one decimal place.

EX 6-17 Cost-volume-profit chart — Obj. 4

✔ b. $1,500,000

For the coming year, Loudermilk Inc. anticipates fixed costs of $600,000, a unit variable cost of $75, and a unit selling price of $125. The maximum sales within the relevant range are $2,500,000.

a. Construct a cost-volume-profit chart.

b. Estimate the break-even sales (dollars) by using the cost-volume-profit chart constructed in part (a).

c. What is the main advantage of presenting the cost-volume-profit analysis in graphic form rather than equation form?

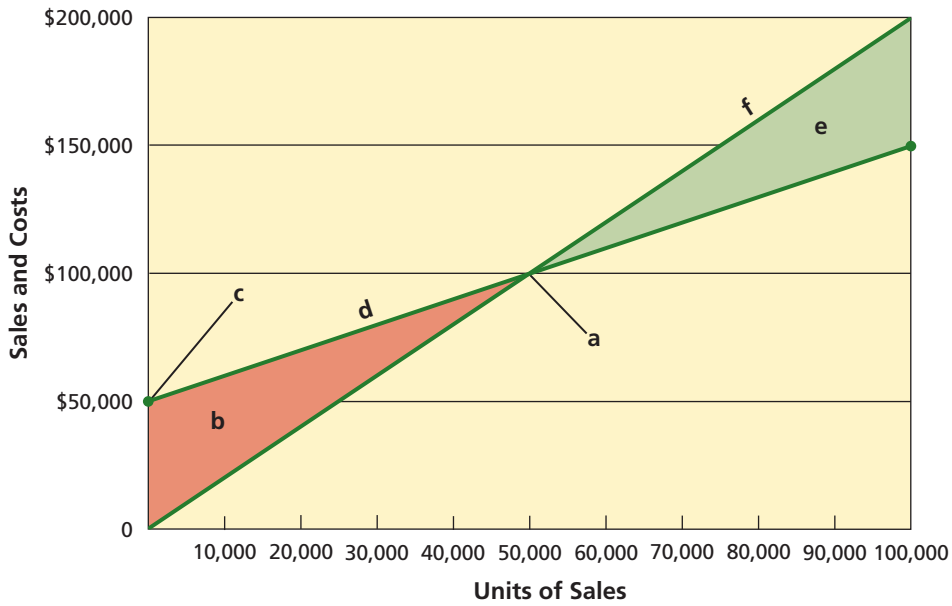
EX 6-18 Profit-volume chart — Obj. 4

✔ b. $400,000

Using the data for Loudermilk Inc. in Exercise 17, (a) determine the maximum possible operating loss, (b) compute the maximum possible operating profit, (c) construct a profit-volume chart, and (d) estimate the break-even sales (units) by using the profit-volume chart constructed in part (c).

EX 6-19 Break-even chart — Obj. 4

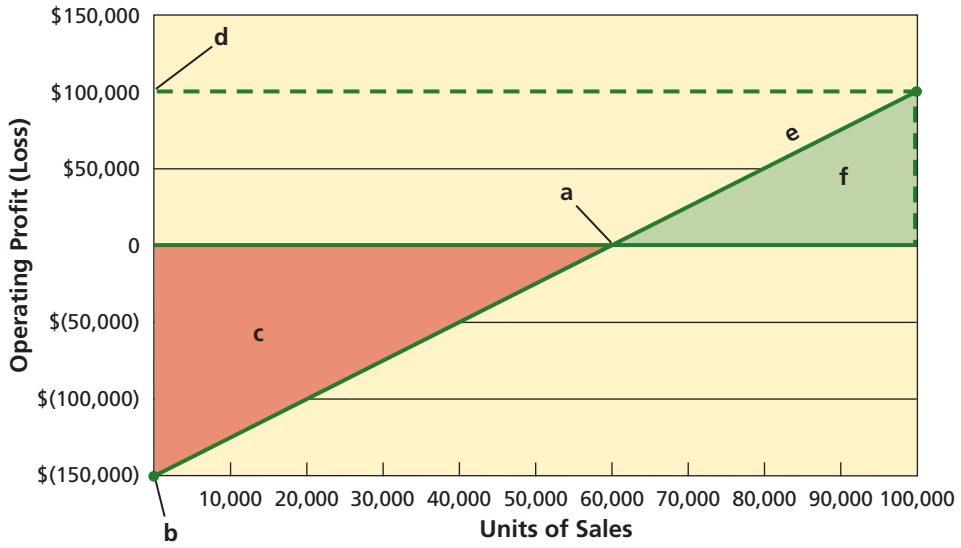
Name the following chart, and identify the items represented by the letters (a) through (f):



EX 6-20 Break-even chart

Obj. 4

Name the following chart, and identify the items represented by the letters (a) through (f):



EX 6-21 Sales mix and break-even sales

Obj. 5

✔ a. 15,500 units

SHOW ME HOW

Dragon Sports Inc. manufactures and sells two products, baseball bats and baseball gloves. The fixed costs are $620,000, and the sales mix is 40% bats and 60% gloves. The unit selling price and the unit variable cost for each product are as follows:

Products	Unit Selling Price	Unit Variable Cost
Bats	$ 90	$50
Gloves	105	65

a. Compute the break-even sales (units) for the overall enterprise product, E.

b. How many units of each product, baseball bats and baseball gloves, would be sold at the break-even point?

EX 6-22 Break-even sales and sales mix for a service company

Obj. 5

✔ a. 60 seats

Zero Turbulence Airline provides air transportation services between Los Angeles, California, and Kona, Hawaii. A single Los Angeles to Kona round-trip flight has the following operating statistics:

Fuel	$7,000
Flight crew salaries	3,200
Airplane depreciation	3,480
Variable cost per passenger—business class	140
Variable cost per passenger—economy class	120
Round-trip ticket price—business class	800
Round-trip ticket price—economy class	300

It is assumed that the fuel, crew salaries, and airplane depreciation are fixed, regardless of the number of seats sold for the round-trip flight.

a. Compute the break-even number of seats sold on a single round-trip flight for the overall enterprise product, E. Assume that the overall product mix is 10% business class and 90% economy class tickets.

b. How many business class and economy class seats would be sold at the break-even point?

EX 6-23 Margin of safety

Obj. 5

✔ a. (2) 20%

SHOW ME HOW

a. If Canace Company, with a break-even point at $960,000 of sales, has actual sales of $1,200,000, what is the margin of safety expressed (1) in dollars and (2) as a percentage of sales?

b. If the margin of safety for Canace Company was 20%, fixed costs were $1,875,000, and variable costs were 80% of sales, what was the amount of actual sales (dollars)? (*Hint:* Determine the break-even in sales dollars first.)

EX 6-24 Break-even and margin of safety relationships

Obj. 5

At a recent staff meeting, the management of Boost Technologies Inc. was considering discontinuing the Rocket Man line of electronic games from the product line. The chief financial analyst reported the following current monthly data for the Rocket Man:

Units of sales	420,000
Break-even units	472,500
Margin of safety in units	29,400

For what reason would you question the validity of these data?

EX 6-25 Operating leverage

Obj. 5

✔ a. Beck, 5.0

Beck Inc. and Bryant Inc. have the following operating data:

	Beck Inc.	Bryant Inc.
Sales	$1,250,000	$ 2,000,000
Variable costs	(750,000)	(1,250,000)
Contribution margin	$ 500,000	$ 750,000
Fixed costs	(400,000)	(450,000)
Operating income	$ 100,000	$ 300,000

a. Compute the operating leverage for Beck Inc. and Bryant Inc.

b. How much would operating income increase for each company if the sales of each increased by 20%?

c. Why is there a difference in the increase in operating income for the two companies? Explain.

Problems: Series A

PR 6-1A Classify costs

Obj. 1

Seymour Clothing Co. manufactures a variety of clothing types for distribution to several major retail chains. The following costs are incurred in the production and sale of blue jeans:

a. Shipping boxes used to ship orders
b. Consulting fee of $200,000 paid to industry specialist for marketing advice
c. Straight-line depreciation on sewing machines
d. Salesperson's salary, $10,000 plus 2% of the total sales
e. Fabric
f. Dye
g. Thread
h. Salary of designers
i. Brass buttons
j. Legal fees paid to attorneys in defense of the company in a patent infringement suit, $50,000 plus $87 per hour
k. Insurance premiums on property, plant, and equipment, $70,000 per year plus $5 per $30,000 of insured value over $8,000,000
l. Rental costs of warehouse, $5,000 per month plus $4 per square foot of storage used
m. Supplies
n. Leather for patches identifying the brand on individual pieces of apparel
o. Rent on plant equipment, $50,000 per year
p. Salary of production vice president
q. Janitorial services, $2,200 per month
r. Wages of machine operators
s. Electricity costs of $0.10 per kilowatt-hour
t. Property taxes on property, plant, and equipment

(Continued)

Instructions

Classify the preceding costs as either fixed, variable, or mixed. Use the following tabular headings and place an X in the appropriate column. Identify each cost by letter in the cost column.

Cost	Fixed Cost	Variable Cost	Mixed Cost

PR 6-2A Break-even sales under present and proposed conditions

Obj. 2, 3

✔ 2. b. $100



Portmann Company, operating at full capacity, sold 1,000,000 units at a price of $188 per unit during the current year. Its income statement is as follows:

Sales		$ 188,000,000
Cost of goods sold		(100,000,000)
Gross profit		$ 88,000,000
Expenses:		
Selling expenses	$16,000,000	
Administrative expenses	12,000,000	
Total expenses		(28,000,000)
Operating income		$ 60,000,000

The division of costs between variable and fixed is as follows:

	Variable	Fixed
Cost of goods sold	70%	30%
Selling expenses	75%	25%
Administrative expenses	50%	50%

Management is considering a plant expansion program for the following year that will permit an increase of $11,280,000 in yearly sales. The expansion will increase fixed costs by $5,000,000 but will not affect the relationship between sales and variable costs.

Instructions

1. Determine the total variable costs and the total fixed costs for the current year.
2. Determine (a) the unit variable cost and (b) the unit contribution margin for the current year.
3. Compute the break-even sales (units) for the current year.
4. Compute the break-even sales (units) under the proposed program for the following year.
5. Determine the amount of sales (units) that would be necessary under the proposed program to realize the $60,000,000 of operating income that was earned in the current year.
6. Determine the maximum operating income possible with the expanded plant.
7. If the proposal is accepted and sales remain at the current level, what will the operating income or loss be for the following year?
8. Based on the data given, would you recommend accepting the proposal? Explain.

PR 6-3A Break-even sales and cost-volume-profit chart

Obj. 3, 4

✔ 1. 12,000 units

For the coming year, Cleves Company anticipates a unit selling price of $100, a unit variable cost of $60, and fixed costs of $480,000.

Instructions

1. Compute the anticipated break-even sales (units).
2. Compute the sales (units) required to realize a target profit of $240,000.
3. Construct a cost-volume-profit chart, assuming maximum sales of 20,000 units within the relevant range.
4. Determine the probable operating income (loss) if sales total 16,000 units.

PR 6-4A Break-even sales and cost-volume-profit chart

Obj. 3, 4

✔ 1. 1,000 units

Last year, Hever Inc. had sales of $500,000, based on a unit selling price of $250. The variable cost per unit was $175, and fixed costs were $75,000. The maximum sales within Hever Inc.'s relevant range are 2,500 units. Hever Inc. is considering a proposal to spend an additional $33,750 on billboard advertising during the current year in an attempt to increase sales and utilize unused capacity.

Instructions

1. Construct a cost-volume-profit chart indicating the break-even sales for last year. Verify your answer, using the break-even equation.
2. Using the cost-volume-profit chart prepared in part (1), determine (a) the operating income for last year and (b) the maximum operating income that could have been realized during the year. Verify your answers using the mathematical approach to cost-volume-profit analysis.
3. Construct a cost-volume-profit chart indicating the break-even sales for the current year, assuming that a noncancellable contract is signed for the additional billboard advertising. No changes are expected in the unit selling price or other costs. Verify your answer, using the break-even equation.
4. Using the cost-volume-profit chart prepared in part (3), determine (a) the operating income if sales total 2,000 units and (b) the maximum operating income that could be realized during the year. Verify your answers using the mathematical approach to cost-volume-profit analysis.

PR 6-5A Sales mix and break-even sales

Obj. 5

✔ 1. 4,030 units

Data related to the expected sales of laptops and tablets for Tech Products Inc. for the current year, which is typical of recent years, are as follows:

Products	Unit Selling Price	Unit Variable Cost	Sales Mix
Laptops	$1,600	$800	40%
Tablets	850	350	60%

The estimated fixed costs for the current year are $2,498,600.

Instructions

1. Determine the estimated units of sales of the overall (total) product, E, necessary to reach the break-even point for the current year.
2. Based on the break-even sales (units) in part (1), determine the unit sales of both laptops and tablets for the current year.
3. Assume that the sales mix was 50% laptops and 50% tablets. Compare the break-even point with that in part (1). Why is it so different?

PR 6-6A Contribution margin, break-even sales, cost-volume-profit chart, margin of safety, and operating leverage

Obj. 2, 3, 4, 5

✔ 2. 25%

EXCEL TEMPLATE

Wolsey Industries Inc. expects to maintain the same inventories at the end of 20Y3 as at the beginning of the year. The total of all production costs for the year is therefore assumed to be equal to the cost of goods sold. With this in mind, the various department heads were asked to submit estimates of the costs for their departments during the year. A summary report of these estimates is as follows:

	Estimated Fixed Cost	Estimated Variable Cost (per unit sold)
Production costs:		
Direct materials	—	$ 46
Direct labor	—	40
Factory overhead	$200,000	20
Selling expenses:		
Sales salaries and commissions	110,000	8
Advertising	40,000	—
Travel	12,000	—
Miscellaneous selling expense	7,600	1
Administrative expenses:		
Office and officers' salaries	132,000	—
Supplies	10,000	4
Miscellaneous administrative expense	13,400	1
Total	$525,000	$120

It is expected that 21,875 units will be sold at a price of $160 a unit. Maximum sales within the relevant range are 27,000 units.

(Continued)

Instructions

1. Prepare an estimated income statement for 20Y3.
2. What is the expected contribution margin ratio?
3. Determine the break-even sales in units and dollars.
4. Construct a cost-volume-profit chart indicating the break-even sales.
5. What is the expected margin of safety in dollars and as a percentage of sales?
6. Determine the operating leverage.

Problems: Series B

PR 6-1B Classify costs **Obj. 1**

Cromwell Furniture Company manufactures sofas for distribution to several major retail chains. The following costs are incurred in the production and sale of sofas:

a. Fabric for sofa coverings
b. Wood for framing the sofas
c. Legal fees paid to attorneys in defense of the company in a patent infringement suit, $25,000 plus $160 per hour
d. Salary of production supervisor
e. Cartons used to ship sofas
f. Rent on experimental equipment, $50 for every sofa produced
g. Straight-line depreciation on factory equipment
h. Rental costs of warehouse, $30,000 per month
i. Property taxes on property, plant, and equipment
j. Insurance premiums on property, plant, and equipment, $25,000 per year plus $25 per $25,000 of insured value over $16,000,000
k. Springs for seat cushions
l. Consulting fee of $120,000 paid to efficiency specialists
m. Electricity costs of $0.13 per kilowatt-hour
n. Salesperson's salary, $80,000 plus 4% of the selling price of each sofa sold
o. Foam rubber for cushion fillings
p. Janitorial supplies, $2,500 per month
q. Employer's FICA taxes on controller's salary of $180,000
r. Salary of designers
s. Wages of sewing machine operators
t. Sewing supplies

Instructions

Classify the preceding costs as either fixed, variable, or mixed. Use the following tabular headings and place an X in the appropriate column. Identify each cost by letter in the cost column.

Cost	Fixed Cost	Variable Cost	Mixed Cost

PR 6-2B Break-even sales under present and proposed conditions

Obj. 2, 3

✔ 3. 29,375 units



Howard Industries Inc., operating at full capacity, sold 64,000 units at a price of $45 per unit during the current year. Its income statement is as follows:

Sales		$ 2,880,000
Cost of goods sold		(1,400,000)
Gross profit		$ 1,480,000
Expenses:		
Selling expenses	$400,000	
Administrative expenses	387,500	
Total expenses		(787,500)
Operating income		$ 692,500

The division of costs between variable and fixed is as follows:

	Variable	Fixed
Cost of goods sold	75%	25%
Selling expenses	60%	40%
Administrative expenses	80%	20%

Management is considering a plant expansion program for the following year that will permit an increase of $900,000 in yearly sales. The expansion will increase fixed costs by $212,500 but will not affect the relationship between sales and variable costs.

Instructions

1. Determine the total fixed costs and the total variable costs for the current year.
2. Determine (a) the unit variable cost and (b) the unit contribution margin for the current year.
3. Compute the break-even sales (units) for the current year.
4. Compute the break-even sales (units) under the proposed program for the following year.
5. Determine the amount of sales (units) that would be necessary under the proposed program to realize the $692,500 of operating income that was earned in the current year.
6. Determine the maximum operating income possible with the expanded plant.
7. If the proposal is accepted and sales remain at the current level, what will the operating income or loss be for the following year?
8. Based on the data given, would you recommend accepting the proposal? Explain.

PR 6-3B Break-even sales and cost-volume-profit chart

Obj. 3, 4

✔ 1. 20,000 units

For the coming year, Culpeper Products Inc. anticipates a unit selling price of $150, a unit variable cost of $110, and fixed costs of $800,000.

Instructions

1. Compute the anticipated break-even sales (units).
2. Compute the sales (units) required to realize a target profit of $300,000.
3. Construct a cost-volume-profit chart, assuming maximum sales of 40,000 units within the relevant range.
4. Determine the probable operating income (loss) if sales total 32,000 units.

PR 6-4B Break-even sales and cost-volume-profit chart

Obj. 3, 4

✔ 1. 3,000 units

Last year, Parr Co. had sales of $900,000, based on a unit selling price of $200. The variable cost per unit was $125, and fixed costs were $225,000. The maximum sales within Parr Co.'s relevant range are 7,500 units. Parr Co. is considering a proposal to spend an additional $112,500 on billboard advertising during the current year in an attempt to increase sales and utilize unused capacity.

Instructions

1. Construct a cost-volume-profit chart indicating the break-even sales for last year. Verify your answer, using the break-even equation.
2. Using the cost-volume-profit chart prepared in part (1), determine (a) the operating income for last year and (b) the maximum operating income that could have been realized during the year. Verify your answers using the mathematical approach to cost-volume-profit analysis.

(Continued)

3. Construct a cost-volume-profit chart indicating the break-even sales for the current year, assuming that a noncancellable contract is signed for the additional billboard advertising. No changes are expected in the selling price or other costs. Verify your answer, using the break-even equation.
4. Using the cost-volume-profit chart prepared in part (3), determine (a) the operating income if sales total 6,000 units and (b) the maximum operating income that could be realized during the year. Verify your answers using the mathematical approach to cost-volume-profit analysis.

PR 6-5B Sales mix and break-even sales — Obj. 5

✔ 1. 4,500 units

Data related to the expected sales of two types of frozen pizzas for Norfolk Frozen Foods Inc. for the current year, which is typical of recent years, are as follows:

Products	Unit Selling Price	Unit Variable Cost	Sales Mix
12" Pizza	$12	$3	30%
16" Pizza	15	4	70%

The estimated fixed costs for the current year are $46,800.

Instructions

1. Determine the estimated units of sales of the overall enterprise product, E, necessary to reach the break-even point for the current year.
2. Based on the break-even sales (units) in part (1), determine the unit sales of both the 12" pizza and 16" pizza for the current year.
3. Assume that the sales mix was 50% 12" pizza and 50% 16" pizza. Compare the break-even point with that in part (1). Why is it so different?

PR 6-6B Contribution margin, break-even sales, cost-volume-profit chart, margin of safety, and operating leverage — Obj. 2, 3, 4, 5

✔ 3. 8,000 units

EXCEL TEMPLATE

Belmain Co. expects to maintain the same inventories at the end of 20Y7 as at the beginning of the year. The total of all production costs for the year is therefore assumed to be equal to the cost of goods sold. With this in mind, the various department heads were asked to submit estimates of the costs for their departments during the year. A summary report of these estimates is as follows:

	Estimated Fixed Cost	Estimated Variable Cost (per unit sold)
Production costs:		
Direct materials	—	$50.00
Direct labor	—	30.00
Factory overhead	$ 350,000	6.00
Selling expenses:		
Sales salaries and commissions	340,000	4.00
Advertising	116,000	—
Travel	4,000	—
Miscellaneous selling expense	2,300	1.00
Administrative expenses:		
Office and officers' salaries	325,000	—
Supplies	6,000	4.00
Miscellaneous administrative expense	8,700	1.00
Total	$1,152,000	$96.00

It is expected that 12,000 units will be sold at a price of $240 a unit. Maximum sales within the relevant range are 18,000 units.

Instructions

1. Prepare an estimated income statement for 20Y7.
2. What is the expected contribution margin ratio?
3. Determine the break-even sales in units and dollars.
4. Construct a cost-volume-profit chart indicating the break-even sales.
5. What is the expected margin of safety in dollars and as a percentage of sales? Round to one decimal place.
6. Determine the operating leverage.

Make a Decision
Cost-Volume-Profit Analysis for Service Companies

MAD 6-1 Analyze Global Air's cost-volume-profit relationships Obj. 6

Global Air is considering a new flight between Atlanta and Los Angeles. The average fare per seat for the flight is $760. The costs associated with the flight are as follows:

Fixed costs for the flight:	
Crew salaries	$ 5,000
Operating costs	50,000
Aircraft depreciation	25,000
Total	$80,000
Variable costs per passenger:	
Passenger check-in	$ 20
Operating costs	100
Total	$120

The airline estimates that the flight will sell 175 seats.

a. Determine the break-even number of passengers per flight.
b. Based on your answer in (a), should the airline add this flight to its schedule?
c. How much profit should each flight produce?
d. What additional issues might the airline consider in this decision?

MAD 6-2 Analyze Ocean Escape Cruise Lines' cost-volume-profit relationships Obj. 6

Ocean Escape Cruise Lines has a boat with a capacity of 1,200 passengers. An eight-day ocean cruise involves the following costs:

Crew	$240,000
Fuel	60,000
Fixed operating costs	800,000

The variable costs per passenger for the eight-day cruise include the following:

Meals	$900
Variable operating costs	400

The price of the cruise is $2,400 per passenger.

a. Determine the break-even number of passengers for the eight-day cruise.
b. Assume 900 passengers booked the cruise. What would be the profit or loss for the cruise?
c. Assume the cruise was booked to capacity. What would be the profit or loss for the cruise?
d. If the cruise cannot book enough passengers to break even, how might the cruise line respond?

MAD 6-3 Analyze Star Stream's cost-volume-profit relationships Obj. 6

Star Stream is a subscription-based video streaming service. Subscribers pay $120 per year for the service. Star Stream licenses and develops content for its subscribers. In addition, Star Stream leases servers to hold this content. These costs are not variable to the number of subscribers, but must be incurred regardless of the subscriber base. In addition, Star Stream compensates telecommunication companies for bandwidth so that Star Stream customers receive fast streaming services. These costs are variable to the number of subscribers. These and other costs are as follows:

Server lease costs per year	$ 100,000,000
Content costs per year	2,000,000,000
Fixed operating costs per year	900,000,000
Bandwidth costs per subscriber per year	15
Variable operating costs per subscriber per year	25

(Continued)

a. Determine the break-even number of subscribers.
b. Assume Star Stream planned to increase available programming and thus increase the annual content costs to $2,600,000,000. What impact would this change have on the break-even number of subscribers?
c. Assume the same content cost scenario as in (b). How much would the annual subscription need to change in order to maintain the same break-even as in (a)?

MAD 6-4 Analyze MusicLand Theme Park's cost-volume-profit relationships **Obj. 6**

MusicLand Theme Park has an average daily admission price of $60 per guest. The following financial data are available for analysis:

Daily operating fixed costs	$750,000
Variable daily operating cost per guest	24
Average daily concession revenue per guest	30
Average daily variable cost of concession items per guest	16

Additional operating data indicate that the park averages 24,000 daily guests during the weekdays and 40,000 average daily guests on Saturdays and Sundays.

a. Determine the break-even number of guests per day at the theme park.
b. How much profit does MusicLand earn on an average weekday?
c. How much profit does MusicLand earn on an average weekend day?
d. Determine the revised break-even if the daily fixed costs increased to $1,000,000.
e. Would the theme park still remain profitable for an average weekday under the scenario in (d)?

Take It Further

ETHICS

TIF 6-1 Future break-even points

Edward Seymour is a financial consultant to Cornish Inc., a real estate syndicate. Cornish finances and develops commercial real estate (office buildings) projects. The completed projects are then sold as limited partnership interests to individual investors. The syndicate makes a profit on the sale of these partnership interests. Edward provides financial information for prospective investors in a document called the offering "prospectus." This document discusses the financial and legal details of the limited partnership investment.

One of the company's current projects is called JEDI 2, and has the syndicate borrowing money from a local bank to build a commercial office building. The interest rate on the loan is 6.5% for the first four years. After four years, the interest rate jumps to 9% for the remaining 20 years of the loan. The interest expense is one of the major costs of this project and significantly affects the number of renters needed for the project to break even. In the prospectus, Edward has prominently reported that the break-even occupancy for the first four years is 65%. This is the amount of office space that must be leased to cover the interest and general upkeep costs during the first four years. The 65% break-even point is very low compared to similar projects and thus communicates a low risk to potential investors. Edward uses the 65% break-even rate as a major marketing tool in selling the limited partnership interests. Buried in the fine print of the prospectus is additional information that would allow an astute investor to determine that the break-even occupancy jumps to 95% after the fourth year when the interest rate on the loan increases to 9%. Edward believes prospective investors are adequately informed of the investment's risk.

Is Edward behaving ethically? Explain your answer.

TEAM ACTIVITY REAL WORLD

TIF 6-2 Use of break-even by colleges and universities

Break-even analysis is an important tool for managing any business, including colleges and universities. In a group, identify three areas where break-even analysis might be used at your college or university. For each area, identify the revenues, variable costs, and fixed costs.

COMMUNICATION

TIF 6-3 Decreasing break-even by raising prices

Sun Airlines is a commercial airline that targets business and nonbusiness travelers. In recent months, the airline has been unprofitable. The company has break-even sales volume of 75% of capacity, which is significantly higher than the industry average of 65%. Sun's CEO, Neil Armstrong, is concerned about the recent string of losses and is considering a strategic plan that could reduce the break-even sales volume by increasing ticket prices. He has asked for your help in evaluating this plan.

Write a brief memo to Neil Armstrong evaluating this strategy.

TIF 6-4 Profitability strategies

Somerset Inc. has finished a new video game, *Snowboard Challenge*. Management is now considering its marketing strategies. The following information is available:

Anticipated sales price per unit	$80
Variable cost per unit*	$35
Anticipated volume	1,000,000 units
Production costs	$20,000,000
Anticipated advertising	$15,000,000

*The cost of the video game, packaging, and copying costs.

Two managers, James Hamilton and Thomas Seymour, had the following discussion of ways to increase the profitability of this new offering:

James: I think we need to think of some way to increase our profitability. Do you have any ideas?

Thomas: Well, I think the best strategy would be to become aggressive on price.

James: How aggressive?

Thomas: If we drop the price to $60 per unit and maintain our advertising budget at $15,000,000, I think we will generate total sales of 2,000,000 units.

James: I think that's the wrong way to go. You're giving up too much on price. Instead, I think we need to follow an aggressive advertising strategy.

Thomas: How aggressive?

James: If we increase our advertising to a total of $25,000,000, we should be able to increase sales volume to 1,400,000 units without any change in price.

Thomas: I don't think that's reasonable. We'll never cover the increased advertising costs.

Which strategy is best: Keep the price and advertising budget as set, follow the advice of Thomas Seymour, or follow the advice of James Hamilton?

TIF 6-5 Analysis of costs for a printer

The owner of Warwick Printing is planning direct labor needs for the upcoming year. The owner has provided you with the following information for next year's plans:

	One Color	Two Color	Three Color	Four Color	Total
Number of banners	212	274	616	698	1,800

Each color on the banner must be printed one at a time. Thus, for example, a four-color banner will need to be run through the printing operation four separate times. The total production volume last year was 800 banners, as follows:

	One Color	Two Color	Three Color	Total
Number of banners	180	240	380	800

The four-color banner is a new product offering for the upcoming year. The owner believes that the expected 1,000-unit increase in volume from last year means that direct labor expenses should increase by 125% (1,000 ÷ 800). What do you think?

TIF 6-6 Analysis of costs for a shipping department

Sales volume has been dropping at Mumford Industries. During this time, the Shipping Department manager has been under severe financial constraints. Most of the Shipping Department's efforts are related to pulling inventory from the warehouse for each order and performing the paperwork. The paperwork involves preparing shipping documents for each order. Thus, the pulling and paperwork effort associated with each sales order is essentially the same, regardless of the size of the order. The Shipping Department manager has discussed the financial situation with senior management. Senior management has responded by pointing out that because sales volume has been dropping, the amount of work in the Shipping Department also should be dropping. Thus, senior management told the Shipping Department manager that costs should be decreasing in the department.

The Shipping Department manager prepared the following information:

Month	Sales Volume	Number of Customer Orders	Sales Volume per Order
January	$472,000	1,180	400
February	475,800	1,220	390
March	456,950	1,235	370
April	425,000	1,250	340
May	464,750	1,430	325
June	421,200	1,350	312
July	414,000	1,380	300
August	430,700	1,475	292

Given this information, how would you respond to senior management?

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Taylor Corporation is analyzing the cost behavior of three cost items, A, B, and C, to budget for the upcoming year. Past trends have indicated the following dollars were spent at three different levels of output:

	Unit Levels		
	10,000	12,000	15,000
A costs	$25,000	$29,000	$35,000
B costs	10,000	15,000	15,000
C costs	15,000	18,000	22,500

In establishing a budget for 14,000 units, Taylor should treat A, B, and C costs as:

a. semivariable, fixed, and variable, respectively.
b. variable, fixed, and variable, respectively.
c. semivariable, semivariable, and semivariable, respectively.
d. variable, semivariable, and semivariable, respectively.

2. Kimber Company has the following unit costs for the current year:

Raw materials	$20.00
Direct labor	25.00
Variable manufacturing overhead	10.00
Fixed manufacturing overhead	15.00
Total unit cost	$70.00

Fixed manufacturing cost is based on an annual activity level of 8,000 units. Based on these data, the total manufacturing cost expected to be incurred to manufacture 9,000 units in the current year is:

a. $560,000.
b. $575,000.
c. $615,000.
d. $630,000.

3. Bolger and Co. manufactures large gaskets for the turbine industry. Bolger's per-unit sales price and variable costs for the current year are as follows:

Sales price per unit	$300
Variable costs per unit	210

Bolger's total fixed costs aggregate to $360,000. Bolger's labor agreement is expiring at the end of the year, and management is concerned about the effects of a new labor agreement on its break-even point in units. The controller performed a sensitivity analysis to ascertain the estimated effect of a $10-per-unit direct labor increase and a $10,000 reduction in fixed costs. Based on these data, the break-even point would:

a. decrease by 1,000 units.
b. decrease by 125 units.
c. increase by 375 units.
d. increase by 500 units.

4. Eagle Brand Inc. produces two products as follows:

	Product X	Product Y
Selling price per unit	$100	$130
Variable costs per unit	$80	$100
Raw materials used per unit	4 lbs.	10 lbs.

Eagle Brand has 1,000 lbs. of raw materials that can be used to produce Products X and Y.

Which of the following alternatives should Eagle Brand accept to maximize the contribution margin?

a. 100 units of Product Y.
b. 250 units of Product X.
c. 200 units of Product X and 20 units of Product Y.
d. 200 units of Product X and 50 units of Product Y.

Pathways Challenge



This is Accounting!

Information/Consequences

The equation for the slope of a line and the equation for the variable cost using the high-low method are identical. From the high-low method, we learn that the variable cost per unit is the difference between the total costs at the high and low points divided by the difference in the units produced at the high and low points. In other words, $\frac{y_1 - y_2}{x_1 - x_2}$.

When computing the variable cost per unit and the fixed cost using the high-low method, we assume that the costs are *linearly* related to the total number of units. In other words, the total cost line can be graphed as a straight line. For this reason, we can use the mathematical equation for a line to help us approximate the variable and fixed costs.

Suggested Answer

Chapter 7

Variable Costing for Management Analysis

Principles

Chapter 1 *Introduction to Managerial Accounting*

Developing Information

COST SYSTEMS

Chapter 2 *Job Order Costing*
Chapter 3 *Process Costing*
Chapter 4 *Activity-Based Costing*

COST ALLOCATIONS

Chapter 5 *Support Departments*
Chapter 5 *Joint Costs*

Decision Making

PLANNING AND EVALUATING TOOLS

Chapter 6 *Cost-Volume-Profit Analysis*
Chapter 7 ***Variable Costing***
Chapter 8 *Budgeting Systems*
Chapter 9 *Standard Costing and Variances*
Chapter 10 *Decentralized Operations*
Chapter 11 *Differential Analysis*

STRATEGIC TOOLS

Chapter 12 *Capital Investment Analysis*
Chapter 13 *Lean Manufacturing*
Chapter 13 *Activity Analysis*
Chapter 14 *The Balanced Scorecard*
Chapter 14 *Corporate Social Responsibility*

Adobe Systems Inc.

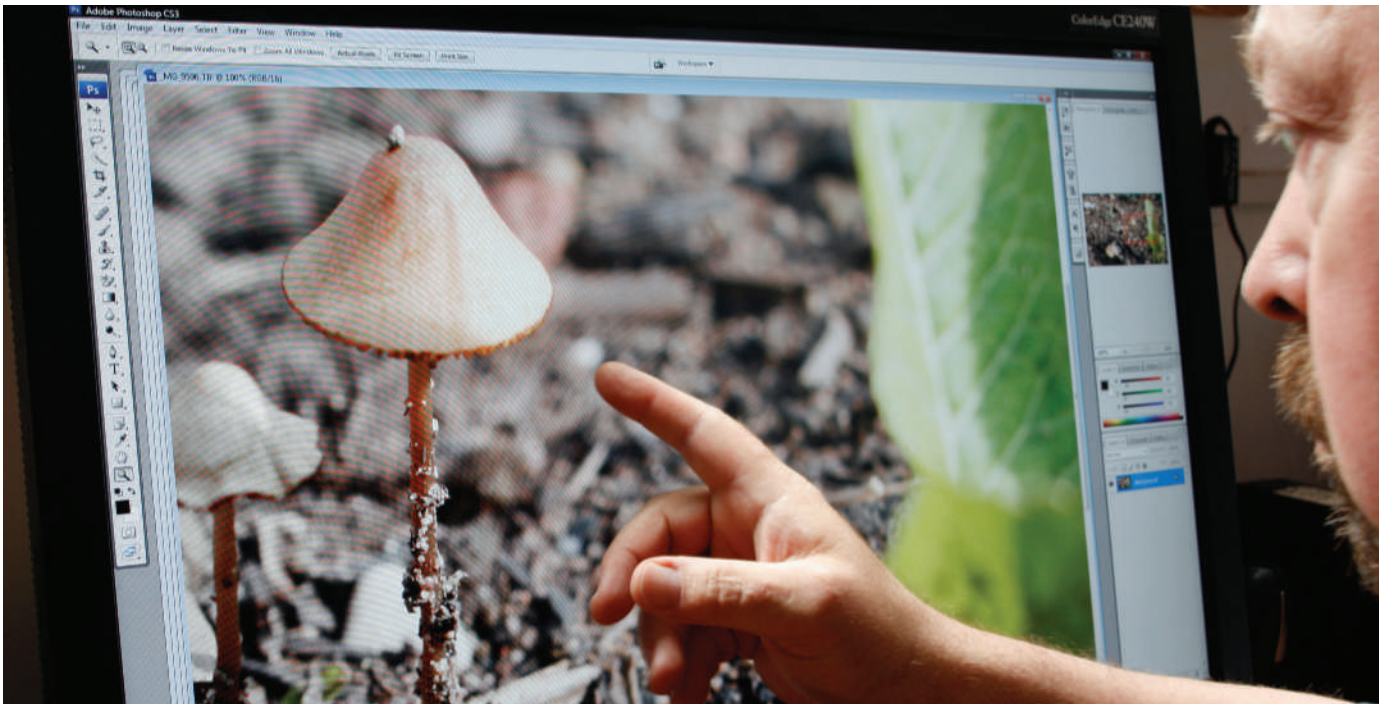
Assume that you have three different options for a summer job. How would you evaluate these options? Naturally there are many things to consider, including how much you could earn from each job.

Determining how much you could earn from each job may not be as simple as comparing the wage rate per hour. For example, a job as an office clerk at a local company pays $8 per hour. A job delivering pizza pays $10 per hour (including estimated tips), although you must use your own transportation. Another job working in a beach resort over 500 miles away from your home pays $8 per hour. All three jobs offer 40 hours per week for the whole summer. If these options were ranked according to their pay per hour, the pizza delivery job would be the most attractive. However, the costs associated with each job must also be evaluated. For example, the office job may require that you pay for downtown parking and purchase office clothes. The pizza delivery job will require you to pay for gas and maintenance for your car. The resort job will require you to move to the resort city and incur additional living costs. Only by considering the costs for each job will you be able to determine which job will provide you with the most income.

Just as you should evaluate the relative income of various choices, a business also evaluates the income earned from its choices. Important choices include the products offered and the geographical regions to be served.

A company will often evaluate the profitability of products and regions. For example, **Adobe Systems Inc. (ADBE)**, one of the largest software companies in the world, determines the income earned from its various product lines, such as Acrobat®, Photoshop®, Premiere®, and Dreamweaver® software. Adobe uses this information to establish product line pricing, as well as sales, support, and development effort. Likewise, Adobe evaluates the income earned in the geographic regions it serves, such as the United States, Europe, and Asia. Again, such information aids management in managing revenue and expenses within the regions.

In this chapter, how businesses measure profitability using absorption costing and variable costing is discussed. After illustrating and comparing these concepts, how businesses use them for controlling costs, pricing products, planning production, analyzing market segments, and analyzing contribution margins is described and illustrated.



PETE JENKINS/ALAMY STOCK PHOTO

Link to Adobe Systems . . . . . Pages 305, 309, 312, 316, 319

What's Covered

Variable Costing for Management Analysis

Income Under Absorption and Variable Costing
- Absorption Costing (Obj. 1)
- Variable Costing (Obj. 1)
- Effects of Inventory (Obj. 1)
- Analyzing Income (Obj. 2)

Using Absorption and Variable Costing
- Controlling Costs (Obj. 3)
- Pricing Products (Obj. 3)
- Planning Production (Obj. 3)
- Analyzing Market Segments (Obj. 4)

Variable Costing for Service Businesses
- Reporting Income (Obj. 5)
- Analyzing Segments (Obj. 5)

Learning Objectives

Obj. 1 Describe and illustrate reporting operating income under absorption and variable costing.

Obj. 2 Describe and illustrate the effects of absorption and variable costing on analyzing operating income.

Obj. 3 Describe management's use of absorption and variable costing.

Obj. 4 Use variable costing for analyzing market segments, including product, territories, and salespersons segments.

Obj. 5 Describe and illustrate variable costing for service businesses.

Analysis for Decision Making

Obj. 6 Describe and illustrate the use of segment analysis and earnings before interest, taxes, depreciation, and amortization (EBITDA) in evaluating a company's performance.

Objective 1
Describe and illustrate reporting operating income under absorption and variable costing.

Operating Income: Absorption and Variable Costing

Operating income is one of the most important items reported by a company. Depending on the decision-making needs of management, operating income can be determined using absorption or variable costing.

Absorption Costing

Absorption costing is required under generally accepted accounting principles (GAAP) for financial statements distributed to external users. Under absorption costing, the cost of goods manufactured includes direct materials, direct labor, and factory overhead costs. Both fixed and variable factory costs are included as part of factory overhead. In the financial statements, these costs are included in the cost of goods sold (income statement) and inventory (balance sheet).

The reporting of operating income under absorption costing is as follows:

Sales	$XXX
Cost of goods sold	(XXX)
Gross profit	$XXX
Selling and administrative expenses	(XXX)
Operating income	$XXX

The income statements illustrated in the preceding chapters of this text have used absorption costing.

Adobe Systems uses absorption costing for its annual financial statements filed with the Securities and Exchange Commission.

Link to Adobe Systems

Variable Costing

For internal use in decision making, managers often use variable costing. Under **variable costing**, sometimes called *direct costing*, the cost of goods manufactured includes only variable manufacturing costs. Thus, the cost of goods manufactured consists of the following:

- Direct materials
- Direct labor
- *Variable* factory overhead

Under variable costing, *fixed* factory overhead costs are not a part of the cost of goods manufactured. Instead, fixed factory overhead costs are treated as a period expense. Exhibit 1 illustrates the differences between absorption costing and variable costing.

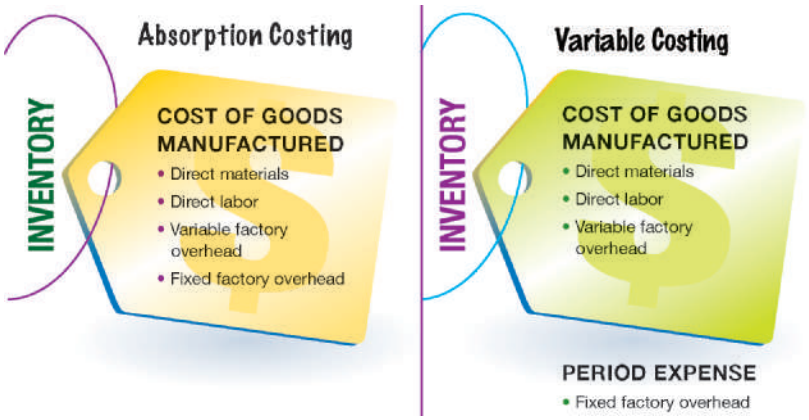


Exhibit 1
Absorption Costing Versus Variable Costing

The reporting of operating income under variable costing is as follows:

Sales		$XXX
Variable cost of goods sold		(XXX)
Manufacturing margin		$XXX
Variable selling and administrative expenses		(XXX)
Contribution margin		$XXX
Fixed costs:		
Fixed manufacturing costs	$XXX	
Fixed selling and administrative expenses	XXX	
Total fixed costs		(XXX)
Operating income		$XXX

Manufacturing margin is the excess of sales over variable cost of goods sold:

Manufacturing Margin = Sales – Variable Cost of Goods Sold

Variable cost of goods sold consists of direct materials, direct labor, and variable factory overhead for the units sold. **Contribution margin** is the excess of manufacturing margin over variable selling and administrative expenses:

Contribution Margin = Manufacturing Margin – Variable Selling and Administrative Expenses

Subtracting fixed costs from contribution margin yields *operating income*:

Operating Income = Contribution Margin – Fixed Costs

To illustrate variable costing and absorption costing, assume that Martinez Co. manufactures 15,000 units, which are sold at a price of $50. The related costs and expenses for Martinez are as follows:

	Total Cost	Number of Units	Unit Cost
Manufacturing costs:			
Variable	$375,000	15,000	$25
Fixed	150,000	15,000	10
Total	$525,000		$35
Selling and administrative expenses:			
Variable	$ 75,000	15,000	$ 5
Fixed	50,000		
Total	$125,000		

Exhibit 2 shows the absorption costing income statement prepared for Martinez. The computations are shown in parentheses.

Exhibit 2
Absorption Costing Income Statement

Sales (15,000 × $50)	$ 750,000
Cost of goods sold (15,000 × $35)	(525,000)
Gross profit	$ 225,000
Selling and administrative expenses ($75,000 + $50,000)	(125,000)
Operating income	$ 100,000

Absorption costing does not distinguish between variable and fixed costs. All manufacturing costs are included in the cost of goods sold. Deducting the cost of goods sold of $525,000 from sales of $750,000 yields gross profit of $225,000. Deducting selling and administrative expenses of $125,000 from gross profit yields operating income of $100,000.

Exhibit 3 shows the variable costing income statement prepared for Martinez. The computations are shown in parentheses.

Exhibit 3
Variable Costing Income Statement

Sales (15,000 × $50)		$ 750,000
Variable cost of goods sold (15,000 × $25)		(375,000)
Manufacturing margin		$ 375,000
Variable selling and administrative expenses (15,000 × $5)		(75,000)
Contribution margin		$ 300,000
Fixed costs:		
Fixed manufacturing costs	$150,000	
Fixed selling and administrative expenses	50,000	
Total fixed costs		(200,000)
Operating income		$ 100,000

note:
The variable costing income statement includes only variable manufacturing costs in the cost of goods sold.

Variable costing income reports variable costs separately from fixed costs. Deducting the variable cost of goods sold of $375,000 from sales of $750,000 yields the manufacturing margin of $375,000. Deducting variable selling and administrative expenses of $75,000 from the manufacturing margin yields the contribution margin of $300,000. Deducting fixed costs of $200,000 from the contribution margin yields operating income of $100,000.

The contribution margin reported in Exhibit 3 is the same as that used in Chapter 6. That is, the contribution margin is sales less variable costs and expenses. The only difference is that Exhibit 3 reports manufacturing margin before deducting variable selling and administrative expenses.

Effects of Inventory

Operating income will vary between absorption and variable costing, depending upon whether there is any change in inventory. The effects of inventory on operating income are illustrated for the following:

- Units manufactured equal units sold, resulting in no change in inventory.
- Units manufactured exceed units sold, resulting in an increase in inventory.
- Units manufactured are less than units sold, resulting in a decrease in inventory.

Units Manufactured Equal Units Sold In Exhibits 2 and 3, Martinez manufactured and sold 15,000 units. Thus, the variable and absorption costing income statements reported the same operating income of $100,000. When the number of units manufactured equals the number of units sold, operating income will be the same under both methods.

Units Manufactured Exceed Units Sold When units manufactured exceed the units sold, the variable costing operating income will be *less* than it is for absorption costing. To illustrate, assume that only 12,000 units of the 15,000 units Martinez manufactured were sold.

Exhibit 4 shows the absorption and variable costing income statements when units manufactured exceed units sold.

Exhibit 4
Units Manufactured Exceed Units Sold

Variable Costing Income Statement		
Sales (12,000 × $50)		$ 600,000
Variable cost of goods sold:		
Variable cost of goods manufactured (15,000 × $25)	$ 375,000	
Ending inventory (3,000 × $25)	(75,000)	
Total variable cost of goods sold		(300,000)
Manufacturing margin		$ 300,000
Variable selling and administrative expenses (12,000 × $5)		(60,000)
Contribution margin		$ 240,000
Fixed costs:		
Fixed manufacturing costs	$ 150,000	
Fixed selling and administrative expenses	50,000	
Total fixed costs		(200,000)
Operating income		$ 40,000
Absorption Costing Income Statement		
Sales (12,000 × $50)		$ 600,000
Cost of goods sold:		
Cost of goods manufactured (15,000 × $35)	$ 525,000	
Ending inventory (3,000 × $35)	(105,000)	
Total cost of goods sold		(420,000)
Gross profit		$ 180,000
Selling and administrative expenses [(12,000 × $5) + $50,000]		(110,000)
Operating income		$ 70,000

Exhibit 4 shows a $30,000 ($70,000 − $40,000) difference in operating income. This difference is due to the fixed manufacturing costs. All of the $150,000 of fixed manufacturing costs is included as a period expense in the variable costing statement. However, the 3,000 units of ending inventory in the absorption costing statement include $30,000 (3,000 units × $10) of fixed manufacturing costs. By being included in inventory, this $30,000 is thus excluded from the cost of goods sold. Thus, the absorption costing operating income is $30,000 higher than the operating income for variable costing.

Units Manufactured Less Than Units Sold When the units manufactured are less than the number of units sold, the variable costing operating income will be *greater* than that of absorption costing. To illustrate, assume that beginning inventory, units manufactured, and units sold for Martinez were as follows:

Beginning inventory	5,000 units
Units manufactured during current period	10,000 units
Units sold during current period at $50 per unit	15,000 units

Martinez's manufacturing costs and selling and administrative expenses are as follows:

	Total Cost	Number of Units	Unit Cost
Beginning inventory (5,000 units):			
Manufacturing costs:			
Variable	$125,000	5,000	$25
Fixed	50,000	5,000	10
Total	$175,000		$35
Current period (10,000 units):			
Manufacturing costs:			
Variable	$250,000	10,000	$25
Fixed	150,000	10,000	15
Total	$400,000		$40
Selling and administrative expenses:			
Variable	$ 75,000	15,000	$ 5
Fixed	50,000		
Total	$125,000		

Exhibit 5 shows the absorption and variable costing income statements for Martinez when units manufactured are less than units sold.

Exhibit 5
Units Manufactured Are Less Than Units Sold

Absorption Costing Income Statement		
Sales (15,000 × $50)		$ 750,000
Cost of goods sold:		
Beginning inventory (5,000 × $35)	$175,000	
Cost of goods manufactured (10,000 × $40)	400,000	
Total cost of goods sold		(575,000)
Gross profit		$ 175,000
Selling and administrative expenses ($75,000 + $50,000)		(125,000)
Operating income		$ 50,000
Variable Costing Income Statement		
Sales (15,000 × $50)		$ 750,000
Variable cost of goods sold:		
Beginning inventory (5,000 × $25)	$125,000	
Variable cost of goods manufactured (10,000 × $25)	250,000	
Total variable cost of goods sold		(375,000)
Manufacturing margin		$ 375,000
Variable selling and administrative expenses (15,000 × $5)		(75,000)
Contribution margin		$ 300,000
Fixed costs:		
Fixed manufacturing costs	$150,000	
Fixed selling and administrative expenses	50,000	
Total fixed costs		(200,000)
Operating income		$ 100,000

Exhibit 5 shows a $50,000 ($100,000 − $50,000) difference in operating income. This difference is due to the fixed manufacturing costs. The beginning inventory under absorption costing includes $50,000 (5,000 units × $10) of fixed manufacturing costs incurred in the preceding period.

By being included in the beginning inventory, this $50,000 is included in the cost of goods sold for the current period. Under variable costing, this $50,000 was included as an expense in an income statement of a prior period. Thus, the variable costing operating income is $50,000 higher than the operating income for absorption costing.

The preceding effects of inventory on operating income reported under absorption and variable costing are summarized in Exhibit 6.

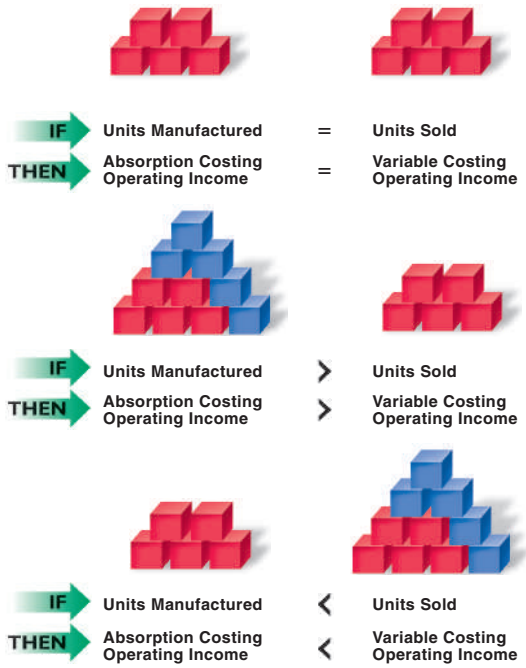


Exhibit 6
Effects of Inventory on Absorption and Variable Costing

Adobe Systems outsources its purchasing, production, inventory, and fulfillment activities to third parties in the United States.

Source: Adobe Systems Inc., *Form 10-K for the Fiscal Year Ended December 2, 2016.*

Link to Adobe Systems

Check Up Corner 7-1 Absorption and Variable Costing Income Statements

Walsh Company manufactured 30,000 units during July. There were no units in inventory on July 1. Costs and expenses for July were as follows:

	Total Cost	Number of Units	Unit Cost
Manufacturing costs:			
Variable	$660,000	30,000	$22.00
Fixed	300,000	30,000	10.00
Total	$960,000		
Selling and administrative expenses:			
Variable	$200,000		
Fixed	160,000		
Total	$360,000		

If the company sells 25,000 units at $75 (units manufactured exceed units sold), prepare an income statement for July using:

a. Absorption costing
b. Variable costing

(Continued)

Solution:

a.

Under absorption costing, both fixed and variable manufacturing costs are included in cost of goods sold and in inventory.

Absorption Costing Income Statement

Sales		$1,875,000	← 25,000 units sold × $75 selling price per unit
Cost of goods sold:			
Cost of goods manufactured	$ 960,000		← $660,000 variable manufacturing cost + $300,000 fixed manufacturing costs for 30,000 units
Ending inventory	(160,000)		← 5,000 units (30,000 units manufactured – 25,000 units sold) × $32 manufacturing cost per unit ($960,000 total manufacturing cost ÷ 30,000 units manufactured)
Total cost of goods sold		(800,000)	
Gross profit		$1,075,000	
Selling and administrative expenses		(360,000)	
Operating income		$ 715,000	

b.

Under variable costing, only variable manufacturing costs are included in cost of goods sold and inventory.

Variable Costing Income Statement

Sales		$1,875,000	← 25,000 units sold × $75 selling price per unit
Variable cost of goods sold:			
Variable cost of goods manufactured	$ 660,000		← 30,000 units manufactured × $22 variable cost per unit
Ending inventory	(110,000)		← 5,000 units (30,000 units manufactured – 25,000 units sold) × $22 variable cost per unit
Total variable cost of goods sold		(550,000)	
Manufacturing margin		$1,325,000	← The excess of sales over variable cost of goods sold
Variable selling and administrative expenses		(200,000)	
Contribution margin		$1,125,000	← The excess of sales over all variable costs
Fixed costs:			
Fixed manufacturing costs	$ 300,000		
Fixed selling and administrative expenses	160,000		
Total fixed costs		(460,000)	← Fixed Costs
Operating income		$ 665,000	

Variable Costs

Check Up Corner

Objective 2
Describe and illustrate the effects of absorption and variable costing on analyzing operating income.

Analyzing Operating Income Using Absorption and Variable Costing

Whenever the units manufactured differ from the units sold, finished goods inventory is affected. When the units manufactured are greater than the units sold, finished goods inventory increases. Under absorption costing, a portion of this increase is related to the allocation of fixed manufacturing overhead to ending inventory. As a result, increases or decreases in operating income can be due to changes in inventory levels. In analyzing operating income, such increases and decreases could be misinterpreted as operating efficiencies or inefficiencies.

To illustrate, assume that Frand Manufacturing Company has no beginning inventory and sales are estimated to be 20,000 units at $75 per unit. Also, assume that sales will not change if more than 20,000 units are manufactured.

Frand's management is evaluating whether to manufacture 20,000 units (Proposal 1) or 25,000 units (Proposal 2). The costs and expenses related to each proposal follow.

Proposal 1: 20,000 Units to Be Manufactured and Sold

	Total Cost	Number of Units	Unit Cost
Manufacturing costs:			
Variable	$ 700,000	20,000	$35
Fixed	400,000	20,000	20*
Total	$1,100,000		$55
Selling and administrative expenses:			
Variable	$ 100,000	20,000	$ 5
Fixed	100,000		
Total	$ 200,000		

*$400,000 ÷ 20,000 units

Proposal 2: 25,000 Units to Be Manufactured and 20,000 Units to Be Sold

	Total Cost	Number of Units	Unit Cost
Manufacturing costs:			
Variable	$ 875,000	25,000	$35
Fixed	400,000	25,000	16*
Total	$1,275,000		$51
Selling and administrative expenses:			
Variable	$ 100,000	20,000	$ 5
Fixed	100,000		
Total	$ 200,000		

*$400,000 ÷ 25,000 units

The absorption costing income statements for each proposal are shown in Exhibit 7.

Frand Manufacturing Company
Absorption Costing Income Statements

	Proposal 1 20,000 Units Manufactured	Proposal 2 25,000 Units Manufactured
Sales (20,000 units × $75)	$ 1,500,000	$ 1,500,000
Cost of goods sold:		
Cost of goods manufactured:		
(20,000 units × $55)	$(1,100,000)	
(25,000 units × $51)		$(1,275,000)
Ending inventory:		
(5,000 units × $51)		255,000
Total cost of goods sold	$(1,100,000)	$(1,020,000)
Gross profit	$ 400,000	$ 480,000
Selling and administrative expenses:		
($100,000 + $100,000)	(200,000)	(200,000)
Operating income	$ 200,000	$ 280,000

Exhibit 7
Absorption Costing Income Statements for Two Production Levels

Exhibit 7 shows that if Frand manufactures 25,000 units, sells 20,000 units, and adds the 5,000 units to finished goods inventory (Proposal 2), operating income will be $280,000. In contrast, if Frand manufactures and sells 20,000 units (Proposal 1), operating income will be $200,000. In other words, Frand can increase operating income by $80,000 ($280,000 – $200,000) by simply increasing finished goods inventory by 5,000 units.

The $80,000 increase in operating income under Proposal 2 is caused by the allocation of the fixed manufacturing costs of $400,000 over a greater number of units manufactured. Specifically, an increase in production from 20,000 units to 25,000 units means that the fixed manufacturing cost per unit decreases from $20 ($400,000 ÷ 20,000 units) to $16 ($400,000 ÷ 25,000 units). Thus, the cost of goods sold when 25,000 units are manufactured is $4 per unit less, or $80,000 less in total (20,000 units sold × $4). Since the cost of goods sold is less, operating income is $80,000 more when 25,000 units rather than 20,000 units are manufactured.

Managers should be careful in analyzing operating income under absorption costing when finished goods inventory changes. Increases in operating income may be created by simply increasing finished goods inventory. Thus, managers could misinterpret such increases (or decreases) in operating income as due to changes in sales volume, prices, or costs.

Link to Adobe Systems

In a recent absorption costing income statement, **Adobe Systems** reported (in millions) total revenue of $5,854, cost of revenue of $820, gross profit of $5,034, operating expenses of $3,541, and operating income of $1,493.

Under variable costing, operating income is $200,000, regardless of whether 20,000 units or 25,000 units are manufactured. This is because no fixed manufacturing costs are allocated to the units manufactured. Instead, all fixed manufacturing costs are treated as a period expense.

To illustrate, Exhibit 8 shows the variable costing income statements for Frand for the production of 20,000 units, 25,000 units, and 30,000 units. In each case, the operating income is $200,000.

Exhibit 8
Variable Costing Income Statements for Three Production Levels

Frand Manufacturing Company
Variable Costing Income Statements

	20,000 Units Manufactured	25,000 Units Manufactured	30,000 Units Manufactured
Sales (20,000 units × $75)	$1,500,000	$1,500,000	$ 1,500,000
Variable cost of goods sold:			
Variable cost of goods manufactured:			
(20,000 units × $35)	$ (700,000)		
(25,000 units × $35)		$ (875,000)	
(30,000 units × $35)			$(1,050,000)
Ending inventory:			
(0 units × $35)	0		
(5,000 units × $35)		175,000	
(10,000 units × $35)			350,000
Total variable cost of goods sold	$ (700,000)	$ (700,000)	$ (700,000)
Manufacturing margin	$ 800,000	$ 800,000	$ 800,000
Variable selling and administrative expenses	(100,000)	(100,000)	(100,000)
Contribution margin	$ 700,000	$ 700,000	$ 700,000
Fixed costs:			
Fixed manufacturing costs	$ (400,000)	$ (400,000)	$ (400,000)
Fixed selling and administrative expenses	(100,000)	(100,000)	(100,000)
Total fixed costs	$ (500,000)	$ (500,000)	$ (500,000)
Operating income	$ 200,000	$ 200,000	$ 200,000



Ethics: Do It!

Taking an "Absorption Hit"

Aligning production to demand is a critical decision in business. Managers must not allow the temporary benefits of excess production through higher absorption of fixed costs to guide their decisions. Likewise, if demand falls, production should be dropped and inventory liquidated to match the new demand level, even though earnings will be penalized. The following interchange provides an example of an appropriate response to lowered demand for **H.J. Heinz Company**:

Analyst's question: *It seems. . . . that you're guiding to a little bit of a drop in performance between 3Q (third Quarter) and 4Q (fourth Quarter). . . . if so, maybe you could walk us through some of the drivers of that relative softness.*

Heinz executive's response: *No, I think, frankly, we're really pleased with the performance in the business. . . . We're also aggressively taking out inventory in the fourth quarter. And as you know, as you reduce inventory, you take an absorption hit. You're pulling basically fixed costs off the balance sheet into the P&L and there's a hit associated with that, but we think that's the right thing to do, to pull inventory out and to drive cash flow. So now, we feel very good about the business and feel very good about the fact that we're taking it to the middle of the range and taking up the bottom end of our guidance.*

Management operating with integrity will seek the tangible benefits of reducing inventory, even though there may be an adverse impact on published financial statements caused by absorption costing.

Source of question and response: "H. J. Heinz Management Discusses Q3 2012 Results—Earnings Call Transcript," *SeekingAlpha.com* (http://seekingalpha.com/article/375151-h-j-heinz-management-discusses-q3-2012-resultsearnings-call-transcript?page=6&p=qanda).

As shown, absorption costing may encourage managers to produce inventory. This is because producing inventory absorbs fixed manufacturing costs, which increases operating income. However, producing inventory leads to higher handling, storage, financing, and obsolescence costs. For this reason, many accountants believe that variable costing should be used by management for evaluating operating performance.

Check Up Corner 7-2 Absorption and Variable Costing with Different Levels of Production

Third Street Manufacturing Company has no beginning inventory, and sales are estimated to be 30,000 units at $100 per unit. Third Street's management is evaluating whether to manufacture 30,000 units (Proposal 1) or 40,000 units (Proposal 2). Sales will not change if more than 30,000 units are manufactured. The costs and expenses for each proposal follow:

	Proposal 1: 30,000 Units Manufactured			Proposal 2: 40,000 Units Manufactured		
	Total Cost	Number of Units	Unit Cost	Total Cost	Number of Units	Unit Cost
Manufacturing costs:						
Variable	$1,200,000	30,000	$40	$1,600,000	40,000	$40
Fixed	600,000	30,000	20	600,000	40,000	15
Total	$1,800,000			$2,200,000		
Selling and administrative expenses:						
Variable	$ 210,000	30,000	7	$ 210,000	30,000	7
Fixed	140,000			140,000		
Total	$ 350,000			$ 350,000		

a. Prepare an estimated income statement, comparing operating results if 30,000 and 40,000 units are manufactured in (1) the absorption costing format and (2) the variable costing format.
b. What is the reason for the difference in operating income reported for the two levels of production by the absorption costing income statement?

(Continued)

Solution:

a. (1)

Absorption Costing Income Statements

	Proposal 1: 30,000 Units Manufactured	Proposal 2: 40,000 Units Manufactured
Sales (30,000 units × $100)	$ 3,000,000	$ 3,000,000
Cost of goods sold:		
Cost of goods manufactured	$(1,800,000)	$(2,200,000)
Ending inventory	—	550,000
Total cost of goods sold	$(1,800,000)	$(1,650,000)
Gross profit	$ 1,200,000	$ 1,350,000
Selling and administrative expenses	(350,000)	(350,000)
Operating income	$ 850,000	$ 1,000,000

(30,000 units produced × $40 variable manufacturing cost per unit) + $600,000 fixed cost

(40,000 units produced × $40 variable manufacturing cost per unit) + $600,000 fixed cost

10,000 units (40,000 produced – 30,000 sold) × $55 per unit ($2,200,000 ÷ 40,000 units)

(30,000 units sold × $7 variable selling cost per unit) + $140,000

(2)

Variable Costing Income Statements

	Proposal 1: 30,000 Units Manufactured	Proposal 2: 40,000 Units Manufactured
Sales (30,000 units × $100)	$ 3,000,000	$ 3,000,000
Variable cost of goods sold:		
Variable cost of goods manufactured	$(1,200,000)	$(1,600,000)
Ending inventory	—	400,000
Total variable cost of goods sold	$(1,200,000)	$(1,200,000)
Manufacturing margin	$ 1,800,000	$ 1,800,000
Variable selling and administrative expenses	(210,000)	(210,000)
Contribution margin	$ 1,590,000	$ 1,590,000
Fixed costs:		
Fixed manufacturing costs	$ (600,000)	$ (600,000)
Fixed selling and administrative expenses	(140,000)	(140,000)
Total fixed costs	$ (740,000)	$ (740,000)
Operating income	$ 850,000	$ 850,000

Variable Costs

30,000 units produced × $40 variable manufacturing cost per unit

40,000 units produced × $40 variable manufacturing cost per unit

10,000 units (40,000 produced – 30,000 sold) × $40 variable cost per unit

30,000 units sold × $7 variable selling cost per unit

Fixed Costs

b. The difference (in a.) is caused by including $150,000 fixed manufacturing costs (10,000 units × $15 fixed manufacturing cost per unit) in the ending inventory, which decreases the cost of goods sold and increases the operating income by $150,000.

Check Up Corner

Pathways Challenge



This is Accounting!

Economic Activity

Absorption costing is required by generally accepted accounting principles (GAAP) for reporting to external stakeholders. Thus, auto manufacturers like **Ford Motor Company (F)** and **General Motors Company (GM)** use absorption costing in preparing their financial statements. Under absorption costing, fixed manufacturing costs are included in inventory. Thus, the more cars the auto companies make, the lower the fixed cost per car and the smaller the cost of goods sold. In the years preceding the U.S. financial crisis and economic downturn of 2008, Ford and General Motors produced more cars than were sold to customers.[1]

Critical Thinking/Judgment

If Ford and General Motors have high fixed costs and low variable costs, how would producing more cars affect their operating income under absorption costing? under variable costing?

If absorption costing allows companies like Ford and General Motors to change their operating income by increasing or decreasing production, why does GAAP require absorption costing?

Suggested answer at end of chapter.

[1] Marielle Segarra, "Why the Big Three Put Too Many Cars on the Lot," *CFO.com* (ww2.cfo.com/management-accounting/2012/02/why-the-big-three-put-too-many-cars-on-the-lot/), February 2, 2012.

Using Absorption and Variable Costing

Objective 3
Describe management's use of absorption and variable costing.

Each decision-making situation should be carefully analyzed in deciding whether absorption or variable costing reporting would be more useful. As a basis for discussion, the use of absorption and variable costing in the following decision-making situations is described:

- Controlling costs
- Pricing products
- Planning production
- Analyzing market segments

The role of accounting reports in these decision-making situations is shown in Exhibit 9.



Exhibit 9
Accounting Reports and Management Decisions

Controlling Costs

All costs are controllable in the long run by someone within a business. However, not all costs are controllable at the same level of management. For example, plant supervisors control the use of direct materials in their departments. They have no control, though, over insurance costs related to the property, plant, and equipment.

For a level of management, **controllable costs** are costs that can be influenced (increased or decreased) by management at that level. **Noncontrollable costs** are costs that another level of management controls. This distinction is useful for reporting costs to those responsible for their control.

Variable manufacturing costs are controlled by operating management. In contrast, fixed manufacturing overhead costs such as the salaries of production supervisors are normally controlled at a higher level of management. Likewise, control of the variable and fixed operating expenses usually involves different levels of management. Since fixed costs and expenses are reported separately under variable costing, variable costing reports are normally more useful than absorption costing reports for controlling costs.

Pricing Products

Many factors enter into determining the selling price of a product. However, the cost of making the product is significant in all pricing decisions.

In the short run, fixed costs cannot be avoided. Thus, the selling price of a product should at least be equal to the variable costs of making and selling it. Any price above this minimum selling price contributes to covering fixed costs and generating income. Since variable costing reports variable and fixed costs and expenses separately, it is often more useful than absorption costing for setting short-run prices.

Why It Matters

Balancing Product Costs with Selling Prices

Apple Inc. (AAPL) has become one of the most financially successful companies of the past decade by using variable cost information to carefully price its iPhone family of products. The cost of an iPhone consists almost entirely of direct materials and other variable costs. For example, it is estimated that each iPhone costs Apple between $200–$300 to produce. When designing a new iPhone, Apple has to carefully balance product features with the variable cost of direct materials. For example, the iPhone X includes edge-to-edge display, FaceID facial unlocking, and advanced front and rear cameras. In determining the price of the iPhone X, which starts at $999, Apple had to balance cost and functionality with the willingness of customers to pay for these additional features.

In the long run, a company must set its selling price high enough to cover all costs and expenses (variable and fixed) and generate operating income. Since absorption costing includes fixed and variable costs in the cost of manufacturing a product, absorption costing is often more useful than variable costing for setting long-term prices.

Planning Production

In the short run, planning production is limited to existing capacity. In many cases, operating decisions must be made quickly before opportunities are lost.

To illustrate, a company with seasonal demand for its products may have an opportunity to obtain an off-season order that will not interfere with its current production schedule. The relevant factors for such a short-run decision are the additional revenues and the additional variable costs associated with the order. If the revenues from the order exceed the related variable costs, the order will increase contribution margin and, thus, increase the company's operating income. Since variable costing reports contribution margin, it is often more useful than absorption costing in such cases.

In the long run, planning production can include expanding existing capacity. Thus, when analyzing and evaluating long-run sales and operating decisions, absorption costing, which considers fixed and variable costs, is often more useful.

Analyzing Market Segments

Market analysis determines the profit contributed by the market segments of a company. A **market segment** is a portion of a company that can be analyzed using sales, costs, and expenses to determine its profitability. Examples of market segments include sales territories, products, salespersons, and customers. Variable costing as an aid in decision making regarding market segments is discussed next.

Link to Adobe Systems

Adobe Systems organizes its operations into three segments: Digital Marketing, Digital Media, and Print and Publishing.

Objective 4
Use variable costing for analyzing market segments, including product, territories, and salespersons segments.

Analyzing Market Segments

Companies can report operating income for internal decision making using either absorption or variable costing. Absorption costing is often used for long-term analysis of market segments. Variable costing is often used for short-term analysis of market segments. In this section, segment profitability reporting using variable costing is described and illustrated.

Most companies prepare variable costing reports for each product. These reports are often used for product pricing and deciding whether to discontinue a product. In addition, variable costing reports may be prepared for geographic areas, customers, distribution channels, or salespersons. A distribution channel is the method for selling a product to a customer.

To illustrate analysis of market segments using variable costing, the following data for the month ending March 31 for Camelot Fragrance Company are used:

Camelot Fragrance Company
Sales and Production Data
For the Month Ended March 31

	Northern Territory	Southern Territory	Total
Sales:			
Gwenevere	$60,000	$30,000	$ 90,000
Lancelot	20,000	50,000	70,000
Total territory sales	$80,000	$80,000	$160,000
Variable production costs:			
Gwenevere (12% of sales)	$ 7,200	$ 3,600	$ 10,800
Lancelot (12% of sales)	2,400	6,000	8,400
Total variable production cost by territory	$ 9,600	$ 9,600	$ 19,200
Promotion costs:			
Gwenevere (variable at 30% of sales)	$18,000	$ 9,000	$ 27,000
Lancelot (variable at 20% of sales)	4,000	10,000	14,000
Total promotion cost by territory	$22,000	$19,000	$ 41,000
Sales commissions:			
Gwenevere (variable at 20% of sales)	$12,000	$ 6,000	$ 18,000
Lancelot (variable at 10% of sales)	2,000	5,000	7,000
Total sales commissions by territory	$14,000	$11,000	$ 25,000

Camelot Fragrance manufactures and sells the Gwenevere perfume for women and the Lancelot cologne for men. To simplify, no inventories are assumed to exist at the beginning or end of March.

Why It Matters

CONCEPT CLIP

Business Segments

A business segment represents a component of business that earns revenues and incurs expenses and whose performance is evaluated by management. Business segments can be determined along different dimensions, such as the nature of products and services, geographic region, class of customer, or methods for distributing products or providing services. Some examples are as follows:

Company	Segment Type	Segments
Amazon.com, Inc. (AMZN)	Geographic	North America, Germany, Japan, UK, Other International
Apple Inc. (AAPL)	Product	iPhone, iPad, Mac, Services, Other Products
Boeing Company (BA)	Product	Commercial Airplanes, Military Aircraft, Network and Space Systems, Global Services and Support, Boeing Capital
Comcast Corporation (CMCSA)	Distribution channel	Cable Communications, Cable Networks, Broadcast TV, Filmed Entertainment, Theme Parks
Deere & Company (DE)	Customer application	Agriculture and Turf, Construction and Forestry
Intel Corporation (INTC)	Customer	Hewlett-Packard, Dell Inc., Lenovo Group Limited
McDonald's Corporation (MCD)	Geographic	United States, Europe, APMEA (Asia-Pacific, Middle East, and Africa), Other Countries
Procter & Gamble Co. (PG)	Product	Beauty, Grooming, Health Care, Fabric and Home Care
Skechers USA Inc. (SKX)	Distribution channel	Domestic Wholesale, International Wholesale, Retail, E-commerce

Sales Territory Profitability Analysis

An income statement presenting the contribution margin by sales territories is often used in evaluating past performance and in directing future sales efforts. Sales territory profitability analysis may lead management to do the following:

- Reduce costs in lower-profit sales territories
- Increase sales efforts in higher-profit territories

To illustrate sales territory profitability analysis, Exhibit 10 shows the contribution margin for the Northern and Southern territories of Camelot Fragrance Company. As Exhibit 10 indicates, the Northern Territory is generating $34,400 of contribution margin, while the Southern Territory is generating $40,400 of contribution margin.

Exhibit 10
Contribution Margin by Sales Territory Report

Camelot Fragrance Company
Contribution Margin by Sales Territory
For the Month Ended March 31

	Northern Territory		Southern Territory	
Sales		$80,000		$80,000
Variable cost of goods sold		(9,600)		(9,600)
Manufacturing margin		$70,400		$70,400
Variable selling expenses:				
Promotion costs	$22,000		$19,000	
Sales commissions	14,000		11,000	
Total variable selling expenses		(36,000)		(30,000)
Contribution margin		$34,400		$40,400
Contribution margin ratio		43%		50.5%

In addition to the contribution margin, the contribution margin ratio for each territory is shown in Exhibit 10. The contribution margin ratio is computed as follows:

$$\text{Contribution Margin Ratio} = \frac{\text{Contribution Margin}}{\text{Sales}}$$

Exhibit 10 indicates that the Northern Territory has a contribution margin ratio of 43% ($34,400 ÷ $80,000). In contrast, the Southern Territory has a contribution margin ratio of 50.5% ($40,400 ÷ $80,000).

The difference in profit of the Northern and Southern territories is due to the difference in sales mix between the territories. **Sales mix**, sometimes referred to as *product mix*, is the relative amount of sales among the various products. The sales mix is computed by dividing the sales of each product by the total sales of each territory. Sales mix of the Northern and Southern territories is as follows:

	Northern Territory		Southern Territory	
Product	**Sales**	**Sales Mix**	**Sales**	**Sales Mix**
Gwenevere	$60,000	75%	$30,000	37.5%
Lancelot	20,000	25	50,000	62.5
Total	$80,000	100%	$80,000	100.0%

As shown, 62.5% of the Southern Territory's sales are sales of Lancelot. Since the Southern Territory's contribution margin ($40,400) is higher (as shown in Exhibit 10) than that of the Northern Territory ($34,400), Lancelot must be more profitable than Gwenevere. To verify this, product profitability analysis is performed.

Product Profitability Analysis

A company should focus its sales efforts on products that will provide the maximum total contribution margin. In doing so, product profitability analysis is often used by management in making decisions regarding product sales and promotional efforts.

To illustrate product profitability analysis, Exhibit 11 shows the contribution margin by product for Camelot Fragrance Company.

Camelot Fragrance Company
Contribution Margin by Product Line
For the Month Ended March 31

	Gwenevere		Lancelot	
Sales		$ 90,000		$ 70,000
Variable cost of goods sold		(10,800)		(8,400)
Manufacturing margin		$ 79,200		$ 61,600
Variable selling expenses:				
Promotion costs	$27,000		$14,000	
Sales commissions	18,000		7,000	
Total variable selling expenses		(45,000)		(21,000)
Contribution margin		$ 34,200		$ 40,600
Contribution margin ratio		38%		58%

Exhibit 11
Contribution Margin by Product Line Report

Exhibit 11 indicates that Lancelot's contribution margin ratio (58%) is greater than Gwenevere's (38%). Lancelot's higher contribution margin ratio is a result of its lower promotion and sales commissions costs. Thus, management should consider the following:

- Emphasizing Lancelot in its marketing plans
- Reducing Gwenevere's promotion and sales commissions costs
- Increasing the price of Gwenevere

Adobe Systems recently reported the following data (in millions) for its three segments:

Link to Adobe Systems

	Digital Media	Digital Marketing	Print and Publishing
Revenue	$ 3,941	$1,737	$177
Cost of revenue	(231)	(581)	(8)
Gross profit	$3,710	$1,156	$169

Source: Adobe Systems Inc., *Form 10-K for the Fiscal Year Ended December 2, 2016.*

Salesperson Profitability Analysis

A salesperson profitability report is useful in evaluating sales performance. Such a report normally includes total sales, variable cost of goods sold, variable selling expenses, contribution margin, and contribution margin ratio for each salesperson.

Exhibit 12 illustrates such a salesperson profitability report for three salespersons in the Northern Territory of Camelot Fragrance Company. The exhibit indicates that Beth Williams produced the greatest contribution margin ($15,200), but had the lowest contribution margin ratio (38%). Beth sold $40,000 of product, which is twice as much product as the other two salespersons. However, Beth sold only Gwenevere, which has the lowest contribution margin ratio (from Exhibit 11). The other two salespersons sold equal amounts of Gwenevere and Lancelot. As a result, Inez Rodriguez and Deshawn Thomas had higher contribution margin ratios because they sold more Lancelot. The Northern Territory manager could use this report to encourage Inez and Deshawn to sell more total product, while encouraging Beth to sell more Lancelot.

Exhibit 12
Contribution Margin by Salesperson Report

Camelot Fragrance Company
Contribution Margin by Salesperson—Northern Territory
For the Month Ended March 31

	Inez Rodriguez	Deshawn Thomas	Beth Williams	Northern Territory—Total
Sales	$20,000	$20,000	$ 40,000	$ 80,000
Variable cost of goods sold	(2,400)	(2,400)	(4,800)	(9,600)
Manufacturing margin	$17,600	$17,600	$ 35,200	$ 70,400
Variable selling expenses:				
Promotion costs	$ (5,000)	$ (5,000)	$(12,000)	$(22,000)
Sales commissions	(3,000)	(3,000)	(8,000)	(14,000)
Total variable selling expenses	$ (8,000)	$ (8,000)	$(20,000)	$(36,000)
Contribution margin	$ 9,600	$ 9,600	$ 15,200	$ 34,400
Contribution margin ratio	48%	48%	38%	43%
Sales mix (% Lancelot sales)	50%	50%	0%	25%

Other factors should also be considered in evaluating salespersons' performance. For example, sales growth rates, years of experience, customer service, territory size, and actual performance compared to budgeted performance may also be important.

Why It Matters

Chipotle Contribution Margin per Restaurant

Chipotle Mexican Grill, Inc.'s **(CMG)** annual report identifies revenues and costs for its restaurants. We assume that food, beverage, packaging, and labor are variable and that occupancy (rent expense) and other expenses are fixed. By dividing the totals provided in the annual report by the number of stores (2,250), a contribution margin can be computed for an average restaurant as follows (in thousands):

Sales		$ 1,735
Variable restaurant expenses:		
Food, beverage, and packaging	$607	
Labor	491	
Total variable restaurant operating costs		(1,098)
Contribution margin		$ 637

Chipotle can use its average contribution margin per store for pricing its menus so that it can cover its fixed costs and generate operating income.

Source: Chipotle Mexican Grill, Inc., *Form 10-K for the Fiscal Year Ended December 31, 2016.*

Check Up Corner 7-3 Contribution Margin by Segment

Vintage Apparel Company manufactures and sells two styles of baseball jerseys, the Retro and the New Age. These jerseys are sold in two regions, East and West. Information about the two jerseys and sales in the two regions is as follows:

	Retro	New Age
Sales price	$100	$120
Variable cost of goods sold per unit	(75)	(90)
Manufacturing margin per unit	$ 25	$ 30
Variable selling expense per unit	(17)	(18)
Contribution margin per unit	$ 8	$ 12

	Units Sold	
	East Region	West Region
Retro	10,000	6,000
New Age	0	5,000

Prepare a contribution margin by sales territory report. Compute the contribution margin ratio for each territory.

Solution:

	East Region	West Region
Sales	$1,000,000	$1,200,000
Variable cost of goods sold	(750,000)	(900,000)
Manufacturing margin	$ 250,000	$ 300,000
Variable selling expenses	(170,000)	(192,000)
Contribution margin	$ 80,000	$ 108,000
Contribution margin ratio	8%	9%

10,000 units of Retro × $100 sales price

(6,000 units of Retro × $100 sales price) + (5,000 units of New Age × $120 sales price)

(6,000 units of Retro × $75 variable cost per unit) + (5,000 units of New Age × $90 variable cost per unit)

(6,000 units of Retro × $17 variable selling expense per unit) + (5,000 units of New Age × $18 variable selling expense per unit)

10,000 units of Retro × $75 variable cost per unit

10,000 units of Retro × $17 variable selling expense per unit

Check Up Corner

Variable Costing for Service Businesses

Objective 5
Describe and illustrate variable costing for service businesses.

Variable costing and the use of variable costing for manufacturing firms have been discussed earlier in this chapter. Service companies also use variable costing, and segment analysis.

Reporting Income

Unlike a manufacturing company, a service company does not make or sell a product. Thus, service companies do not have inventory. Since most service companies have no inventory, they do not use absorption costing to allocate fixed costs. In addition, variable costing reports of service companies do not report a manufacturing margin.

To illustrate variable costing for a service company, Blue Skies Airlines Inc., which operates as a small commercial airline, is used. The variable and fixed costs of Blue Skies are shown in Exhibit 13.

Exhibit 13
Costs of Blue Skies Airlines Inc.

Cost	Amount	Cost Behavior	Activity Base
Depreciation expense	$3,600,000	Fixed	
Food and beverage service expense	444,000	Variable	Number of passengers
Fuel expense	4,080,000	Variable	Number of miles flown
Rental expense	800,000	Fixed	
Selling expense	3,256,000	Variable	Number of passengers
Wages expense	6,120,000	Variable	Number of miles flown

As discussed in Chapter 6, a cost is classified as a fixed or variable cost according to how it changes relative to an activity base. A common activity for a manufacturing firm is the number of units produced. In contrast, most service companies use several activity bases.

To illustrate, Blue Skies uses the activity base *number of passengers* for food and beverage service and selling expenses. Blue Skies uses *number of miles flown* for fuel and wage expenses.

The variable costing income statement for Blue Skies, assuming revenue of $19,238,000, is shown in Exhibit 14.

Exhibit 14
Variable Costing Income Statement for a Service Company

Blue Skies Airlines Inc.
Variable Costing Income Statement
For the Month Ended April 30

Revenue		$ 19,238,000
Variable costs:		
Fuel expense	$4,080,000	
Wages expense	6,120,000	
Food and beverage service expense	444,000	
Selling expense	3,256,000	
Total variable costs		(13,900,000)
Contribution margin		$ 5,338,000
Fixed costs:		
Depreciation expense	$3,600,000	
Rental expense	800,000	
Total fixed costs		(4,400,000)
Operating income		$ 938,000

Unlike a manufacturing company, Exhibit 14 does not report cost of goods sold, inventory, or manufacturing margin. However, as shown in Exhibit 14, contribution margin is reported separately from operating income.

Analyzing Segments

A contribution margin report for service companies can be used to analyze and evaluate market segments. Typical segments for various service companies are shown in Exhibit 15.

Exhibit 15
Service Industry Market Segments

Service Industry	Market Segments
Electric power	Regions, customer types (industrial, consumer)
Banking	Customer types (commercial, retail), products (loans, savings accounts)
Airlines	Products (passengers, cargo), routes
Railroads	Products (commodity type), routes
Hotels	Hotel properties
Telecommunications	Customer type (commercial, retail), service type (voice, data)
Health care	Procedure, payment type (Medicare, insured)

To illustrate, a contribution margin report segmented by route is used for Blue Skies Airlines Inc. In preparing the report, the following data for April are used:

	Chicago/Atlanta	Atlanta/LA	LA/Chicago
Average ticket price per passenger	$400	$1,075	$805
Total passengers served	16,000	7,000	6,600
Total miles flown	56,000	88,000	60,000

The variable costs per unit are as follows:

Fuel	$ 20 per mile
Wages	30 per mile
Food and beverage service	15 per passenger
Selling	110 per passenger

A contribution margin report for Blue Skies is shown in Exhibit 16. The report is segmented by the routes (city pairs) flown.

Exhibit 16
Contribution Margin by Segment Report for a Service Company

Blue Skies Airlines Inc.
Contribution Margin by Route
For the Month Ended April 30

	Chicago/ Atlanta	Atlanta/ Los Angeles	Los Angeles/ Chicago	Total
Revenue				
(Ticket price × No. of passengers)	$ 6,400,000	$ 7,525,000	$ 5,313,000	$19,238,000
Aircraft fuel				
($20 × No. of miles flown)	(1,120,000)	(1,760,000)	(1,200,000)	(4,080,000)
Wages and benefits				
($30 × No. of miles flown)	(1,680,000)	(2,640,000)	(1,800,000)	(6,120,000)
Food and beverage service				
($15 × No. of passengers)	(240,000)	(105,000)	(99,000)	(444,000)
Selling expenses				
($110 × No. of passengers)	(1,760,000)	(770,000)	(726,000)	(3,256,000)
Contribution margin	$ 1,600,000	$ 2,250,000	$ 1,488,000	$ 5,338,000
Contribution margin ratio* (rounded)	25%	30%	28%	28%

*Contribution Margin/Revenue

Exhibit 16 indicates that the Chicago/Atlanta route has the lowest contribution margin ratio of 25%. In contrast, the Atlanta/Los Angeles route has the highest contribution margin ratio of 30%.

Analysis for Decision Making

Objective 6
Describe and illustrate the use of segment analysis and earnings before interest, taxes, depreciation, and amortization (EBITDA) in evaluating a company's performance.

Segment Analysis and EBITDA

The financial statements of public companies include footnote disclosure of selected segment information. This information can be used to identify strengths and weaknesses among segments.

To illustrate, **Amazon.com, Inc. (AMZN)** reports three segments, North America, International, and Amazon Web Services (AWS). The sales, operating income, and depreciation expense are segment disclosures in Amazon's financial statement footnotes and are shown as follows for a recent year (in millions):

	North America	International	AWS	Total
Sales	$79,785	$43,983	$12,219	$135,987
Segment operating income (loss)	2,361	(1,283)	3,108	4,186
Depreciation and amortization expense	1,971	930	3,461	6,362

North America sales are approximately 59% ($79,785 ÷ $135,987) of the total sales, International sales are 32% ($43,983 ÷ $135,987), and AWS sales are 9% ($12,219 ÷ $135,987) of total sales. Thus, the International and AWS segments, while smaller than North America, are still significant.

Operating income is often expressed by adding back depreciation and amortization expense. This amount is termed earnings before interest, taxes, depreciation, and amortization, or **EBITDA**.[2] EBITDA removes a significant fixed and noncash cost from operating income and may approximate the contribution margin. As a result, EBITDA may be used by managers for decision making, either in addition to contribution margin or as a substitute.

The EBITDA as a percent of sales, termed EBITDA margin, can be compared between Amazon's three segments as follows:

	North America	International	AWS	Total
Segment operating income (EBIT)	$2,361	$(1,283)	$3,108	$ 4,186
Depreciation and amortization expense	1,971	930	3,461	6,362
Operating income before depreciation and amortization expense (EBITDA)	$4,332	$ (353)	$6,569	$10,548
EBITDA as a percent of segment sales	5.4%	(0.8)%	53.8%	7.8%
	($4,332 ÷ $79,785)	[$(353) ÷ $43,983]	($6,569 ÷ $12,219)	($10,548 ÷ $135,987)

North America has an EBITDA of 5.4% of sales, while the International and AWS segments have EBITDAs of (0.1)% and 53.8%, respectively. The AWS segment has the highest EBITDA (contribution margin) followed by the North America segment. The lower EBITDA in the International segment may be due to significant competition from China's **Alibaba.com (BABA)**.

Make a Decision Segment Analysis and EBITDA

Analyze Comcast Corporation by segment (MAD 7-1)

Analyze Yum! Brands by segment (MAD 7-2)

Analyze The Walt Disney Company by segment (MAD 7-3)

Analyze Apple Inc. by segment (MAD 7-4)

Make a Decision

[2] Recall that operating income is already determined prior to deducting interest and tax expense, and is often termed earnings before interest and taxes (EBIT).

Let's Review

Chapter Summary

1. Under absorption costing, the cost of goods manufactured is comprised of all direct materials, direct labor, and factory overhead costs (both fixed and variable). Under variable costing, the cost of goods manufactured is composed of only variable costs: direct materials, direct labor, and variable factory overhead costs. Fixed factory overhead costs are considered a period expense.

   The variable costing income statement is structured differently than a traditional absorption costing income statement. Sales less variable cost of goods sold is presented as manufacturing margin. Manufacturing margin less variable selling and administrative expenses is presented as contribution margin. Contribution margin less fixed costs is presented as operating income.

2. Management should be aware of the effects of changes in inventory levels on operating income reported under variable costing and absorption costing. If absorption costing is used, managers could misinterpret increases or decreases in operating income due to changes in inventory levels to be the result of operating efficiencies or inefficiencies.

3. Variable costing is especially useful at the operating level of management because the amount of variable manufacturing costs is controllable at this level. The fixed factory overhead costs are ordinarily controllable by a higher level of management.

   In the short run, variable costing may be useful in establishing the selling price of a product. This price should be at least equal to the variable costs of making and selling the product. In the long run, however, absorption costing is useful in establishing selling prices because all costs must be covered and a reasonable amount of operating income earned.

4. Variable costing can support management decision making in analyzing and evaluating market segments, such as territories, products, salespersons, and customers. Contribution margin reports by segment can be used by managers to support price decisions, evaluate cost changes, and plan volume changes.

5. Service businesses will not have inventories, manufacturing margin, or cost of goods sold. Service firms can prepare variable costing income statements and contribution margin reports for market segments.

6. Companies often report segment information that can be used to analyze and interpret the operating performance of individual segments. By adding back depreciation and amortization expense to operating income, earnings before interest, taxes, depreciation, and amortization (or EBITDA) can be computed. EBITDA removes a significant amount of fixed and noncash costs from the operating income and may approximate contribution margin.

Key Terms

absorption costing (304)
contribution margin (305)
controllable costs (315)
EBITDA (324)
manufacturing margin (305)
market segment (316)
noncontrollable costs (315)
sales mix (318)
variable cost of goods sold (305)
variable costing (305)

Practice

Multiple-Choice Questions

1. Sales were $750,000, the variable cost of goods sold was $400,000, the variable selling and administrative expenses were $90,000, and fixed costs were $200,000. The contribution margin was:
   a. $60,000.
   b. $260,000.
   c. $350,000.
   d. none of the above.

2. During the year in which the number of units manufactured exceeded the number of units sold, the operating income reported under the absorption costing concept would be:
   a. larger than the operating income reported under the variable costing concept.
   b. smaller than the operating income reported under the variable costing concept.
   c. the same as the operating income reported under the variable costing concept.
   d. none of the above.

3. During a year in which the number of units manufactured is less than the number of units sold, the operating income reported under the variable costing concept would be:
   a. larger than the operating income reported under the absorption costing concept.
   b. smaller than the operating income reported under the absorption costing concept.
   c. the same as the operating income reported under the absorption costing concept.
   d. none of the above.

4. The beginning inventory consists of 6,000 units, all of which are sold during the period. The beginning inventory fixed costs are $20 per unit, and the variable costs per unit are $90 per unit. Assuming no ending inventory, what is the difference in operating income between variable and absorption costing?
   a. Variable costing operating income is $540,000 less than under absorption costing.
   b. Variable costing operating income is $600,000 greater than under absorption costing.
   c. Variable costing operating income is $120,000 less than under absorption costing.
   d. Variable costing operating income is $120,000 greater than under absorption costing.

5. Variable costs are $70 per unit and fixed costs are $150,000. Sales are estimated to be 10,000 units. How much would absorption costing operating income differ between a plan to produce 10,000 units and 12,000 units?
   a. $150,000 greater for 12,000 units
   b. $150,000 less for 12,000 units
   c. $25,000 greater for 12,000 units
   d. $25,000 less for 12,000 units

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Variable costing — Obj. 1

Light Company has the following information for January:

Sales	$648,000
Variable cost of goods sold	233,200
Fixed manufacturing costs	155,500
Variable selling and administrative expenses	51,800
Fixed selling and administrative expenses	36,800

Determine (a) the manufacturing margin, (b) the contribution margin, and (c) operating income for Light Company for the month of January.

2. Variable costing—production exceeds sales — Obj. 1

Fixed manufacturing costs are $60 per unit, and variable manufacturing costs are $150 per unit. Production was 453,000 units, while sales were 426,000 units. Determine (a) whether variable costing operating income is less than or greater than absorption costing operating income, and (b) the difference in variable costing and absorption costing operating income.

3. Variable costing—sales exceed production **Obj. 1**

The beginning inventory is 11,600 units. All of the units that were manufactured during the period and 11,600 units of the beginning inventory were sold. The beginning inventory fixed manufacturing costs are $32 per unit, and variable manufacturing costs are $72 per unit. Determine (a) whether variable costing operating income is less than or greater than absorption costing operating income, and (b) the difference in variable costing and absorption costing operating income.

4. Analyzing income under absorption and variable costing **Obj. 2**

Variable manufacturing costs are $13 per unit, and fixed manufacturing costs are $75,000. Sales are estimated to be 12,000 units.

a. How much would absorption costing operating income differ between a plan to produce 12,000 units and a plan to produce 15,000 units?

b. How much would variable costing operating income differ between the two production plans?

5. Contribution margin by segment **Obj. 4**

The following information is for Olivio Coaster Bikes Inc.:

	North	South
Sales volume (units):		
Red Dream	50,000	66,000
Blue Marauder	112,000	140,000
Sales price:		
Red Dream	$480	$500
Blue Marauder	$560	$600
Variable cost per unit:		
Red Dream	$248	$248
Blue Marauder	$260	$260

Determine the contribution margin for (a) Red Dream and (b) North Region.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

During the current period, McLaughlin Company sold 60,000 units of product at $30 per unit. At the beginning of the period, there were 10,000 units in inventory and McLaughlin Company manufactured 50,000 units during the period. The manufacturing costs and selling and administrative expenses were as follows:

	Total Cost	Number of Units	Unit Cost
Beginning inventory:			
Direct materials	$ 67,000	10,000	$ 6.70
Direct labor	155,000	10,000	15.50
Variable factory overhead	18,000	10,000	1.80
Fixed factory overhead	20,000	10,000	2.00
Total	$ 260,000		$26.00
Current period costs:			
Direct materials	$ 350,000	50,000	$ 7.00
Direct labor	810,000	50,000	16.20
Variable factory overhead	90,000	50,000	1.80
Fixed factory overhead	100,000	50,000	2.00
Total	$1,350,000		$27.00
Selling and administrative expenses:			
Variable	$ 65,000		
Fixed	45,000		
Total	$ 110,000		

(Continued)

Instructions

1. Prepare an income statement based on the absorption costing concept.
2. Prepare an income statement based on the variable costing concept.
3. Give the reason for the difference in the amount of operating income in parts (1) and (2).

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **b** The contribution margin of $260,000 (answer b) is determined by deducting all the variable costs ($400,000 + $90,000) from sales ($750,000).
2. **a** In a period in which the number of units manufactured exceeds the number of units sold, the operating income under the absorption costing concept is larger than the operating income reported under the variable costing concept (answer a). This is because a proportion of the fixed manufacturing costs are deferred when the absorption costing concept is used. This deferment has the effect of excluding a portion of the fixed manufacturing costs from the current cost of goods sold.
3. **a** In a period in which the number of units manufactured is less than the number of units sold, the operating income under the variable costing concept is larger than the operating income reported under the absorption costing concept (answer a). This is because a proportion of the fixed manufacturing costs from a prior period are included in the beginning inventory that was sold under absorption costing. Thus, the cost of goods sold will be more under absorption costing than under variable costing and thus, operating income will be larger under variable costing.
4. **d** (6,000 units × $20 per unit) Answer a incorrectly computes the difference in operating income using the variable cost per unit. Answer b incorrectly computes the difference in operating income using the total cost per unit. Answer c is incorrect because variable costing operating income will be greater than absorption costing operating income when units manufactured are less than units sold.
5. **c** [2,000 units × ($150,000 ÷ 12,000)] Answers a and b incorrectly compute the difference in operating income using variable cost per unit. When production exceeds sales, absorption costing will include fixed costs in the ending inventory, which causes cost of goods sold to decline and operating income to increase. Thus, operating income would not decline (answer d) for a production level of 12,000 units.

Exercises

1. a. $414,800 = $648,000 − $233,200
   b. $363,000 = $414,800 − $51,800
   c. $170,700 = $363,000 − $155,500 − $36,800
2. a. Variable costing operating income is less than absorption costing operating income because the units manufactured are greater than the units sold.
   b. $1,620,000 ($60 per unit × 27,000 units)
3. a. Variable costing operating income is greater than absorption costing operating income because the units manufactured are less than the units sold.
   b. $371,200 ($32 per unit × 11,600 units)

4. a. $15,000 greater in producing 15,000 units. 12,000 units × ($6.25* − $5.00**), or [3,000 units × ($75,000 ÷ 15,000 units)].
   * $75,000 ÷ 12,000 units
   ** $75,000 ÷ 15,000 units
   b. There would be no difference in variable costing operating income.

5. a. $28,232,000 = [50,000 units × ($480 − $248)] + [66,000 units × ($500 − $248)]
   b. $45,200,000 = [50,000 units × ($480 − $248)] + [112,000 units × ($560 − $260)]

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1.

Absorption Costing Income Statement		
Sales (60,000 × $30)		$ 1,800,000
Cost of goods sold:		
Beginning inventory (10,000 × $26)	$ 260,000	
Cost of goods manufactured (50,000 × $27)	1,350,000	
Total cost of goods sold		(1,610,000)
Gross profit		$ 190,000
Selling and administrative expenses ($65,000 + $45,000)		(110,000)
Operating income		$ 80,000

2.

Variable Costing Income Statement		
Sales (60,000 × $30)		$ 1,800,000
Variable cost of goods sold:		
Beginning inventory (10,000 × $24)	$ 240,000	
Variable cost of goods manufactured (50,000 × $25)	1,250,000	
Total variable cost of goods sold		(1,490,000)
Manufacturing margin		$ 310,000
Variable selling and administrative expenses		(65,000)
Contribution margin		$ 245,000
Fixed costs:		
Fixed manufacturing costs	$ 100,000	
Fixed selling and administrative expenses	45,000	
Total fixed costs		(145,000)
Operating income		$ 100,000

3. The difference of $20,000 ($100,000 − $80,000) in the amount of operating income is attributable to the different treatment of the fixed manufacturing costs. The beginning inventory in the absorption costing income statement includes $20,000 (10,000 units × $2) of fixed manufacturing costs incurred in the preceding period. This $20,000 was included as an expense in a variable costing income statement of a prior period. Therefore, none of it is included as an expense in the current period variable costing income statement.

Discussion Questions

1. What types of costs are customarily included in the cost of manufactured products under (a) the absorption costing concept and (b) the variable costing concept?
2. Which type of manufacturing cost (direct materials, direct labor, variable factory overhead, fixed factory overhead) is included in the cost of goods manufactured under the absorption costing concept but is excluded from the cost of goods manufactured under the variable costing concept?
3. Which of the following costs would be included in the cost of a manufactured product according to the variable costing concept: (a) rent on factory building, (b) direct materials, (c) property taxes on factory building, (d) electricity purchased to operate factory equipment, (e) salary of factory supervisor, (f) depreciation on factory building, (g) direct labor?
4. In the variable costing income statement, how are the fixed manufacturing costs reported, and how are the fixed selling and administrative expenses reported?
5. The managers of a company are planning to manufacture more product than is needed for expected sales for the coming year. What effect will this have on operating income under (a) the absorption costing concept and (b) the variable costing concept?
6. Since all costs of operating a business are controllable, what is the significance of the term *noncontrollable cost*?
7. Discuss how financial data prepared on the basis of variable costing can assist management in the development of short-run pricing policies.
8. Why might management analyze product profitability?
9. Explain why rewarding sales personnel on the basis of total sales might not be in the best interests of a business whose goal is to maximize profits.
10. Explain why service companies use different activity bases than manufacturing companies to classify costs as fixed or variable.

Basic Exercises



BE 7-1 Variable costing **Obj. 1**

Marley Company has the following information for March:

Sales	$912,000
Variable cost of goods sold	474,000
Fixed manufacturing costs	82,000
Variable selling and administrative expenses	238,100
Fixed selling and administrative expenses	54,700

Determine (a) the manufacturing margin, (b) the contribution margin, and (c) operating income for Marley Company for the month of March.



BE 7-2 Variable costing—production exceeds sales **Obj. 1**

Fixed manufacturing costs are $44 per unit, and variable manufacturing costs are $100 per unit. Production was 67,200 units, while sales were 50,400 units. Determine (a) whether variable costing operating income is less than or greater than absorption costing operating income, and (b) the difference in variable costing and absorption costing operating income.



BE 7-3 Variable costing—sales exceed production **Obj. 1**

The beginning inventory is 52,800 units. All of the units that were manufactured during the period and 52,800 units of the beginning inventory were sold. The beginning inventory fixed manufacturing costs are $14.70 per unit, and variable manufacturing costs are $30 per unit. Determine (a) whether variable costing operating income is less than or greater than absorption costing operating income, and (b) the difference in variable costing and absorption costing operating income.

SHOW ME HOW

BE 7-4 Analyzing income under absorption and variable costing — Obj. 2

Variable manufacturing costs are $126 per unit, and fixed manufacturing costs are $157,500. Sales are estimated to be 10,000 units.

a. How much would absorption costing operating income differ between a plan to produce 10,000 units and a plan to produce 15,000 units?

b. How much would variable costing operating income differ between the two production plans?

SHOW ME HOW

BE 7-5 Contribution margin by segment — Obj. 4

The following information is for LaPlanche Industries Inc.:

	East	West
Sales volume (units):		
Product XX	45,000	38,000
Product YY	60,000	50,000
Sales price:		
Product XX	$700	$660
Product YY	$728	$720
Variable cost per unit:		
Product XX	$336	$336
Product YY	$360	$360

Determine the contribution margin for (a) Product YY and (b) West Region.

Exercises

EX 7-1 Inventory valuation under absorption costing and variable costing — Obj. 1

✔ a. Inventory, $1,806,000

At the end of the first year of operations, 21,500 units remained in the finished goods inventory. The unit manufacturing costs during the year were as follows:

Direct materials	$30
Direct labor	18
Fixed factory overhead	22
Variable factory overhead	14

Determine the cost of the finished goods inventory reported on the balance sheet under (a) the absorption costing concept and (b) the variable costing concept.

EX 7-2 Income statements under absorption costing and variable costing — Obj. 1

✔ a. Operating income, $715,000

SHOW ME HOW

Gallatin County Motors Inc. assembles and sells snowmobile engines. The company began operations on July 1 and operated at 100% of capacity during the first month. The following data summarize the results for July:

Sales (4,000 units)		$2,600,000
Production costs (4,350 units):		
Direct materials	$1,218,000	
Direct labor	522,000	
Variable factory overhead	87,000	
Fixed factory overhead	130,500	1,957,500
Selling and administrative expenses:		
Variable selling and administrative expenses	$ 60,000	
Fixed selling and administrative expenses	25,000	85,000

a. Prepare an income statement according to the absorption costing concept.

b. Prepare an income statement according to the variable costing concept.

c. What is the reason for the difference in the amount of operating income reported in (a) and (b)?

EX 7-3 Income statements under absorption costing and variable costing — Obj. 1

✔ b. Operating income, $26,655,000



Fresno Industries Inc. manufactures and sells high-quality camping tents. The company began operations on January 1 and operated at 100% of capacity (150,000 units) during the first month, creating an ending inventory of 20,000 units. During February, the company produced 130,000 units during the month but sold 150,000 units at $500 per unit. The February manufacturing costs and selling and administrative expenses were as follows:

	Number of Units	Unit Cost	Total Cost
Manufacturing costs in February 1 beginning inventory:			
Variable	20,000	$275.00	$ 5,500,000
Fixed	20,000	26.00	520,000
Total		$301.00	$ 6,020,000
Manufacturing costs in February:			
Variable	130,000	$275.00	$35,750,000
Fixed	130,000	30.00	3,900,000
Total		$305.00	$39,650,000
Selling and administrative expenses in February:			
Variable	150,000	$ 20.00	$ 3,000,000
Fixed	150,000	1.30	195,000
Total		$ 21.30	$ 3,195,000

a. Prepare an income statement according to the absorption costing concept for the month ending February 28.

b. Prepare an income statement according to the variable costing concept for for the month ending February 28.

c. What is the reason for the difference in the amount of operating income reported in (a) and (b)?

EX 7-4 Cost of goods manufactured, using variable costing and absorption costing — Obj. 1

✔ b. Absorption costing unit cost of goods manufactured, $122

On March 31, the end of the first month of operations, Barnard Inc. manufactured 15,000 units and sold 12,000 units. The following income statement was prepared, based on the variable costing concept:

Barnard Inc.
Variable Costing Income Statement
For the Month Ended March 31

Sales		$ 2,160,000
Variable cost of goods sold:		
Variable cost of goods manufactured	$1,620,000	
Inventory, March 31	(324,000)	
Total variable cost of goods sold		(1,296,000)
Manufacturing margin		$ 864,000
Total variable selling and administrative expenses		(96,000)
Contribution margin		$ 768,000
Fixed costs:		
Fixed manufacturing costs	$ 210,000	
Fixed selling and administrative expenses	45,000	
Total fixed costs		(255,000)
Operating income		$ 513,000

Determine the unit cost of goods manufactured, based on (a) the variable costing concept and (b) the absorption costing concept.

EX 7-5 Variable costing income statement

Obj. 1

✔ Operating income, $925,000



On April 30, the end of the first month of operations, Joplin Company prepared the following income statement, based on the absorption costing concept:

Joplin Company
Absorption Costing Income Statement
For the Month Ended April 30

Sales (275,000 units)		$ 4,950,000
Cost of goods sold:		
Cost of goods manufactured (300,000 units)	$4,050,000	
Inventory, April 30 (25,000 units)	(337,500)	
Total cost of goods sold		(3,712,500)
Gross profit		$ 1,237,500
Selling and administrative expenses		(275,000)
Operating income		$ 962,500

If the fixed manufacturing costs were $450,000 and the fixed selling and administrative expenses were $165,000, prepare an income statement according to the variable costing concept.

EX 7-6 Absorption costing income statement

Obj. 1

✔ Operating income, $1,770,000



On October 31, the end of the first month of operations, Maryville Equipment Company prepared the following income statement, based on the variable costing concept:

Maryville Equipment Company
Variable Costing Income Statement
For the Month Ended October 31

Sales (220,000 units)		$ 7,920,000
Variable cost of goods sold:		
Variable cost of goods manufactured	$ 6,360,000	
Inventory, October 31 (45,000 units)	(1,080,000)	
Total variable cost of goods sold		(5,280,000)
Manufacturing margin		$ 2,640,000
Variable selling and administrative expenses		(330,000)
Contribution margin		$ 2,310,000
Fixed costs:		
Fixed manufacturing costs	$ 530,000	
Fixed selling and administrative expenses	100,000	
Total fixed costs		(630,000)
Operating income		$ 1,680,000

Prepare an income statement under absorption costing.

EX 7-7 Variable costing income statement

Obj. 1

✔ a. Operating income, $13,955



The following data were adapted from a recent income statement of **The Procter & Gamble Company (PG)**:

	(in millions)
Sales	$ 65,058
Operating costs:	
Cost of products sold	$(32,535)
Marketing, administrative, and other expenses	(18,568)
Total operating costs	$(51,103)
Operating income	$ 13,955

(Continued)

Assume that the variable amount of each category of operating costs is as follows:

	(in millions)
Cost of products sold	$19,500
Marketing, administrative, and other expenses	14,000

a. Based on the data given, prepare a variable costing income statement for Procter & Gamble, assuming that the company maintained constant inventory levels during the period.

b. If Procter & Gamble reduced its inventories during the period, what impact would that have on the operating income determined under absorption costing?

EX 7-8 Estimated income statements, using absorption and variable costing — Obj. 1, 2

✔ a. 1. Operating income, $1,069,000 (50,000 units)

SHOW ME HOW

Prior to the first month of operations ending October 31, Marshall Inc. estimated the following operating results:

Sales (40,000 × $90)	$3,600,000
Manufacturing costs (40,000 units):	
Direct materials	1,440,000
Direct labor	480,000
Variable factory overhead	240,000
Fixed factory overhead	120,000
Fixed selling and administrative expenses	75,000
Variable selling and administrative expenses	200,000

The company is evaluating a proposal to manufacture 50,000 units instead of 40,000 units, thus creating an ending inventory of 10,000 units. Manufacturing the additional units will not change sales, unit variable factory overhead costs, total fixed factory overhead cost, or total selling and administrative expenses.

a. Prepare an estimated income statement, comparing operating results if 40,000 and 50,000 units are manufactured in (1) the absorption costing format and (2) the variable costing format.

b. What is the reason for the difference in operating income reported for the two levels of production by the absorption costing income statement?

EX 7-9 Variable and absorption costing — Obj. 1

✔ a. Contribution margin, $13,324

REAL WORLD

The following data were adapted from a recent income statement of **Caterpillar Inc. (CAT)** for the year ended December 31:

	(in millions)
Sales	$ 38,537
Cost of goods sold	$(28,309)
Selling, administrative, and other expenses	(9,730)
Total expenses	$(38,039)
Operating income	$ 498

Assume that $8,500 million of cost of goods sold and $4,000 million of selling, administrative, and other expenses were fixed costs. Inventories at the beginning and end of the year were as follows:

Beginning inventory	$9,700
Ending inventory	8,614

Also, assume that 30% of the beginning and ending inventories were fixed costs.

a. Prepare an income statement according to the variable costing concept for Caterpillar Inc. Round numbers to nearest million.

b. Explain the difference between the amount of operating income reported under the absorption costing and variable costing concepts. Round numbers to nearest million.

EX 7-10 Variable and absorption costing—three products

Obj. 2, 3

✔ b. Cross Training Shoes, operating income, $348,000

Winslow Inc. manufactures and sells three types of shoes. The income statements prepared under the absorption costing method for the three shoes are as follows:

Winslow Inc.
Product Income Statements—Absorption Costing
For the Year Ended December 31

	Cross Training Shoes	Golf Shoes	Running Shoes
Revenues	$ 5,800,000	$ 6,900,000	$ 4,200,000
Cost of goods sold	(3,016,000)	(3,381,000)	(2,814,000)
Gross profit	$ 2,784,000	$ 3,519,000	$ 1,386,000
Selling and administrative expenses	(2,436,000)	(2,484,000)	(2,142,000)
Operating income	$ 348,000	$ 1,035,000	$ (756,000)

In addition, you have determined the following information with respect to allocated fixed costs:

	Cross Training Shoes	Golf Shoes	Running Shoes
Fixed costs:			
Cost of goods sold	$928,000	$897,000	$798,000
Selling and administrative expenses	696,000	828,000	588,000

These fixed costs are used to support all three product lines and will not change with the elimination of any one product. In addition, you have determined that the effects of inventory may be ignored.

The management of the company has deemed the profit performance of the running shoe line as unacceptable. As a result, it has decided to eliminate the running shoe line. Management does not expect to be able to increase sales in the other two lines. However, as a result of eliminating the running shoe line, management expects the profits of the company to increase by $756,000.

a. Do you agree with management's decision and conclusions? Explain your answer.

b. Prepare a variable costing income statement for the three products.

c. Use the report in (b) to determine the profit impact of eliminating the running shoe line, assuming no other changes.

EX 7-11 Change in sales mix and contribution margin

Obj. 4

✔ Sun Sound headphones increase in profitability, $940,800

Head Pops Inc. manufactures two models of solar-powered, noise-canceling headphones: Sun Sound and Ear Bling models. The company is operating at less than full capacity. Market research indicates that 28,000 additional Sun Sound and 30,000 additional Ear Bling headphones could be sold. The operating income by unit of product is as follows:

	Sun Sound Headphones	Ear Bling Headphones
Sales price	$140.00	$125.00
Variable cost of goods sold	(78.40)	(70.00)
Manufacturing margin	$ 61.60	$ 55.00
Variable selling and administrative expenses	(28.00)	(25.00)
Contribution margin	$ 33.60	$ 30.00
Fixed manufacturing costs	(14.00)	(12.50)
Operating income	$ 19.60	$ 17.50

Prepare an analysis indicating the increase or decrease in total profitability if 28,000 additional Sun Sound and 30,000 additional Ear Bling headphones are produced and sold, assuming that there is sufficient capacity for the additional production.

EX 7-12 Product profitability analysis

Obj. 4

✔ a. Hurricane contribution margin, $18,400,000

Galaxy Sports Inc. manufactures and sells two styles of All Terrain Vehicles (ATVs), the Conquistador and Hurricane, from a single manufacturing facility. The manufacturing facility operates at 100% of capacity. The following per-unit information is available for the two products:

	Conquistador	Hurricane
Sales price	$ 6,000	$11,500
Variable cost of goods sold	(3,600)	(5,750)
Manufacturing margin	$ 2,400	$ 5,750
Variable selling expenses	(900)	(1,150)
Contribution margin	$ 1,500	$ 4,600
Fixed expenses	(750)	(1,000)
Operating income	$ 750	$ 3,600

In addition, the following sales unit volume information for the period is as follows:

	Conquistador	Hurricane
Sales unit volume	10,000	4,000

a. Prepare a contribution margin by product report. Compute the contribution margin ratio for each.

b. What advice would you give to the management of Galaxy Sports Inc. regarding the profitability of the two products?

EX 7-13 Territory and product profitability analysis

Obj. 4

✔ a. East Coast contribution margin, $640,000

Coast to Coast Surfboards Inc. manufactures and sells two styles of surfboards, Atlantic Wave and Pacific Pounder. These surfboards are sold in two regions, East Coast and West Coast. Information about the two surfboards is as follows:

	Atlantic Wave	Pacific Pounder
Sales price	$ 200	$120
Variable cost of goods sold per unit	(150)	(90)
Manufacturing margin per unit	$ 50	$ 30
Variable selling expense per unit	(34)	(16)
Contribution margin per unit	$ 16	$ 14

The sales unit volume for the sales territories and products for the period is as follows:

	East Coast	West Coast
Atlantic Wave	40,000	25,000
Pacific Pounder	0	25,000

a. Prepare a contribution margin by sales territory report. Compute the contribution margin ratio for each territory as a whole percent, rounded to two decimal places.

b. What advice would you give to the management of Coast to Coast Surfboards regarding the relative profitability of the two territories?

EX 7-14 Sales territory and salesperson profitability analysis

Obj. 4

✔ 1. a. Steve contribution margin, $145,920

SHOW ME HOW

Havasu Off-Road Inc. manufactures and sells a variety of commercial vehicles in the Northeast and Southwest regions. There are two salespersons assigned to each territory. Higher commission rates go to the most experienced salespersons. The following sales statistics are available for each salesperson:

	Northeast		Southwest	
	Rene	Steve	Colleen	Paul
Average per unit:				
Sales price	$15,500	$16,000	$14,000	$18,000
Variable cost of goods sold	$9,300	$8,000	$8,400	$9,000
Commission rate	8%	12%	10%	8%
Units sold	36	24	40	60
Manufacturing margin ratio	40%	50%	40%	50%

a. 1. Prepare a contribution margin by salesperson report. Compute the contribution margin ratio for each salesperson.

2. Interpret the report.

b. 1. Prepare a contribution margin by territory report. Compute the contribution margin for each territory as a percent, rounded to one decimal place.

2. Interpret the report.

EX 7-15 Segment profitability analysis

Obj. 4

✔ a. Contribution margin for Electric Power, $824.92

REAL WORLD

The marketing segment sales for **Caterpillar Inc. (CAT)** for a year follow:

Caterpillar Inc.
Machinery and Engines Marketing Segment Sales
(in millions)

	Building Construction Products	Cat Japan	Core Components	Earth-moving	Electric Power	Excavation	Large Power Systems	Logistics	Marine & Petroleum Power	Mining	Turbines
Sales	$2,217	$1,225	$1,234	$5,045	$2,847	$4,562	$2,885	$659	$2,132	$3,975	$3,321

In addition, assume the following information:

	Building Construction Products	Cat Japan	Core Components	Earth-moving	Electric Power	Excavation	Large Power Systems	Logistics	Marine & Petroleum Power	Mining	Turbines
Variable cost of goods sold as a percent of sales	45%	55%	49%	51%	54%	52%	53%	50%	50%	52%	48%
Dealer commissions as a percent of sales	9%	11%	8%	8%	10%	6%	5%	10%	9%	7%	9%
Variable promotion expenses (in millions)	$310	$120	$150	$600	$200	$600	$300	$75	$270	$480	$400

a. Use the sales information and the additional assumed information to prepare a contribution margin by segment report. Round to two decimal places. In addition, compute the contribution margin ratio for each segment as a percentage, rounded to one decimal place.

b. Prepare a table showing the manufacturing margin, dealer commissions, and variable promotion expenses as a percent of sales for each segment. Round whole percents to one decimal place.

c. Use the information in (a) and (b) to interpret the segment performance.

EX 7-16 Segment contribution margin analysis

Obj. 4

✔ a. Turner, $6,818 and 60%



The operating revenues of the three largest business segments for **Time Warner, Inc. (TWX)**, for a recent year follow. Each segment includes a number of businesses, examples of which are indicated in parentheses.

Time Warner, Inc. Segment Revenues (in millions)	
Turner (cable networks and digital media)	$11,364
Home Box Office (pay television)	5,890
Warner Bros. (films, television, and videos)	13,037

Assume that the variable costs as a percent of sales for each segment are as follows:

Turner	40%
Home Box Office	35%
Warner Bros.	25%

a. Determine the contribution margin (round to whole millions) and contribution margin ratio (round to whole percents) for each segment from the information given.

b. Does the segment with the highest contribution margin in (a) mean that it is the most profitable segment with the highest operating income?

EX 7-17 Variable costing income statement for a service company

Obj. 5

✔ a. Contribution margin, Atlanta/Baltimore, $(29,291)

East Coast Railroad Company transports commodities among three routes (city-pairs): Atlanta/Baltimore, Baltimore/Pittsburgh, and Pittsburgh/Atlanta. Significant costs, their cost behavior, and activity rates for April are as follows:

Cost	Amount	Cost Behavior	Activity Rate
Labor costs for loading and unloading railcars	$ 175,582	Variable	$46.00 per railcar
Fuel costs	460,226	Variable	12.40 per train-mile
Train crew labor costs	267,228	Variable	7.20 per train-mile
Switchyard labor costs	118,327	Variable	31.00 per railcar
Track and equipment depreciation	194,400	Fixed	
Maintenance	129,600	Fixed	
	$1,345,363		

Operating statistics from the management information system reveal the following for April:

	Atlanta/ Baltimore	Baltimore/ Pittsburgh	Pittsburgh/ Atlanta	Total
Number of train-miles	12,835	10,200	14,080	37,115
Number of railcars	425	2,160	1,232	3,817
Revenue per railcar	$600	$275	$440	

a. Prepare a contribution margin by route report for East Coast Railroad Company for the month of April. Compute the contribution margin ratio in whole percents, rounded to one decimal place.

b. Evaluate the route performance of the railroad using the report in (a).

EX 7-18 Variable costing income statement for a service company — Obj. 5

✔ Contribution margin, $2,147,700



The actual and planned data for Underwater University for the Fall term were as follows:

	Actual	Planned
Enrollment	4,500	4,125
Tuition per credit hour	$120	$135
Credit hours	60,450	43,200
Registration, records, and marketing cost per enrolled student	$275	$275
Instructional costs per credit hour	$64	$60
Depreciation on classrooms and equipment	$825,600	$825,600

Registration, records, and marketing costs vary by the number of enrolled students, while instructional costs vary by the number of credit hours. Depreciation is a fixed cost.

Prepare a variable costing income statement showing the contribution margin and operating income for the Fall term.

Problems: Series A

PR 7-1A Absorption and variable costing income statements — Obj. 1, 2

✔ 2. Operating income, $868,000



During the first month of operations ended August 31, Kodiak Fridgeration Company manufactured 80,000 mini refrigerators, of which 72,000 were sold. Operating data for the month are summarized as follows:

Sales		$10,800,000
Manufacturing costs:		
Direct materials	$6,400,000	
Direct labor	1,600,000	
Variable manufacturing cost	1,280,000	
Fixed manufacturing cost	320,000	9,600,000
Selling and administrative expenses:		
Variable	$1,080,000	
Fixed	180,000	1,260,000

Instructions

1. Prepare an income statement based on the absorption costing concept.
2. Prepare an income statement based on the variable costing concept.
3. Explain the reason for the difference in the amount of operating income reported in (1) and (2).

PR 7-2A Income statements under absorption costing and variable costing — Obj. 1, 2

✔ 2. Contribution margin, $42,000

The demand for solvent, one of numerous products manufactured by Logan Industries Inc., has dropped sharply because of recent competition from a similar product. The company's chemists are currently completing tests of various new formulas, and it is anticipated that the manufacture of a superior product can be started on November 1, one month in the future. No changes will be needed in the present production facilities to manufacture the new product because only the mixture of the various materials will be changed.

(Continued)

The controller has been asked by the president of the company for advice on whether to continue production during October or to suspend the manufacture of solvent until November 1. The following data have been assembled:

Logan Industries Inc.
Income Statement—Solvent
For the Month Ended September 30

Sales (10,000 units)	$800,000
Cost of goods sold	(770,000)
Gross profit	$ 30,000
Selling and administrative expenses	(100,000)
Operating loss	$ (70,000)

The production costs and selling and administrative expenses, based on production of 10,000 units in September, are as follows:

Direct materials	$35 per unit
Direct labor	24 per unit
Variable manufacturing cost	8 per unit
Variable selling and administrative expenses	6 per unit
Fixed manufacturing cost	$100,000 for September
Fixed selling and administrative expenses	40,000 for September

Sales for October are expected to drop about 40% below those of September. No significant changes are anticipated in the fixed costs or variable costs per unit. No extra costs will be incurred in discontinuing operations in the portion of the plant associated with solvent. The inventory of solvent at the beginning and end of October is not expected to be significant (material).

Instructions

1. Prepare an estimated income statement in absorption costing form for October for solvent, assuming that production continues during the month.
2. Prepare an estimated income statement in variable costing form for October for solvent, assuming that production continues during the month.
3. What would be the estimated operating loss if the solvent production were temporarily suspended for October?
4. What advice should you give to management?

PR 7-3A Absorption and variable costing income statements for two months and analysis

Obj. 1, 2

✔ 1. b. Operating income, $1,084,000



During the first month of operations ended May 31, Big Sky Creations Company produced 40,000 designer cowboy boots, of which 36,000 were sold. Operating data for the month are summarized as follows:

Sales		$4,500,000
Manufacturing costs:		
Direct materials	$ 960,000	
Direct labor	2,000,000	
Variable manufacturing cost	520,000	
Fixed manufacturing cost	120,000	3,600,000
Selling and administrative expenses:		
Variable	$ 72,000	
Fixed	80,000	152,000

During June, Big Sky Creations produced 32,000 designer cowboy boots and sold 36,000 cowboy boots. Operating data for June are summarized as follows:

Sales		$4,500,000
Manufacturing costs:		
Direct materials	$ 768,000	
Direct labor	1,600,000	
Variable manufacturing cost	416,000	
Fixed manufacturing cost	120,000	2,904,000
Selling and administrative expenses:		
Variable	$ 72,000	
Fixed	80,000	152,000

Instructions

1. Using the absorption costing concept, prepare income statements for (a) May and (b) June.
2. Using the variable costing concept, prepare income statements for (a) May and (b) June.
3. a. Explain the reason for the differences in operating income in (1) and (2) for May.
   b. Explain the reason for the differences in operating income in (1) and (2) for June.
4. Based on your answers to (1) and (2), did Big Sky Creations Company operate more profitably in May or in June? Explain.

PR 7-4A Salespersons' report and analysis

Obj. 4

✔ 1. Dix contribution margin ratio, 44%

Walthman Industries Inc. employs seven salespersons to sell and distribute its product throughout the state. Data taken from reports received from the salespersons during the year ended December 31 are as follows:

Salesperson	Total Sales	Variable Cost of Goods Sold	Variable Selling Expenses
Case	$610,000	$268,400	$109,800
Dix	603,000	241,200	96,480
Johnson	588,000	305,760	105,840
LaFave	586,000	281,280	123,060
Orcas	616,000	221,760	86,240
Sussman	620,000	310,000	124,000
Willbond	592,000	272,320	88,800

Instructions

1. Prepare a table indicating contribution margin, variable cost of goods sold as a percent of sales, variable selling expenses as a percent of sales, and contribution margin ratio by salesperson. Round whole percent.
2. Which salesperson generated the highest contribution margin ratio for the year and why?
3. Briefly list factors other than contribution margin that should be considered in evaluating the performance of salespersons.

PR 7-5A Segment variable costing income statement and effect on operating income of change in operations

Obj. 4

✔ 1. Contribution margin, Size S, $235,520

EXCEL TEMPLATE

Valdespin Company manufactures three sizes of camping tents—small (S), medium (M), and large (L). The income statement has consistently indicated a net loss for the M size, and management is considering three proposals: (1) continue Size M, (2) discontinue Size M and reduce total output accordingly, or (3) discontinue Size M and conduct an advertising campaign to expand the sales of Size S so that the entire plant capacity can continue to be used.

If Proposal 2 is selected and Size M is discontinued and production curtailed, the annual fixed production costs and fixed operating expenses could be reduced by $46,080 and $32,240, respectively. If Proposal 3 is selected, it is anticipated that an additional annual expenditure of $34,560 for the rental of additional warehouse space would yield an additional 130% in Size S sales volume. It is also assumed that the increased production of Size S would utilize the plant facilities released by the discontinuance of Size M.

(Continued)

The sales and costs have been relatively stable over the past few years, and they are expected to remain so for the foreseeable future. The income statement for the past year ended June 30, 20Y9, is as follows:

	Size			
	S	**M**	**L**	**Total**
Sales	$ 668,000	$ 737,300	$ 956,160	$ 2,361,460
Cost of goods sold:				
Variable costs	$(300,000)	$(357,120)	$(437,760)	$(1,094,880)
Fixed costs	(74,880)	(138,250)	(172,800)	(385,930)
Total cost of goods sold	$(374,880)	$(495,370)	$ (610,560)	$(1,480,810)
Gross profit	$ 293,120	$ 241,930	$ 345,600	$ 880,650
Operating expenses:				
Variable expenses	$(132,480)	$(155,500)	$ (195,840)	$ (483,820)
Fixed expenses	(92,160)	(103,680)	(115,200)	(311,040)
Total operating expenses	$(224,640)	$ (259,180)	$ (311,040)	$ (794,860)
Operating income (loss)	$ 68,480	$ (17,250)	$ 34,560	$ 85,790

Instructions

1. Prepare an income statement for the past year in the variable costing format. Use the following headings:

	Size		
S	M	L	Total

Data for each size should be reported through contribution margin. The fixed costs should be deducted from the total contribution margin, as reported in the "Total" column, to determine operating income.

2. Based on the income statement prepared in (1) and the other data presented, determine the amount by which total annual operating income would be reduced below its present level if Proposal 2 is accepted.
3. Prepare an income statement in the variable costing format, indicating the projected annual operating income if Proposal 3 is accepted. Use the following headings:

	Size	
S	L	Total

Data for each style should be reported through contribution margin. The fixed costs should be deducted from the total contribution margin as reported in the "Total" column. For purposes of this problem, the expenditure of $34,560 for the rental of additional warehouse space can be added to the fixed operating expenses.

4. By how much would total annual operating income increase above its present level if Proposal 3 is accepted? Explain.

Problems: Series B

PR 7-1B Absorption and variable costing income statements — Obj. 1, 2

✔ 2. Contribution margin, $666,000



During the first month of operations ended July 31, YoSan Inc. manufactured 2,400 flat panel televisions, of which 2,000 were sold. Operating data for the month are summarized as follows:

Sales		$2,150,000
Manufacturing costs:		
Direct materials	$960,000	
Direct labor	420,000	
Variable manufacturing cost	156,000	
Fixed manufacturing cost	288,000	1,824,000
Selling and administrative expenses:		
Variable	$204,000	
Fixed	96,000	300,000

Instructions

1. Prepare an income statement based on the absorption costing concept.
2. Prepare an income statement based on the variable costing concept.
3. Explain the reason for the difference in the amount of operating income reported in (1) and (2).

PR 7-2B Income statements under absorption costing and variable costing Obj. 1, 2

✔ 2. Contribution margin, $960,000

The demand for aloe vera hand lotion, one of numerous products manufactured by Smooth Skin Care Products Inc., has dropped sharply because of recent competition from a similar product. The company's chemists are currently completing tests of various new formulas, and it is anticipated that the manufacture of a superior product can be started on December 1, one month in the future. No changes will be needed in the present production facilities to manufacture the new product because only the mixture of the various materials will be changed.

The controller has been asked by the president of the company for advice on whether to continue production during November or to suspend the manufacture of aloe vera hand lotion until December 1. The controller has assembled the following pertinent data:

Smooth Skin Care Products Inc.
Income Statement—Aloe Vera Hand Lotion
For the Month Ended October 31

Sales (400,000 units)	$32,000,000
Cost of goods sold	(28,330,000)
Gross profit	$ 3,670,000
Selling and administrative expenses	(4,270,000)
Operating loss	$ (600,000)

The production costs and selling and administrative expenses, based on production of 400,000 units in October, are as follows:

Direct materials	$15 per unit
Direct labor	17 per unit
Variable manufacturing cost	35 per unit
Variable selling and administrative expenses	10 per unit
Fixed manufacturing cost	$1,530,000 for October
Fixed selling and administrative expenses	270,000 for October

Sales for November are expected to drop about 20% below those of the preceding month. No significant changes are anticipated in the fixed costs or variable costs per unit. No extra costs will be incurred in discontinuing operations in the portion of the plant associated with aloe vera hand lotion. The inventory of aloe vera hand lotion at the beginning and end of November is expected to be inconsequential.

Instructions

1. Prepare an estimated income statement in absorption costing form for November for aloe vera hand lotion, assuming that production continues during the month.
2. Prepare an estimated income statement in variable costing form for November for aloe vera hand lotion, assuming that production continues during the month.
3. What would be the estimated operating loss if the aloe vera hand lotion production were temporarily suspended for November?
4. What advice should the controller give to management?

PR 7-3B Absorption and variable costing income statements for two months and analysis

Obj. 1, 2

✔ 2. a. Manufacturing margin, $37,440

SHOW ME HOW

During the first month of operations ended July 31, Head Gear Inc. manufactured 6,400 hats, of which 5,200 were sold. Operating data for the month are summarized as follows:

Sales		$104,000
Manufacturing costs:		
Direct materials	$47,360	
Direct labor	22,400	
Variable manufacturing cost	12,160	
Fixed manufacturing cost	15,360	97,280
Selling and administrative expenses:		
Variable	$10,920	
Fixed	5,200	16,120

During August, Head Gear Inc. manufactured 4,000 hats and sold 5,200 hats. Operating data for August are summarized as follows:

Sales		$104,000
Manufacturing costs:		
Direct materials	$29,600	
Direct labor	14,000	
Variable manufacturing cost	7,600	
Fixed manufacturing cost	15,360	66,560
Selling and administrative expenses:		
Variable	$10,920	
Fixed	5,200	16,120

Instructions

1. Using the absorption costing concept, prepare income statements for (a) July and (b) August.
2. Using the variable costing concept, prepare income statements for (a) July and (b) August.
3. a. Explain the reason for the differences in the amount of operating income in (1) and (2) for July.
   b. Explain the reason for the differences in the amount of operating income in (1) and (2) for August.
4. Based on your answers to (1) and (2), did Head Gear Inc. operate more profitably in July or in August? Explain.

PR 7-4B Salespersons' report and analysis

Obj. 4

✔ 1. Crowell contribution margin ratio, 44%

Pachec Inc. employs seven salespersons to sell and distribute its product throughout the state. Data taken from reports received from the salespersons during the year ended June 30 are as follows:

Salesperson	Total Sales	Variable Cost of Goods Sold	Variable Selling Expenses
Asarenka	$437,500	$196,875	$ 83,125
Crowell	570,000	228,000	91,200
Dempster	675,000	310,500	141,750
MacLean	587,500	246,750	123,375
Ortiz	525,000	215,250	126,000
Sullivan	587,500	246,750	99,875
Williams	575,000	253,000	115,000

Instructions

1. Prepare a table indicating contribution margin, variable cost of goods sold as a percent of sales, variable selling expenses as a percent of sales, and contribution margin ratio by salesperson.
2. Which salesperson generated the highest contribution margin ratio for the year and why?
3. Briefly list factors other than contribution margin that should be considered in evaluating the performance of salespersons.

PR 7-5B Variable costing income statement and effect on income of change in operations

Obj. 4

✔ 3. Operating income, $106,820



EXCEL TEMPLATE

Kimbrell Inc. manufactures three sizes of utility tables—small (S), medium (M), and large (L). The income statement has consistently indicated a net loss for the M size, and management is considering three proposals: (1) continue Size M, (2) discontinue Size M and reduce total output accordingly, or (3) discontinue Size M and conduct an advertising campaign to expand the sales of Size S so that the entire plant capacity can continue to be used.

If Proposal 2 is selected and Size M is discontinued and production curtailed, the annual fixed production costs and fixed operating expenses could be reduced by $142,500 and $28,350, respectively. If Proposal 3 is selected, it is anticipated that an additional annual expenditure of $85,050 for the salary of an assistant brand manager (classified as a fixed operating expense) would yield an additional 130% in Size S sales volume. It is also assumed that the increased production of Size S would utilize the plant facilities released by the discontinuance of Size M.

The sales and costs have been relatively stable over the past few years, and they are expected to remain so for the foreseeable future. The income statement for the past year ended December 31, 20Y8, is as follows:

	Size			
	S	M	L	Total
Sales	$ 990,000	$ 1,087,500	$ 945,000	$ 3,022,500
Cost of goods sold:				
Variable costs	$ (538,500)	$ (718,500)	$(567,000)	$(1,824,000)
Fixed costs	(241,000)	(288,000)	(250,000)	(779,000)
Total cost of goods sold	$ (779,500)	$(1,006,500)	$(817,000)	$(2,603,000)
Gross profit	$ 210,500	$ 81,000	$ 128,000	$ 419,500
Less operating expenses:				
Variable expenses	$ (118,100)	$ (108,750)	$ (85,050)	$ (311,900)
Fixed expenses	(32,125)	(42,525)	(14,250)	(88,900)
Total operating expenses	$(150,225)	$ (151,275)	$ (99,300)	$ (400,800)
Operating income (loss)	$ 60,275	$ (70,275)	$ 28,700	$ 18,700

Instructions

1. Prepare an income statement for the past year in the variable costing format. Use the following headings:

	Size		
S	M	L	Total

Data for each size should be reported through contribution margin. The fixed costs should be deducted from the total contribution margin, as reported in the "Total" column, to determine operating income.

2. Based on the income statement prepared in (1) and the other data presented above, determine the amount by which total annual operating income would be reduced below its present level if Proposal 2 is accepted.

3. Prepare an income statement in the variable costing format, indicating the projected annual operating income if Proposal 3 is accepted. Use the following headings:

	Size	
S	L	Total

Data for each style should be reported through contribution margin. The fixed costs should be deducted from the total contribution margin as reported in the "Total" column. For purposes of this problem, the additional expenditure of $85,050 for the assistant brand manager's salary can be added to the fixed operating expenses.

4. By how much would total annual operating income increase above its present level if Proposal 3 is accepted? Explain.

Make a Decision
Segment Analysis and EBITDA

REAL WORLD

MAD 7-1 Analyze Comcast Corporation by segment — Obj. 6

Comcast Corporation (CMCSA) is a global media and entertainment company with operations divided into five major segments:

- Cable Communications (XFINITY)
- Cable Networks (USA Network, Syfy, E!, CNBC, others)
- Broadcast Television (NBC)
- Filmed Entertainment (Universal Pictures)
- Theme Parks (Universal)

Revenue, operating income, and depreciation and amortization information for these segments for a recent year are as follows (in millions):

Segment	Revenue	Operating Income	Depreciation and Amortization
Cable Communications	$50,048	$12,439	$7,670
Cable Networks	10,464	2,964	745
Broadcast Television	10,147	1,195	125
Filmed Entertainment	6,360	650	47
Theme Parks	4,946	1,678	512
Total	$81,965	$18,926	$9,099

a. Prepare a vertical analysis of the segment revenues to total revenues. Round to nearest whole percent.

b. Which segment contributes most to total revenues?

c. Compute (1) EBITDA and (2) EBITDA as a percent of revenue for each segment. Round to nearest whole percent.

d. Evaluate segment EBITDA as a percent of revenue.

e. What might management do to increase performance in the segments with the lowest EBITDA?

REAL WORLD

MAD 7-2 Analyze Yum! Brands by segment — Obj. 6

Yum! Brands, Inc. (YUM) is a worldwide operator and franchisor of fast-food restaurants, under the familiar brands of KFC, Pizza Hut, and Taco Bell. Segment revenues, operating income, and depreciation and amortization expense for Yum!'s operating segments are provided for a recent year as follows (in millions):

Segment	Sales	Operating Income	Depreciation and Amortization Expense
KFC	$3,232	$874	$173
Pizza Hut	1,111	370	36
Taco Bell	2,025	593	91

a. Prepare a vertical analysis of the sales as a percent of total sales for the three segments. Round percentages to the nearest whole percent. Which segment has the greatest percentage of total sales?

b. Determine the earnings before interest, taxes, depreciation, and amortization (EBITDA) for the three segments.

c. Determine the EBITDA as a percent of sales (EBITDA margin) for the three segments. Round percentages to the nearest whole percent.

d. Interpret the analysis in (c).

REAL WORLD

MAD 7-3 Analyze The Walt Disney Company by segment Obj. 6

The Walt Disney Company (DIS) is a leading worldwide entertainment company. Disney operates four business segments. These segments and some of their larger businesses are:

- Media Networks: ABC Network, ESPN, Disney Channel, and A&E
- Parks and Resorts: Walt Disney World Resort, Disneyland, and International Disney Resorts
- Studio Entertainment: Walt Disney Pictures, Pixar, Marvel, and Lucasfilm
- Consumer Products and Interactive Media: Licensing of Disney characters, publishing, and retail stores

Recent comparative revenues for the four segments are as follows (in millions):

Segment	Year 3	Year 1
Media Networks	$23,689	$21,152
Parks and Resorts	16,974	15,099
Studio Entertainment	9,441	7,278
Consumer Products and Interactive Media	5,528	5,284
Total	$55,632	$48,813

a. Prepare a vertical analysis of the segment sales to total sales for Year 1 and Year 3. Round percentages to nearest whole percent.

b. Using the analysis in (a), has the relative segment sales changed between Year 1 and Year 3?

c. Prepare a horizontal analysis of the segment sales between Year 1 and Year 3. Round percentages to nearest whole percent.

d. Interpret the horizontal segment sales analysis in (c).

REAL WORLD

MAD 7-4 Analyze Apple Inc. by segment Obj. 6

Segment disclosure by **Apple Inc. (AAPL)** provides sales information for its major product lines for three recent years as follows (in millions):

Segment	Year 3	Year 2	Year 1
iPhone	$136,700	$155,041	$101,991
iPad	20,628	23,227	30,283
Mac	22,831	25,471	24,079
Services	24,348	19,909	18,063
Other Products	11,132	10,067	8,379
Total sales	$215,639	$233,715	$182,795

The Services segment includes sales from iTunes Store, App Store, Mac App Store, TV App Store, iBooks Store, Apple Music, AppleCare, and Apple Pay. The Other Products segment includes sales from Apple TV, Apple Watch, Beats products, iPod, and Apple-branded accessories.

a. Which product had the greatest percentage of Year 3 sales? Which product had the least percentage of Year 3 sales? Round to nearest whole percent.

b. Which product grew the most in sales, in percentage terms, using Year 1 as the base year? Round to nearest whole percent.

Take It Further

ETHICS

TIF 7-1 Absorption costing operating income

The Southern Division manager of Texcaliber Inc. is growing concerned that the division will not be able to meet its current period income objectives. The division uses absorption costing for internal profit reporting and had an appropriate level of inventory at the beginning of the period. The division manager knows that he can boost profits by increasing production at the end of the period. The increased production will allocate fixed costs over a greater number of units, reducing cost of goods sold and increasing earnings. Unfortunately, it is unlikely that additional production will be sold, resulting in a large ending inventory balance.

The division manager has come to Aston Melon, the divisional controller, to determine exactly how much additional production is needed to increase net income enough to meet the division's profit objectives. Aston analyzes the data and determines that the division will need to increase inventory by 30% in order to absorb enough fixed costs to meet the division's income objective. Aston reports this information to the division manager.

Is Aston acting ethically?

TEAM ACTIVITY

TIF 7-2 Inventory effects under absorption costing

BendOR, Inc., manufactures control panels for the electronics industry and has just completed its first year of operations. The following discussion took place between the controller, Gordon Merrick, and the company president, Matt McCray:

Matt: I've been looking over our first year's performance by quarters. Our earnings have been increasing each quarter, even though our sales have been flat and our prices and costs have not changed. Why is this?

Gordon: Our actual sales have stayed even throughout the year, but we've been increasing the utilization of our factory every quarter. By keeping our factory utilization high, we will keep our costs down by allocating the fixed plant costs over a greater number of units. Naturally, this causes our cost per unit to be lower than it would be otherwise.

Matt: Yes, but what good is this if we are unable to sell everything that we make? Our inventory is also increasing.

Gordon: This is true. However, our unit costs are lower because of the additional production. When these lower costs are matched against sales, it has a positive impact on our earnings.

Matt: Are you saying that we are able to create additional earnings merely by building inventory? Can this be true?

Gordon: Well, I've never thought about it quite that way. . . but I guess so.

Matt: And another thing. What will happen if we begin to reduce our production in order to liquidate the inventory? Don't tell me our earnings will go down even though our production effort drops!

Gordon: Well. . .

Matt: There must be a better way. I'd like our quarterly income statements to reflect what's really going on. I don't want our income reports to reward building inventory and penalize reducing inventory.

Gordon: I'm not sure what I can do—we have to follow generally accepted accounting principles.

In teams:

a. Discuss why reporting income under generally accepted accounting principles "rewards" building inventory and "penalizes" reducing inventory.

b. Discuss what advice you would give to Gordon in responding to Matt's concern about the present method of accounting.

Be prepared to discuss your answers in class.

COMMUNICATION

TIF 7-3 Salesperson profitability analysis

Bon Jager Inc. manufactures and sells medical devices used in cardiovascular surgery. The sales team consists of two salespeople, Dean and Martin. A contribution margin report by salesperson was prepared as follows:

Bon Jager Inc.
Contribution Margin by Salesperson

	Dean	Martin
Sales	$ 400,000	$ 480,000
Variable cost of goods sold	(184,000)	(264,000)
Manufacturing margin	$ 216,000	$ 216,000
Variable selling expenses:		
Variable promotion expenses	$ (72,000)	$ (43,200)
Variable sales commission expenses	(56,000)	(67,200)
Total variable selling expenses	$(128,000)	$(110,400)
Contribution margin	$ 88,000	$ 105,600
Manufacturing margin as a percent of sales (manufacturing margin ratio)	54%	45%
Contribution margin ratio	22%	22%

Write a brief memo to Anna Berenson, the Vice President of Marketing, evaluating the performance of the company's salespeople and providing recommendations on how the salespeople could improve profitability.

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Data for the last fiscal year for Merlene Company are as follows:

	Units
Beginning inventory of finished goods	100
Production during the year	700
Sales	750
Ending inventory of finished goods	50

	Per Unit
Product selling price	$ 200
Variable manufacturing cost	90
Fixed manufacturing cost	20*
Budgeted selling and administrative costs (all fixed)	$45,000

*Denominator level of activity is 750 units for the year

Actual selling and administrative costs equaled the budgeted amount, and there were no work in process inventories at the end of the period. Under the variable costing concept, the amount of operating income earned by Merlene for the year was:

a. $21,500.
b. $22,500.
c. $28,000.
d. $31,000.

2. Chassen Company, a cracker and cookie manufacturer, has the following unit costs for the month of June:

Variable manufacturing cost	$5.00
Variable marketing cost	3.50
Fixed manufacturing cost	2.00
Fixed marketing cost	4.00

A total of 100,000 units were manufactured during June, of which 10,000 remain in ending inventory. Chassen uses the first-in, first-out (FIFO) inventory method, and the 10,000 units are the only finished goods inventory at June 30. Under the absorption costing concept, the value of Chassen's June 30 finished goods inventory would be:

a. $50,000.
b. $70,000.
c. $85,000.
d. $145,000.

3. Mill Corporation had the following unit costs for the recent calendar year:

	Variable	Fixed
Manufacturing	$8.00	$3.00
Nonmanufacturing	2.00	5.50

Inventory for Mill's sole product totaled 6,000 units on January 1 and 5,200 units on December 31. When compared to variable costing income, Mill's absorption costing income is:

a. $2,400 lower.
b. $2,400 higher.
c. $6,800 lower.
d. $6,800 higher.

4. Bethany Company has just completed the first month of producing a new product but has not yet shipped any of this product. The product incurred variable manufacturing costs of $5,000,000, fixed manufacturing costs of $2,000,000, variable marketing costs of $1,000,000, and fixed marketing costs of $3,000,000.

Under the variable costing concept, the inventory value of the new product would be:

a. $5,000,000.
b. $6,000,000.
c. $8,000,000.
d. $11,000,000.

Pathways Challenge



This is Accounting!

Information/Consequences

By producing more cars than were sold, **Ford (F)** and **General Motors (GM)** increased their operating income reported under absorption costing. This is because a portion of their fixed manufacturing costs were included in ending inventory rather than cost of goods sold.

Under variable costing, producing more cars would not affect operating income, because all fixed manufacturing costs are included in cost of goods sold regardless of how many cars are produced.

A reason often given for why GAAP requires absorption costing is that it focuses on operating income "over the long term." In other words, while operating income may vary from year to year, all manufacturing costs are eventually reported on the income statement as cost of goods sold or as a write-down of inventory using the lower-of-cost-or-market rule. Thus, over the life of a company, the total amount of operating income will be the same regardless of whether absorption or variable costing is used.

Suggested Answer

Chapter 8

Budgeting

Principles

Chapter 1 *Introduction to Managerial Accounting*

Developing Information

COST SYSTEMS

Chapter 2 *Job Order Costing*
Chapter 3 *Process Costing*
Chapter 4 *Activity-Based Costing*

COST ALLOCATIONS

Chapter 5 *Support Departments*
Chapter 5 *Joint Costs*

Decision Making

PLANNING AND EVALUATING TOOLS

Chapter 6 *Cost-Volume-Profit Analysis*
Chapter 7 *Variable Costing*
Chapter 8 ***Budgeting Systems***
Chapter 9 *Standard Costing and Variances*
Chapter 10 *Decentralized Operations*
Chapter 11 *Differential Analysis*

STRATEGIC TOOLS

Chapter 12 *Capital Investment Analysis*
Chapter 13 *Lean Manufacturing*
Chapter 13 *Activity Analysis*
Chapter 14 *The Balanced Scorecard*
Chapter 14 *Corporate Social Responsibility*

Hendrick Motorsports

You may have financial goals for your life. To achieve these goals, it is necessary to plan for future expenses. For example, you may consider taking a part-time job to save money for school expenses for the coming school year. How much money would you need to earn and save in order to pay these expenses? One way to find an answer to this question would be to prepare a budget. A budget would show an estimate of your expenses associated with school, such as tuition, fees, and books. In addition, you would have expenses for day-to-day living, such as rent, food, and clothing. You might also have expenses for travel and entertainment. Once the school year begins, you can use the budget as a tool for guiding your spending priorities during the year.

The budget is used in businesses in much the same way it can be used in personal life. For example, **Hendrick Motorsports**, featuring drivers Dale Earnhardt, Jr., Jeff Gordon, and Jimmie Johnson, uses budget information to remain one of the most valuable racing teams in NASCAR. Hendrick uses budgets to keep revenues greater than expenses. For example, Hendrick plans revenues from car sponsorships and winnings. Primary and secondary sponsorships (car decals) can provide as much as 70% of the revenues for a typical race team. Costs include salaries, engines, tires, cars, travel, and research and development. In addition, star drivers such as Jimmie Johnson can earn millions in salary, winnings, and endorsements. Overall, Hendrick earns millions in revenues and operating income from its four race teams. The budget provides the company with a "game plan" for the year. In this chapter, you will see how budgets can be used for financial planning and control.

Sources: Chris Smith, "Nascar's Most Valuable Teams 2018," *Forbes*, February 21, 2018. www.hendrickmotorsports.com.



BRAD MCPHERSON/SHUTTERSTOCK.COM

Link to Hendrick Motorsports . . . . . Pages 354, 356, 358, 362, 364, 365, 370

What's Covered

Budgeting

Nature and Objectives of Budgeting
- Objectives (Obj. 1)
- Human Behavior (Obj. 1)

Budgeting Systems
- Static Budget (Obj. 2)
- Flexible Budget (Obj. 2)

Master Budget
- Operating and Financial Components (Obj. 3)
- Sales Budget (Obj. 4)
- Production Budget (Obj. 4)
- Direct Materials Purchases Budget (Obj. 4)
- Direct Labor Cost Budget (Obj. 4)
- Factory Overhead Cost Budget (Obj. 4)
- Cost of Goods Sold Budget (Obj. 4)
- Selling and Administrative Expenses Budget (Obj. 4)
- Budgeted Income Statement (Obj. 4)
- Cash Budget (Obj. 5)
- Capital Expenditures Budget (Obj. 5)

Learning Objectives

Obj. 1 Describe budgeting, its objectives, and its impact on human behavior.

Obj. 2 Describe the basic elements of the budget process, the two major types of budgeting, and the use of computers in budgeting.

Obj. 3 Describe the master budget for a manufacturing company.

Obj. 4 Prepare the basic operating budgets for a manufacturing company.

Obj. 5 Prepare financial budgets for a manufacturing company.

Analysis for Decision Making

Obj. 6 Describe and illustrate the use of staffing budgets for nonmanufacturing businesses.

Objective 1
Describe budgeting, its objectives, and its impact on human behavior.

Nature and Objectives of Budgeting

Budgets play an important role for organizations of all sizes and forms. For example, budgets are used in managing the operations of government agencies, churches, hospitals, and other nonprofit organizations. Individuals and families also use budgeting in managing their financial affairs. This chapter describes and illustrates budgeting for a manufacturing company.

Link to Hendrick Motorsports

Hendrick Motorsports holds a record of 11 NASCAR Sprint Cup Series Championships won by the following drivers: 6 by Jimmie Johnson, 4 by Jeff Gordon, and 1 by Terry Labonte.

Objectives of Budgeting

Budgeting involves (1) establishing specific goals, (2) executing plans to achieve the goals, and (3) periodically comparing actual results with the goals. In doing so, budgeting affects the following managerial functions:

- Planning
- Directing
- Controlling

The relationships of these activities are illustrated in Exhibit 1.

Planning involves setting goals to guide decisions and help motivate employees. The planning process often identifies where operations can be improved.

Directing involves decisions and actions to achieve budgeted goals. A budgetary unit of a company is called a **responsibility center**. Each responsibility center is led by a manager who has the authority and responsibility for achieving the center's budgeted goals.

Exhibit 1 Planning, Directing, and Controlling



Controlling involves comparing actual performance against the budgeted goals. Such comparisons provide feedback to managers and employees about their performance. If necessary, responsibility centers can use such feedback to adjust their activities in the future.

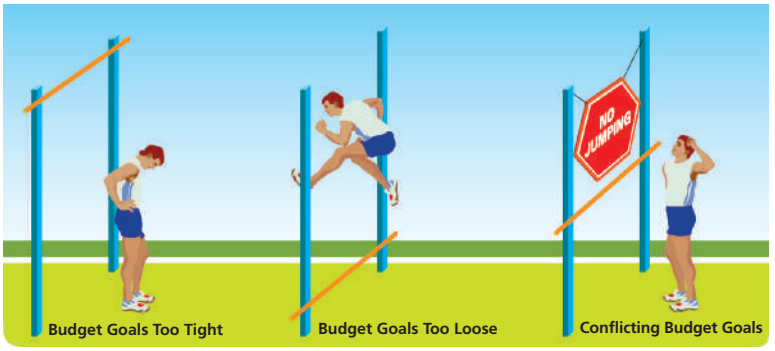
Human Behavior and Budgeting

Human behavior problems can arise in the budgeting process in the following situations:

- Budgeted goals are set too tight, which are very hard or impossible to achieve.
- Budgeted goals are set too loose, which are very easy to achieve.
- Budgeted goals conflict with the objectives of the company and employees.

These behavior problems are illustrated in Exhibit 2.

Exhibit 2
Human Behavior Problems in Budgeting



Setting Budget Goals Too Tightly

Employees and managers may become discouraged if budgeted goals are set too high. That is, if budgeted goals are viewed as unrealistic or unachievable, the budget may have a negative effect on the ability of the company to achieve its goals.

Reasonable, attainable goals are more likely to motivate employees and managers. For this reason, it is important for employees and managers to be involved in the budgeting process. Involving employees in the budgeting process provides them with a sense of control and, thus, more of a commitment in meeting budgeted goals.

Setting Budget Goals Too Loosely

Although it is desirable to establish attainable goals, it is undesirable to plan budget goals that are too easy. Such budget "padding" is termed **budgetary slack**. Managers may plan slack in their budgets to provide a "cushion" for unexpected events. However, slack budgets may create inefficiency by reducing the budgetary incentive to trim spending.

Setting Conflicting Budget Goals

Goal conflict occurs when the employees' or managers' self-interest differs from the company's objectives or goals. To illustrate, assume that the Sales Department manager is given an increased sales goal and as a result accepts customers who are poor credit risks. Thus, while the Sales Department might meet sales goals, the overall firm may suffer reduced profitability from bad debts.

Ethics: Do It!

Budget Games

The budgeting system is designed to plan and control a business. However, it is common for the budget to be "gamed" by its participants. For example, managers may pad their budgets with excess resources. In this way, the managers have additional resources for unexpected events during the period. If the budget is being used to establish the incentive plan, then sales managers have incentives to understate the sales potential of a territory to ensure hitting their quotas. Other times, managers engage in "land grabbing," which occurs when they overstate the sales potential of a territory to guarantee access to resources. If managers believe that unspent resources will not roll over to future periods, then they may be encouraged to "spend it or lose it," causing wasteful expenditures. These types of problems can be partially overcome by separating the budget into planning and incentive components. This is why many organizations have two budget processes, one for resource planning and another, more challenging budget for motivating managers.

Objective 2
Describe the basic elements of the budget process, the two major types of budgeting, and the use of computers in budgeting.

Budgeting Systems

Budgeting systems vary among companies and industries. For example, the budget system used by **Ford Motor Company (F)** differs from that used by **Delta Air Lines (DAL)**. However, the basic budgeting concepts discussed in this section apply to all types of businesses and organizations.

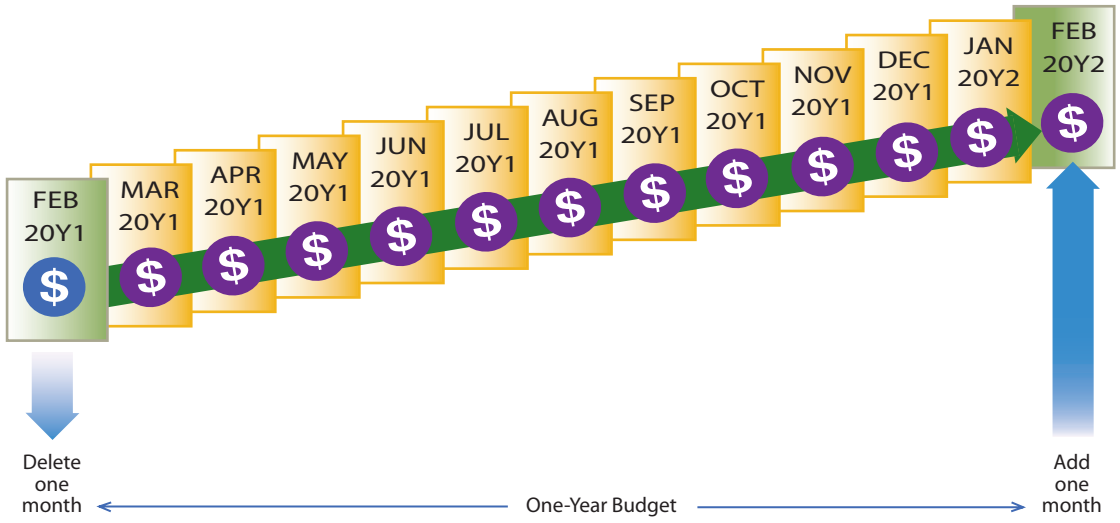
The budgetary period for operating activities normally includes the fiscal year of a company. A year is short enough that future operations can be estimated fairly accurately, yet long enough that the future can be viewed in a broad context. However, for control purposes, annual budgets are usually subdivided into shorter time periods, such as quarters of the year, months, or weeks.

Link to Hendrick Motorsports

Rick Hendrick uses budgeting in **Hendrick Motorsports** as well as the **Hendrick Automotive Group**. The Hendrick Automotive Group is the largest privately held dealership group in the United States with more than 140 retail franchises.

A variation of fiscal-year budgeting, called **continuous budgeting**, maintains a 12-month projection into the future. The 12-month budget is continually revised by replacing the data for the month just ended with the budget data for the same month in the next year. A continuous budget is illustrated in Exhibit 3.

Exhibit 3 Continuous Budgeting



Developing an annual budget usually begins several months prior to the end of the current year. This responsibility is normally assigned to a budget committee. Such a committee often consists of the budget director, the controller, the treasurer, the production manager, and the sales manager. The budget process is monitored and summarized by the Accounting Department, which reports to the committee.

There are several methods of developing budget estimates. One method, called **zero-based budgeting**, requires managers to estimate sales, production, and other operating data as though operations are being started for the first time. This approach has the benefit of taking a fresh view of operations each year. A more common approach is to start with last year's budget and revise it for actual results and expected changes for the coming year.

Static Budget

A **static budget** shows the expected results of a responsibility center for only one activity level. Once the budget has been determined, it is not changed, even if the activity changes. Static budgeting is used by many service companies and governmental entities and for some functions of manufacturing companies, such as purchasing, engineering, and accounting.

To illustrate, the static budget for the Assembly Department of Colter Manufacturing Company is shown in Exhibit 4.

Exhibit 4
Static Budget

	A	B
1	**Colter Manufacturing Company**	
2	**Assembly Department Budget**	
3	**For the Year Ending July 31, 20Y8**	
4	Direct labor	$40,000
5	Electric power	5,000
6	Supervisor salaries	15,000
7	Total department costs	$60,000
8		

A disadvantage of static budgets is that they do not adjust for changes in activity levels. For example, assume that the Assembly Department of Colter Manufacturing spent $70,800 for the year ended July 31, 20Y8. Thus, the Assembly Department spent $10,800 ($70,800 – $60,000), or 18% ($10,800 ÷ $60,000) more than budgeted. Is this good news or bad news?

The first reaction is that this is bad news and the Assembly Department was inefficient in spending more than budgeted. However, assume that the Assembly Department's budget was based on plans to assemble 8,000 units during the year. If 10,000 units were actually assembled, the additional $10,800 spent in excess of budget might be good news. That is, the Assembly Department assembled 25% (2,000 units ÷ 8,000 units) more than planned for only 18% more cost. In this case, a static budget may not be useful for controlling costs.

Why It Matters

CONCEPT CLIP

Film Budgeting

Service businesses, like film and entertainment, use budgets as a roadmap to control expenses. In film production, the budget is a valuable tool to manage the tension between creative expression and cost.

The film budget is a static budget that can be divided into three major categories:

- above the line
- below the line
- post-production costs

The *above the line* costs include costs attributed to creative talent, such as the lead cast's and director's salaries and script fees. The *below the line* costs include the remaining costs to create the film, including location, costume, and prop rentals; permits; and other production costs. The *post-production costs* include the costs to complete the film, including editing, sound, and special effects. Marketing has a separate budget.

The total cost of the film is influenced by many decisions, including the cost of story rights, location, star quality of creative talent, union representation of the production crew, music, and special effects. Even a low-budget indie (independent) documentary could easily have a budget of more than $1 million. In contrast, a special effect-laden Hollywood film could have a budget in excess of $200 million.

Link to Hendrick Motorsports

Rick Hendrick started by selling used cars. At age 26, he invested all of his assets in a struggling Chevrolet dealership, becoming the youngest Chevrolet dealer in the United States. This dealership was the predecessor of the **Hendrick Automotive Group**.

Flexible Budget

note:
Flexible budgets show expected results for several activity levels.

Unlike static budgets, **flexible budgets** show the expected results of a responsibility center for several activity levels. A flexible budget is, in effect, a series of static budgets for different levels of activity.

To illustrate, a flexible budget for the Assembly Department of Colter Manufacturing Company is shown in Exhibit 5.

Exhibit 5
Flexible Budget

	A	B	C	D
1	**Colter Manufacturing Company**			
2	**Assembly Department Budget**			
3	**For the Year Ending July 31, 20Y8**			
4		**Level 1**	**Level 2**	**Level 3**
5	Units of production	8,000	9,000	10,000
6	Variable cost:			
7	Direct labor ($5 per unit)	$40,000	$45,000	$50,000
8	Electric power ($0.50 per unit)	4,000	4,500	5,000
9	Total variable cost	$44,000	$49,500	$55,000
10	Fixed cost:			
11	Electric power	$ 1,000	$ 1,000	$ 1,000
12	Supervisor salaries	15,000	15,000	15,000
13	Total fixed cost	$16,000	$16,000	$16,000
14	Total department costs	$60,000	$65,500	$71,000
15				

Step 1 (row 5)
Step 2 (rows 6–13)
Step 3 (columns B–D)

A flexible budget is constructed as follows:

- Step 1. Identify the relevant activity levels. The relevant levels of activity could be expressed in units, machine hours, direct labor hours, or some other activity base. In Exhibit 5, the levels of activity are 8,000, 9,000, and 10,000 units of production.
- Step 2. Identify the fixed and variable cost components of the costs being budgeted. In Exhibit 5, the electric power cost is separated into its fixed cost ($1,000 per year) and variable cost ($0.50 per unit). The direct labor is a variable cost, and the supervisor salaries are all fixed costs.
- Step 3. Prepare the budget for each activity level by multiplying the variable cost per unit by the activity level and then adding the monthly fixed cost.

With a flexible budget, actual costs can be compared to the budgeted costs for actual activity. To illustrate, assume that the Assembly Department spent $70,800 to produce 10,000 units. Exhibit 5 indicates that the Assembly Department was *under* budget by $200 ($71,000 – $70,800).

Under the static budget in Exhibit 4, the Assembly Department was $10,800 *over* budget. This comparison is illustrated in Exhibit 6.

The flexible budget for the Assembly Department is much more accurate and useful than the static budget. This is because the flexible budget adjusts for changes in the level of activity. Flexible budgets can be used in service businesses when the variable costs can be associated with an activity. For example, hospital room expenses are related to number of patients, or transportation fuel costs are related to number of miles.

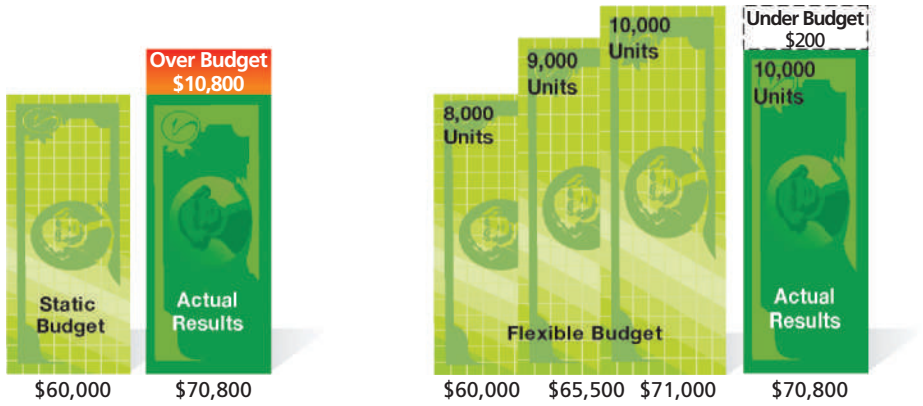


Exhibit 6
Static and Flexible Budgets

Check Up Corner 8-1 Flexible Budget

O-wen Snowboard Company designs and manufactures snowboards. The boards are assembled in the company's Assembly Department in Colorado. Information for the Assembly Department is as follows:

Depreciation	$4,500	per month
Direct labor hours per unit produced	0.5	hour per board
Supervisor salaries	$22,000	per month
Utilities	$1	per direct labor hour plus $1,500 per month
Wages	$20	per hour

Prepare a flexible budget for the Assembly Department for 3,000, 4,000, and 5,000 boards in August 20Y1.

Solution:

Variable costs change with the level of activity.

O-wen Snowboard Company
Assembly Department Budget
For the Month Ending August 31, 20Y1

Units of production	3,000	4,000	5,000
Variable costs:			
Direct labor	$30,000	$40,000	$50,000
Utilities	1,500	2,000	2,500
Total variable costs	$31,500	$42,000	$52,500
Fixed costs:			
Depreciation	$ 4,500	$ 4,500	$ 4,500
Supervisor salaries	22,000	22,000	22,000
Utilities	1,500	1,500	1,500
Total fixed costs	$28,000	$28,000	$28,000
Total department costs	$59,500	$70,000	$80,500

Flexible budgets show the expected results of a responsibility center for several activity levels.

3,000 units × 0.5 hour per unit × $20 per hour

4,000 units × 0.5 hour per unit × $20 per hour

5,000 units × 0.5 hour per unit × $20 per hour

The variable utility cost is equal to the activity level (# of units) × 0.5 direct labor hour × $1 per direct labor hour

Fixed costs remain constant across all activity levels.

Total estimated costs change with the level of activity.

Check Up Corner

In developing budgets, companies use a variety of approaches. Two of the most popular approaches use:

- Spreadsheet software such as Microsoft Excel
- Integrated budgeting and planning (B&P) software systems

Spreadsheets ease budget preparation by summarizing budget information in linked spreadsheets across the organization. In addition, the impact of proposed changes in various assumptions or operating alternatives can be analyzed on a spreadsheet.

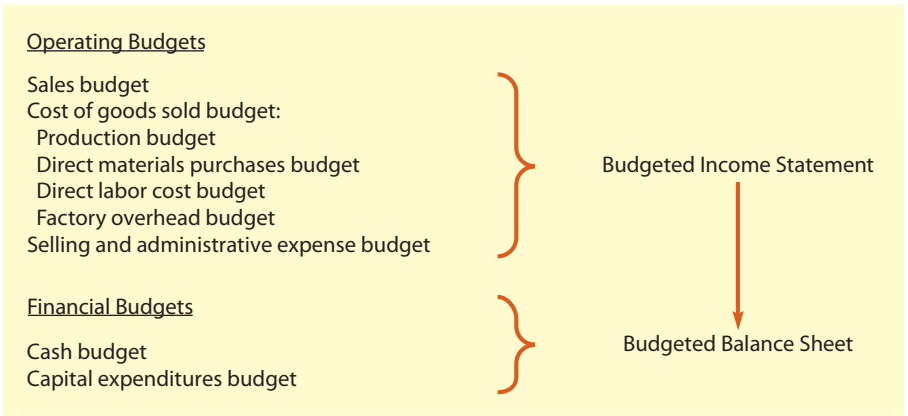
B&P software systems use the Web (Intranet) to link thousands of employees together during the budget process. Employees can input budget data online that are integrated and summarized throughout the company. In this way, a company can quickly and consistently integrate top-level strategies and goals to lower-level operational goals.

Objective 3
Describe the master budget for a manufacturing company.

Master Budget

The **master budget** is an integrated set of operating and financial budgets for a period of time. Most companies prepare a master budget on a yearly basis. Exhibit 7 shows that the operating budgets can be used to prepare a budgeted income statement, while the financial budgets provide information for a budgeted balance sheet.

Exhibit 7
Master Budget for a Manufacturing Company



The master budget begins with preparing the operating budgets, which form the budgeted income statement. Exhibit 8 shows the relationships among the operating budgets leading to an income statement budget.

Why It Matters

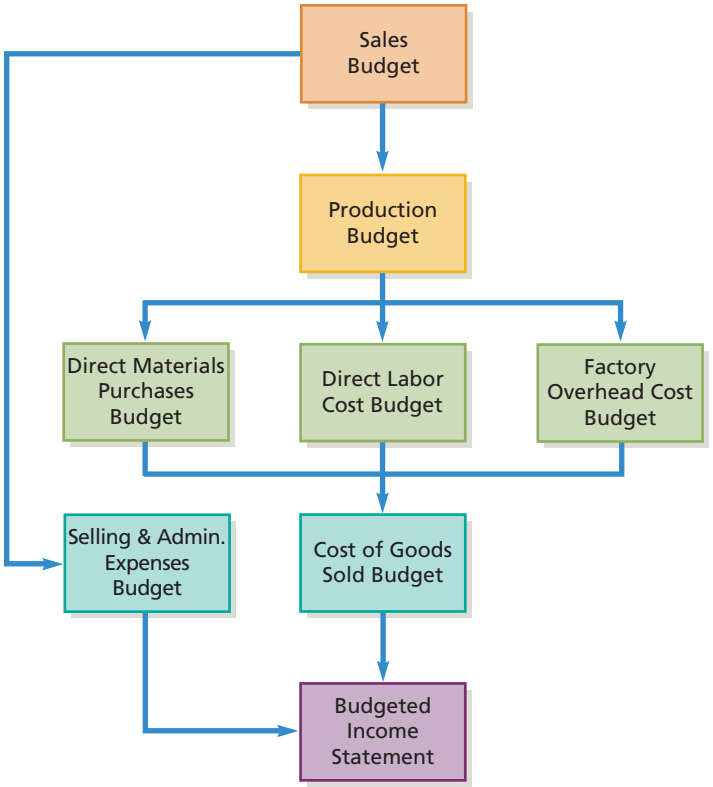
Build Versus Harvest

Budgeting systems are not "one size fits all" solutions but must adapt to the underlying business conditions. For example, a business can adopt either a build strategy or a harvest strategy. A *build* strategy is one where the business is designing, launching, and growing new products and markets. **Apple Inc.**'s **(AAPL)** iPad® is an example of a product managed under a build strategy. A *harvest* strategy is often employed for business units with mature products enjoying high market share in low-growth industries. **H.J. Heinz Company**'s ketchup and **P&G**'s **(PG)** *Ivory* soap are examples of such products. A build strategy often has greater uncertainty, unpredictability, and change than a harvest strategy. The difference between these strategies implies different budgeting approaches.

The build strategy should employ a budget approach that is flexible to the uncertainty of the business. Thus, budgets should adapt to changing conditions by allowing periodic revisions and flexible targets. The budget serves as a short-term planning tool to guide management in executing an uncertain and evolving product market strategy.

In a harvest strategy, the business is often much more stable and is managed to maximize profitability and cash flow. Because cost control is much more important in this strategy, the budget is used to restrict the actions of managers.

Exhibit 8
Operating Budgets



Operating Budgets

Objective 4
Prepare the basic operating budgets for a manufacturing company.

The integrated operating budgets that support the income statement budget are illustrated for **Elite Accessories Inc.**, a small manufacturing company of personal accessories.

Sales Budget

The **sales budget** begins by estimating the quantity of sales. The prior year's sales are often used as a starting point. These sales quantities are then revised for such factors as planned advertising and promotion, projected pricing changes, and expected industry and general economic conditions.

Once sales quantities are estimated, the budgeted sales revenue can be determined as follows:

Budgeted Revenue = Expected Sales Volume × Expected Unit Sales Price

To illustrate, **Elite Accessories Inc.** manufactures wallets and handbags that are sold in two regions, the East and West regions. Elite Accessories estimates the following sales volumes and prices for 20Y1:

	East Region Sales Volume	West Region Sales Volume	Unit Selling Price
Wallets	287,000	241,000	$12
Handbags	156,400	123,600	25

Exhibit 9 illustrates the sales budget for Elite Accessories based on the preceding data.

Exhibit 9
Sales Budget

	A	B	C	D
1	Elite Accessories Inc.			
2	Sales Budget			
3	For the Year Ending December 31, 20Y1			
4		Unit Sales	Unit Selling	
5	Product and Region	Volume	Price	Total Sales
6	Wallet:			
7	East	287,000	$12.00	$ 3,444,000
8	West	241,000	12.00	2,892,000
9	Total	528,000		$ 6,336,000
10				
11	Handbag:			
12	East	156,400	$25.00	$ 3,910,000
13	West	123,600	25.00	3,090,000
14	Total	280,000		$ 7,000,000
15				
16	Total revenue from sales			$13,336,000
17				

Link to Hendrick Motorsports In a recent year, **Hendrick Automotive Group** generated over $8 billion of revenue across 14 states.

Production Budget

The production budget should be integrated with the sales budget to ensure that production and sales are kept in balance during the year. The **production budget** estimates the number of units to be manufactured to meet budgeted sales and desired inventory levels.

The budgeted units to be produced are determined as follows:

Expected units to be sold	XXX units
Desired units in ending inventory	XXX
Estimated units in beginning inventory	(XXX)
Total units to be produced	XXX units

Elite Accessories Inc. expects the following inventories of wallets and handbags:

	Estimated Inventory, January 1, 20Y1	Desired Inventory, December 31, 20Y1
Wallets	88,000	80,000
Handbags	48,000	60,000

Exhibit 10 illustrates the production budget for Elite Accessories.

Exhibit 10
Production Budget

	A	B	C
1	Elite Accessories Inc.		
2	Production Budget		
3	For the Year Ending December 31, 20Y1		
4		Units	
5		Wallet	Handbag
6	Expected units to be sold (from Exhibit 9)	528,000	280,000
7	Desired ending inventory, December 31, 20Y1	80,000	60,000
8	Total units available	608,000	340,000
9	Estimated beginning inventory, January 1, 20Y1	(88,000)	(48,000)
10	Total units to be produced	520,000	292,000
11			

Direct Materials Purchases Budget

The direct materials purchases budget should be integrated with the production budget to ensure that production is not interrupted during the year. The **direct materials purchases budget** estimates the quantities of direct materials to be purchased to support budgeted production and desired inventory levels and can be developed in three steps.

Step 1 Determine the budgeted direct material required for production, which is computed as follows:

Budgeted Direct Material Required for Production	=	Budgeted Production Volume (from Exhibit 10)	×	Direct Material Quantity Expected per Unit

To illustrate, **Elite Accessories Inc.** uses leather and lining in producing wallets and handbags. The quantity of direct materials expected to be used for each unit of product is as follows:

	Wallet	Handbag
Leather	0.30 sq. yd. per unit	1.25 sq. yds. per unit
Lining	0.10 sq. yd. per unit	0.50 sq. yd. per unit

For the wallet, the direct material required for production is computed as follows:

Leather: 520,000 units × 0.30 sq. yd. per unit = 156,000 sq. yds.
Lining: 520,000 units × 0.10 sq. yd. per unit = 52,000 sq. yds.

For the handbag, the direct material required for production is computed as follows:

Leather: 292,000 units × 1.25 sq. yds. per unit = 365,000 sq. yds.
Lining: 292,000 units × 0.50 sq. yd. per unit = 146,000 sq. yds.

Step 2 The budgeted material required for production is adjusted for beginning and ending inventories to determine the direct materials to be purchased for each material, as follows:

Materials required for production (Step 1)	XXX
Desired ending materials inventory	XXX
Estimated beginning materials inventory	(XXX)
Direct material quantity to be purchased	XXX

Step 3 The budgeted direct materials to be purchased is computed as follows:

Budgeted Direct Material to Be Purchased	=	Direct Material Quantity to Be Purchased (Step 2)	×	Unit Price

Complete Direct Materials Purchases Budget The following inventory and unit price information for **Elite Accessories Inc.** is expected:

	Estimated Direct Materials Inventory, January 1, 20Y1	Desired Direct Materials Inventory, December 31, 20Y1
Leather	18,000 sq. yds.	20,000 sq. yds.
Lining	15,000 sq. yds.	12,000 sq. yds.

The estimated price per square yard of leather and lining during 20Y1 follows:

	Price per Square Yard
Leather	$4.50
Lining	1.20

Exhibit 11 illustrates the complete direct materials purchases budget for Elite Accessories by combining all three steps into a single schedule.

Exhibit 11
Direct Materials Purchases Budget

	A	B	C	D	E
1		**Elite Accessories Inc.**			
2		**Direct Materials Purchases Budget**			
3		**For the Year Ending December 31, 20Y1**			
4			**Direct Materials**		
5			**Leather**	**Lining**	**Total**
6		Square yards required for production:			
7		Wallet (Note A)	156,000	52,000	
8		Handbag (Note B)	365,000	146,000	
9		Desired inventory, December 31, 20Y1	20,000	12,000	
10		Total square yards available	541,000	210,000	
11		Estimated inventory, January 1, 20Y1	(18,000)	(15,000)	
12		Total square yards to be purchased	523,000	195,000	
13		Unit price (per square yard)	× $4.50	× $1.20	
14		Total direct materials to be purchased	$2,353,500	$234,000	$2,587,500
15					
16	Note A:	Leather: 520,000 units × 0.30 sq. yd. per unit = 156,000 sq. yds.			
17		Lining: 520,000 units × 0.10 sq. yd. per unit = 52,000 sq. yds.			
18					
19	Note B:	Leather: 292,000 units × 1.25 sq. yds. per unit = 365,000 sq. yds.			
20		Lining: 292,000 units × 0.50 sq. yd. per unit = 146,000 sq. yds.			
21					

Step 1: rows 7–8
Step 2: rows 9–12
Step 3: rows 13–14

The timing of the direct materials purchases should be coordinated between the purchasing and production departments so that production is not interrupted.

Link to Hendrick Motorsports

Hendrick Motorsports uses sheet metal in building its race cars. "Used" sections of sheet metal (from crashed cars) can be purchased from its online store.

Direct Labor Cost Budget

The **direct labor cost budget** estimates the direct labor hours and related cost needed to support budgeted production. Production managers study work methods to provide estimates used in preparing the direct labor cost budget.

The direct labor cost budget for each department is determined in two steps, as follows.

Step 1 Determine the budgeted direct labor hours required for production, which is computed as follows:

Budgeted Direct Labor Hours Required for Production = Budgeted Production Volume (from Exhibit 10) × Direct Labor Hours Expected per Unit

To illustrate, **Elite Accessories Inc.**'s production managers estimate the following direct labor hours are needed to produce a wallet and handbag:

	Wallet	Handbag
Cutting Department	0.10 hr. per unit	0.15 hr. per unit
Sewing Department	0.25 hr. per unit	0.40 hr. per unit

Thus, for the wallet, the budgeted direct labor hours required for production is computed as follows:

Cutting: 520,000 units × 0.10 hr. per unit = 52,000 direct labor hours
Sewing: 520,000 units × 0.25 hr. per unit = 130,000 direct labor hours

For the handbag, the budgeted direct labor hours required for production is computed as follows:

Cutting: 292,000 units × 0.15 hr. per unit = 43,800 direct labor hours
Sewing: 292,000 units × 0.40 hr. per unit = 116,800 direct labor hours

Step 2 Determine the total direct labor cost as follows:

Direct Labor Cost = Direct Labor Required for Production (Step 1) × Hourly Rate

The estimated direct labor hourly rates for the Cutting and Sewing departments for **Elite Accessories Inc.** during 20Y1 follow:

	Hourly Rate
Cutting Department	$12
Sewing Department	15

Complete Direct Labor Cost Budget Exhibit 12 illustrates the direct labor cost budget by combining both steps for **Elite Accessories Inc.**

Exhibit 12
Direct Labor Cost Budget

	A	B	C	D	E
1	Elite Accessories Inc.				
2	Direct Labor Cost Budget				
3	For the Year Ending December 31, 20Y1				
4			Cutting	Sewing	Total
5	Hours required for production:				
6	Step 1	Wallet (Note A)	52,000	130,000	
7	Step 1	Handbag (Note B)	43,800	116,800	
8		Total	95,800	246,800	
9	Step 2	Hourly rate	× $12	× $15	
10	Step 2	Total direct labor cost	$1,149,600	$3,702,000	$4,851,600
11					
12	Note A:	Cutting Department: 520,000 units × 0.10 hr. per unit = 52,000 hrs.			
13		Sewing Department: 520,000 units × 0.25 hr. per unit = 130,000 hrs.			
14					
15	Note B:	Cutting Department: 292,000 units × 0.15 hr. per unit = 43,800 hrs.			
16		Sewing Department: 292,000 units × 0.40 hr. per unit = 116,800 hrs.			
17					

The direct labor needs should be coordinated between the production and personnel departments so that there will be enough labor available for production.

Hendrick Motorports offers an internship program for college students who want to experience and learn the operations of a NASCAR team.

Link to Hendrick Motorsports

Factory Overhead Cost Budget

The **factory overhead cost budget** estimates the cost for each item of factory overhead needed to support budgeted production.

Exhibit 13 illustrates the factory overhead cost budget for **Elite Accessories Inc.**

Exhibit 13
Factory Overhead Cost Budget

	A	B
1	**Elite Accessories Inc.**	
2	**Factory Overhead Cost Budget**	
3	**For the Year Ending December 31, 20Y1**	
4	Indirect factory wages	$ 732,800
5	Supervisor salaries	360,000
6	Power and light	306,000
7	Depreciation of plant and equipment	288,000
8	Indirect materials	182,800
9	Maintenance	140,280
10	Insurance and property taxes	79,200
11	Total factory overhead cost	$2,089,080
12		

The factory overhead cost budget shown in Exhibit 13 may be supported by departmental schedules. Such schedules normally separate factory overhead costs into fixed and variable costs to better enable department managers to monitor and evaluate costs during the year.

The factory overhead cost budget should be integrated with the production budget to ensure that production is not interrupted during the year.

Cost of Goods Sold Budget

The **cost of goods sold budget** is prepared by integrating the following budgets:

- Direct materials purchases budget (Exhibit 11)
- Direct labor cost budget (Exhibit 12)
- Factory overhead cost budget (Exhibit 13)

In addition, the estimated and desired inventories for direct materials, work in process, and finished goods must be integrated into the cost of goods sold budget.

Elite Accessories Inc. expects the following direct materials, work in process, and finished goods inventories:

	Estimated Inventory, January 1, 20Y1	Desired Inventory, December 31, 20Y1
Direct materials:		
Leather	$ 81,000 (18,000 sq. yds. × $4.50)	$ 90,000 (20,000 sq. yds. × $4.50)
Lining	18,000 (15,000 sq. yds. × $1.20)	14,400 (12,000 sq. yds. × $1.20)
Total direct materials	$ 99,000	$ 104,400
Work in process	$ 214,400	$ 220,000
Finished goods	$1,095,600	$1,565,000

The cost of goods sold budget for Elite Accessories in Exhibit 14 indicates that total manufacturing costs of $9,522,780 are budgeted to be incurred in 20Y1. Of this total, $2,582,100 is budgeted for direct materials, $4,851,600 is budgeted for direct labor, and $2,089,080 is budgeted for factory overhead. After considering work in process inventories, the total budgeted cost of goods manufactured and transferred to finished goods during 20Y1 is $9,517,180. Based on expected sales, the budgeted cost of goods sold is $9,047,780.

Exhibit 14
Cost of Goods Sold Budget

	A	B	C	D
1	**Elite Accessories Inc.**			
2	**Cost of Goods Sold Budget**			
3	**For the Year Ending December 31, 20Y1**			
4	Finished goods inventory, January 1, 20Y1			$ 1,095,600
5	Work in process inventory, January 1, 20Y1		$ 214,400	
6	Direct materials:			
7	Direct materials inventory,			
8	January 1, 20Y1	$ 99,000		
9	Direct materials purchases (from Exhibit 11)	2,587,500		
10	Cost of direct materials available for use	$2,686,500		
11	Direct materials inventory,			
12	December 31, 20Y1	(104,400)		
13	Cost of direct materials placed in production	$2,582,100		
14	Direct labor (from Exhibit 12)	4,851,600		
15	Factory overhead (from Exhibit 13)	2,089,080		
16	Total manufacturing costs		9,522,780	
17	Total work in process during period		$9,737,180	
18	Work in process inventory,			
19	December 31, 20Y1		(220,000)	
20	Cost of goods manufactured			9,517,180
21	Cost of finished goods available for sale			$10,612,780
22	Finished goods inventory,			
23	December 31, 20Y1			(1,565,000)
24	Cost of goods sold			$ 9,047,780
25				

Direct materials purchases budget

Direct labor cost budget

Factory overhead cost budget

Check Up Corner 8-2 Direct Materials, Direct Labor, and Cost of Goods Sold Budget

Cooperstown Retros makes replica major league baseball jerseys that match those worn in the 1950s. The company budgeted production of 15,000 jerseys in 20Y1. Each jersey requires 1.5 square yards of wool fabric. Wool fabric costs $14 per square yard. Each jersey requires cutting and assembly. Assume that 3.5 hours are required to cut and assemble each jersey. Labor costs are estimated at $20 per hour. Factory overhead was budgeted for $210,000.

Estimated January 1 and desired December 31 inventories are as follows:

	Direct Materials: Wool Fabric	Work in Process	Finished Goods
Estimated inventory, January 1, 20Y1	2,250 sq. yds.	$20,000	$200,000
Desired inventory, December 31, 20Y1	2,340 sq. yds.	$24,500	$230,000

Prepare (a) a direct materials purchases budget, (b) a direct labor cost budget, and (c) a cost of goods sold budget for Cooperstown for the year ending December 31, 20Y1.

Solution:

a.

Cooperstown Retros
Direct Materials Purchases Budget
For the Year Ending December 31, 20Y1

Square yards of material required for production	22,500
Desired ending inventory, December 31	2,340
Total square yards available	24,840
Estimated beginning inventory, January 1	(2,250)
Total square yards to be purchased	22,590
Unit price (per square yard)	× $14
Total direct materials to be purchased	$316,260

15,000 expected units of production (jerseys) × 1.5 square yards per jersey

Estimated quantity of direct materials to be purchased to support budgeted production and meet desired inventory levels

(Continued)

b.

Cooperstown Retros
Direct Labor Cost Budget
For the Year Ending December 31, 20Y1

Hours required for cutting and assembly	52,500
Hourly rate	× $20
Total direct labor cost	$1,050,000

15,000 expected units of production (jerseys) × 3.5 hours per jersey

c.

Cooperstown Retros
Cost of Goods Sold Budget
For the Year Ending December 31, 20Y1

Finished goods inventory, January 1		$ 200,000
Work in process inventory, January 1	$ 20,000	
Direct materials:		
Direct materials, January 1	$ 31,500	
Direct materials purchases	316,260	
Cost of direct materials available for use	$ 347,760	
Direct materials inventory, December 31	(32,760)	
Cost of direct materials placed in production	$ 315,000	
Direct labor	1,050,000	
Factory overhead	210,000	
Total manufacturing cost	1,575,000	
Total work in process during period	$1,595,000	
Work in process inventory, December 31	(24,500)	
Cost of goods manufactured		1,570,500
Cost of finished goods available for sale		$1,770,500
Finished goods inventory, December 31		(230,000)
Cost of goods sold		$1,540,500

2,250 estimated sq. yds. of beg. inv. × $14 per sq. yd.

From direct materials purchases budget

2,340 desired sq. yards of ending inventory × $14 per sq. yd.

From direct labor cost budget

Check Up Corner

Selling and Administrative Expenses Budget

The sales budget is often used as the starting point for the selling and administrative expenses budget. For example, a budgeted increase in sales may require more advertising expenses.

Exhibit 15 illustrates the selling and administrative expenses budget for **Elite Accessories Inc.**

Exhibit 15
Selling and Administrative Expenses Budget

	A	B	C
1	**Elite Accessories Inc.**		
2	**Selling and Administrative Expenses Budget**		
3	**For the Year Ending December 31, 20Y1**		
4	Selling expenses:		
5	Sales salaries expense	$715,000	
6	Advertising expense	360,000	
7	Travel expense	115,000	
8	Total selling expenses		$1,190,000
9	Administrative expenses:		
10	Officers' salaries expense	$360,000	
11	Office salaries expense	258,000	
12	Office rent expense	34,500	
13	Office supplies expense	17,500	
14	Miscellaneous administrative expenses	25,000	
15	Total administrative expenses		695,000
16	Total selling and administrative expenses		$1,885,000
17			

The selling and administrative expenses budget shown in Exhibit 15 is normally supported by departmental schedules. For example, an advertising expense schedule for the Marketing Department could include the advertising media to be used (newspaper, direct mail, television), quantities (column inches, number of pieces, minutes), and related costs per unit.

Budgeted Income Statement

The budgeted income statement, sometimes called a *pro forma* income statement, for **Elite Accessories Inc.** in Exhibit 16 is prepared by integrating the following budgets:

- Sales budget (Exhibit 9)
- Cost of goods sold budget (Exhibit 14)
- Selling and administrative expenses budget (Exhibit 15)

In addition, estimates of other revenue, other expense, and income tax are also integrated into the budgeted income statement.

This budget summarizes the budgeted operating activities of the company. In doing so, the budgeted income statement allows management to assess the effects of estimated sales, costs, and expenses on profits for the year.

Exhibit 16
Budgeted Income Statement

	A	B	C	
1	**Elite Accessories Inc.**			
2	**Budgeted Income Statement**			
3	**For the Year Ending December 31, 20Y1**			
4	Revenue from sales (from Exhibit 9)		$ 13,336,000	← Sales budget
5	Cost of goods sold (from Exhibit 14)		(9,047,780)	← Cost of goods sold budget
6				
7	Gross profit		$ 4,288,220	
8	Selling and administrative expenses:			
9	Selling expenses (from Exhibit 15)	$1,190,000		⌐ Selling and administrative expenses budget
10	Administrative expenses (from Exhibit 15)	695,000		⌐
11	Total selling and administrative expenses		(1,885,000)	
12	Operating income		$ 2,403,220	
13	Other revenue and expense:			
14	Interest revenue	$ 98,000		
15	Interest expense	(90,000)	8,000	
16	Income before income tax		$ 2,411,220	
17	Income tax		(600,000)	
18	Net income		$ 1,811,220	
19				

Why It Matters

Mad Men

The advertising budget can be one of the largest selling and administrative expenses for a business. The top 200 leading national advertisers accounted for 51% of all advertising dollars for all businesses combined. Of this amount, 68.5% went toward video broadcast advertising, 7.2% for Internet display ads, and 24.3% for print and radio. The top five spenders according to *Advertising Age* were:

Company	U.S. Advertising Spending
Procter & Gamble Co. (PG)	$4.6 billion
AT&T Inc. (T)	3.3 billion
General Motors Corporation (GM)	3.1 billion
Comcast Corporation (CMCSA)	3.0 billion
Verizon Communications Inc. (VZ)	2.5 billion

The advertising budget is segmented between "measured" and "unmeasured" media. Measured media are tracked to determine the number of impressions an ad is receiving due to audience, viewership, or readership counts. Unmeasured media are not counted for impressions, and include promotions, direct marketing, and coupons.

A major trend is allocating ad budget dollars toward digital strategies, such as search, social, video, and mobile. These strategies are believed to be more efficient and effective than TV or print. For **Colgate-Palmolive Company (CL)**, digital went from 2% of the advertising budget in 2006 to 13% in 2014, with expectations of growing to 25%.

Source: Bradley Johnson, "Big Spenders on a Budget: What the Top 200 U.S. Advertisers Are Doing to Spend Smarter," *Advertising Age*, July 5, 2015.

Pathways Challenge



This is Accounting!

Economic Activity

Internal operating budgets for sales, purchasing, production, and selling and administrative expenses can be used to generate pro forma financial statements for an upcoming period. Such pro forma financial statements are sometimes disclosed to external stakeholders of a company. For example, **Exela Technologies Inc. (XELA)**, a large provider of transaction processing software, regularly releases quarterly pro forma financials. The Securities and Exchange Commission does not require pro forma statements to be audited, and pro forma statements are not required to conform to generally accepted accounting principles (GAAP). As a result, Exela's pro forma statements include non-GAAP information that Exela management thinks is important for external stakeholders to consider.*

* "Exela Technologies Reports Second Quarter 2017 Pro Forma Financial Results," *GlobalNewswire.com* (www.globenewswire.com/news-release/2017/08/09/1082772/0/en/Exela-Technologies-Reports-Second-Quarter-2017-Pro-Forma-Financial-Results.html), August 9, 2017.

Critical Thinking/Judgment

How does managerial accounting information influence the preparation of pro forma financial statements?
What is the primary benefit to external stakeholders of allowing pro forma financial statements?
What is the primary risk to external stakeholders of allowing companies to publish unaudited, non-GAAP-conforming financial information?

Suggested answer at end of chapter.

Link to Hendrick Motorsports

Hendrick Motorsports is located in Concord, North Carolina, one mile from the Charlotte Motor Speedway. Visitors are welcome, and tours are provided at no charge during the week.

Objective 5

Prepare financial budgets for a manufacturing company.

Financial Budgets

While the operating budgets reflect the operating activities of the company, the financial budgets reflect the financing and investing activities. In this section, the following financial budgets are described and illustrated:

- Cash budget
- Capital expenditures budget

Cash Budget

note:

The cash budget presents the expected receipts and payments of cash for a period of time.

The **cash budget** estimates the expected receipts (inflows) and payments (outflows) of cash for a period of time. The cash budget is integrated with the various operating budgets. In addition, the capital expenditures budget, dividends, and equity or long-term debt financing plans of the company affect the cash budget.

To illustrate, a monthly cash budget for January, February, and March 20Y1 for **Elite Accessories Inc.** is prepared. The preparation of the cash budget begins by estimating cash receipts.

Estimated Cash Receipts The primary source of estimated cash receipts is from cash sales and collections on account. In addition, cash receipts may be obtained from plans to issue equity or debt financing as well as other sources such as interest revenue.

To estimate cash receipts from cash sales and collections on account, a *schedule of collections from sales* is prepared. To illustrate, the following data for **Elite Accessories Inc.** are used:

	January	February	March
Sales:			
Budgeted sales	$1,080,000	$1,240,000	$970,000
Accounts receivable:			
Accounts receivable, January 1, 20Y1	$ 480,000		
Receipts from sales on account:			
From prior month's sales on account	40%		
From current month's sales on account	60		
	100%		

The budgeted cash collected for any month is the sum of the cash collected from the previous month's sales and the cash collected from the current month's sales. To illustrate, the cash collected in February is 40% of cash collected on sales in January ($1,080,000 × 40%) added to 60% of cash collected on sales in February ($1,240,000 × 60%), shown as follows:

	January	February
Budgeted sales	$1,080,000	$1,240,000
× 40%		× 60%
Cash collected from prior month's sales		$ 432,000
Cash collected from current month's sales		744,000
Total receipts from sales on account		$1,176,000

Using the preceding data, Exhibit 17 shows the schedule of collections from sales for Elite Accessories for all three months. To simplify, it is assumed that all accounts receivable are collected and there are no cash sales.

Exhibit 17
Schedule of Collections from Sales

	A	B	C	D	E
1	Elite Accessories Inc.				
2	Schedule of Collections from Sales				
3	For the Three Months Ending March 31, 20Y1				
4			January	February	March
5	Cash collected from prior month's sales—Note A		$ 480,000	$ 432,000	$ 496,000
6	Cash collected from current month's sales—Note B		648,000	744,000	582,000
7	Total receipts from sales on account		$1,128,000	$1,176,000	$1,078,000
8					
9	Note A:	$480,000, given as January 1, 20Y1, Accounts Receivable balance			
10		$432,000 = $1,080,000 × 40%			
11		$496,000 = $1,240,000 × 40%			
12					
13	Note B:	$648,000 = $1,080,000 × 60%			
14		$744,000 = $1,240,000 × 60%			
15		$582,000 = $970,000 × 60%			
16					

Estimated Cash Payments Estimated cash payments must be budgeted for operating costs and expenses such as manufacturing costs, selling expenses, and administrative expenses. In addition, estimated cash payments may be planned for capital expenditures, dividends, interest payments, or long-term debt payments.

To estimate cash payments for manufacturing costs, a *schedule of payments for manufacturing costs* is prepared. To illustrate, the following data for **Elite Accessories Inc.** are used:

	January	February	March
Manufacturing costs:			
Budgeted manufacturing costs	$840,000	$780,000	$812,000
Depreciation on machines included in manufacturing costs	24,000	24,000	24,000
Accounts payable:			
Accounts payable, January 1, 20Y1	$190,000		
Payments of manufacturing costs on account:			
From prior month's manufacturing costs	25%		
From current month's manufacturing costs	75		
	100%		

Depreciation on machines is included in budgeted manufacturing costs but does not require a cash outlay. Thus, depreciation is deducted (not included) in determining monthly budgeted cash payments. In addition, manufacturing costs incurred in one month may be paid in the following month. To illustrate, the cash paid in February is 25% of manufacturing costs (less depreciation) in January [($840,000 − $24,000) × 25%] added to 75% of cash paid on manufacturing costs (less depreciation) in February [($780,000 − $24,000) × 75%], computed as follows:

	January	February
Budgeted manufacturing costs	$840,000	$780,000
Depreciation on machines	(24,000)	(24,000)
Manufacturing costs (less depreciation)	$816,000	$756,000
× 25%		× 75%
Payments of prior month's manufacturing costs (less depreciation)		$204,000
Payments of current month's manufacturing costs (less depreciation)		567,000
Total payments		$771,000

Using the preceding data, Exhibit 18 shows the schedule of payments for manufacturing costs for Elite Accessories for all three months.

Exhibit 18
Schedule of Payments for Manufacturing Costs

	A	B	C	D	E
1	Elite Accessories Inc.				
2	Schedule of Payments for Manufacturing Costs				
3	For the Three Months Ending March 31, 20Y1				
4			January	February	March
5	Payments of prior month's manufacturing costs				
6	{[25% × previous month's manufacturing costs				
7	(less depreciation)]—Note A}		$190,000	$204,000	$189,000
8	Payments of current month's manufacturing costs				
9	{[75% × current month's manufacturing costs				
10	(less depreciation)]—Note B}		612,000	567,000	591,000
11	Total payments		$802,000	$771,000	$780,000
12					
13	Note A:	$190,000, given as January 1, 20Y1, Accounts Payable balance			
14		$204,000 = ($840,000 − $24,000) × 25%			
15		$189,000 = ($780,000 − $24,000) × 25%			
16					
17	Note B:	$612,000 = ($840,000 − $24,000) × 75%			
18		$567,000 = ($780,000 − $24,000) × 75%			
19		$591,000 = ($812,000 − $24,000) × 75%			
20					

Completing the Cash Budget The cash budget is structured for a budget period as follows:

Budget Period:

Estimated cash receipts	
Less estimated cash payments	
Cash increase (decrease)	
Plus cash balance at the beginning of the month	
Cash balance at the end of the month	→ Becomes the beginning balance for the next period
Less minimum cash balance	
Excess (deficiency)	

The budgeted balance at the end of the period is determined by adding the net increase (decrease) for the period to the beginning cash balance. The ending balance is compared to a minimum cash balance to support operations as determined by management. Any difference between the ending balance and the minimum cash balance represents an excess or deficiency that may require management action.

To illustrate, assume the following additional data for **Elite Accessories Inc.**:

Cash balance on January 1, 20Y1	$225,000
Quarterly taxes paid on March 31, 20Y1	150,000
Quarterly interest expense paid on January 10, 20Y1	22,500
Quarterly interest revenue received on March 21, 20Y1	24,500
Sewing equipment purchased in February 20Y1	274,000
Selling and administrative expenses (paid in month incurred):	

January	February	March
$160,000	$165,000	$145,000

The cash budget for Elite Accessories is shown in Exhibit 19.

The estimated cash receipts include the total receipts from sales on account (Exhibit 17). The estimated cash payments include the cash payments from manufacturing costs (Exhibit 18). Other receipts and payments are provided by the additional information. Additionally, assume the minimum cash balance is $340,000.

Exhibit 19
Cash Budget

	A	B	C	D
1	**Elite Accessories Inc.**			
2	**Cash Budget**			
3	**For the Three Months Ending March 31, 20Y1**			
4		**January**	**February**	**March**
5	Estimated cash receipts from:			
6	Collections of accounts receivable			
7	(from Exhibit 17)	$1,128,000	$ 1,176,000	$ 1,078,000
8	Interest revenue			24,500
9	Total cash receipts	$1,128,000	$ 1,176,000	$ 1,102,500
10	Less estimated cash payments for:			
11	Manufacturing costs (from Exhibit 18)	$ (802,000)	$ (771,000)	$ (780,000)
12	Selling and administrative expenses	(160,000)	(165,000)	(145,000)
13	Capital additions (sewing equipment)		(274,000)	
14	Interest expense	(22,500)		
15	Income taxes			(150,000)
16	Total cash payments	$ (984,500)	$(1,210,000)	$(1,075,000)
17	Cash increase (decrease)	$ 143,500	$ (34,000)	$ 27,500
18	Cash balance at beginning of month	225,000	368,500	334,500
19	Plus cash balance at end of month	$ 368,500	$ 334,500	$ 362,000
20	Less minimum cash balance	(340,000)	(340,000)	(340,000)
21	Excess (deficiency)	$ 28,500	$ (5,500)	$ 22,000
22				

→ Schedule of collections from sales

→ Schedule of payments for manufacturing costs

Exhibit 19 indicates that Elite Accessories expects a cash excess at the end of January of $28,500. This excess could be invested in temporary income-producing securities such as U.S. Treasury bills or notes. In contrast, the estimated cash deficiency at the end of February of $(5,500) might require Elite Accessories to borrow cash from its bank.

Check Up Corner 8-3 Cash Budget

Quincy Company has both cash and credit customers. The company expects that 40% of total monthly sales will be collected in cash in the month of sale, and the remaining 60% will be collected in the month following the month of sale. The Accounts Receivable balance on January 1 is $97,500, all of which is expected to be collected during January. Projected sales for the first three months of the year are as follows:

January	$190,000
February	200,000
March	210,000

Projected manufacturing costs and selling and administrative expenses for the first three months of the year are as follows:

	Manufacturing Costs	Selling & Administrative Expenses
January	$110,000	$72,000
February	134,000	70,000
March	160,000	75,000

Manufacturing costs include depreciation, insurance, and property taxes, which represent $18,000 of the estimated monthly manufacturing costs. The annual insurance premium was paid on December 31 of the prior year, and property taxes for the year will be paid in June. Sixty percent of the remainder of manufacturing costs are expected to be paid in the month in which they are incurred, with the balance to be paid in the following month. The Accounts Payable balance on January 1, which consisted entirely of unpaid manufacturing costs from December, is $36,700. All selling and administrative expenses are paid in cash in the period in which they are incurred. The cash balance on January 1 was $26,000, and management desires to maintain a minimum cash balance of $20,000.

Prepare:

a. A schedule of collections from sales.
b. A schedule of cash payments for manufacturing costs.
c. A cash budget.

Solution:

a.

Quincy Company
Schedule of Collections from Sales
For the Three Months Ending March 31

	January	February	March
Cash collections from prior month's sales	$ 97,500	$114,000	$120,000
Cash collections from current month's sales	76,000	80,000	84,000
Total cash collections from sales	$173,500	$194,000	$204,000

January 1 accounts receivable balance

60% × January sales

40% × March sales

b.

Quincy Company
Schedule of Payments for Manufacturing Costs
For the Three Months Ending March 31

	January	February	March
Payment of prior month's costs	$36,700	$ 36,800	$ 46,400
Payment of current month's costs	55,200	69,600	85,200
Total manufacturing cost cash payments	$91,900	$106,400	$131,600

January 1 accounts payable balance

40% × January manufacturing costs excluding depreciation, insurance, and property taxes ($110,000 – $18,000)

60% × March manufacturing costs excluding depreciation, insurance, and property taxes ($160,000 – $18,000)

60% × February manufacturing costs excluding depreciation, insurance, and property taxes ($134,000 – $18,000)

c.

Quincy Company
Cash Budget
For the Three Months Ending March 31

	January	February	March	
Estimated cash receipts	$ 173,500	$ 194,000	$ 204,000	← From schedule of cash collections in part (a)
Less estimated cash payments for:				
Manufacturing costs	$ (91,900)	$(106,400)	$(131,600)	← From schedule of cash payments in part (b)
Selling and administrative expenses	(72,000)	(70,000)	(75,000)	
Total cash payments	$(163,900)	$(176,400)	$(206,600)	
Cash increase (decrease)	$ 9,600	$ 17,600	$ (2,600)	
Plus cash balance at beginning of month	26,000	35,600	53,200	
Cash balance at end of month	$ 35,600	$ 53,200	$ 50,600	
Less minimum cash balance	(20,000)	(20,000)	(20,000)	
Excess (deficiency)	$ 15,600	$ 33,200	$ 30,600	

Check Up Corner

Capital Expenditures Budget

The **capital expenditures budget** summarizes plans for acquiring fixed assets. Such expenditures are necessary as machinery and other fixed assets wear out or become obsolete. In addition, purchasing additional fixed assets may be necessary to meet increasing demand for the company's product.

To illustrate, a five-year capital expenditures budget for **Elite Accessories Inc.** is shown in Exhibit 20.

	A	B	C	D	E	F
1	Elite Accessories Inc.					
2	Capital Expenditures Budget					
3	For the Five Years Ending December 31, 20Y5					
4	Item	20Y1	20Y2	20Y3	20Y4	20Y5
5	Machinery—Cutting Department	$400,000			$280,000	$360,000
6	Machinery—Sewing Department	274,000	$260,000	$560,000	200,000	
7	Office equipment		90,000			60,000
8	Total	$674,000	$350,000	$560,000	$480,000	$420,000
9						

Exhibit 20
Capital Expenditures Budget

As shown in Exhibit 20, capital expenditures budgets are often prepared for five to ten years into the future. This is necessary because fixed assets often must be ordered years in advance. Likewise, it could take years to construct new buildings or other production facilities.

The capital expenditures budget should be integrated with the operating and financing budgets. For example, depreciation of new manufacturing equipment affects the factory overhead cost budget. The plans for financing the capital expenditures also affect the cash budget.

Budgeted Balance Sheet

The budgeted balance sheet, sometimes called a *pro forma* balance sheet, is prepared based on the operating and financial budgets of the master budget. The budgeted balance sheet is dated as of the end of the budget period and is similar to a normal balance sheet except that estimated amounts are used. For this reason, a budgeted balance sheet for Elite Accessories Inc. is not illustrated.

Analysis for Decision Making

Objective 6
Describe and illustrate the use of staffing budgets for nonmanufacturing businesses.

Nonmanufacturing Staffing Budgets

The budgeting illustrated in this chapter is similar to budgeting used for nonmanufacturing businesses. However, many nonmanufacturing businesses often do not have direct materials purchases budgets, direct labor cost budgets, or factory overhead cost budgets. Thus, the budgeted income statement is simplified in many nonmanufacturing settings.

A primary budget in nonmanufacturing businesses is the labor, or staffing, budget. This budget, which is highly flexible to service demands, is used to manage staffing levels. For example, a theme park will have greater staffing in the summer vacation months than in the fall months. Likewise, a retailer will have greater staffing during the holidays than on typical weekdays.

To illustrate, Concord Hotel operates a hotel in a business district. The hotel has 150 rooms that average 120 guests per night during the weekdays and 50 guests per night during the weekend. The housekeeping staff is able to clean 10 rooms per employee. The number of housekeepers required for an average weekday and weekend is determined as follows:

	Weekday	Weekend
Number of guests per day	120	50
Rooms per housekeeper	÷ 10	÷ 10
Number of housekeepers per day	12	5

If each housekeeper is paid $15 per hour for an eight-hour shift per day, the annual budget for the staff is as follows:

	Weekday	Weekend	Total
Number of housekeepers per day	12	5	
Hours per shift	× 8	× 8	
Days per year	× 260*	× 104**	
Number of hours per year	24,960	4,160	
Rate per hour	× $15	× $15	
Housekeeping staff annual budget	$374,400	$62,400	$436,800

* 52 weeks × 5 days

** 52 weeks × 2 days

The budget can be used to plan and manage the staffing of the hotel. For example, if a wedding were booked for the weekend, the budgeted increase in staffing could be compared with the increased revenue from the wedding to verify the profit plan.

Make a Decision Nonmanufacturing Staffing Budgets

Analyze Johnson Stores' staffing budget for holidays (MAD 8-1)

Analyze Mercy Hospital's staffing budget (MAD 8-2)

Analyze Adventure Park's staffing budget (MAD 8-3)

Analyze Ambassador Suites' staffing budget (MAD 8-4)

Make a Decision

Let's Review

Chapter Summary

1. Budgeting involves (1) establishing plans (planning), (2) directing operations (directing), and (3) evaluating performance (controlling). In addition, budgets should be established to avoid human behavior problems.
2. The budget estimates received by the budget committee should be carefully studied, analyzed, revised, and integrated. The static and flexible budgets are two major budgeting approaches. Computers can be used to make the budget process more efficient and organizationally integrated.
3. The master budget is an integrated set of operating and financial budgets for a period of time. The operating budgets are prepared and integrated into a budgeted income statement. The financial budgets are prepared and integrated into a budgeted balance sheet.
4. The basic operating budgets are the sales budget, production budget, direct materials purchases budget, direct labor cost budget, factory overhead cost budget, cost of goods sold budget, and selling and administrative expenses budget. These budgets are the basis for preparing a budgeted income statement.
5. The cash budget and capital expenditures budget are financial budgets showing the investing and financing activities of the firm. These budgets are the basis for preparing a budgeted balance sheet.
6. Nonmanufacturing businesses normally do not have direct materials purchases budgets, direct labor cost budgets, or factory overhead cost budgets. A primary budget in nonmanufacturing businesses is the labor, or staffing, budget. This budget, which is highly flexible to service demands, is used to manage staffing levels.

Key Terms

budgetary slack (355)
budgets (354)
capital expenditures budget (375)
cash budget (370)
continuous budgeting (356)
cost of goods sold budget (366)
direct labor cost budget (364)
direct materials purchases budget (363)
factory overhead cost budget (366)
flexible budgets (358)
goal conflict (355)
master budget (360)
production budget (362)
responsibility center (354)
sales budget (361)
static budget (357)
zero-based budgeting (357)

Practice

Multiple-Choice Questions

1. A tight budget may create:
   a. budgetary slack.
   b. discouragement.
   c. a flexible budget.
   d. a "spend it or lose it" mentality.
2. The first step of the budget process is to:
   a. plan.
   b. direct.
   c. control.
   d. analyze feedback.
3. Static budgets are often used by:
   a. production departments.
   b. administrative departments.
   c. responsibility centers.
   d. capital projects.

4. The total estimated sales for the coming year is 250,000 units. The estimated inventory at the beginning of the year is 22,500 units, and the desired inventory at the end of the year is 30,000 units. The total production indicated in the production budget is:
   a. 242,500 units.
   b. 257,500 units.
   c. 280,000 units.
   d. 302,500 units.

5. Dixon Company expects $650,000 of credit sales in March and $800,000 of credit sales in April. Dixon historically collects 70% of its sales in the month of sale and 30% in the following month. How much cash does Dixon expect to collect in April?
   a. $800,000
   b. $560,000
   c. $755,000
   d. $1,015,000

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Flexible budgeting — Obj. 2

At the beginning of the period, the Assembly Department budgeted direct labor of $112,000 and property tax of $12,000 for 7,000 hours of production. The department actually completed 7,500 hours of production. Determine the budget for the department, assuming that it uses flexible budgeting.

2. Production budget — Obj. 4

MyLife Chronicles Inc. projected sales of 240,000 diaries for the year. The estimated January 1 inventory is 19,900 units, and the desired December 31 inventory is 18,800 units. What is the budgeted production (in units) for the year?

3. Direct materials purchases budget — Obj. 4

MyLife Chronicles Inc. budgeted production of 238,900 diaries for the year. Paper is required to produce a diary. Assume five square yards of paper are required for each diary. The estimated January 1 paper inventory is 32,400 square yards. The desired December 31 paper inventory is 30,800 square yards. If paper costs $0.30 per square yard, determine the direct materials purchases budget for the year.

4. Direct labor cost budget — Obj. 4

MyLife Chronicles Inc. budgeted production of 238,900 diaries for the year. Each diary requires assembly. Assume that six minutes are required to assemble each diary. If assembly labor costs $12 per hour, determine the direct labor cost budget for the year.

5. Cost of goods sold budget — Obj. 4

Prepare a cost of goods sold budget for MyLife Chronicles Inc. using the information in Exercises 3 and 4. Assume the estimated inventories on January 1 for finished goods and work in process were $25,000 and $19,000, respectively. Also assume the desired inventories on December 31 for finished goods and work in process were $31,500 and $16,700, respectively. Factory overhead was budgeted at $197,100.

6. Cash budget — Obj. 5

MyLife Chronicles Inc. collects 30% of its sales on account in the month of the sale and 70% in the month following the sale. If sales on account are budgeted to be $170,000 for June and $200,000 for July, what are the budgeted cash receipts from sales on account for July?

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Selected information concerning sales and production for Cabot Co. for July are summarized as follows:

a. Estimated sales:

Product K:	40,000 units at $30 per unit
Product L:	20,000 units at $65 per unit

b. Estimated inventories, July 1:

Material A:	4,000 lbs.	Product K:	3,000 units at $17 per unit	$ 51,000
Material B:	3,500 lbs.	Product L:	2,700 units at $35 per unit	94,500
		Total		$145,500

There were no work in process inventories estimated for July.

c. Desired inventories at July 31:

Material A:	3,000 lbs.	Product K:	2,500 units at $17 per unit	$ 42,500
Material B:	2,500 lbs.	Product L:	2,000 units at $35 per unit	70,000
		Total		$112,500

There were no work in process inventories desired for July 31.

d. Direct materials used in production:

	Product K	Product L
Material A:	0.7 lb. per unit	3.5 lbs. per unit
Material B:	1.2 lbs. per unit	1.8 lbs. per unit

e. Unit costs for direct materials:

Material A:	$4.00 per lb.
Material B:	$2.00 per lb.

f. Direct labor requirements:

	Department 1	Department 2
Product K	0.4 hr. per unit	0.15 hr. per unit
Product L	0.6 hr. per unit	0.25 hr. per unit

g.

	Department 1	Department 2
Direct labor rate	$12 per hr.	$16 per hr.

h. Estimated factory overhead costs for July:

Indirect factory wages	$200,000
Depreciation of plant and equipment	40,000
Power and light	25,000
Indirect materials	34,000
Total	$299,000

Instructions

1. Prepare a sales budget for July.
2. Prepare a production budget for July.
3. Prepare a direct materials purchases budget for July.
4. Prepare a direct labor cost budget for July.
5. Prepare a cost of goods sold budget for July.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **b** Individuals can be discouraged with budgets that appear too tight or unobtainable. Flexible budgeting (answer c) provides a series of budgets for varying rates of activity and thereby builds into the budgeting system the effect of fluctuations in the level of activity. Budgetary slack (answer a) comes from a loose budget, not a tight budget. A "spend it or lose it" mentality (answer d) is often associated with loose budgets.

2. **a** The first step of the budget process is to develop a plan. Once plans are established, management may direct actions (answer b). The results of actions can be controlled (answer c) by comparing them to the plan. This feedback (answer d) can be used by management to change plans or redirect actions.

3. **b** Administrative departments (answer b), such as Purchasing or Human Resources, will often use static budgeting. Production departments (answer a) frequently use flexible budgets. Responsibility centers (answer c) can use either static or flexible budgeting. Capital expenditures budgets are used to plan capital projects (answer d).

4. **b** The total production indicated in the production budget is 257,500 units (answer b), which is computed as follows:

Sales	250,000 units
Desired ending inventory	30,000 units
Total	280,000 units
Estimated beginning inventory	(22,500) units
Total production	257,500 units

5. **c** Dixon expects to collect 70% of April sales ($560,000) plus 30% of the March sales ($195,000) in April, for a total of $755,000 (answer c). Answer a is 100% of April sales. Answer b is 70% of April sales. Answer d adds 70% of both March and April sales.

Exercises

1. Variable cost:

Direct labor (7,500 hours × $16* per hour)	$120,000
Fixed cost:	
Property tax	12,000
Total department costs	$132,000

* $112,000 ÷ 7,000 hours

2.

MyLife Chronicles Inc.
Production Budget
For the Year Ending December 31

Expected units to be sold	240,000
Desired ending inventory, December 31	18,800
Total units available	258,800
Estimated beginning inventory, January 1	(19,900)
Total units to be produced	238,900

3.

MyLife Chronicles Inc.
Direct Materials Purchases Budget
For the Year Ending December 31

Square yards required for production:	
Diaries (238,900 × 5 sq. yds.)	1,194,500
Desired ending inventory, December 31	30,800
Total square yards available	1,225,300
Estimated beginning inventory, January 1	(32,400)
Total square yards to be purchased	1,192,900
Unit price (per sq. yd.)	× $0.30
Total direct materials to be purchased	$ 357,870

4.

MyLife Chronicles Inc.
Direct Labor Cost Budget
For the Year Ending December 31

Hours required for assembly:		
Diaries (238,900 × 6 min.)	1,433,400	min.
Convert minutes to hours	÷ 60	min.
Assembly hours	23,890	hrs.
Hourly rate	× $12	
Total direct labor cost	$ 286,680	

5.

MyLife Chronicles Inc.
Cost of Goods Sold Budget
For the Year Ending December 31

Finished goods inventory, January 1			$ 25,000
Work in process inventory, January 1		$ 19,000	
Direct materials:			
Direct materials inventory, January 1 (32,400 × $0.30)	$ 9,720		
Direct materials purchases	357,870		
Cost of direct materials available for use	$367,590		
Less direct materials inventory, December 31 (30,800 × $0.30)	(9,240)		
Cost of direct materials placed in production	$358,350		
Direct labor	286,680		
Factory overhead	197,100		
Total manufacturing costs		842,130	
Total work in process during period		$861,130	
Work in process inventory, December 31		(16,700)	
Cost of goods manufactured			844,430
Cost of finished goods available for sale			$869,430
Finished goods inventory, December 31			(31,500)
Cost of goods sold			$837,930

6.

	July
Collections from June sales (70% × $170,000)	$119,000
Collections from July sales (30% × $200,000)	60,000
Total receipts from sales on account	$179,000

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1.

	A	B	C	D
1	**Cabot Co.**			
2	**Sales Budget**			
3	**For the Month Ending July 31**			
4	**Product**	**Unit Sales Volume**	**Unit Selling Price**	**Total Sales**
5	Product K	40,000	$30.00	$1,200,000
6	Product L	20,000	65.00	1,300,000
7	Total revenue from sales			$2,500,000
8				

2.

	A	B	C
1	**Cabot Co.**		
2	**Production Budget**		
3	**For the Month Ending July 31**		
4		**Units**	
5		**Product K**	**Product L**
6	Sales	40,000	20,000
7	Desired inventories at July 31	2,500	2,000
8	Total units available	42,500	22,000
9	Estimated inventories, July 1	(3,000)	(2,700)
10	Total units to be produced	39,500	19,300
11			

3.

	A	B	C	D	E	F	G
1	**Cabot Co.**						
2	**Direct Materials Purchases Budget**						
3	**For the Month Ending July 31**						
4			**Direct Materials**				
5			**Material A**		**Material B**		**Total**
6	Units required for production:						
7	Product K (39,500 × lbs. per unit)		27,650	lbs.*	47,400	lbs.*	
8	Product L (19,300 × lbs. per unit)		67,550	**	34,740	**	
9	Desired units of inventory, July 31		3,000		2,500		
10	Total		98,200	lbs.	84,640	lbs.	
11	Estimated units of inventory, July 1		(4,000)		(3,500)		
12	Total units to be purchased		94,200	lbs.	81,140	lbs.	
13	Unit price		× $4.00		× $2.00		
14	Total direct materials to be purchased		$376,800		$162,280		$539,080
15							
16	*27,650 = 39,500 × 0.7	47,400 = 39,500 × 1.2					
17	**67,550 = 19,300 × 3.5	34,740 = 19,300 × 1.8					
18							

4.

	A	B	C	D	E	F	G
1	**Cabot Co.**						
2	**Direct Labor Cost Budget**						
3	**For the Month Ending July 31**						
4			**Department 1**		**Department 2**		**Total**
5	Hours required for production:						
6	Product K (39,500 × hrs. per unit)		15,800	*	5,925	*	
7	Product L (19,300 × hrs. per unit)		11,580	**	4,825	**	
8	Total		27,380		10,750		
9	Hourly rate		× $12		× $16		
10	Total direct labor cost		$328,560		$172,000		$500,560
11							
12	*15,800 = 39,500 × 0.4	5,925 = 39,500 × 0.15					
13	**11,580 = 19,300 × 0.6	4,825 = 19,300 × 0.25					
14							

5.

	A	B	C	D
1	**Cabot Co.**			
2	**Cost of Goods Sold Budget**			
3	**For the Month Ending July 31**			
4	Finished goods inventory, July 1			$ 145,500
5	Direct materials:			
6	Direct materials inventory, July 1 (Note A)		$ 23,000	
7	Direct materials purchases		539,080	
8	Cost of direct materials available for use		$562,080	
9	Direct materials inventory, July 31 (Note B)		(17,000)	
10	Cost of direct materials placed in production		$545,080	
11	Direct labor		500,560	
12	Factory overhead		299,000	
13	Cost of goods manufactured			1,344,640
14	Cost of finished goods available for sale			$1,490,140
15	Finished goods inventory, July 31			(112,500)
16	Cost of goods sold			$1,377,640
17				
18	Note A:			
19	Material A 4,000 lbs. at $4.00 per lb.	$16,000		
20	Material B 3,500 lbs. at $2.00 per lb.	7,000		
21	Direct materials inventory, July 1	$23,000		
22				
23	Note B:			
24	Material A 3,000 lbs. at $4.00 per lb.	$12,000		
25	Material B 2,500 lbs. at $2.00 per lb.	5,000		
26	Direct materials inventory, July 31	$17,000		
27				

Discussion Questions

1. What are the three major objectives of budgeting?
2. Briefly describe the type of human behavior problems that might arise if budget goals are set too tightly.
3. What behavioral problems are associated with setting a budget too loosely?
4. What behavioral problems are associated with establishing conflicting goals within the budget?
5. Under what circumstances would a static budget be appropriate?
6. How does software aid firms in the budgeting process?
7. Why should the production requirements set forth in the production budget be carefully coordinated with the sales budget?
8. Why should the timing of direct materials purchases be closely coordinated with the production budget?
9. a. Discuss the purpose of the cash budget.
   b. If the cash for the first quarter of the fiscal year indicates excess cash at the end of each of the first two months, how might the excess cash be used?
10. Give an example of how the capital expenditures budget affects other operating budgets.

Basic Exercises

SHOW ME HOW

BE 8-1 Flexible budgeting — Obj. 2

At the beginning of the period, the Fabricating Department budgeted direct labor of $72,000 and equipment depreciation of $18,500 for 2,400 hours of production. The department actually completed 2,350 hours of production. Determine the budget for the department, assuming that it uses flexible budgeting.

SHOW ME HOW

BE 8-2 Production budget — Obj. 4

Pasadena Candle Inc. projected sales of 800,000 candles for January. The estimated January 1 inventory is 35,000 units, and the desired January 31 inventory is 20,000 units. What is the budgeted production (in units) for January?

SHOW ME HOW

BE 8-3 Direct materials purchases budget — Obj. 4

Pasadena Candle Inc. budgeted production of 785,000 candles for January. Wax is required to produce a candle. Assume 10 ounces of wax is required for each candle. The estimated January 1 wax inventory is 16,000 pounds. The desired January 31 wax inventory is 12,500 pounds. If candle wax costs $1.24 per pound, determine the direct materials purchases budget for January.

SHOW ME HOW

BE 8-4 Direct labor cost budget — Obj. 4

Pasadena Candle Inc. budgeted production of 785,000 candles for January. Each candle requires molding. Assume that six minutes are required to mold each candle. If molding labor costs $18 per hour, determine the direct labor cost budget for January.

SHOW ME HOW

BE 8-5 Cost of goods sold budget — Obj. 4

Prepare a cost of goods sold budget for Pasadena Candle Inc. using the information in Basic Exercises 3 and 4. Assume the estimated inventories on January 1 for finished goods and work in process were $200,000 and $41,250, respectively. Also assume the desired inventories on January 31 for finished goods and work in process were $120,000 and $28,500, respectively. Factory overhead was budgeted at $300,000.

SHOW ME HOW

BE 8-6 Cash budget — Obj. 5

Pasadena Candle Inc. pays 40% of its purchases on account in the month of the purchase and 60% in the month following the purchase. If purchases are budgeted to be $40,000 for August and $36,000 for September, what are the budgeted cash payments for purchases on account for September?

Exercises

✔ a. December 31 cash balance, $3,490

SHOW ME HOW EXCEL TEMPLATE

EX 8-1 Personal budget — Obj. 2, 5

At the beginning of the school year, Craig Kovar decided to prepare a cash budget for the months of September, October, November, and December. The budget must plan for enough cash on

December 31 to pay the spring semester tuition, which is the same as the fall tuition. The following information relates to the budget:

Cash balance, September 1 (from a summer job)	$9,250
Purchase season football tickets in September	160
Additional entertainment for each month	250
Pay fall semester tuition in September	4,800
Pay rent at the beginning of each month	600
Pay for food each month	550
Pay apartment deposit on September 2 (to be returned December 15)	600
Part-time job earnings each month (net of taxes)	1,200

a. Prepare a cash budget for September, October, November, and December.

b. Are the four monthly budgets that are presented prepared as static budgets or flexible budgets?

c. What are the budget implications for Craig Kovar?

EX 8-2 Flexible budget for selling and administrative expenses for a service company

Obj. 2, 4

✔ Total selling and administrative expenses at $500,000 sales, $440,000

SHOW ME HOW EXCEL TEMPLATE

Digital Solutions Inc. uses flexible budgets that are based on the following data:

Sales commissions	8% of sales
Advertising expense	15% of sales
Miscellaneous administrative expense	$10,000 per month plus 4% of sales
Office salaries expense	$50,000 per month
Customer support expenses	$20,000 per month plus 30% of sales
Research and development expense	$75,000 per month

Prepare a flexible selling and administrative expenses budget for October for sales volumes of $500,000, $750,000, and $1,000,000.

EX 8-3 Static budget versus flexible budget

Obj. 2, 4

✔ b. Excess of actual cost over budget for May, $(16,000)

SHOW ME HOW EXCEL TEMPLATE

The production supervisor of the Machining Department for Hagerstown Company agreed to the following monthly static budget for the upcoming year:

Hagerstown Company
Machining Department
Monthly Production Budget

Wages	$2,250,000
Utilities	72,000
Depreciation	36,000
Total	$2,358,000

The actual amount spent and the actual units produced in the first three months in the Machining Department were as follows:

	Amount Spent	Units Produced
May	$1,600,000	40,000
June	1,950,000	48,000
July	2,200,000	52,000

The Machining Department supervisor has been very pleased with this performance because actual expenditures for May–July have been significantly less than the monthly static budget of $2,358,000. However, the plant manager believes that the budget should not remain fixed for

(Continued)

every month but should "flex" or adjust to the volume of work that is produced in the Machining Department. Additional budget information for the Machining Department is as follows:

Wages per hour	$25.00
Utility cost per direct labor hour	$0.80
Direct labor hours per unit	1.5
Planned monthly unit production	60,000

a. Prepare a flexible budget for the actual units produced for May, June, and July in the Machining Department. Assume depreciation is a fixed cost.

b. Compare the flexible budget with the actual expenditures for the first three months. What does this comparison suggest?

EX 8-4 Flexible budget for Assembly Department — Obj. 2

✔ Total department costs at 70,000 units, $856,500

SHOW ME HOW EXCEL TEMPLATE

REAL WORLD

Steelcase Inc. (SCS) is one of the largest manufacturers of office furniture in the United States. In Grand Rapids, Michigan, it assembles filing cabinets in an Assembly Department. Assume the following information for the Assembly Department:

Direct labor per filing cabinet	18 minutes
Supervisor salaries	$250,000 per month
Depreciation	$18,500 per month
Direct labor rate	$28 per hour

Prepare a flexible budget for 70,000, 80,000, and 90,000 filing cabinets for the month ending February 28 in the Assembly Department, similar to Exhibit 5.

EX 8-5 Production budget — Obj. 4

✔ Bath scale total units to be produced, 118,200 units

SHOW ME HOW

Healthy Measures Inc. produces a Bath and Gym version of its popular electronic scale. The anticipated unit sales for the scales by sales region are as follows:

	Bath Scale	Gym Scale
Northern Region unit sales	40,000	25,000
Southern Region unit sales	75,000	35,000
Total	115,000	60,000

The finished goods inventory estimated for March 1, for the Bath and Gym scale models is 11,800 and 8,100 units, respectively. The desired finished goods inventory for March 31 for the Bath and Gym scale models is 15,000 and 7,500 units, respectively.

Prepare a production budget for the Bath and Gym scales for the month ended March 31.

EX 8-6 Sales and production budgets — Obj. 4

✔ b. Model Rumble total production, 25,750 units

SHOW ME HOW EXCEL TEMPLATE

Sonic Inc. manufactures two models of speakers, Rumble and Thunder. Based on the following production and sales data for June, prepare (a) a sales budget and (b) a production budget:

	Rumble	Thunder
Estimated inventory (units), June 1	750	300
Desired inventory (units), June 30	500	250
Expected sales volume (units):		
Midwest Region	12,000	3,500
South Region	14,000	4,000
Unit sales price	$60	$90

EX 8-7 Professional fees earned budget for a service company — Obj. 4

✔ Total professional fees earned, $16,550,000

Lundquist & Fretwell, CPAs, offer three types of services to clients: auditing, tax, and small business accounting. Based on experience and projected growth, the following billable hours have been estimated for the year ending May 31, 20Y8:

	Billable Hours
Audit Department:	
Staff	25,000
Partners	6,000
Tax Department:	
Staff	40,000
Partners	8,500
Small Business Accounting Department:	
Staff	5,000
Partners	500

The average billing rate for staff is $140 per hour, and the average billing rate for partners is $450 per hour. Prepare a professional fees earned budget for Lundquist & Fretwell, CPAs, for the year ending May 31, 20Y8, using the following column headings and showing the estimated professional fees by type of service rendered:

Billable Hours	Hourly Rate	Total Revenue

EX 8-8 Professional labor cost budget for a service company

Obj. 4

✔ Staff total labor cost, $2,800,000

Based on the data in Exercise 7 and assuming that the average compensation per hour for staff is $40 and for partners is $175, prepare a professional labor cost budget for each department for Lundquist & Fretwell, CPAs, for the year ending May 31, 20Y8. Use the following column headings:

Staff	Partners

EX 8-9 Direct materials purchases budget

Obj. 4

✔ Total cheese purchases, $92,480


SHOW ME HOW


EXCEL TEMPLATE

Tobin's Frozen Pizza Inc. has determined from its production budget the following estimated production volumes for 12" and 16" frozen pizzas for November:

	Units	
	12" Pizza	16" Pizza
Budgeted production volume	70,000	50,000

There are three direct materials used in producing the two types of pizza. The quantities of direct materials expected to be used for each pizza are as follows:

	12" Pizza	16" Pizza
Direct materials:		
Dough	0.55 lb. per unit	0.80 lb. per unit
Tomato	0.25	0.40
Cheese	0.70	1.20

In addition, Tobin's has determined the following information about each material:

	Dough	Tomato	Cheese
Estimated inventory, November 1	2,500 lbs.	1,000 lbs.	3,000 lbs.
Desired inventory, November 30	2,000 lbs.	1,200 lbs.	2,800 lbs.
Price per pound	$0.50	$0.60	$0.85

Prepare November's direct materials purchases budget for Tobin's Frozen Pizza Inc.

EX 8-10 Direct materials purchases budget

Obj. 4

✔ Concentrate budgeted purchases, $47,400


REAL WORLD

Coca-Cola Enterprises (CCE) is the largest bottler of Coca-Cola® in Western Europe. The company purchases Coke® and Sprite® concentrate from **The Coca-Cola Company (KO)**, dilutes and mixes the concentrate with carbonated water, and then fills the blended beverage into cans or

(Continued)

plastic two-liter bottles. Assume that the estimated production for Coke and Sprite two-liter bottles at the Wakefield, UK, bottling plant is as follows for the month of May:

Coke	153,000 two-liter bottles
Sprite	86,500 two-liter bottles

In addition, assume that the concentrate costs $75 per pound for both Coke and Sprite and is used at a rate of 0.15 pound per 100 liters of carbonated water in blending Coke and 0.10 pound per 100 liters of carbonated water in blending Sprite. Assume that two liters of carbonated water are used for each two-liter bottle of finished product. Assume further that two-liter bottles cost $0.08 per bottle and carbonated water costs $0.06 per liter.

Prepare a direct materials purchases budget for May, assuming inventories are ignored, because there are no changes between beginning and ending inventories for concentrate, bottles, and carbonated water.

EX 8-11 Direct materials purchases budget — Obj. 4

✔ Total steel belt purchases, $291,200



Anticipated sales for Safety Grip Company were 42,000 passenger car tires and 19,000 truck tires. Rubber and steel belts are used in producing passenger car and truck tires as follows:

	Passenger Car	Truck
Rubber	35 lbs. per unit	78 lbs. per unit
Steel belts	5 lbs. per unit	8 lbs. per unit

The purchase prices of rubber and steel are $1.20 and $0.80 per pound, respectively. The desired ending inventories of rubber and steel belts are 40,000 and 10,000 pounds, respectively. The estimated beginning inventories for rubber and steel belts are 46,000 and 8,000 pounds, respectively.

Prepare a direct materials purchases budget for Safety Grip Company for the year ended December 31, 20Y9.

EX 8-12 Direct labor cost budget — Obj. 4

✔ Total direct labor cost, Assembly, $31,080

Ace Racket Company manufactures two types of tennis rackets, the Junior and Pro Striker models. The production budget for July for the two rackets is as follows:

	Junior	Pro Striker
Production budget	1,500 units	6,200 units

Both rackets are produced in two departments, Forming and Assembly. The direct labor hours required for each racket are estimated as follows:

	Forming Department	Assembly Department
Junior	0.16 hr. per unit	0.24 hr. per unit
Pro Striker	0.20 hr. per unit	0.30 hr. per unit

The direct labor rate for each department is as follows:

Forming Department	$18 per hour
Assembly Department	$14 per hour

Prepare the direct labor cost budget for July.

EX 8-13 Production and direct labor cost budgets — Obj. 4

✔ a. Total production of 501 Jeans, 53,300





Levi Strauss & Co. manufactures slacks and jeans under a variety of brand names, such as Dockers® and 501 Jeans®. Slacks and jeans are assembled by a variety of different sewing operations.

Assume that the sales budget for Dockers and 501 Jeans shows estimated sales of 23,600 and 53,100 pairs, respectively, for May. The finished goods inventory is assumed as follows:

	Dockers	501 Jeans
May 1 estimated inventory	670	1,660
May 31 desired inventory	420	1,860

Assume the following direct labor data per 10 pairs of Dockers and 501 Jeans for four different sewing operations:

	Direct Labor per 10 Pairs	
	Dockers	501 Jeans
Inseam	18 minutes	9 minutes
Outerseam	20	14
Pockets	6	9
Zipper	12	6
Total	56 minutes	38 minutes

a. Prepare a production budget for May. Prepare the budget in two columns: Dockers® and 501 Jeans®.

b. Prepare the May direct labor cost budget for the four sewing operations, assuming a $13 wage per hour for the inseam and outerseam sewing operations and a $15 wage per hour for the pocket and zipper sewing operations. Prepare the direct labor cost budget in four columns: inseam, outerseam, pockets, and zipper.

EX 8-14 Factory overhead cost budget

Obj. 4

✔ Total variable factory overhead costs, $268,000



Sweet Tooth Candy Company budgeted the following costs for anticipated production for August:

Advertising expenses	$232,000	Production supervisor wages	$135,000
Manufacturing supplies	14,000	Production control wages	32,000
Power and light	48,000	Executive officer salaries	310,000
Sales commissions	298,000	Materials management wages	39,000
Factory insurance	30,000	Factory depreciation	22,000

Prepare a factory overhead cost budget, separating variable and fixed costs. Assume that factory insurance and depreciation are the only fixed factory costs.

EX 8-15 Cost of goods sold budget

Obj. 4

✔ Cost of goods sold, $3,788,100



Delaware Chemical Company uses oil to produce two types of plastic products, P1 and P2. Delaware budgeted 35,000 barrels of oil for purchase in June for $90 per barrel. Direct labor budgeted in the chemical process was $240,000 for June. Factory overhead was budgeted at $400,000 during June. The inventories on June 1 were estimated to be:

Oil	$15,200
P1	8,300
P2	8,600
Work in process	12,900

The desired inventories on June 30 were:

Oil	$16,100
P1	9,400
P2	7,900
Work in process	13,500

Use the preceding information to prepare a cost of goods sold budget for June.

EX 8-16 Cost of goods sold budget

Obj. 4

✔ Cost of goods sold, $488,360

The controller of MingWare Ceramics Inc. wishes to prepare a cost of goods sold budget for September. The controller assembled the following information for constructing the cost of goods sold budget:

Direct materials:	Enamel	Paint	Porcelain	Total
Total direct materials purchases budgeted for September	$36,780	$6,130	$145,500	$188,410
Estimated inventory, September 1	1,240	950	4,250	6,440
Desired inventory, September 30	1,890	1,070	5,870	8,830

Direct labor cost:	Kiln Department	Decorating Department	Total
Total direct labor cost budgeted for September	$47,900	$145,700	$193,600

Finished goods inventories:	Dish	Bowl	Figurine	Total
Estimated inventory, September 1	$5,780	$3,080	$2,640	$11,500
Desired inventory, September 30	3,710	2,670	3,290	9,670

Work in process inventories:	
Estimated inventory, September 1	$3,400
Desired inventory, September 30	1,990

Budgeted factory overhead costs for September:	
Indirect factory wages	$ 81,900
Depreciation of plant and equipment	14,300
Power and light	5,200
Indirect materials	4,100
Total	$105,500

Use the preceding information to prepare a cost of goods sold budget for September.

EX 8-17 Schedule of cash collections of accounts receivable

Obj. 5

✔ Total cash collected in March, $677,500


SHOW ME HOW


EXCEL TEMPLATE

Pet Supplies Inc., a pet wholesale supplier, was organized on January 1. Projected sales for each of the first three months of operations are as follows:

January	$300,000
February	500,000
March	750,000

All sales are on account. Seventy-five percent of sales are expected to be collected in the month of the sale, 20% in the month following the sale, and the remainder in the second month following the sale.

Prepare a schedule indicating cash collections from sales for January, February, and March.

EX 8-18 Schedule of cash collections of accounts receivable

Obj. 5

✔ Total cash collected in October, $62,550

OfficeMart Inc. has "cash and carry" customers and credit customers. OfficeMart estimates that 25% of monthly sales are to cash customers, while the remaining sales are to credit customers. Of the credit customers, 30% pay their accounts in the month of sale, while the remaining 70% pay their accounts in the month following the month of sale. Projected sales for the next three months are as follows:

October	$58,000
November	65,000
December	72,000

The Accounts Receivable balance on September 30 was $35,000.

Prepare a schedule of cash collections from sales for October, November, and December.

EX 8-19 Schedule of cash payments for a service company — Obj. 5

✔ Total cash payments in May, $58,490

Horizon Financial Inc. was organized on February 28. Projected selling and administrative expenses for each of the first three months of operations are as follows:

March	$52,400
April	64,200
May	68,900

Depreciation, insurance, and property taxes represent $9,000 of the estimated monthly expenses. The annual insurance premium was paid on February 28, and property taxes for the year will be paid in June. Seventy percent of the remainder of the expenses are expected to be paid in the month in which they are incurred, with the balance to be paid in the following month.

Prepare a schedule of cash payments for selling and administrative expenses for March, April, and May.

EX 8-20 Schedule of cash payments for a service company — Obj. 5

✔ Total cash payments in March, $113,740



EastGate Physical Therapy Inc. is planning its cash payments for operations for the first quarter (January–March). The Accrued Expenses Payable balance on January 1 is $15,000. The budgeted expenses for the next three months are as follows:

	January	February	March
Salaries	$56,900	$ 68,100	$ 72,200
Utilities	2,400	2,600	2,500
Other operating expenses	32,300	41,500	44,700
Total	$91,600	$112,200	$119,400

Other operating expenses include $3,000 of monthly depreciation expense and $500 of monthly insurance expense that was prepaid for the year on May 1 of the previous year. Of the remaining expenses, 70% are paid in the month in which they are incurred, with the remainder paid in the following month. The Accrued Expenses Payable balance on January 1 relates to the expenses incurred in December.

Prepare a schedule of cash payments for operations for January, February, and March.

EX 8-21 Capital expenditures budget — Obj. 5

✔ Total capital expenditures in 20Y6, $4,000,000



On January 1, 20Y6, the controller of Omicron Inc. is planning capital expenditures for the years 20Y6–20Y9. The following interviews helped the controller collect the necessary information for the capital expenditures budget:

Director of Facilities: A construction contract was signed in late 20Y5 for the construction of a new factory building at a contract cost of $10,000,000. The construction is scheduled to begin in 20Y6 and be completed in 20Y9.

Vice President of Manufacturing: Once the new factory building is finished, we plan to purchase $1.5 million in equipment in late 20Y7. I expect that an additional $200,000 will be needed early in the following year (20Y8) to test and install the equipment before we can begin production. If sales continue to grow, I expect we'll need to invest another $1,000,000 in equipment in 20Y9.

Chief Operating Officer: We have really been growing lately. I wouldn't be surprised if we need to expand the size of our new factory building in 20Y9 by at least 35%. Fortunately, we expect inflation to have minimal impact on construction costs over the next four years. Additionally, I would expect the cost of the expansion to be proportional to the size of the expansion.

Director of Information Systems: We need to upgrade our information systems to wireless network technology. It doesn't make sense to do this until after the new factory building is completed and producing product. During 20Y8, once the factory is up and running, we should equip the whole facility with wireless technology. I think it would cost us $800,000 today to install the technology. However, prices have been dropping by 25% per year, so it should be less expensive at a later date.

Chief Financial Officer: I am excited about our long-term prospects. My only short-term concern is managing our cash flow while we expend the $4,000,000 of construction costs in 20Y6 and $6,000,000 in 20Y7 on the portion of the new factory building scheduled to be completed in 20Y9.

Use this interview information to prepare a capital expenditures budget for Omicron Inc. for the years 20Y6–20Y9.

Problems: Series A

PR 8-1A Forecast sales volume and sales budget

Obj. 4

✔ 3. Total revenue from sales, $878,403



EXCEL TEMPLATE

For 20Y8, Raphael Frame Company prepared the sales budget that follows.

At the end of December 20Y8, the following unit sales data were reported for the year:

	Unit Sales	
	8" × 10" Frame	12" × 16" Frame
East	8,755	3,686
Central	6,510	3,090
West	12,348	5,616

Raphael Frame Company
Sales Budget
For the Year Ending December 31, 20Y8

Product and Area	Unit Sales Volume	Unit Selling Price	Total Sales
8" × 10" Frame:			
East	8,500	$16	$136,000
Central	6,200	16	99,200
West	12,600	16	201,600
Total	27,300		$436,800
12" × 16" Frame:			
East	3,800	$30	$114,000
Central	3,000	30	90,000
West	5,400	30	162,000
Total	12,200		$366,000
Total revenue from sales			$802,800

For the year ending December 31, 20Y9, unit sales are expected to follow the patterns established during the year ending December 31, 20Y8. The unit selling price for the 8" × 10" frame is expected to increase to $17 and the unit selling price for the 12" × 16" frame is expected to increase to $32, effective January 1, 20Y9.

Instructions

1. Compute the increase or decrease of actual unit sales for the year ended December 31, 20Y8, over budget. Place your answers in a columnar table with the following format:

	Unit Sales, Year Ended 20Y8		Increase (Decrease) Actual Over Budget	
	Budget	Actual Sales	Amount	Percent
8" × 10" Frame:				
East				
Central				
West				
12" × 16" Frame:				
East				
Central				
West				

2. Assuming that the increase or decrease in actual sales to budget indicated in part (1) is to continue in 20Y9, compute the unit sales volume to be used for preparing the sales budget for the year ending December 31, 20Y9. Place your answers in a columnar table similar to that in part (1) but with the following column heads. Round budgeted units to the nearest unit.

20Y8 Actual Units	Percentage Increase (Decrease)	20Y9 Budgeted Units (rounded)

3. Prepare a sales budget for the year ending December 31, 20Y9.

PR 8-2A Sales, production, direct materials purchases, and direct labor cost budgets Obj. 4

✔ 3. Total direct materials purchases, $771,490



EXCEL TEMPLATE

The budget director of Gourmet Grill Company requests estimates of sales, production, and other operating data from the various administrative units every month. Selected information concerning sales and production for July is summarized as follows:

a. Estimated sales for July by sales territory:

Maine:	
Backyard Chef	310 units at $700 per unit
Master Chef	150 units at $1,200 per unit
Vermont:	
Backyard Chef	240 units at $750 per unit
Master Chef	110 units at $1,300 per unit
New Hampshire:	
Backyard Chef	360 units at $750 per unit
Master Chef	180 units at $1,400 per unit

b. Estimated inventories at July 1:

Direct materials:		Finished products:	
Grates	290 units	Backyard Chef	30 units
Stainless steel	1,500 lbs.	Master Chef	32 units
Burner subassemblies	170 units		
Shelves	340 units		

c. Desired inventories at July 31:

Direct materials:		Finished products:	
Grates	340 units	Backyard Chef	40 units
Stainless steel	1,800 lbs.	Master Chef	22 units
Burner subassemblies	155 units		
Shelves	315 units		

d. Direct materials used in production:

In manufacture of Backyard Chef:	
Grates	3 units per unit of product
Stainless steel	24 lbs. per unit of product
Burner subassemblies	2 units per unit of product
Shelves	4 units per unit of product
In manufacture of Master Chef:	
Grates	6 units per unit of product
Stainless steel	42 lbs. per unit of product
Burner subassemblies	4 units per unit of product
Shelves	5 units per unit of product

e. Anticipated purchase price for direct materials:

Grates	$15 per unit	Burner subassemblies	$110 per unit
Stainless steel	$6 per lb.	Shelves	$10 per unit

f. Direct labor requirements:

Backyard Chef:	
Stamping Department	0.50 hr. at $17 per hr.
Forming Department	0.60 hr. at $15 per hr.
Assembly Department	1.00 hr. at $14 per hr.
Master Chef:	
Stamping Department	0.60 hr. at $17 per hr.
Forming Department	0.80 hr. at $15 per hr.
Assembly Department	1.50 hrs. at $14 per hr.

(Continued)

Instructions

1. Prepare a sales budget for July.
2. Prepare a production budget for July.
3. Prepare a direct materials purchases budget for July.
4. Prepare a direct labor cost budget for July.

PR 8-3A Budgeted income statement and supporting budgets

Obj. 4

✔ 4. Total direct labor cost in Fabrication Dept., $293,850



EXCEL TEMPLATE

The budget director of Birding Homes & Feeders Inc., with the assistance of the controller, treasurer, production manager, and sales manager, has gathered the following data for use in developing the budgeted income statement for January:

a. Estimated sales for January:

Bird house	15,000 units at $25 per unit
Bird feeder	40,000 units at $15 per unit

b. Estimated inventories at January 1:

Direct materials:		Finished products:	
Wood	600 ft.	Bird house	1,000 units at $15 per unit
Plastic	1,000 lbs.	Bird feeder	2,500 units at $8 per unit

c. Desired inventories at January 31:

Direct materials:		Finished products:	
Wood	500 ft.	Bird house	1,500 units at $15 per unit
Plastic	1,250 lbs.	Bird feeder	3,000 units at $8 per unit

d. Direct materials used in production:

In manufacture of bird house:		In manufacture of bird feeder:	
Wood	0.80 ft. per unit of product	Wood	0.20 ft. per unit of product
Plastic	0.10 lb. per unit of product	Plastic	1.00 lb. per unit of product

e. Anticipated cost of purchases and beginning and ending inventory of direct materials:

Wood	$2.50 per ft.	Plastic	$0.80 per lb.

f. Direct labor requirements:

Bird house:	
Fabrication Department	0.40 hr. at $18 per hr.
Assembly Department	0.20 hr. at $12 per hr.
Bird feeder:	
Fabrication Department	0.25 hr. at $18 per hr.
Assembly Department	0.10 hr. at $12 per hr.

g. Estimated factory overhead costs for January:

Indirect factory wages	$40,000	Power and light	$10,000
Depreciation of plant and equipment	20,000	Insurance and property tax	5,000

h. Estimated operating expenses for January:

Sales salaries expense	$125,000
Advertising expense	80,000
Office salaries expense	40,000
Depreciation expense—office equipment	4,000
Travel expense—selling	25,000
Office supplies expense	2,500
Miscellaneous administrative expense	3,500

i. Estimated other revenue and expense for January:

Interest revenue	$4,540
Interest expense	3,000

j. Estimated tax rate: 25%

Instructions

1. Prepare a sales budget for January.
2. Prepare a production budget for January.
3. Prepare a direct materials purchases budget for January.
4. Prepare a direct labor cost budget for January.
5. Prepare a factory overhead cost budget for January.
6. Prepare a cost of goods sold budget for January. Work in process at the beginning of January is estimated to be $9,000, and work in process at the end of January is estimated to be $10,500.
7. Prepare a selling and administrative expenses budget for January.
8. Prepare a budgeted income statement for January.

PR 8-4A Budgeted income statement and supporting budgets for three months

Obj. 4

✔ 8. Operating income for quarter, $2,365,000

Bellaire Inc. gathered the following data for use in developing the budgets for the first quarter (January, February, March) of its fiscal year:

a. Estimated sales at $125 per unit:

January	25,000 units
February	30,000 units
March	45,000 units
April	50,000 units

b. Estimated finished goods inventories:

January 1	2,000 units
January 31	10% of next month's sales
February 28	10% of next month's sales
March 31	10% of next month's sales

c. Work in process inventories are estimated to be insignificant (zero).

d. Estimated direct materials inventories:

January 1	1,000 lbs.
January 31	1,500 lbs.
February 28	2,000 lbs.
March 31	2,500 lbs.

e. Manufacturing costs:

	Per Unit
Direct materials (0.8 lb. per unit × $15 per lb.)	$12
Direct labor (2.5 hrs. per unit × $24 per hr.)	60
Variable factory overhead ($1.20 per direct labor hour)	3
Fixed factory overhead ($200,000 per month, allocated using 40,000 units)	5
Total per-unit manufacturing costs	$80

f. Selling expenses:

Variable selling expenses	$4 per unit
Fixed selling expenses	$150,000
Administrative expenses (all fixed costs)	$400,000

(Continued)

Instructions

Prepare the following budgets using one column for each month and a total column for the first quarter, as shown for the sales budget:

Bellaire Inc.
Sales Budget
For the First Quarter Ending March 31

	January	February	March	First Quarter
Estimated units sold	25,000	30,000	45,000	100,000

1. Prepare a sales budget for March.
2. Prepare a production budget for March.
3. Prepare a direct materials purchases budget for March.
4. Prepare a direct labor cost budget for March.
5. Prepare a factory overhead cost budget for March.
6. Prepare a cost of goods sold budget for March.
7. Prepare a selling and administrative expenses budget for March.
8. Prepare a budgeted income statement with budgeted operating income for March.

PR 8-5A Cash budget

Obj. 5

✔ 1. November deficiency, $(8,500)


SHOW ME HOW


EXCEL TEMPLATE

The controller of Bridgeport Housewares Inc. instructs you to prepare a monthly cash budget for the next three months. You are presented with the following budget information:

	September	October	November
Sales	$250,000	$300,000	$315,000
Manufacturing costs	150,000	180,000	185,000
Selling and administrative expenses	42,000	48,000	51,000
Capital expenditures			200,000

The company expects to sell about 10% of its merchandise for cash. Of sales on account, 70% are expected to be collected in the month following the sale and the remainder the following month (second month following sale). Depreciation, insurance, and property tax expense represent $50,000 of the estimated monthly manufacturing costs. The annual insurance premium is paid in January, and the annual property taxes are paid in December. Of the remainder of the manufacturing costs, 80% are expected to be paid in the month in which they are incurred and the balance in the following month.

Current assets as of September 1 include cash of $40,000, marketable securities of $75,000, and accounts receivable of $300,000 ($60,000 from July sales and $240,000 from August sales). Sales on account for July and August were $200,000 and $240,000, respectively. Current liabilities as of September 1 include $40,000 of accounts payable incurred in August for manufacturing costs. All selling and administrative expenses are paid in cash in the period they are incurred. An estimated income tax payment of $55,000 will be made in October. Bridgeport's regular quarterly dividend of $25,000 is expected to be declared in October and paid in November. Management desires to maintain a minimum cash balance of $50,000.

Instructions

1. Prepare a monthly cash budget and supporting schedules for September, October, and November.
2. On the basis of the cash budget prepared in part (1), what recommendation should be made to the controller?

PR 8-6A Budgeted income statement and balance sheet

Obj. 4, 5

✔ 1. Budgeted net income, $96,600



EXCEL TEMPLATE

As a preliminary to requesting budget estimates of sales, costs, and expenses for the fiscal year beginning January 1, 20Y9, the following tentative trial balance as of December 31, 20Y8, is prepared by the Accounting Department of Regina Soap Co.:

Cash	$ 85,000	
Accounts Receivable	125,600	
Finished Goods	69,300	
Work in Process	32,500	
Materials	48,900	
Prepaid Expenses	2,600	
Plant and Equipment	325,000	
Accumulated Depreciation—Plant and Equipment		$156,200
Accounts Payable		62,000
Common Stock, $10 par		180,000
Retained Earnings		290,700
	$688,900	$688,900

Factory output and sales for 20Y9 are expected to total 200,000 units of product, which are to be sold at $5.00 per unit. The quantities and costs of the inventories at December 31, 20Y9, are expected to remain unchanged from the balances at the beginning of the year.

Budget estimates of manufacturing costs and operating expenses for the year are summarized as follows:

	Estimated Costs and Expenses	
	Fixed (Total for Year)	Variable (Per Unit Sold)
Cost of goods manufactured and sold:		
Direct materials	—	$1.10
Direct labor	—	0.65
Factory overhead:		
Depreciation of plant and equipment	$40,000	—
Other factory overhead	12,000	0.40
Selling expenses:		
Sales salaries and commissions	46,000	0.45
Advertising	64,000	—
Miscellaneous selling expense	6,000	0.25
Administrative expenses:		
Office and officers salaries	72,400	0.12
Supplies	5,000	0.10
Miscellaneous administrative expense	4,000	0.05

Balances of accounts receivable, prepaid expenses, and accounts payable at the end of the year are not expected to differ significantly from the beginning balances. Federal income tax of $30,000 on 20Y9 taxable income will be paid during 20Y9. Regular quarterly cash dividends of $0.15 per share are expected to be declared and paid in March, June, September, and December on 18,000 shares of common stock outstanding. It is anticipated that fixed assets will be purchased for $75,000 cash in May.

Instructions

1. Prepare a budgeted income statement for 20Y9.
2. Prepare a budgeted balance sheet as of December 31, 20Y9, with supporting calculations.

Problems: Series B

PR 8-1B Forecast sales volume and sales budget

Obj. 4

✔ 3. Total revenue from sales, $2,148,950



EXCEL TEMPLATE

Sentinel Systems Inc. prepared the following sales budget for 20Y8:

Sentinel Systems Inc.
Sales Budget
For the Year Ending December 31, 20Y8

Product and Area	Unit Sales Volume	Unit Selling Price	Total Sales
Home Alert System:			
United States	1,700	$200	$ 340,000
Europe	580	200	116,000
Asia	450	200	90,000
Total	2,730		$ 546,000
Business Alert System:			
United States	980	$750	$ 735,000
Europe	350	750	262,500
Asia	240	750	180,000
Total	1,570		$1,177,500
Total revenue from sales			$1,723,500

At the end of December 20Y8, the following unit sales data were reported for the year:

	Unit Sales	
	Home Alert System	Business Alert System
United States	1,734	1,078
Europe	609	329
Asia	432	252

For the year ending December 31, 20Y9, unit sales are expected to follow the patterns established during the year ending December 31, 20Y8. The unit selling price for the Home Alert System is expected to increase to $250, and the unit selling price for the Business Alert System is expected to be increased to $820, effective January 1, 20Y9.

Instructions

1. Compute the increase or decrease of actual unit sales for the year ended December 31, 20Y8, over budget. Place your answers in a columnar table with the following format:

	Unit Sales, Year Ended 20Y8		Increase (Decrease) Actual Over Budget	
	Budget	Actual Sales	Amount	Percent
Home Alert System:				
United States				
Europe				
Asia				
Business Alert System:				
United States				
Europe				
Asia				

2. Assuming that the increase or decrease in actual sales to budget indicated in part (1) is to continue in 20Y9, compute the unit sales volume to be used for preparing the sales budget for the year ending December 31, 20Y9. Place your answers in a columnar table similar to that in part (1) but with the following column heads. Round budgeted units to the nearest unit.

20Y8 Actual Units	Percentage Increase (Decrease)	20Y9 Budgeted Units (rounded)

3. Prepare a sales budget for the year ending December 31, 20Y9.

PR 8-2B Sales, production, direct materials purchases, and direct labor cost budgets

Obj. 4

✔ 3. Total direct materials purchases, $987,478



EXCEL TEMPLATE

The budget director of Royal Furniture Company requests estimates of sales, production, and other operating data from the various administrative units every month. Selected information concerning sales and production for February is summarized as follows:

a. Estimated sales of King and Prince chairs for February by sales territory:

Northern Domestic:	
King	610 units at $780 per unit
Prince	750 units at $550 per unit
Southern Domestic:	
King	340 units at $780 per unit
Prince	440 units at $550 per unit
International:	
King	360 units at $850 per unit
Prince	290 units at $600 per unit

b. Estimated inventories at February 1:

Direct materials:		Finished products:	
Fabric	420 sq. yds.	King	90 units
Wood	580 linear ft.	Prince	25 units
Filler	250 cu. ft.		
Springs	660 units		

c. Desired inventories at February 28:

Direct materials:		Finished products:	
Fabric	390 sq. yds.	King	80 units
Wood	650 linear ft.	Prince	35 units
Filler	300 cu. ft.		
Springs	540 units		

d. Direct materials used in production:

In manufacture of King:	
Fabric	6.0 sq. yds. per unit of product
Wood	38 linear ft. per unit of product
Filler	4.2 cu. ft. per unit of product
Springs	16 units per unit of product
In manufacture of Prince:	
Fabric	4.0 sq. yds. per unit of product
Wood	26 linear ft. per unit of product
Filler	3.4 cu. ft. per unit of product
Springs	12 units per unit of product

e. Anticipated purchase price for direct materials:

Fabric	$12.00 per sq. yd.	Filler	$3.00 per cu. ft.
Wood	7.00 per linear ft.	Springs	4.50 per unit

(Continued)

f. Direct labor requirements:

King:	
Framing Department	1.2 hrs. at $12 per hr.
Cutting Department	0.5 hr. at $14 per hr.
Upholstery Department	0.8 hr. at $15 per hr.
Prince:	
Framing Department	1.0 hr. at $12 per hr.
Cutting Department	0.4 hr. at $14 per hr.
Upholstery Department	0.6 hr. at $15 per hr.

Instructions

1. Prepare a sales budget for February.
2. Prepare a production budget for February.
3. Prepare a direct materials purchases budget for February.
4. Prepare a direct labor cost budget for February.

PR 8-3B Budgeted income statement and supporting budgets

Obj. 4

✔ 4. Total direct labor cost in Assembly Dept., $171,766

EXCEL TEMPLATE

The budget director of Gold Medal Athletic Co., with the assistance of the controller, treasurer, production manager, and sales manager, has gathered the following data for use in developing the budgeted income statement for March:

a. Estimated sales for March:

Batting helmet	1,200 units at $40 per unit
Football helmet	6,500 units at $160 per unit

b. Estimated inventories at March 1:

Direct materials:		Finished products:	
Plastic	90 lbs.	Batting helmet	40 units at $25 per unit
Foam lining	80 lbs.	Football helmet	240 units at $77 per unit

c. Desired inventories at March 31:

Direct materials:		Finished products:	
Plastic	50 lbs.	Batting helmet	50 units at $25 per unit
Foam lining	65 lbs.	Football helmet	220 units at $78 per unit

d. Direct materials used in production:

In manufacture of batting helmet:	
Plastic	1.2 lbs. per unit of product
Foam lining	0.5 lb. per unit of product
In manufacture of football helmet:	
Plastic	3.5 lbs. per unit of product
Foam lining	1.5 lbs. per unit of product

e. Anticipated cost of purchases and beginning and ending inventory of direct materials:

Plastic	$6 per lb.
Foam lining	$4 per lb.

f. Direct labor requirements:

Batting helmet:	
Molding Department	0.2 hr. at $20 per hr.
Assembly Department	0.5 hr. at $14 per hr.
Football helmet:	
Molding Department	0.5 hr. at $20 per hr.
Assembly Department	1.8 hrs. at $14 per hr.

g. Estimated factory overhead costs for March:

Indirect factory wages	$86,000	Power and light	$4,000
Depreciation of plant and equipment	12,000	Insurance and property tax	2,300

h. Estimated operating expenses for March:

Sales salaries expense	$184,300
Advertising expense	87,200
Office salaries expense	32,400
Depreciation expense—office equipment	3,800
Telephone expense—selling	5,800
Telephone expense—administrative	1,200
Travel expense—selling	9,000
Office supplies expense	1,100
Miscellaneous administrative expense	1,000

i. Estimated other revenue and expense for March:

Interest revenue	$940
Interest expense	872

j. Estimated tax rate: 30%

Instructions

1. Prepare a sales budget for March.
2. Prepare a production budget for March.
3. Prepare a direct materials purchases budget for March.
4. Prepare a direct labor cost budget for March.
5. Prepare a factory overhead cost budget for March.
6. Prepare a cost of goods sold budget for March. Work in process at the beginning of March is estimated to be $15,300, and work in process at the end of March is desired to be $14,800.
7. Prepare a selling and administrative expenses budget for March.
8. Prepare a budgeted income statement for March.

PR 8-4B Budgeted income statement and supporting budgets for three months

Obj. 4

✔ 8. Operating income for quarter, $10,851,600

Newport Inc. gathered the following data for use in developing the budgets for the first quarter (June, July, August) of its fiscal year:

a. Estimated sales at $36 per unit:

June	300,000 units
July	400,000 units
August	500,000 units
September	500,000 units

b. Estimated finished goods inventories:

May 31	16,000 units
June 30	5% of next month's sales
July 31	5% of next month's sales
August 31	5% of next month's sales

c. Work in process inventories are estimated to be insignificant (zero).

d. Estimated direct materials inventories:

May 31	35,000 pounds
June 30	40,000 pounds
July 31	45,000 pounds
August 31	50,000 pounds

(Continued)

e. Manufacturing costs:

	Per Unit
Direct materials (1.5 lbs. per unit × $4 per lb.)	$ 6.00
Direct labor (0.4 hr. per unit × $25 per hr.)	10.00
Variable factory overhead ($4 per direct labor hour)	1.60
Fixed factory overhead ($1,200,000 per month allocated using 500,000 units)	2.40
Total per-unit manufacturing costs	$20.00

f. Selling expenses:

Variable selling expenses	$3 per unit
Fixed selling expenses	$800,000
Administrative expenses (all fixed costs)	$550,000

Instructions

Prepare the following budgets using one column for each month and a total column for the first quarter, as shown for the sales budget:

Newport Inc.
Sales Budget
For the First Quarter Ending August 31

	June	July	August	First Quarter
Estimated units sold	300,000	400,000	500,000	1,200,000

1. Prepare a sales budget for August.
2. Prepare a production budget for August.
3. Prepare a direct materials purchases budget for August.
4. Prepare a direct labor cost budget for August.
5. Prepare a factory overhead cost budget for August.
6. Prepare a cost of goods sold budget for August.
7. Prepare a selling and administrative expenses budget for August.
8. Prepare a budgeted income statement with budgeted operating income for August.

PR 8-5B Cash budget

Obj. 5

✔ 1. August deficiency, $(9,000)


SHOW ME HOW


EXCEL TEMPLATE

The controller of Mercury Shoes Inc. instructs you to prepare a monthly cash budget for the next three months. You are presented with the following budget information:

	June	July	August
Sales	$160,000	$185,000	$200,000
Manufacturing costs	66,000	82,000	105,000
Selling and administrative expenses	40,000	46,000	51,000
Capital expenditures	—	—	120,000

The company expects to sell about 10% of its merchandise for cash. Of sales on account, 60% are expected to be collected in the month following the sale and the remainder the following month (second month after sale). Depreciation, insurance, and property tax expense represent $12,000 of the estimated monthly manufacturing costs. The annual insurance premium is paid in February, and the annual property taxes are paid in November. Of the remainder of the manufacturing costs, 80% are expected to be paid in the month in which they are incurred and the balance in the following month.

Current assets as of June 1 include cash of $42,000, marketable securities of $25,000, and accounts receivable of $198,000 ($150,000 from May sales and $48,000 from April sales). Sales on account in April and May were $120,000 and $150,000, respectively. Current liabilities as of June 1 include $13,000 of accounts payable incurred in May for manufacturing costs. All selling and administrative expenses are paid in cash in the period they are incurred. An estimated income tax payment of $24,000 will be made in July. Mercury Shoes' regular quarterly dividend of $15,000 is expected to be declared in July and paid in August. Management desires to maintain a minimum cash balance of $40,000.

Instructions

1. Prepare a monthly cash budget and supporting schedules for June, July, and August.
2. On the basis of the cash budget prepared in part (1), what recommendation should be made to the controller?

PR 8-6B Budgeted income statement and balance sheet

Obj. 4, 5

✔ 1. Budgeted net income, $114,660

EXCEL TEMPLATE

As a preliminary to requesting budget estimates of sales, costs, and expenses for the fiscal year beginning January 1, 20Y9, the following tentative trial balance as of December 31, 20Y8, is prepared by the Accounting Department of Mesa Publishing Co.:

Cash	$ 26,000	
Accounts Receivable	23,800	
Finished Goods	16,900	
Work in Process	4,200	
Materials	6,400	
Prepaid Expenses	600	
Plant and Equipment	82,000	
Accumulated Depreciation—Plant and Equipment		$ 32,000
Accounts Payable		14,800
Common Stock, $1.50 par		30,000
Retained Earnings		83,100
	$159,900	$159,900

Factory output and sales for 20Y9 are expected to total 3,800 units of product, which are to be sold at $120 per unit. The quantities and costs of the inventories at December 31, 20Y9, are expected to remain unchanged from the balances at the beginning of the year.

Budget estimates of manufacturing costs and operating expenses for the year are summarized as follows:

	Estimated Costs and Expenses	
	Fixed (Total for Year)	Variable (Per Unit Sold)
Cost of goods manufactured and sold:		
Direct materials	—	$30.00
Direct labor	—	8.40
Factory overhead:		
Depreciation of plant and equipment	$ 4,000	—
Other factory overhead	1,400	4.80
Selling expenses:		
Sales salaries and commissions	12,800	13.50
Advertising	13,200	—
Miscellaneous selling expense	1,000	2.50
Administrative expenses:		
Office and officers salaries	7,800	7.00
Supplies	500	1.20
Miscellaneous administrative expense	400	2.40

Balances of accounts receivable, prepaid expenses, and accounts payable at the end of the year are not expected to differ significantly from the beginning balances. Federal income tax of $35,000 on 20Y9 taxable income will be paid during 20Y9. Regular quarterly cash dividends of $0.20 per share are expected to be declared and paid in March, June, September, and December on 20,000 shares of common stock outstanding. It is anticipated that fixed assets will be purchased for $22,000 cash in May.

Instructions

1. Prepare a budgeted income statement for 20Y9.
2. Prepare a budgeted balance sheet as of December 31, 20Y9, with supporting calculations.

Make a Decision
Nonmanufacturing Staffing Budgets

MAD 8-1 Analyze Johnson Stores' staffing budget for holidays — Obj. 6

Johnson Stores is planning its staffing for the upcoming holiday season. From past history, the store determines that it needs one additional sales clerk for each $12,000 in daily sales. The average daily sales is anticipated to increase by $96,000 from Black Friday until Christmas Eve, or 27 shopping days. Each additional sales clerk will work an eight-hour shift and will be paid $14 per hour.

a. Determine the amount to budget for additional sales clerks for the holiday season.

b. If Johnson Stores has an average 40% gross profit on sales, should it add the staff suggested by your answer in (a)? That is, is it profitable to staff for the increased sales in (a)?

MAD 8-2 Analyze Mercy Hospital's staffing budget — Obj. 6

Mercy Hospital staffs its medical/surgical floors with nurses depending on the number of patients assigned to the floor and the severity of their condition. The index used to capture nurse effort is termed a relative value unit, or RVU. For example, taking vital signs for a single patient may be equal to one RVU. RVU's are then summed to estimate the total RVU requirements for the floor. From this, the nursing staff budget is determined.

The medical/surgical floor is scheduled to have 25 patients for each day of the coming seven-day week. Some patients will require more nursing effort than others, depending on the severity of their conditions or their ages. The following table summarizes the expected RVU requirements for the patients:

Number of Patients	RVUs per Day
5	20
8	25
10	30
2	40

A nurse earns $180 per day and is able to perform 40 RVUs per day.

a. Determine the total number of RVUs expected per day for the coming week.

b. Determine the total weekly nurse budget for the coming week.

MAD 8-3 Analyze Adventure Park's staffing budget — Obj. 6

Adventure Park is a large theme park. Staffing for the theme park involves many different labor classifications, one of which is the parking lot staff. The parking lot staff collects parking fees, provides directions, and operates trams. The staff size is a function of the number of daily vehicles. Adventure Park has determined from historical experience that a staff member is needed for every 200 vehicles.

Adventure Park estimates staff for both school days and nonschool days. Nonschool days are higher attendance days than school days. The number of expected vehicles for each day is as follows:

	School Days	Nonschool Days
Number of vehicles per day	3,000	8,000
Number of days per year	165	200

Parking fees are $10 per vehicle. Each parking lot employee is paid $110 per day.

a. Determine the annual parking lot staff budget for school days, nonschool days, and total.

b. Determine the parking revenue for school days, nonschool days, and total.

c. If depreciation expense and other expenses for running the parking lot were estimated to be $2 million per year, determine the parking lot's budgeted profit.

MAD 8-4 Analyze Ambassador Suites' staffing budget — Obj. 6

Ambassador Suites Inc. operates a downtown hotel property that has 300 rooms. On average, 80% of Ambassador Suites' rooms are occupied on weekdays, and 40% are occupied during the weekend. The manager has asked you to develop a budget for the housekeeping and restaurant staff for weekdays and weekends. You have determined that the housekeeping staff requires 30 minutes to clean each occupied room. The housekeeping staff is paid $14 per hour. The housekeeping labor cost is fully variable to the number of occupied rooms. The restaurant has six full-time staff on duty to staff the restaurant for breakfast and lunch (eight hours), regardless of occupancy. However, for every 60 occupied rooms, an additional person is brought in to work in the restaurant for breakfast and lunch (eight hours). The restaurant staff is paid $12 per hour.

Prepare two columns, labeled as weekday and weekend day.

a. Determine the number of rooms occupied for an average weekday and weekend day.
b. Determine the housekeeping staff budget for an average weekday and weekend day.
c. Determine the restaurant staff budget for an average weekday and weekend day.
d. Determine the total staff budget for an average weekday and weekend day.

Take It Further

ETHICS

TIF 8-1 Budgeting and timing of expenditures

The director of marketing for Starr Computer Co., Megan Hewitt, had the following discussion with the company controller, Cam Morley, on July 26 of the current year:

Megan: Cam, it looks like I'm going to spend much less than indicated on my July budget.

Cam: I'm glad to hear it.

Megan: Well, I'm not so sure it's good news. I'm concerned that the president will see that I'm under budget and reduce my budget in the future. The only reason that I look good is that we've delayed an advertising campaign. Once the campaign hits in September, I'm sure my actual expenditures will go up. You see, we are also having our sales convention in September. Having the advertising campaign and the convention at the same time is going to kill my September numbers.

Cam: I don't think that's anything to worry about. We all expect some variation in actual spending month to month. What's really important is staying within the budgeted targets for the year. Does that look as if it's going to be a problem?

Megan: I don't think so, but just the same, I'd like to be on the safe side.

Cam: What do you mean?

Megan: Well, this is what I'd like to do. I want to pay the convention-related costs in advance this month. I'll pay the hotel for room and convention space and purchase the airline tickets in advance. In this way, I can charge all these expenditures to July's budget. This would cause my actual expenses to come close to budget for July. Moreover, when the big advertising campaign hits in September, I won't have to worry about expenditures for the convention on my September budget as well. The convention costs will already be paid. Thus, my September expenses should be pretty close to budget.

Cam: I can't tell you when to make your convention purchases, but I'm not too sure that September items should be expensed in July's budget.

Megan: What's the problem? It looks like "no harm, no foul" to me. I can't see that there's anything wrong with this—it's just smart management.

How should Cam Morley respond to Megan Hewitt's request to expense the advanced payments for convention-related costs against July's budget?

TEAM ACTIVITY REAL WORLD

TIF 8-2 Real-world state budget

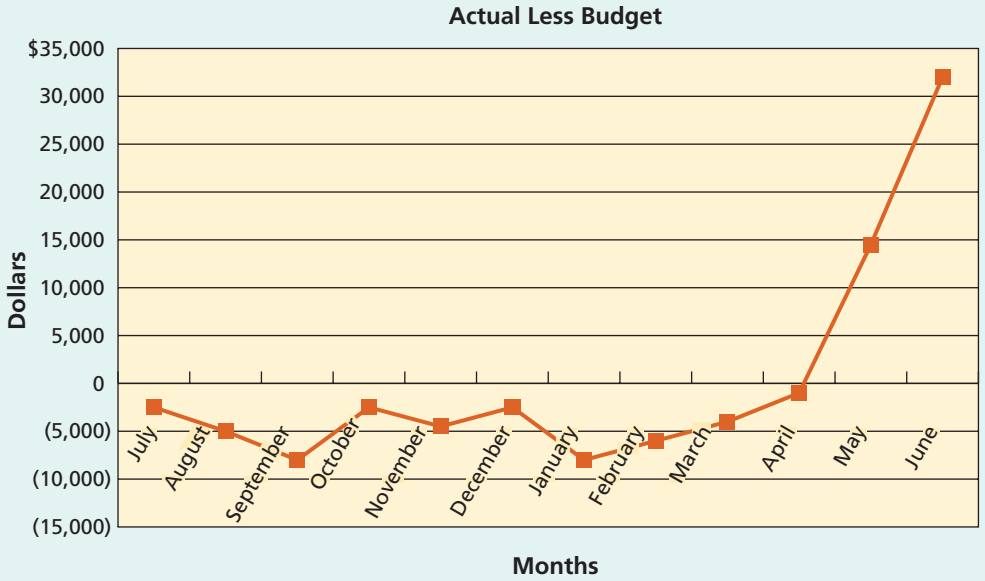
In teams, find the website of a state that interests you. The web address may be of the form *www.statename.gov* or similar. For example, the website for the state of Ohio can be found at www.Ohio.gov. At the site's home page, search for links to the state's annual budget information.

1. What are the budgeted sources of revenue and their percentage breakdown?
2. What are the major categories of budgeted expenditures (or appropriations) and their percentage breakdown?

COMMUNICATION

TIF 8-3 Interpreting budget expenditures

The city of Milton has an annual budget cycle that begins on July 1 and ends on June 30. At the beginning of each budget year, an annual budget is established for each department. The annual budget is divided equally among the 12 months to provide a constant monthly static budget. On June 30, all unspent budgeted monies for the budget year from the various city departments must be "returned" to the General Fund. Thus, if department heads fail to use their budget by year-end, they will lose it. A budget analyst prepared a chart of the difference between the monthly actual and budgeted amounts for all departments in a recent fiscal year. The chart was as follows:



Write a memo to Stacy Poindexter, the city manager, interpreting the chart and suggesting improvements to the budgeting system.

REAL WORLD

TIF 8-4 Evaluating the budgeting system in a service company

Children's Hospital of the King's Daughters Health System in Norfolk, Virginia, introduced a new budgeting method that allowed the hospital's annual plan to be updated for changes in operating plans. For example, if the budget was based on 400 patient days (number of patients × number of days in the hospital) and the actual count rose to 450 patient days, the variable costs of staffing, lab work, and medication costs could be adjusted to reflect this change. The budget manager stated, "I work with hospital directors to turn data into meaningful information and effect change before the month ends."

a. What budgeting methods are being used under the new approach?

b. Why are these methods superior to the former approaches?

TIF 8-5 Static budget for a service company

A bank manager of City Savings Bank Inc. uses the managerial accounting system to track the costs of operating the various departments within the bank. The departments include Cash

Management, Trusts, Commercial Loans, Mortgage Loans, Operations, Credit Card, and Branch Services. The static budget and actual results for the Operations Department are as follows:

Resources	Budget	Actual
Salaries	$200,000	$200,000
Benefits	30,000	30,000
Supplies	45,000	42,000
Travel	20,000	30,000
Training	25,000	35,000
Overtime	25,000	20,000
Total	$345,000	$357,000
Excess of actual over budget		$ 12,000

a. What information is provided by the budget? Specifically, what questions can the bank manager ask of the Operations Department manager?

b. What information does the static budget fail to provide? Specifically, could the budget information be presented differently to provide even more insight for the bank manager?

REAL WORLD

TIF 8-6 Objectives of the master budget

Domino's Pizza LLC (DPZ) operates pizza delivery and carry-out restaurants. The annual report describes its business as follows:

> We offer a focused menu of high-quality, value-priced pizza with three types of crust (Hand-Tossed, Thin Crust, and Deep Dish), along with buffalo wings, bread sticks, cheesy bread, CinnaStix®, and Coca-Cola® products. Our hand-tossed pizza is made from fresh dough produced in our regional distribution centers. We prepare every pizza using real cheese, pizza sauce made from fresh tomatoes, and a choice of high-quality meat and vegetable toppings in generous portions. Our focused menu and use of premium ingredients enable us to consistently and efficiently produce the highest-quality pizza.
>
> Over the 41 years since our founding, we have developed a simple, cost-efficient model. We offer a limited menu, our stores are designed for delivery and carry-out, and we do not generally offer dine-in service. As a result, our stores require relatively small, lower-rent locations and limited capital expenditures.

How would a master budget support planning, directing, and controlling for Domino's?

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. When compared to static budgets, flexible budgets:
   a. offer managers a more realistic comparison of budgeted and actual fixed cost items under their control.
   b. provide a better understanding of the capacity (volume) variances during the period being evaluated.
   c. encourage managers to use less fixed cost items and more variable cost items that are under their control.
   d. offer managers a more realistic comparison of budgeted and actual revenue and cost items under their control.
2. Hannon Retailing Company prices its products by adding 30% to its cost. Hannon anticipates sales of $715,000 in July, $728,000 in August, and $624,000 in September. Hannon's policy is to have on hand enough inventory at the end of the month to cover 25% of the next month's sales. What will be the cost of the inventory that Hannon should budget for purchase in August?
   a. $509,600
   b. $540,000
   c. $560,000
   d. $680,000

3. Ming Company has budgeted sales at 6,300 units for July, and desires to have 590 good units on hand on July 31. Inventory is 470 units on July 1. Ming has found from past experience that 10% of all units produced do not pass final inspection and must therefore be destroyed. How many units should Ming plan to produce in July?
   a. 6,890
   b. 7,062
   c. 7,133
   d. 7,186
4. Krouse Company produces two products, forged putter heads and laminated putter heads, which are sold through specialty golf shops. The company is in the process of developing its operating budget for the coming year. Selected data regarding the company's two products are as follows:

	Putter Heads	
	Forged	**Laminated**
Raw materials:		
Steel	2 pounds @ $5/lb.	1 pound @ $5/lb.
Copper	None	1 pound @ $15/lb.
Direct labor	¼ hour @ $20/hr.	1 hour @ $22/hr.
Expected sales (units)	8,200	2,000
Selling price per unit	$30	$80
Ending inventory target (units)	100	60
Beginning inventory (units)	300	60
Beginning inventory (cost)	$5,250	$3,120

Manufacturing overhead is applied to units using direct labor hours. Variable manufacturing overhead is projected to be $25,000, and fixed manufacturing overhead is expected to be $15,000. The estimated cost to produce one unit of the laminated putter head is:

   a. $42.
   b. $46.
   c. $52.
   d. $62.

Pathways Challenge



This is Accounting!

Information/Consequences

Pro forma financial statements are, in essence, budgets. They are expectations about future events. Managerial accounting information used in developing internal budgets is the foundation for preparing pro forma financial statements.

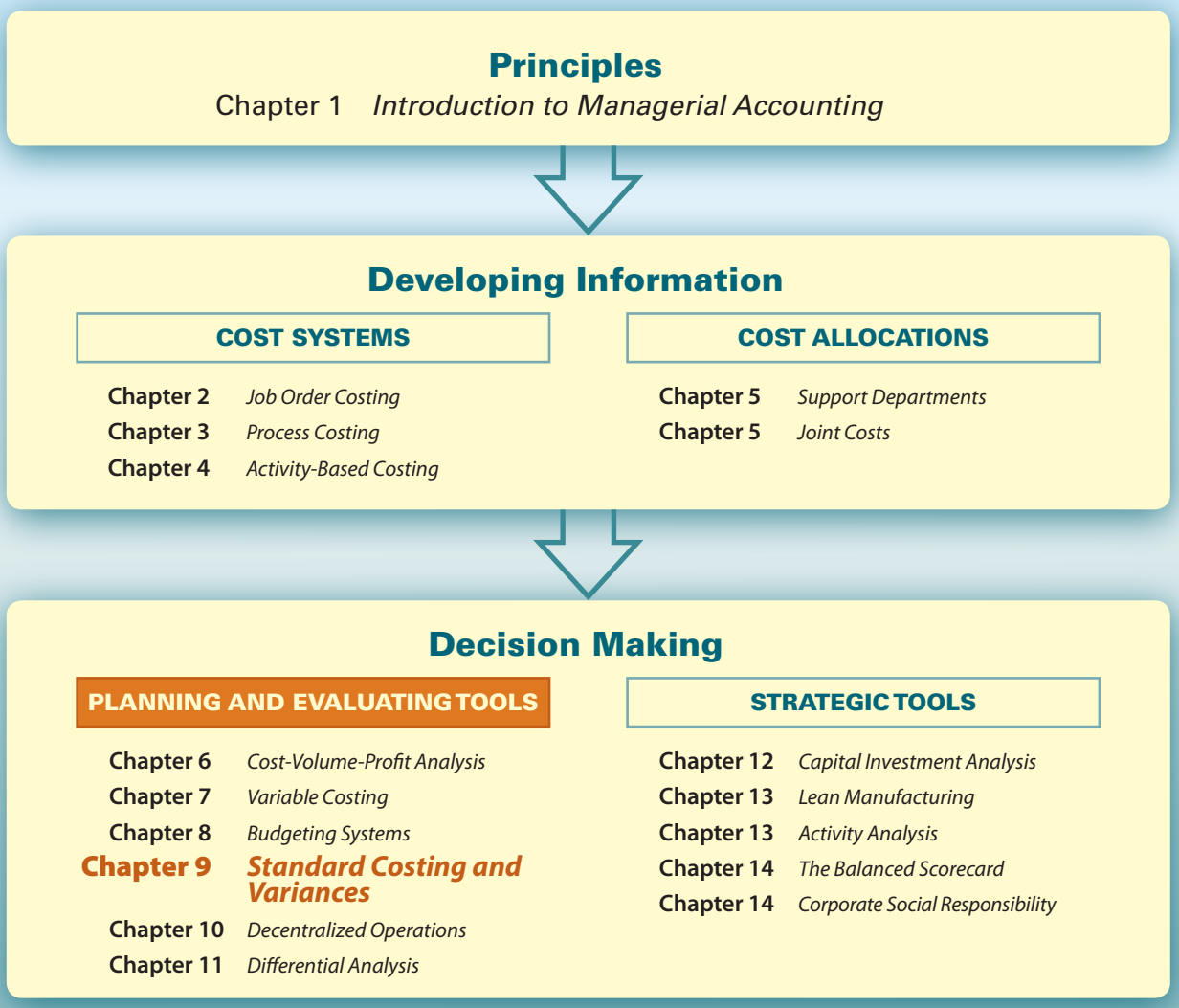
The primary benefit for external stakeholders of pro forma financial statements is that they provide useful input into developing operating performance expectations (predictions) for a company, which could influence their decisions.

The primary risk to external stakeholders is that unaudited, non-GAAP statements may omit important information or contain misleading information. As a result, stakeholders may develop inaccurate expectations that result in nonoptimal decisions.

Suggested Answer

Chapter 9

Evaluating Variances from Standard Costs



BMW Group

When you play a sport, you are evaluated with respect to how well you perform compared to a standard or to a competitor. In bowling, for example, your score is compared to a perfect score of 300 or to the scores of your competitors. In this class, you are compared to performance standards. These standards are often described in terms of letter grades, which provide a measure of how well you achieved the class objectives. In your job, you are also evaluated according to performance standards.

Just as your class performance is evaluated, managers are evaluated according to goals and plans. For example, **BMW Group** uses manufacturing standards at its automobile assembly plants to guide performance. The Mini Cooper, a BMW Group car, is manufactured in a modern facility in Oxford, England. There are a number of performance targets used in this plant. For example, the bodyshell is welded by more than 250 robots so as to be two to three times stiffer than rival cars. In addition, the bodyshell dimensions are tested to the accuracy of the width of a human hair. Such performance standards are not surprising given the automotive racing background of John W. Cooper, the designer of the original Mini Cooper.

If you want to get a view of the BMW manufacturing process, go to www.bmwusfactory.com/manufacturing/production-process/assembly.

Performance is often measured as the difference between actual results and planned results. In this chapter, we will discuss and illustrate the ways in which business performance is evaluated.

Source: www.bmwgroup.com.



AP IMAGES/ALASTAIR GRANT

Link to BMW Group . . . . . Pages 412, 413, 416, 417, 419, 422

What's Covered

Evaluating Variances from Standard Costs

Standards
- Setting Standards (Obj. 1)
- Types of Standards (Obj. 1)
- Reviewing and Revising Standards (Obj. 1)

Variance Analysis
- Budget Performance Report (Obj. 2)
- Direct Materials Variances (Obj. 3)
- Direct Labor Variances (Obj. 3)
- Factory Overhead Variances (Obj. 4)

Recording Variances
- Journalizing Variances (Obj. 5)
- Variances in the Income Statement (Obj. 5)

Learning Objectives

Obj. 1 Describe the types of standards and how they are established.

Obj. 2 Describe and illustrate how standards are used in budgeting.

Obj. 3 Compute and interpret direct materials and direct labor variances.

Obj. 4 Compute and interpret factory overhead controllable and volume variances.

Obj. 5 Describe and illustrate the recording and reporting of standards and variances.

Analysis for Decision Making

Obj. 6 Describe and illustrate the use of the direct labor time variance in evaluating staff performance in a service setting.

Appendix

Obj. App. Compute and interpret revenue variances.

Objective 1
Describe the types of standards and how they are established.

Standards

Standards are performance goals. Manufacturing companies normally use **standard cost** for each of the three following product costs:

- Direct materials
- Direct labor
- Factory overhead

Accounting systems that use standards for product costs are called **standard cost systems**. Standard cost systems enable management to determine the following:

- How much a product *should* cost (standard cost)
- How much it does cost (actual cost)

When actual costs are compared with standard costs, the exceptions or cost variances are reported. This reporting by the *principle of exceptions* allows management to focus on correcting the cost variances.

Link to BMW Group

BMW began in Germany in the early 1900s as a manufacturer of airplane engines. The BMW emblem, which was first used in 1917, represents a rotating airplane propeller with the white and blue state colors of Bavaria.

Setting Standards

The standard-setting process normally requires the joint efforts of accountants, engineers, and other management personnel. The accountant converts the results of judgments and process studies into dollars and cents. Engineers with the aid of operation managers identify the materials, labor, and machine requirements needed to produce the product. For example, engineers estimate direct materials by studying the product specifications and estimating normal spoilage. Time and motion

studies may be used to determine the direct labor required for each manufacturing operation. Engineering studies may also be used to determine standards for factory overhead, such as the amount of power needed to operate machinery.

Types of Standards

Standards imply an acceptable level of production efficiency. One of the major objectives in setting standards is to motivate employees to achieve efficient operations.

Ideal standards, or *theoretical standards*, are standards that can be achieved only under perfect operating conditions, such as no idle time, no machine breakdowns, and no materials spoilage. Such standards may have a negative impact on performance because they may be viewed by employees as unrealistic.

Normal standards, sometimes called *currently attainable standards*, are standards that can be attained with reasonable effort. Such standards, which are used by most companies, allow for normal production difficulties and mistakes. When reasonable standards are used, employees focus more on cost and are more likely to put forth their best efforts.

An example from the game of golf illustrates the distinction between ideal and normal standards. In golf, *par* is an ideal standard for most players. Each player's USGA (United States Golf Association) handicap is the player's normal standard. The motivation of average players is to beat their handicaps because beating par is unrealistic for most players.

Reviewing and Revising Standards

Standard costs should be periodically reviewed to ensure that they reflect current operating conditions. Standards should not be revised, however, just because they differ from actual costs. For example, the direct labor standard would not be revised just because employees are unable to meet properly set standards. On the other hand, standards should be revised when prices, product designs, labor rates, or manufacturing methods change.



Ethics: Do It!

Company Reputation: The Best of the Best

Harris Interactive Inc. (HPOL) annually ranks American corporations in terms of reputation. The ranking is based on how respondents rate companies on 20 attributes in six major areas. The six areas are emotional appeal, products and services, financial performance, workplace environment, social responsibility, and vision and leadership. The five highest (best) ranked companies in a recent survey were **Amazon.com (AMZN)**, **Apple Inc. (AAPL)**, **Alphabet (GOOG)**, **USAA**, and **The Walt Disney Company (DIS)**.

Criticisms of Standard Costs

Some criticisms of using standard costs for performance evaluation include the following:

- Standards limit operating improvements by discouraging improvement beyond the standard.
- Standards are too difficult to maintain in a dynamic manufacturing environment, resulting in "stale standards."
- Standards can cause employees to lose sight of the larger objectives of the organization by focusing only on efficiency improvement.
- Standards can cause employees to unduly focus on their own operations to the possible harm of other operations that rely on them.

Regardless of these criticisms, standards are used widely. In addition, standard costs are only one part of the performance evaluation system used by most companies. As discussed in this chapter, other nonfinancial performance measures are often used to supplement standard costs, with the result that many of the preceding criticisms are overcome.

In addition to BMW, Mini Cooper, and Rolls-Royce automobiles, **BMW Group** manufactures motorcycles.

Link to BMW Group

Objective 2
Describe and illustrate how standards are used in budgeting.

Budgetary Performance Evaluation

As discussed in Chapter 8, the master budget assists a company in planning, directing, and controlling performance. The control function, or budgetary performance evaluation, compares the actual performance against the budget.

To illustrate, **Western Rider Inc.**, a manufacturer of blue jeans, uses standard costs in its budgets. The standards for direct materials, direct labor, and factory overhead are separated into the following two components:

- Standard price
- Standard quantity

The standard cost per unit for direct materials, direct labor, and factory overhead is computed as follows:

$$\text{Standard Cost per Unit} = \text{Standard Price} \times \text{Standard Quantity}$$

Western Rider's standard costs per unit for its XL jeans are shown in Exhibit 1.

Exhibit 1
Standard Cost for XL Jeans

Manufacturing Costs	Standard Price	×	Standard Quantity per Pair	=	Standard Cost per Pair of XL Jeans
Direct materials	$5.00 per sq. yd.		1.50 sq. yds.		$ 7.50
Direct labor	$9.00 per hr.		0.80 hr. per pair		7.20
Factory overhead	$6.00 per hr.		0.80 hr. per pair		4.80
Total standard cost per pair					$19.50

As shown in Exhibit 1, the standard cost per pair of XL jeans is $19.50, which consists of $7.50 for direct materials, $7.20 for direct labor, and $4.80 for factory overhead.

The standard price and standard quantity are separated for each product cost. For example, Exhibit 1 indicates that for each pair of XL jeans, the standard price for direct materials is $5.00 per square yard and the standard quantity is 1.5 square yards. The standard price and quantity are separated because the department responsible for their control is normally different. For example, the direct materials price per square yard is controlled by the Purchasing Department, and the direct materials quantity per pair is controlled by the Production Department.

As illustrated in Chapter 8, the master budget is prepared based on planned sales and production. The budgeted costs for materials purchases, direct labor, and factory overhead are determined by multiplying their standard costs per unit by the planned level of production. Budgeted (standard) costs are then compared to actual costs during the year for control purposes.

Budget Performance Report

The differences between actual and standard costs are called **cost variances**. A **favorable cost variance** occurs when the actual cost is less than the standard cost. An **unfavorable cost variance** occurs when the actual cost exceeds the standard cost. These cost variances are illustrated in Exhibit 2.

Exhibit 2
Cost Variances

Favorable Cost Variance	Unfavorable Cost Variance
Actual cost < Standard cost at actual volumes	Actual cost > Standard cost at actual volumes

The report that summarizes actual costs, standard costs, and the differences for the units produced is called a **budget performance report**. To illustrate, assume that **Western Rider Inc.** produced the following pairs of jeans during June:

XL jeans produced and sold	5,000 pairs
Actual costs incurred in June:	
Direct materials	$ 40,150
Direct labor	38,500
Factory overhead	22,400
Total costs incurred	$101,050

Exhibit 3 illustrates the budget performance report for June for Western Rider.

Exhibit 3
Budget Performance Report

Western Rider Inc.
Budget Performance Report
For the Month Ended June 30

Manufacturing Costs	Actual Costs	Standard Cost at Actual Volume (5,000 pairs of XL Jeans)*	Cost Variance—(Favorable) Unfavorable
Direct materials	$ 40,150	$37,500	$ 2,650
Direct labor	38,500	36,000	2,500
Factory overhead	22,400	24,000	(1,600)
Total manufacturing costs	$101,050	$97,500	$ 3,550

*5,000 pairs × $7.50 per pair = $37,500
5,000 pairs × $7.20 per pair = $36,000
5,000 pairs × $4.80 per pair = $24,000

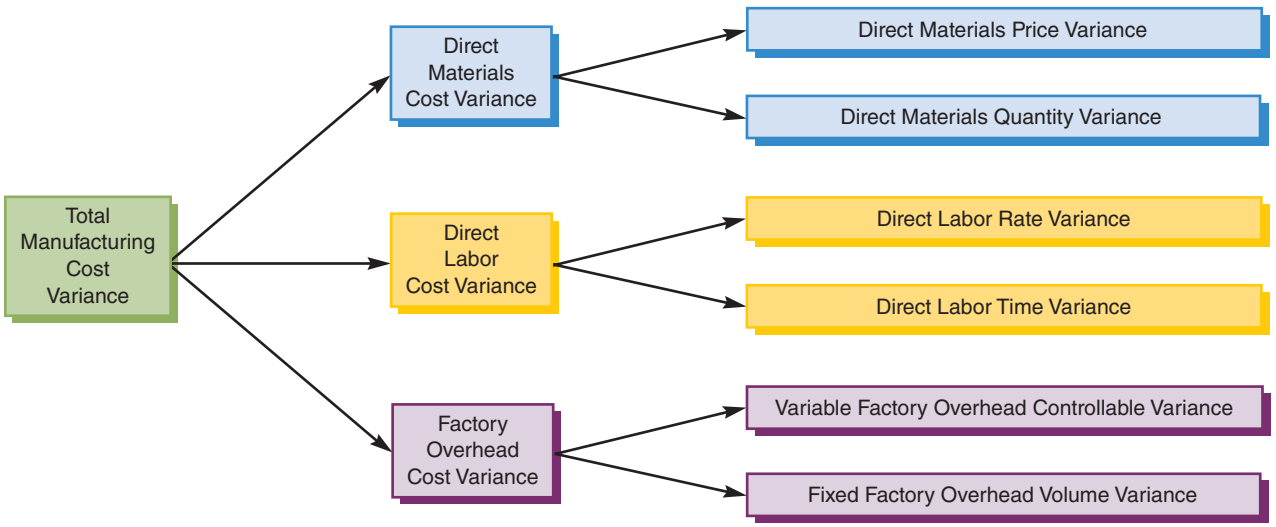
The budget performance report shown in Exhibit 3 is based on the actual units produced in June of 5,000 XL jeans. Even though 6,000 XL jeans might have been *planned* for production, the budget performance report is based on *actual* production.

Manufacturing Cost Variances

The **total manufacturing cost variance** is the difference between total standard costs and total actual cost for the units produced. As shown in Exhibit 3, the total manufacturing cost unfavorable variance is $3,550, which consists of an unfavorable direct materials cost variance of $2,650, an unfavorable direct labor cost variance of $2,500, and a favorable factory overhead cost variance of $1,600.

For control purposes, each product cost variance is separated into two additional variances as shown in Exhibit 4.

Exhibit 4 Manufacturing Cost Variances



The total direct materials variance is separated into a *price* variance and a *quantity* variance. This is because standard and actual direct materials costs are computed as follows:

Actual Direct Materials Cost	=	Actual Price	×	Actual Quantity
Standard Direct Materials Cost	=	Standard Price	×	Standard Quantity
Direct Materials Cost Variance	=	Price Difference	+	Quantity Difference

Thus, the actual and standard direct materials costs may differ because of a price difference (variance), a quantity difference (variance), or both.

Likewise, the total direct labor variance is separated into a *rate* variance and a *time* variance. This is because standard and actual direct labor costs are computed as follows:

Actual Direct Labor Cost	=	Actual Rate	×	Actual Time
Standard Direct Labor Cost	=	Standard Rate	×	Standard Time
Direct Labor Cost Variance	=	Rate Difference	+	Time Difference

Therefore, the actual and standard direct labor costs may differ because of a rate difference (variance), a time difference (variance), or both.

The total factory overhead variance is separated into a *controllable* variance and a *volume* variance. Because factory overhead has fixed and variable cost elements, it uses different variances than direct materials and direct labor, which are variable costs.

In the next sections, the price and quantity variances for direct materials, the rate and time variances for direct labor, and the controllable and volume variances for factory overhead are further described and illustrated.

Link to BMW Group

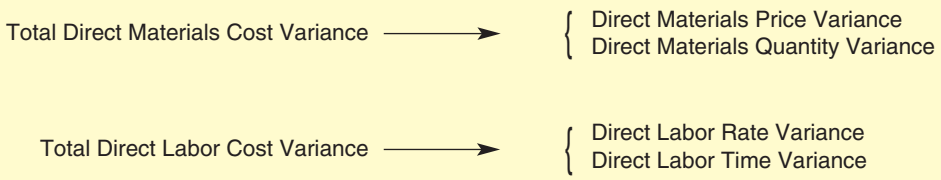
BMW's Spartanburg, South Carolina plant employs 9,000 workers in its 5 million-square-foot facility where it manufactures the X3, X4, X5, and X6 sports activity vehicles. Visitors may tour the manufacturing plant and company museum.

Objective 3
Compute and interpret direct materials and direct labor variances.

Direct Materials and Direct Labor Variances

As indicated in the prior section, the total direct materials and direct labor variances are separated into the direct materials cost and direct labor cost variances for analysis and control purposes. These variances are illustrated in Exhibit 5.

Exhibit 5
Direct Materials and Direct Labor Cost Variances



As a basis for illustration, the variances for Western Rider's June operations shown in Exhibit 3 are used.

Direct Materials Variances

During June, **Western Rider Inc.** reported an unfavorable total direct materials cost variance of $2,650 for the production of 5,000 XL style jeans, as shown in Exhibit 3. This variance was based on the following actual and standard costs:

Actual costs	$ 40,150
Standard costs	(37,500)
Total direct materials cost variance	$ 2,650

The actual costs incurred of $40,150 consist of the following:

$$\begin{aligned}\text{Actual Direct Materials Cost} &= \text{Actual Price} \times \text{Actual Quantity}\\ &= (\$5.50 \text{ per sq. yd.}) \times (7{,}300 \text{ sq. yds.})\\ &= \$40{,}150\end{aligned}$$

The standard costs of $37,500 consist of the following:

$$\begin{aligned}\text{Standard Direct Materials Cost} &= \text{Standard Price} \times \text{Standard Quantity}\\ &= \$5.00 \text{ per sq. yd.} \times 7{,}500 \text{ sq. yds.}\\ &= \$37{,}500\end{aligned}$$

The standard price of $5.00 per square yard is taken from Exhibit 1. In addition, Exhibit 1 indicates that 1.5 square yards is the standard quantity of materials for producing one pair of XL jeans. Thus, 7,500 (5,000 × 1.5) square yards is the standard quantity of materials for producing 5,000 pairs of XL jeans.

Comparing the actual and standard cost computations indicates that the total direct materials unfavorable cost variance of $2,650 is caused by the following:

- A price per square yard of $0.50 ($5.50 – $5.00) more than standard
- A quantity usage of 200 square yards (7,300 sq. yds. – 7,500 sq. yds.) less than standard

The impact of these differences from standard is reported and analyzed as a direct materials *price* variance and direct materials *quantity* variance.

Direct Materials Price Variance

The **direct materials price variance** is computed as follows:

$$\text{Direct Materials Price Variance} = (\text{Actual Price} - \text{Standard Price}) \times \text{Actual Quantity}$$

If the actual price per unit exceeds the standard price per unit, the variance is unfavorable. This positive amount (unfavorable variance) can be thought of as increasing costs (a debit). If the actual price per unit is less than the standard price per unit, the variance is favorable. This negative amount (favorable variance) can be thought of as decreasing costs (a credit).

To illustrate, the direct materials price variance for **Western Rider Inc.** for June is $3,650 (unfavorable), computed as follows:[1]

$$\begin{aligned}\text{Direct Materials Price Variance} &= (\text{Actual Price} - \text{Standard Price}) \times \text{Actual Quantity}\\ &= (\$5.50 - \$5.00) \times 7{,}300 \text{ sq. yds.}\\ &= \$3{,}650 \text{ Unfavorable Variance}\end{aligned}$$

Direct Materials Quantity Variance

The **direct materials quantity variance** is computed as follows:

$$\text{Direct Materials Quantity Variance} = (\text{Actual Quantity} - \text{Standard Quantity}) \times \text{Standard Price}$$

If the actual quantity for the units produced exceeds the standard quantity, the variance is unfavorable. This positive amount (unfavorable variance) can be thought of as increasing costs (a debit). If the actual quantity for the units produced is less than the standard quantity, the variance is favorable. This negative amount (favorable variance) can be thought of as decreasing costs (a credit).

To illustrate, the direct materials quantity variance for **Western Rider Inc.** for June is $1,000 (favorable), computed as follows:

$$\begin{aligned}\text{Direct Materials Quantity Variance} &= (\text{Actual Quantity} - \text{Standard Quantity}) \times \text{Standard Price}\\ &= (7{,}300 \text{ sq. yds.} - 7{,}500 \text{ sq. yds.}) \times \$5.00\\ &= \$(1{,}000) \text{ Favorable Variance}\end{aligned}$$

Steel and aluminium are pressed into doors and side panels in **BMW**'s stamping facility.

Link to BMW Group

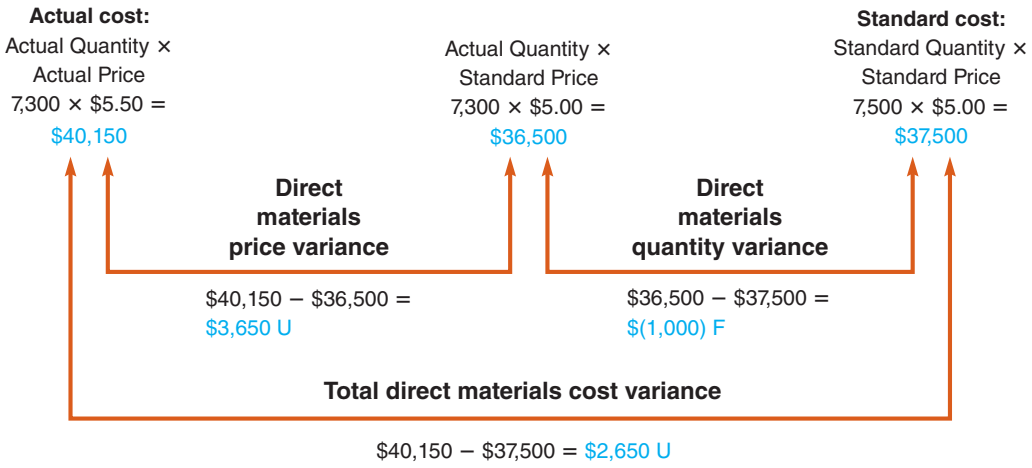
[1] To simplify, it is assumed that there is no change in the beginning and ending materials inventories. Thus, the amount of materials budgeted for production equals the amount purchased.

Direct Materials Variance Relationships The relationship among the *total* direct materials cost variance, the direct materials *price* variance, and the direct materials *quantity* variance is shown in Exhibit 6.

Reporting Direct Materials Variances The direct materials quantity variances should be reported to the manager responsible for the variance. For example, an unfavorable quantity variance might be caused by either of the following:

- Equipment that has not been properly maintained
- Low-quality (inferior) direct materials

Exhibit 6
Direct Materials Variance Relationships



Pathways Challenge



This is Accounting!

Economic Activity

Variances are useful for comparing what actually happened to what was expected. But even more importantly, variances help management understand *why* actual results were different from expectations. Multinational corporations such as **Deere & Company (DE)** are subject to exchange rate fluctuations (changes). Exchange rates represent the price at which different currencies around the world can be purchased. Exchange rates vary over time and can affect a company's operating income. Since Deere purchases goods and services using many currencies around the world, changes in exchange rates affect its operating budgets and income.

A key issue in analyzing and interpreting variances is *controllability*. If a variance is controllable for a given employee, it means that the employee can exert effort to influence the size and direction of the variance. For example, a direct materials quantity variance may be controllable by the production supervisor, who may be able to take actions to decrease waste.

Critical Thinking/Judgment

Assume a Brazilian purchasing agent for Deere purchases direct materials right after the value of the *Brazilian real* (the currency of Brazil) declines. As a result, the purchasing agent spends more to purchase direct materials than budgeted.

Should the purchasing agent be held accountable for the higher cost of the direct materials due to changes in the exchange rate?

Suggested answer at end of chapter.

In the first case, the Operating Department responsible for maintaining the equipment should be held responsible for the variance. In the second case, the Purchasing Department should be held responsible.

Not all variances are controllable. For example, an unfavorable materials price variance might be due to market-wide price increases. In this case, there is nothing the Purchasing Department might have done to avoid the unfavorable variance. On the other hand, if materials of the same quality could have been purchased from another supplier at the standard price, the variance was controllable.

Direct Labor Variances

During June, **Western Rider Inc.** reported an unfavorable total direct labor cost variance of $2,500 for the production of 5,000 XL style jeans, as shown in Exhibit 3. This variance was based on the following actual and standard costs:

Actual costs	$ 38,500
Standard costs	(36,000)
Total direct labor cost variance	$ 2,500

The actual costs incurred of $38,500 consist of the following:

$$\begin{aligned}\text{Actual Direct Labor Cost} &= \text{Actual Rate per Hour} \times \text{Actual Time}\\ &= \$10.00 \text{ per hr.} \times 3{,}850 \text{ hrs.}\\ &= \$38{,}500\end{aligned}$$

The standard costs of $36,000 consist of the following:

$$\begin{aligned}\text{Standard Direct Labor Cost} &= \text{Standard Rate per Hour} \times \text{Standard Time}\\ &= \$9.00 \text{ per hr.} \times 4{,}000 \text{ hrs.}\\ &= \$36{,}000\end{aligned}$$

The standard rate of $9.00 per direct labor hour is taken from Exhibit 1. In addition, Exhibit 1 indicates that 0.80 hour is the standard time required for producing one pair of XL jeans. Thus, 4,000 (5,000 units × 0.80 hr.) direct labor hours is the standard for producing 5,000 pairs of XL jeans.

Comparing the actual and standard cost computations indicates that the total direct labor unfavorable cost variance of $2,500 is caused by the following:

- A rate of $1.00 per hour ($10.00 – $9.00) more than standard
- A quantity of 150 hours (4,000 hrs. – 3,850 hrs.) less than standard

The impact of these differences from standard is reported and analyzed as a direct labor *rate* variance and a direct labor *time* variance.

The camshafts of **BMW**'s engines are manufactured using computer-controlled machine tools to a precision of one hundredth of a human hair. Workers are primarily used to adjust the machine tools.

Link to BMW Group

Direct Labor Rate Variance

The **direct labor rate variance** is computed as follows:

$$\text{Direct Labor Rate Variance} = (\text{Actual Rate per Hour} - \text{Standard Rate per Hour}) \times \text{Actual Hours}$$

If the actual rate per hour exceeds the standard rate per hour, the variance is unfavorable. This positive amount (unfavorable variance) can be thought of as increasing costs (a debit). If the actual rate per hour is less than the standard rate per hour, the variance is favorable. This negative amount (favorable variance) can be thought of as decreasing costs (a credit).

To illustrate, the direct labor rate variance for **Western Rider Inc.** in June is $3,850 (unfavorable), computed as follows:

$$\begin{aligned}\text{Direct Labor Rate Variance} &= (\text{Actual Rate per Hour} - \text{Standard Rate per Hour}) \times \text{Actual Hours}\\ &= (\$10.00 - \$9.00) \times 3{,}850 \text{ hours}\\ &= \$3{,}850 \text{ Unfavorable Variance}\end{aligned}$$

Direct Labor Time Variance The **direct labor time variance** is computed as follows:

$$\text{Direct Labor Time Variance} = (\text{Actual Direct Labor Hours} - \text{Standard Direct Labor Hours}) \times \text{Standard Rate per Hour}$$

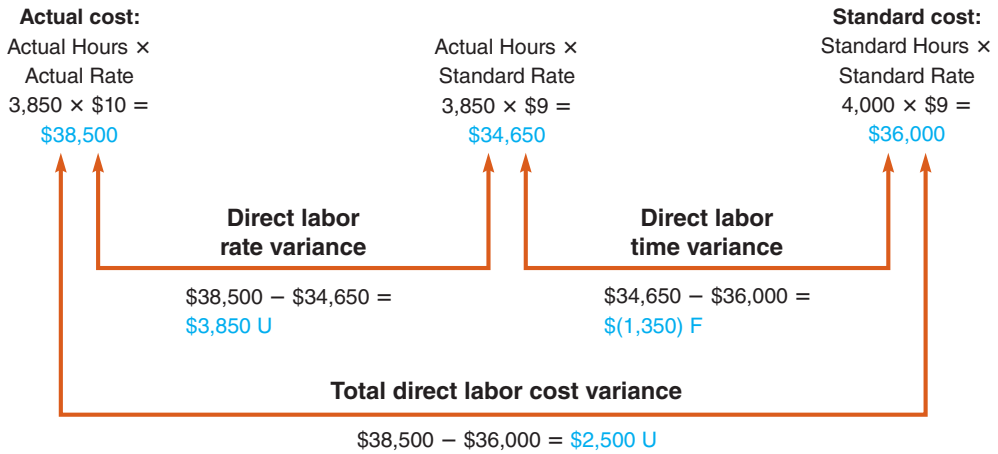
If the actual direct labor hours for the units produced exceed the standard direct labor hours, the variance is unfavorable. This positive amount (unfavorable variance) can be thought of as increasing costs (a debit). If the actual direct labor hours for the units produced are less than the standard direct labor hours, the variance is favorable. This negative amount (favorable variance) can be thought of as decreasing costs (a credit).

To illustrate, the direct labor time variance for **Western Rider Inc.** for June is $1,350 (favorable) computed as follows:

$$\begin{aligned}\text{Direct Labor Time Variance} &= (\text{Actual Direct Labor Hours} - \text{Standard Direct Labor Hours}) \times \text{Standard Rate per Hour}\\ &= (3{,}850 \text{ hours} - 4{,}000 \text{ direct labor hours}) \times \$9.00\\ &= \$(1{,}350) \text{ Favorable Variance}\end{aligned}$$

Direct Labor Variance Relationships The relationship among the *total* direct labor cost variance, the direct labor *rate* variance, and the direct labor *time* variance is shown in Exhibit 7.

Exhibit 7
Direct Labor Variance Relationships



Reporting Direct Labor Variances Production supervisors are normally responsible for controlling direct labor cost. For example, an investigation could reveal the following causes for unfavorable rate and time variances:

- An unfavorable rate variance may be caused by the improper scheduling and use of employees. In such cases, skilled, highly paid employees may be used in jobs that are normally performed by unskilled, lower-paid employees. In this case, the unfavorable rate variance should be reported to the managers who schedule work assignments.
- An unfavorable time variance may be caused by a shortage of skilled employees. In such cases, there may be an abnormally high turnover rate among skilled employees. In this case, production supervisors with high turnover rates should be questioned as to why their employees are quitting.

Direct Labor Standards for Nonmanufacturing Activities Direct labor time standards can also be developed for use in administrative, selling, and service activities. This is most appropriate when the activity involves a repetitive task that produces a common output. In these cases, the use of standards is similar to that for a manufactured product.

To illustrate, standards could be developed for customer service personnel who process sales orders. A standard time for processing a sales order (the output) could be developed and used to control sales order processing costs. Similar standards could be developed for computer help desk operators, nurses, and insurance application processors.

When labor-related activities are not repetitive, direct labor time standards are less commonly used. For example, the time spent by a senior executive or the work of a research and development scientist would not normally be controlled using time standards.

Check Up Corner 9-1 Direct Materials and Direct Labor Cost Variances

Menounos Manufacturing Co. uses standard costs. Standard costs and actual costs for direct materials and direct labor for the manufacture of 3,000 units during 20Y6 were as follows:

	Standard Costs	Actual Costs
Direct materials	18,000 lbs. at $4.50 per lb.	18,500 lbs. at $4.35 per lb.
Direct labor	7,500 hours at $12.00 per hr.	7,420 hours at $12.30 per hr.

Each unit requires 2.5 hours of direct labor.

a. Compute the direct materials price variance, direct materials quantity variance, and total direct materials cost variance. Present your answer using the format shown in Exhibit 6.

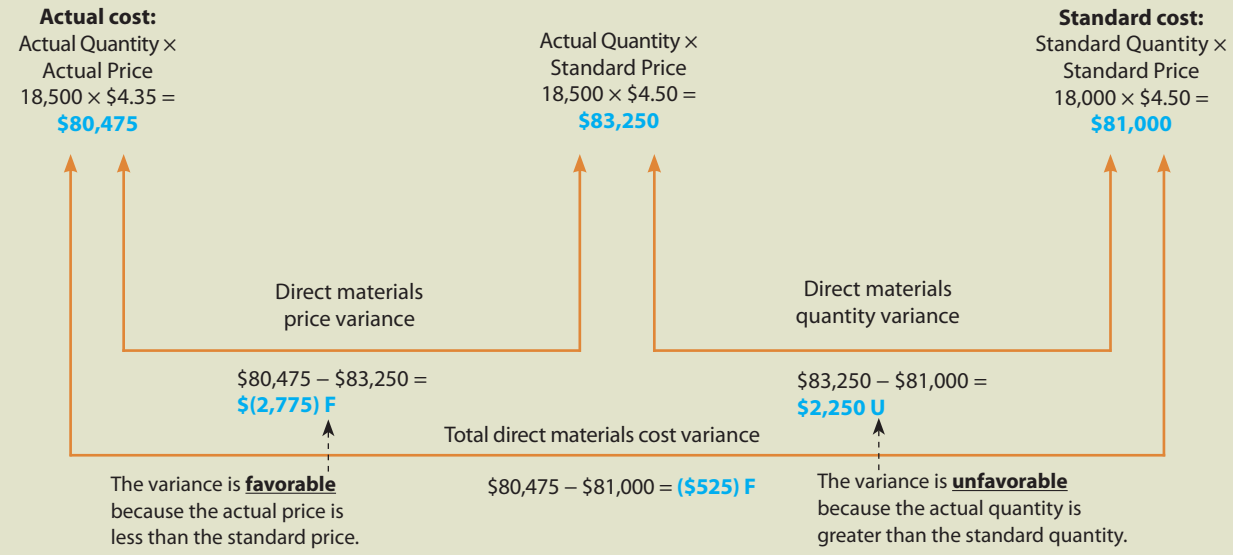
b. Compute the direct labor rate variance, direct labor time variance, and total direct labor cost variance. Present your answer using the format shown in Exhibit 7.

Solution:

a. Direct Materials Variances

Direct Materials Price Variance = (Actual Price – Standard Price) × Actual Quantity
= ($4.35 – $4.50) × 18,500 lbs.
= $(2,775) Favorable Variance

Direct Materials Quantity Variance = (Actual Quantity – Standard Quantity) × Standard Price
= (18,500 lbs. – 18,000 lbs.) × $4.50
= $2,250 Unfavorable Variance

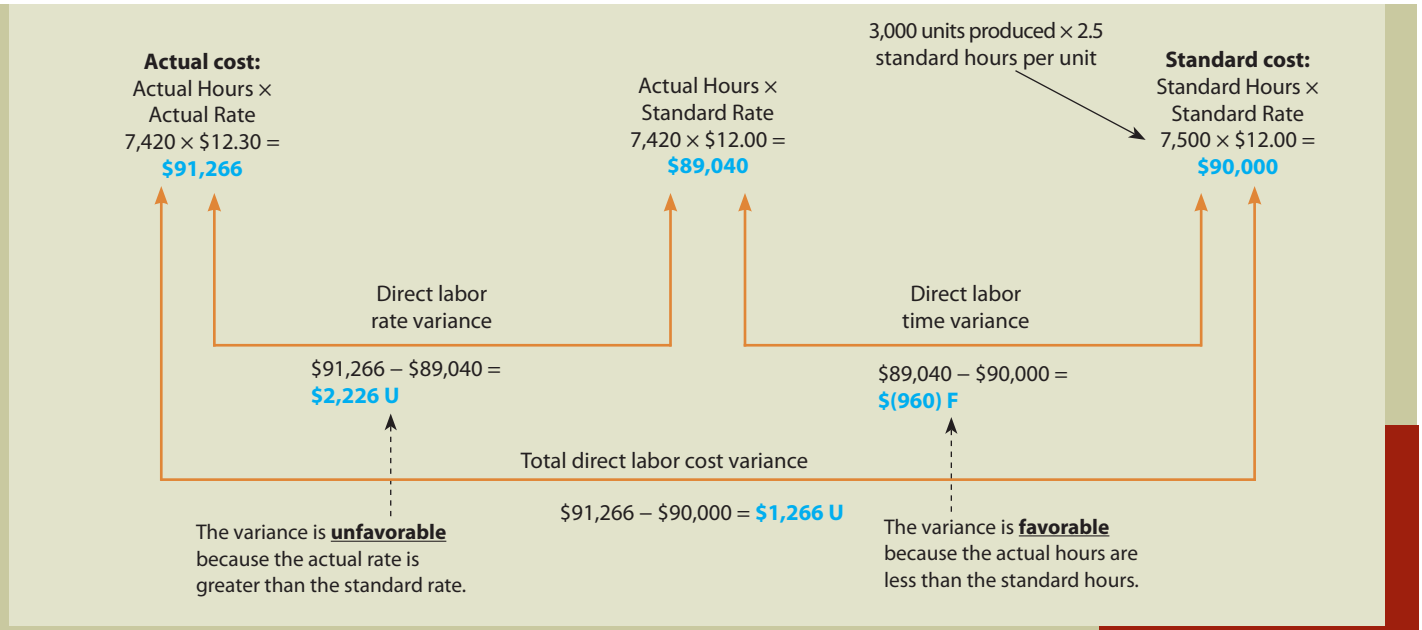


b. Direct Labor Variances

Direct Labor Rate Variance = (Actual Rate per Hour – Standard Rate per Hour) × Actual Hours
= ($12.30 – $12.00) × 7,420 hours
= $2,226 Unfavorable Variance

Direct Labor Time Variance = (Actual Direct Labor Hours – Standard Direct Labor Hours) × Standard Rate per Hour
= (7,420 hours – 7,500 direct labor hours) × $12.00
= $(960) Favorable Variance

(Continued)



Check Up Corner

Objective 4
Compute and interpret factory overhead controllable and volume variances.

Factory Overhead Variances

Factory overhead costs are analyzed differently than direct labor and direct materials costs. This is because factory overhead costs have fixed and variable cost elements. For example, indirect materials and factory supplies normally behave as a variable cost as units produced change. In contrast, straight-line plant depreciation on factory machinery is a fixed cost.

Link to BMW Group

The **BMW Group** has significant overhead costs due to its investment in robotic and other state-of-the-art technology, machinery, and facilities.

Factory overhead costs are budgeted and controlled by separating factory overhead into fixed and variable components. Doing so allows the preparation of flexible budgets and the analysis of factory overhead controllable and volume variances.

Why It Matters

CONCEPT CLIP

Standard Costing in the Restaurant Industry

Many restaurants use standard costs to manage their business. Food costs are typically the largest expense for a restaurant. As a result, many restaurants use food quantity standards to control food costs by establishing the amount of food that is served to a customer. For example, Red Lobster restaurants, a division of **Darden Restaurants, Inc. (DRI)**, establishes food quantity standards for the number of shrimp, scallops, or clams on a seafood plate.

The second-largest cost to most restaurants is labor cost. Many restaurants base their labor cost standards on the labor cost percentage, which is the ratio of total labor cost to total sales. This ratio helps the restaurants of Darden Restaurants, Inc., including Olive Garden and Red Lobster, control and monitor labor costs. Focusing on this metric has paid off recently, as labor cost has dropped and earnings have increased as a percent of sales.

Source: N. Irwin, "What Olive Garden and Red Lobster Tell Us About the Economy," *The Washington Post*, September 21, 2012.

The Factory Overhead Flexible Budget

The preparation of a flexible budget was described and illustrated in Chapter 8. Exhibit 8 illustrates a flexible factory overhead budget for **Western Rider Inc.** for June.

Exhibit 8
Factory Overhead Cost Budget Indicating Standard Factory Overhead Rate

	A	B	C	D	E
1	**Western Rider Inc.**				
2	**Factory Overhead Cost Budget**				
3	**For the Month Ending June 30**				
4	Percent of normal capacity	80%	90%	100%	110%
5	Units produced	5,000	5,625	6,250	6,875
6	Direct labor hours (0.80 hr. per unit)	4,000	4,500	5,000	5,500
7	Budgeted factory overhead:				
8	Variable costs:				
9	Indirect factory wages	$ 8,000	$ 9,000	$10,000	$11,000
10	Power and light	4,000	4,500	5,000	5,500
11	Indirect materials	2,400	2,700	3,000	3,300
12	Total variable cost	$14,400	$16,200	$18,000	$19,800
13	Fixed costs:				
14	Supervisory salaries	$ 5,500	$ 5,500	$ 5,500	$ 5,500
15	Depreciation of plant				
16	and equipment	4,500	4,500	4,500	4,500
17	Insurance and property taxes	2,000	2,000	2,000	2,000
18	Total fixed cost	$12,000	$12,000	$12,000	$12,000
19	Total factory overhead cost	$26,400	$28,200	$30,000	$31,800
20					
21	Factory overhead rate per direct labor hour, $30,000 ÷ 5,000 hours = $6.00				
22					

Exhibit 8 indicates that the budgeted factory overhead rate for Western Rider is $6.00, computed as follows:

$$\text{Factory Overhead Rate} = \frac{\text{Budgeted Factory Overhead at Normal Capacity}}{\text{Normal Productive Capacity}}$$

$$= \frac{\$30{,}000}{5{,}000 \text{ direct labor hrs.}} = \$6.00 \text{ per direct labor hr.}$$

The normal productive capacity is expressed in terms of an activity base such as direct labor hours, direct labor cost, or machine hours. For Western Rider, 100% of normal capacity is 5,000 direct labor hours. The budgeted factory overhead cost at 100% of normal capacity is $30,000, which consists of variable overhead of $18,000 and fixed overhead of $12,000.

For analysis purposes, the budgeted factory overhead rate is subdivided into a variable factory overhead rate and a fixed factory overhead rate. For Western Rider, the variable overhead rate is $3.60 per direct labor hour, and the fixed overhead rate is $2.40 per direct labor hour, computed as follows:

$$\text{Variable Factory Overhead Rate} = \frac{\text{Budgeted Variable Overhead at Normal Capacity}}{\text{Normal Productive Capacity}}$$

$$= \frac{\$18{,}000}{5{,}000 \text{ direct labor hrs.}} = \$3.60 \text{ per direct labor hr.}$$

$$\text{Fixed Factory Overhead Rate} = \frac{\text{Budgeted Fixed Overhead at Normal Capacity}}{\text{Normal Productive Capacity}}$$

$$= \frac{\$12{,}000}{5{,}000 \text{ direct labor hrs.}} = \$2.40 \text{ per direct labor hr.}$$

To summarize, the budgeted factory overhead rates for Western Rider Inc. are as follows:

Variable factory overhead rate	$3.60
Fixed factory overhead rate	2.40
Total factory overhead rate	$6.00

As mentioned previously, factory overhead variances can be separated into a controllable variance and a volume variance as discussed in the next sections.

Variable Factory Overhead Controllable Variance

The variable factory overhead **controllable variance** is the difference between the actual variable overhead costs and the budgeted variable overhead for actual production. It is computed as follows:

$$\begin{array}{c}\text{Variable Factory Overhead}\\ \text{Controllable Variance}\end{array} = \begin{array}{c}\text{Actual}\\ \text{Variable Factory Overhead}\end{array} - \begin{array}{c}\text{Budgeted}\\ \text{Variable Factory Overhead}\end{array}$$

If the actual variable overhead is less than the budgeted variable overhead, the variance is favorable. If the actual variable overhead exceeds the budgeted variable overhead, the variance is unfavorable.

The **budgeted variable factory overhead** is the standard variable overhead for the *actual* units produced. It is computed as follows:

$$\begin{aligned}\text{Budgeted Variable Factory Overhead} &= \text{Standard Hours for Actual Units Produced}\\ &\quad \times \text{Variable Factory Overhead Rate}\end{aligned}$$

To illustrate, the budgeted variable overhead for **Western Rider Inc.** for June, when 5,000 units of XL jeans were produced, is $14,400, computed as follows:

$$\begin{aligned}\text{Budgeted Variable Factory Overhead} &= \text{Standard Hours for Actual Units Produced}\\ &\quad \times \text{Variable Factory Overhead Rate}\\ &= \text{4,000 direct labor hrs.} \times \$3.60\\ &= \$14,400\end{aligned}$$

The preceding computation is based on the fact that Western Rider produced 5,000 XL jeans, which requires a standard of 4,000 (5,000 units × 0.8 hr.) direct labor hours. The variable factory overhead rate of $3.60 was computed earlier. Thus, the budgeted variable factory overhead is $14,400 (4,000 direct labor hrs. × $3.60).

During June, assume that Western Rider incurred the following actual factory overhead costs:

	Actual Costs in June
Variable factory overhead	$10,400
Fixed factory overhead	12,000
Total actual factory overhead	$22,400

Based on the actual variable factory overhead incurred in June, the variable factory overhead controllable variance is a $4,000 favorable variance, computed as follows:

$$\begin{aligned}\begin{array}{c}\text{Variable Factory Overhead}\\ \text{Controllable Variance}\end{array} &= \begin{array}{c}\text{Actual}\\ \text{Variable Factory Overhead}\end{array} - \begin{array}{c}\text{Budgeted}\\ \text{Variable Factory Overhead}\end{array}\\ &= \$10,400 - \$14,400\\ &= \$(4,000)\ \text{Favorable Variance}\end{aligned}$$

The variable factory overhead controllable variance indicates the ability to keep the factory overhead costs within the budget limits. Because variable factory overhead costs are normally controllable at the department level, responsibility for controlling this variance usually rests with department supervisors.

Fixed Factory Overhead Volume Variance

Western Rider's budgeted factory overhead is based on a 100% normal capacity of 5,000 direct labor hours, as shown in Exhibit 8. This is the expected capacity that management believes will be used under normal business conditions. Exhibit 8 indicates that the 5,000 direct labor hours is less than the total available capacity of 110%, which is 5,500 direct labor hours.

The fixed factory overhead **volume variance** is the difference between the budgeted fixed overhead at 100% of normal capacity and the standard fixed overhead for the actual units produced. It is computed as follows:

$$\begin{array}{c}\text{Fixed Factory}\\ \text{Overhead}\\ \text{Volume Variance}\end{array} = \left(\begin{array}{c}\text{Standard Hours}\\ \text{for 100\% of}\\ \text{Normal Capacity}\end{array} - \begin{array}{c}\text{Standard Hours for}\\ \text{Actual Units}\\ \text{Produced}\end{array}\right) \times \begin{array}{c}\text{Fixed Factory}\\ \text{Overhead Rate}\end{array}$$

The volume variance measures the use of fixed overhead resources (plant and equipment). The interpretation of an unfavorable and a favorable fixed factory overhead volume variance is as follows:

- *Unfavorable* fixed factory overhead volume variance. The actual units produced is *less than* 100% of normal capacity; thus, the company used its fixed overhead resources (plant and equipment) less than would be expected under normal operating conditions.
- *Favorable* fixed factory overhead volume variance. The actual units produced is *more than* 100% of normal capacity; thus, the company used its fixed overhead resources (plant and equipment) more than would be expected under normal operating conditions.

To illustrate, the fixed factory overhead volume variance for **Western Rider Inc.** is a $2,400 unfavorable variance, computed as follows:

$$\text{Fixed Factory Overhead Volume Variance} = \left(\text{Standard Hours for 100\% of Normal Capacity} - \text{Standard Hours for Actual Units Produced}\right) \times \text{Fixed Factory Overhead Rate}$$

$$= \left(\text{5,000 direct labor hrs.} - \text{4,000 direct labor hrs.}\right) \times \$2.40$$

$$= \$2{,}400 \text{ Unfavorable Variance}$$

Because Western Rider produced 5,000 XL jeans during June, the standard for the actual units produced is 4,000 (5,000 units × 0.80) direct labor hours. This is 1,000 hours less than the 5,000 standard hours of normal capacity. The fixed overhead rate of $2.40 was computed earlier. Thus, the unfavorable fixed factory overhead volume variance is $2,400 (1,000 direct labor hrs. × $2.40).

Exhibit 9 illustrates graphically the fixed factory overhead volume variance for **Western Rider Inc.** The budgeted fixed overhead does not change and is $12,000 at all levels of production. At 100% of normal capacity (5,000 direct labor hours), the standard fixed overhead line intersects the budgeted fixed costs line. For production levels *more than* 100% of normal capacity (5,000 direct labor hours), the volume variance is *favorable*. For production levels *less than* 100% of normal capacity (5,000 direct labor hours), the volume variance is *unfavorable*.

Exhibit 9 indicates that Western Rider's fixed factory overhead volume variance is unfavorable in June because the actual production is 4,000 direct labor hours, or 80% of normal volume. The unfavorable volume variance of $2,400 can be viewed as the cost of the unused capacity (1,000 direct labor hours).

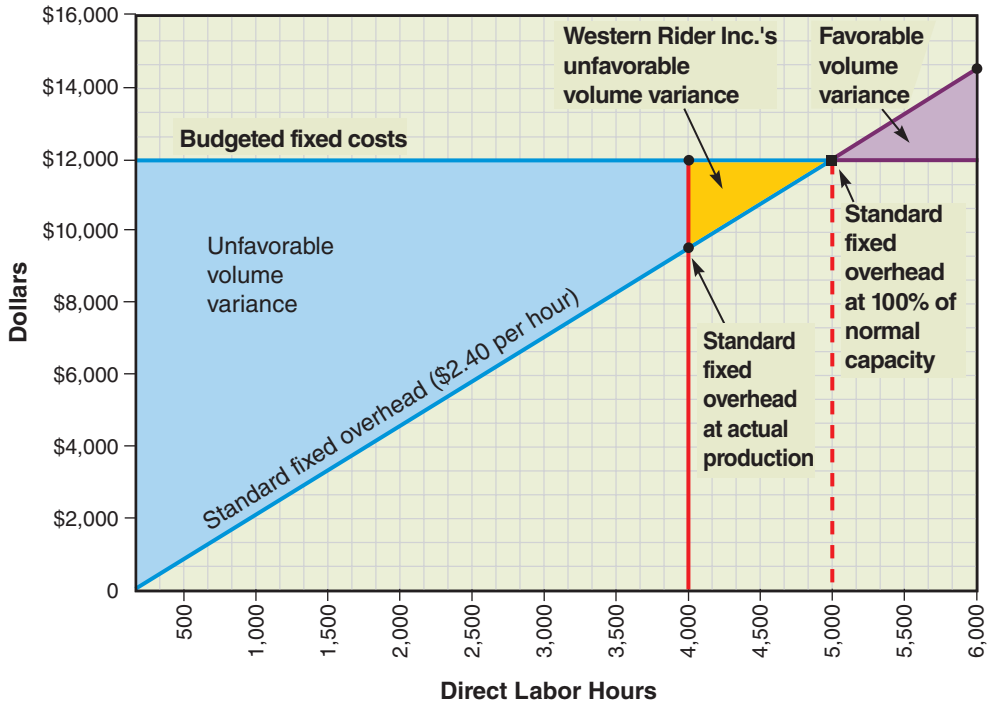


Exhibit 9
Graph of Fixed Overhead Volume Variance

An unfavorable volume variance may be due to factors such as the following:

- Failure to maintain an even flow of work
- Machine breakdowns
- Work stoppages caused by lack of materials or skilled labor
- Lack of enough sales orders to keep the factory operating at normal capacity

Management should determine the causes of the unfavorable variance and consider taking corrective action. For example, a volume variance caused by an uneven flow of work could be remedied by changing operating procedures. Lack of sales orders may be corrected through increased advertising.

Favorable volume variances may not always be desirable. For example, in an attempt to create a favorable volume variance, manufacturing managers might run the factory above the normal capacity. However, if the additional production cannot be sold, it must be stored as inventory, which would incur storage costs.

Reporting Factory Overhead Variances

The total factory overhead cost variance can also be determined as the sum of the variable factory overhead controllable and fixed factory overhead volume variances, computed as follows for **Western Rider Inc.**:

Variable factory overhead controllable variance	$(4,000)	Favorable Variance
Fixed factory overhead volume variance	2,400	Unfavorable Variance
Total factory overhead cost variance	$(1,600)	Favorable Variance

A **factory overhead cost variance report** is useful to management in controlling factory overhead costs. Budgeted and actual costs for variable and fixed factory overhead along with the related controllable and volume variances are reported by each cost element.

Exhibit 10 illustrates a factory overhead cost variance report for Western Rider Inc. for June.

Exhibit 10
Factory Overhead Cost Variance Report

	A	B	C	D	E
1	**Western Rider Inc.**				
2	**Factory Overhead Cost Variance Report**				
3	**For the Month Ending June 30**				
4	Productive capacity for the month (100% of normal)		5,000 hours		
5	Actual production for the month		4,000 hours		
6					
7			**Budget**		
8			**(at Actual**	**Variances**	
9		**Actual Cost**	**Production)**	**Unfavorable**	**(Favorable)**
10	Variable factory overhead costs:				
11	Indirect factory wages	$ 5,100	$ 8,000		$(2,900)
12	Power and light	4,200	4,000	$200	
13	Indirect materials	1,100	2,400		(1,300)
14	Total variable factory				
15	overhead cost	$10,400	$14,400		
16	Fixed factory overhead costs:				
17	Supervisory salaries	$ 5,500	$ 5,500		
18	Depreciation of plant and				
19	equipment	4,500	4,500		
20	Insurance and property taxes	2,000	2,000		
21	Total fixed factory				
22	overhead cost	$12,000	$12,000		
23	Total factory overhead cost	$22,400	$26,400		
24	Total controllable variances			$200	$(4,200)
25					
26					
27	Net controllable variance—favorable [$(4,200) favorable + $200 unfavorable]				$(4,000)
28	Volume variance—unfavorable:				
29	Capacity not used at the standard rate for fixed				
30	factory overhead—1,000 × $2.40				2,400
31	Total factory overhead cost variance—favorable				$(1,600)
32					

Factory Overhead Account

The applied factory overhead for **Western Rider Inc.** for the 5,000 XL jeans produced in June is $24,000, computed as follows:

$$\begin{aligned}\text{Applied Factory Overhead} &= \text{Standard Hours for Actual Units Produced} \times \text{Total Factory Overhead Rate}\\ &= (5{,}000 \text{ jeans} \times 0.80 \text{ direct labor hr. per pair of jeans}) \times \$6.00\\ &= 4{,}000 \text{ direct labor hrs.} \times \$6.00 = \$24{,}000\end{aligned}$$

The total actual factory overhead for Western Rider, as shown in Exhibit 10, was $22,400. Thus, the total factory overhead cost variance for Western Rider for June is a $1,600 favorable variance, computed as follows:

$$\begin{aligned}\text{Total Factory Overhead Cost Variance} &= \text{Actual Factory Overhead} - \text{Applied Factory Overhead}\\ &= \$22{,}400 - \$24{,}000 = \$(1{,}600) \text{ Favorable Variance}\end{aligned}$$

At the end of the period, the factory overhead account normally has a balance. A debit balance in Factory Overhead represents underapplied overhead. Underapplied overhead occurs when actual factory overhead costs exceed the applied factory overhead. A credit balance in Factory Overhead represents overapplied overhead. Overapplied overhead occurs when actual factory overhead costs are less than the applied factory overhead.

The difference between the actual factory overhead and the applied factory overhead is the total factory overhead cost variance. Thus, underapplied and overapplied factory overhead account balances represent the following total factory overhead cost variances:

- *Underapplied* Factory Overhead = *Unfavorable* Total Factory Overhead Cost Variance
- *Overapplied* Factory Overhead = *Favorable* Total Factory Overhead Cost Variance

The factory overhead account for **Western Rider Inc.** for the month ending June 30 is as follows:

Factory Overhead

Actual factory overhead ($10,400 + $12,000)	22,400		24,000 Applied factory overhead (4,000 hrs. × $6.00 per hr.)
		Bal., June 30	1,600 Overapplied factory overhead

The $1,600 overapplied factory overhead account balance and the favorable total factory overhead cost variance shown in Exhibit 10 are the same.

Why It Matters

Standard Costing in Action: Expanding Brewing Operations

U.S. west coast craft brewers **Sierra Nevada** and **New Belgium** recently announced plans to expand their brewing operations to the Asheville, North Carolina, area. Both companies considered the standard cost of their product when making the decision to expand, and in selecting Asheville as their east coast location. The standard price of direct materials includes the cost of shipping direct materials to the manufacturers' place of business. The Asheville location was desirable when considering these costs.

In addition, New Belgium projected that its Fort Collins, Colorado, brewery would reach maximum capacity in three to five years. While operating at 100% capacity creates a favorable overhead volume variance, any demand in excess of 100% capacity will result in lost sales. Thus, New Belgium felt that adding a new brewery prior to reaching 100% capacity at Fort Collins was supported. In both cases, standard costing was used to support the expansion and location decisions.

Sources: H. Dornbusch, "The Case for Low Mileage Beer," *Brewers Association.org;* J. McCurry, "Hops City: Beer Culture Comes to a Head in the Asheville Region," *Site Selection*, July 2012; J. Shikes, "New Belgium, Maker of Fat Tire, Plans a Second Brewery on the East Coast," *Denver Westward*, May 19, 2011.

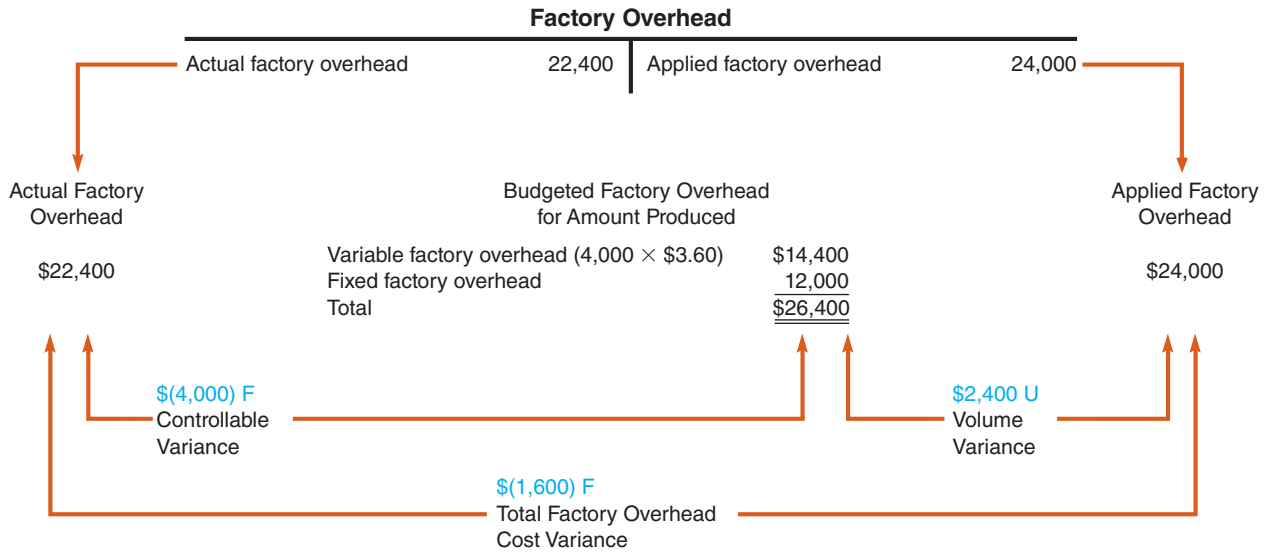
The variable factory overhead controllable variance and the volume variance can be computed by comparing the factory overhead account with the budgeted total overhead for the actual level produced, as shown in Exhibit 11.

The controllable and volume variances are determined as follows:

- The difference between the actual overhead incurred and the budgeted overhead is the *controllable* variance.
- The difference between the applied overhead and the budgeted overhead is the *volume* variance.

If the actual factory overhead exceeds (is less than) the budgeted factory overhead, the controllable variance is unfavorable (favorable). In contrast, if the applied factory overhead is less than (exceeds) the budgeted factory overhead, the volume variance is unfavorable (favorable).

Exhibit 11 Factory Overhead Variances



Check Up Corner 9-2 Factory Overhead Cost Variances

Menounos Manufacturing Co. uses standard costs. Standard costs and actual costs for direct labor and factory overhead for the manufacture of 3,000 units during 20Y6 were as follows:

	Standard Costs	Actual Costs
Direct labor	7,500 hours at $12.00 per hour	7,420 hours at $12.30 per hour
Factory overhead	Rates per direct labor hr., based on 100% of normal capacity of 8,000 direct labor hrs.:	
	Variable cost, $2.20	$16,850 variable cost
	Fixed cost, $0.90	$7,200 fixed cost

Each unit requires 2.5 hours of direct labor.

Compute the:

a. variable factory overhead controllable variance.
b. fixed factory overhead volume variance.
c. total factory overhead cost variance.

Solution:

a. Variable Factory Overhead Controllable Variance = Actual Variable Factory Overhead − Budgeted Variable Factory Overhead
= $16,850 − $16,500
= $350 Unfavorable Variance

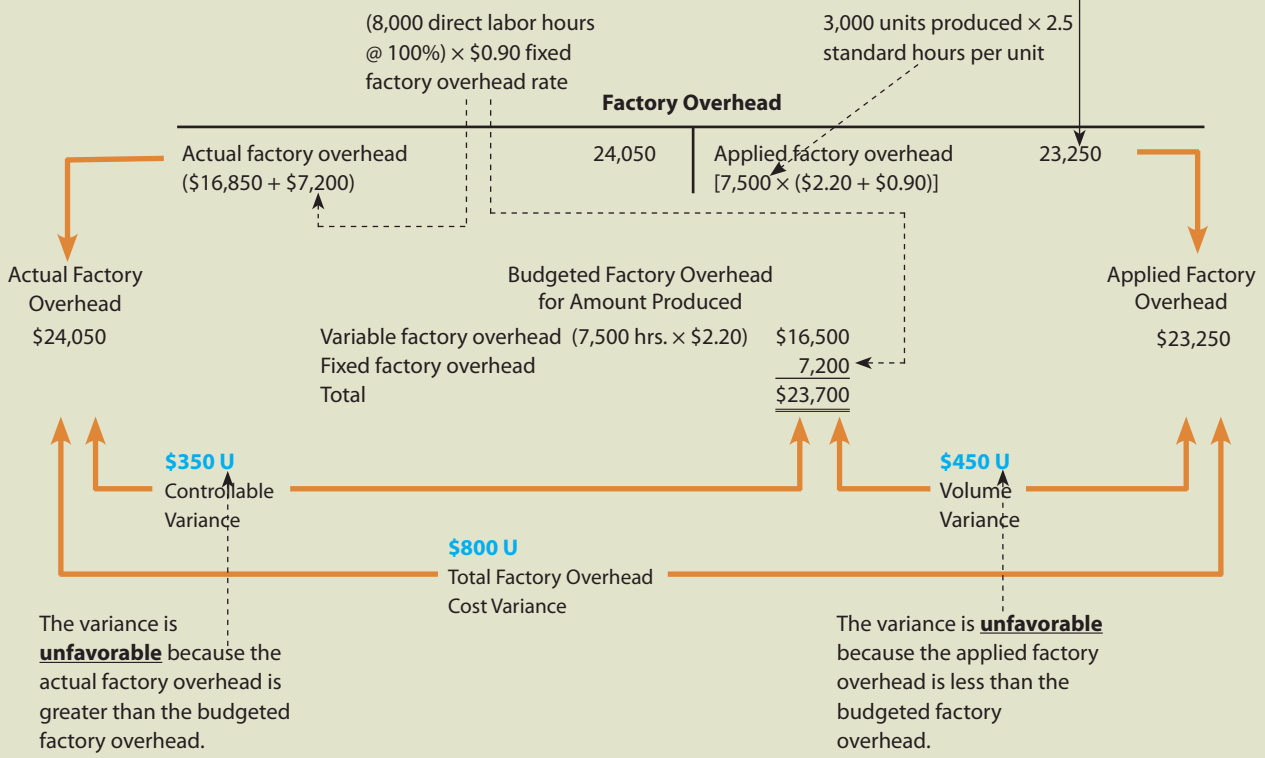
Budgeted Variable Factory Overhead = Standard Hours for Actual Units Produced × Variable Factory Overhead Rate
= 7,500 direct labor hrs. × $2.20
= $16,500

b. Fixed Factory Overhead Volume Variance = (Standard Hours for 100% of Normal Capacity − Standard Hours for Actual Units Produced) × Fixed Factory Overhead Rate
= (8,000 direct labor hrs. − 7,500 direct labor hrs.) × $0.90
= $450 Unfavorable Variance

c. Applied Factory Overhead = Standard Hours for Actual Units Produced × Total Factory Overhead Rate
= (3,000 units × 2.5 direct labor hrs. per unit) × ($2.20 variable cost per hour + $0.90 fixed cost per hour)
= 7,500 direct labor hrs. × $3.10
= $23,250

Total Factory Overhead Cost Variance = Actual Factory Overhead − Applied Factory Overhead
= $24,050 − $23,250
= 800 Unfavorable Variance

Alternative Computation of Overhead Variances



Check Up Corner

Objective 5
Describe and illustrate the recording and reporting of standards and variances.

Recording and Reporting Variances from Standards

Standard costs may be used as a management tool to control costs separately from the accounts in the ledger. However, many companies include standard costs in their accounts. One method for doing so records standard costs and variances at the same time the actual product costs are recorded.

To illustrate, assume that **Western Rider Inc.** purchased, on account, the 7,300 square yards of blue denim used at $5.50 per square yard. The standard price for direct materials is $5.00 per square yard. The entry to record the purchase and the unfavorable direct materials price variance is as follows:

Materials (7,300 sq. yds. × $5.00)	36,500	
Direct Materials Price Variance	3,650	
Accounts Payable (7,300 sq. yds. × $5.50)		40,150

The materials account is debited for the *actual quantity* purchased at the *standard price*, $36,500 (7,300 square yards × $5.00). Accounts Payable is credited for the $40,150 actual cost and the amount due the supplier. The difference of $3,650 is the unfavorable direct materials price variance [($5.50 – $5.00) × 7,300 sq. yds.]. It is recorded by debiting Direct Materials Price Variance. If the variance had been favorable, Direct Materials Price Variance would have been credited for the variance.

A debit balance in the direct materials price variance account represents an unfavorable variance. Likewise, a credit balance in the direct materials price variance account represents a favorable variance.

The direct materials quantity variance is recorded in a similar manner. For example, **Western Rider Inc.** used 7,300 square yards of blue denim to produce 5,000 pairs of XL jeans. The standard quantity of denim for the 5,000 jeans produced is 7,500 square yards. The entry to record the materials used is as follows:

Work in Process (7,500 sq. yds. × $5.00)	37,500	
Direct Materials Quantity Variance		1,000
Materials (7,300 sq. yds. × $5.00)		36,500

Work in Process is debited for $37,500, which is the standard cost of the direct materials required to produce 5,000 XL jeans (7,500 sq. yds. × $5.00). Materials is credited for $36,500, which is the actual quantity of materials used at the standard price (7,300 sq. yds. × $5.00). The difference of $1,000 is the favorable direct materials quantity variance [(7,300 sq. yds. – 7,500 sq. yds.) × $5.00]. It is recorded by crediting Direct Materials Quantity Variance. If the variance had been unfavorable, Direct Materials Quantity Variance would have been debited for the variance.

A debit balance in the direct materials quantity variance account represents an unfavorable variance. Likewise, a credit balance in the direct materials quantity variance account represents a favorable variance.

The journal entries to record the standard costs and variances for *direct labor* are similar to those for direct materials. These entries are summarized as follows:

- Work in Process is debited for the standard cost of direct labor.
- Wages Payable is credited for the actual direct labor cost incurred.

- Direct Labor Rate Variance is debited for an unfavorable variance and credited for a favorable variance.
- Direct Labor Time Variance is debited for an unfavorable variance and credited for a favorable variance.

As illustrated in the prior section, the factory overhead account already incorporates standard costs and variances into its journal entries. That is, Factory Overhead is debited for actual factory overhead and credited for applied (standard) factory overhead. The ending balance of factory overhead (overapplied or underapplied) is the total factory overhead cost variance. By comparing the actual factory overhead with the budgeted factory overhead, the controllable variance can be determined. By comparing the budgeted factory overhead with the applied factory overhead, the volume variance can be determined.

When goods are completed, Finished Goods is debited and Work in Process is credited for the standard cost of the product transferred.

At the end of the period, the balances of each of the variance accounts indicate the net favorable or unfavorable variance for the period. These variances may be reported in an income statement prepared for management's use.

Exhibit 12 is an example of an income statement for **Western Rider Inc.** that includes variances. In Exhibit 12, a sales price of $28 per pair of jeans, selling expenses of $14,500, and administrative expenses of $11,225 are assumed.

Western Rider Inc.
Income Statement
For the Month Ended June 30

	Unfavorable	Favorable	
Sales			$140,000[1]
Cost of goods sold—at standard			(97,500)[2]
Gross profit—at standard			$ 42,500
Variances from standard cost:			
Direct materials price	$3,650		
Direct materials quantity		$ (1,000)	
Direct labor rate	3,850		
Direct labor time		(1,350)	
Factory overhead controllable		(4,000)	
Factory overhead volume	2,400		
Net variance from standard cost—unfavorable			(3,550)
Gross profit			$ 38,950
Operating expenses:			
Selling expenses		$14,500	
Administrative expenses		11,225	
Total operating expenses			(25,725)
Operating income			$ 13,225

[1] 5,000 × $28
[2] $37,500 + $36,000 + $24,000 (from Exhibit 3), or 5,000 × $19.50 (from Exhibit 1)

Exhibit 12
Variance from Standards in Income Statement

The income statement shown in Exhibit 12 is for internal use by management. That is, variances are not reported to external users. Thus, the variances shown in Exhibit 12 must be transferred to other accounts in preparing an income statement for external users.

In preparing an income statement for external users, the balances of the variance accounts are normally transferred to Cost of Goods Sold. However, if the variances are significant or if many of the products manufactured are still in inventory, the variances should be allocated to Work in Process, Finished Goods, and Cost of Goods Sold. Such an allocation, in effect, converts these account balances from standard cost to actual cost.

Check Up Corner 9-3 Income Statement with Variances

Using the variance data for Menounos Manufacturing Co. in Check Up Corners 9-1 and 9-2, prepare an income statement through gross profit for the year ended December 31, 20Y6. Assume the company sold 3,000 units at $100 per unit.

Solution:

Menounos Manufacturing Co.
Income Statement Through Gross Profit
For the Year Ended December 31, 20Y6

Sales			$ 300,000
Cost of goods sold—at standard			(194,250)
Gross profit—at standard			$ 105,750
	Unfavorable	**Favorable**	
Variances from standard cost:			
Direct materials price		$(2,775)	
Direct materials quantity	$2,250		
Direct labor rate	2,226		
Direct labor time		(960)	
Factory overhead controllable	350		
Factory overhead volume	450		
Net variance from standard cost—unfavorable			(1,541)
Gross profit			$104,209

3,000 units sold × $100 selling price per unit

From Check Up Corner 9-1

From Check Up Corner 9-2

Direct materials at standard	$ 81,000
Direct labor cost at standard (3,000 units × 2.5 standard hours per unit × $12 standard rate per hour)	90,000
Factory overhead at standard (3,000 units × 2.5 standard hours per unit × $3.10 standard rate per hour)	23,250
Cost of goods sold at standard	$194,250

Check Up Corner

Analysis for Decision Making

Objective 6
Describe and illustrate the use of the direct labor time variance in evaluating staff performance in a service setting.

Service Staffing Variances

Standards can be used in nonmanufacturing settings where the tasks are repetitive in nature. Standards are used in hotels, hospitals, restaurants, transportation services, banks, retail stores, professional services, software development, automotive services, and many other service settings.

To illustrate, Marion Hotel uses labor standards to control the costs of the housekeeping staff. From historical information, the hotel expects a housekeeping employee to clean a room in 42 minutes. An occupied room for one night is termed a "guest room night." In addition, housekeeping employees are paid $13 per hour. Information for a recent week follows:

Number of guest room nights	1,050
Number of housekeeping staff hours	840

The guest room nights can be translated into standard staff hours as follows:

Number of guest room nights	1,050
Multiplied by standard hours per room (42 min. ÷ 60 min.)	× 0.70
Standard housekeeping staff hours	735

The direct labor time variance can be computed as:

Direct Labor Time Variance = (Actual Staff Hours – Standard Staff Hours) × Standard Rate per Hour
= (840 hrs. – 735 hrs.) × $13 per hour
= $1,365 Unfavorable

The actual staff hours were greater than the standard hours, causing an unfavorable staff time variance. Management can investigate the causes of the variance, which may include overscheduling staff, insufficient staff training, difficult room cleaning situations, and staff inefficiency.

Make a Decision Service Staffing Variances

Analyze Advent Software's staffing variances (MAD 9-1)

Analyze Valley Hospital's admissions time variance (MAD 9-2)

Analyze the U.S. Postal Service's sorting time variance (MAD 9-3)

Analyze Maywood City Police Department's labor time variance (MAD 9-4)

Make a Decision

Appendix Revenue Variances

Objective App
Compute and interpret revenue variances.

This chapter has discussed how managers use variances in planning and controlling operations. In doing so, the chapter has focused on the cost variances. Operating income is also affected by differences between expected (planned) revenues and actual revenues, called **revenue variances**.

A difference between actual and planned revenues may be due to an increase or decrease in one or more of the following:

- Unit sales price
- Units sold

The effects of the preceding two factors on revenue may be analyzed by computing the following two variances:

- Revenue price variance
- Revenue volume variance

The **revenue price variance** is caused by a difference in the planned and actual unit sales price on the actual units sold. The revenue price variance is computed as follows:

Revenue Price Variance = (Planned Selling Price per Unit – Actual Selling Price per Unit) × Actual Units Sold

The **revenue volume variance** is caused by a difference in the planned and actual units sold, assuming no change in unit sales price or unit cost. The revenue volume variance is computed as follows:

Revenue Volume Variance = (Planned Units Sold – Actual Units Sold) × Planned Sales Price

To illustrate, the following August data for Noble Inc., which sells a single product, are used:[2]

	Planned	Actual
Sales price per unit	$8.00	$7.50
Number of units of sales	×100,000	×125,000
Total sales	$800,000	$937,500

The unfavorable revenue price variance of $62,500 is computed as follows:

Revenue Price Variance = (Planned Selling Price per Unit – Actual Selling Price per Unit) × Actual Units Sold
= ($8.00 – $7.50) × 125,000
= $62,500 Unfavorable Variance

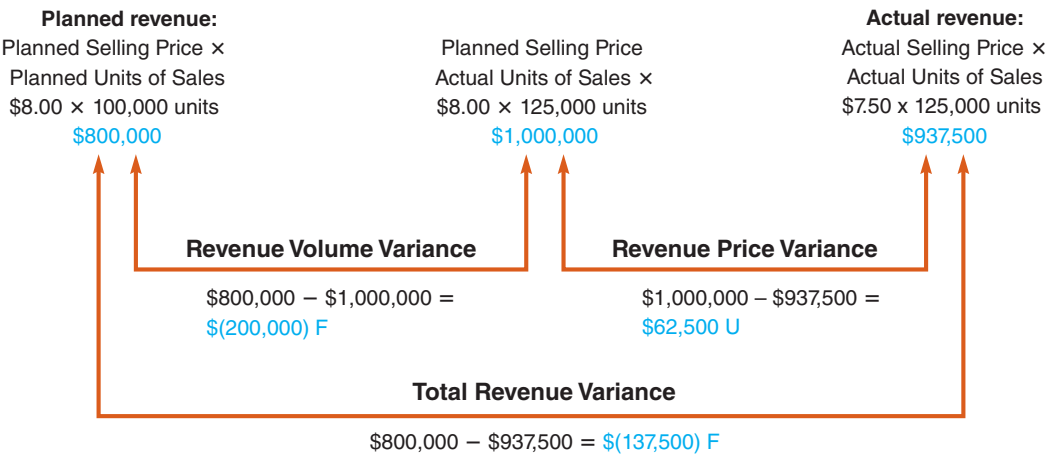
The unfavorable revenue variance of $62,500 has the effect of decreasing revenues and operating income.

The favorable revenue volume variance of $200,000 is computed as follows:

Revenue Volume Variance = (Planned Units Sold – Actual Units of Sales) × Planned Sales Price
= (100,000 – 125,000) × $8.00
= $(200,000) Favorable Variance

The favorable revenue volume variance of $200,000 has the effect of increasing revenues and operating income. The relationship among the total revenue variance, the revenue volume variance, and the revenue price variance is shown in Exhibit 13.

Exhibit 13
Revenue Analysis



For internal reporting, companies may report revenue variances separately or together with cost variances on an income statement.

[2] To simplify, it is assumed that Noble Inc. sells a single product. The analysis would be more complex, but the principles would be the same, if more than one product were sold.

Let's Review

Chapter Summary

1. Standards represent performance goals that can be compared to actual results in evaluating performance. Standards should be established so that they are neither too high nor too low, but are attainable.
2. Budgets are prepared by multiplying the standard cost per unit by the planned production. To measure performance, the standard cost per unit is multiplied by the actual number of units produced, and the actual results are compared with the standard cost at actual volumes (cost variance).
3. The direct materials cost variance can be separated into direct materials price and quantity variances. The direct labor cost variance can be separated into direct labor rate and time variances.
4. The factory overhead cost variance can be separated into a variable factory overhead controllable variance and a fixed factory overhead volume variance.
5. Standard costs and variances can be recorded in the accounts at the same time the manufacturing costs are recorded in the accounts. Work in Process is debited at standard. Under a standard cost system, the cost of goods sold will be reported at standard cost. Manufacturing variances can be disclosed on the income statement to adjust the gross profit at standard to the actual gross profit.
6. Standards can be used in nonmanufacturing settings where the tasks are repetitive in nature. In service businesses such as hotels and hospitals, standards are often used to compute labor time and rate variances.

Key Terms

budget performance report (414)
budgeted variable factory overhead (424)
controllable variance (424)
cost variances (414)
direct labor rate variance (419)
direct labor time variance (420)
direct materials price variance (417)
direct materials quantity variance (417)
factory overhead cost variance report (426)
favorable cost variance (414)
ideal standards (413)
normal standards (413)
revenue price variance (433)
revenue variances (433)
revenue volume variance (433)
standard cost (412)
standard cost systems (412)
standards (412)
total manufacturing cost variance (415)
unfavorable cost variance (414)
volume variance (424)

Practice

Multiple-Choice Questions

1. The actual and standard direct materials costs for producing a specified quantity of product are as follows:

Actual:	51,000 lbs. at $5.05	$257,550
Standard:	50,000 lbs. at $5.00	$250,000

The direct materials price variance is:

a. $50 unfavorable.
b. $2,500 unfavorable.
c. $2,550 unfavorable.
d. $7,550 unfavorable.

2. Bower Company produced 4,000 units of product. Each unit requires 0.5 standard hour. The standard labor rate is $12 per hour. Actual direct labor for the period was $22,000 (2,200 hrs. × $10 per hr.). The direct labor time variance is:
   a. 200 hours unfavorable.
   b. $2,000 unfavorable.
   c. $4,000 favorable.
   d. $2,400 unfavorable.

3. The actual and standard factory overhead costs for producing a specified quantity of product are as follows:

Actual: Variable factory overhead	$72,500	
Fixed factory overhead	40,000	$112,500
Standard: 19,000 hrs. at $6		
($4 variable and $2 fixed)		114,000

   If 1,000 hours were unused, the fixed factory overhead volume variance would be:
   a. $1,500 favorable.
   b. $2,000 unfavorable.
   c. $4,000 unfavorable.
   d. $6,000 unfavorable.

4. Ramathan Company produced 6,000 units of Product Y, which is 80% of capacity. Each unit required 0.25 standard machine hour for production. The standard variable factory overhead rate is $5 per machine hour. The actual variable factory overhead incurred during the period was $8,000. The variable factory overhead controllable variance is:
   a. $500 favorable.
   b. $500 unfavorable.
   c. $1,875 favorable.
   d. $1,875 unfavorable.

5. Applegate Company has a normal budgeted capacity of 200 machine hours. Applegate produced 600 units. Each unit requires a standard 0.2 machine hour to complete. The standard fixed factory overhead is $12 per hour, determined at normal capacity. The fixed factory overhead volume variance is:
   a. $4,800 unfavorable.
   b. $4,800 favorable.
   c. $960 favorable.
   d. $960 unfavorable.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Direct materials variances — Obj. 3

Lo-bed Company produces a product that requires 2 standard gallons per unit. The standard price is $20.00 per gallon. If 4,000 units required 8,200 gallons, which were purchased at $19.75 per gallon, what is the direct materials (a) price variance, (b) quantity variance, and (c) total cost variance?

2. Direct labor variances — Obj. 3

Lo-bed Company produces a product that requires 4 standard direct labor hours per unit at a standard hourly rate of $28.00 per hour. If 4,000 units required 16,750 direct labor hours at an hourly rate of $28.40 per hour, what is the direct labor (a) rate variance, (b) time variance, and (c) total cost variance?

3. Factory overhead controllable variance — Obj. 4

Lo-bed Company produced 4,000 units of product that required 4 standard hours per unit. The standard variable overhead cost per unit is $3.00 per hour. The actual variable factory overhead was $51,240. Determine the variable factory overhead controllable variance.

4. Factory overhead volume variance — Obj. 4

Lo-bed Company produced 4,000 units of product that required 4 standard hours per unit. The standard fixed overhead cost per unit is $1.20 per hour at 16,400 hours, which is 100% of normal capacity. Determine the fixed factory overhead volume variance.

5. Standard cost journal entries — Obj. 5

Lo-bed Company produced 4,000 units that require 2 standard gallons per unit at $20.00 standard price per gallon. The company actually used 8,200 gallons in production. Journalize the entry to record the standard direct materials used in production.

6. Income statement with variances — Obj. 5

Prepare an income statement for Lo-bed Company for the month ending March 31. Prepare the income statement through gross profit using the variance data from Exercises 1, 2, 3, and 4. Assume Lo-bed sold 4,000 units at $250 per unit.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Hawley Inc. manufactures designer briefcases for national distribution. The standard costs for manufacturing a batch of designer briefcases were as follows:

	Standard Costs	Actual Costs
Direct materials	1,500 lbs. at $35	1,600 lbs. at $32
Direct labor	4,800 hrs. at $11	4,500 hrs. at $11.80
Factory overhead	Rates per labor hour, based on 100% of normal capacity of 5,500 labor hrs.:	
	Variable cost, $2.40	$12,300 variable cost
	Fixed cost, $3.50	$19,250 fixed cost

Instructions

1. Determine the direct materials price variance, direct materials quantity variance, and total direct materials cost variance for the batch of designer briefcases.
2. Determine the direct labor rate variance, direct labor time variance, and total direct labor cost variance for the batch of designer briefcases.
3. Determine the variable factory overhead controllable variance, fixed factory overhead volume variance, and total factory overhead cost variance for the batch of designer briefcases.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **c** The unfavorable direct materials price variance of $2,550 is determined as follows:

Actual price	$ 5.05 per lb.
Standard price	(5.00)
Price variance	$ 0.05 per lb.
Actual lbs.	× 51,000 lbs.
Price variance—unfavorable	$ 2,550

2. **d** The unfavorable direct labor time variance of $2,400 is determined as follows:

Actual direct labor time	2,200 hrs.
Standard direct labor time	(2,000) hrs.*
Direct labor time variance	200 hrs.
Standard direct labor rate	× $12
Direct labor time variance—unfavorable	$2,400

*4,000 units × 0.5 hr.

3. **b** The unfavorable factory overhead volume variance of $2,000 is determined as follows:

Productive capacity not used	1,000 hrs.
Standard fixed factory overhead cost rate	× $2
Factory overhead volume variance—unfavorable	$2,000

4. **b** The controllable variable factory overhead variance is determined as follows:

Actual variable overhead	$ 8,000
Budgeted variable overhead at actual volume	(7,500)*
Controllable variance—unfavorable	$ 500

*6,000 units × 0.25 hr. = 1,500 hours;
1,500 hrs. × $5 per hr. = $7,500

5. **d** The fixed factory overhead volume variance can be determined as follows:

Practical capacity	200 machine hrs.
Actual production in standard hours	(120) machine hrs.*
Idle capacity	80 machine hrs.
Standard fixed factory overhead rate	×$12
Volume variance—unfavorable	$960

*600 units × 0.2 machine hr. = 120 machine hrs.

Exercises

1. a. Direct materials price variance (favorable) $(2,050) [($19.75 – $20.00) × 8,200 gal.]
   b. Direct materials quantity variance (unfavorable) $4,000 [(8,200 gal. – 8,000 gal.) × $20.00]
   c. Direct materials total cost variance (unfavorable) $1,950 [$(2,050) + $4,000] or [($19.75 × 8,200 gal.) – ($20.00 × 8,000 gal.)] = $161,950 – $160,000

2. a. Direct labor rate variance (unfavorable) $6,700 [($28.40 – $28.00) × 16,750 hrs.]
   b. Direct labor time variance (unfavorable) $21,000 [(16,750 hrs. – 16,000 hrs.) × $28.00]
   c. Direct labor total cost variance (unfavorable) $27,700 ($6,700 + $21,000) or [($28.40 × 16,750 hrs.) – ($28.00 × 16,000 hrs.)] = $475,700 – $448,000

3. Variable Factory Overhead Controllable Variance = $51,240 – [$3.00 × (4,000 units × 4 hrs.)]
   = $51,240 – $48,000
   = $3,240 Unfavorable

4. $480 Unfavorable = $1.20 × [16,400 hrs. – (4,000 units × 4 hrs.)]

5.

Work in Process (8,000* gal. × $20.00)	160,000	
Direct Materials Quantity Variance**	4,000	
Materials (8,200 gal. × $20.00)		164,000

*4,000 units × 2 standard gal. per unit
**[(8,200 gal. – 8,000 gal.) × $20.00]

6.

Lo-bed Company
Income Statement Through Gross Profit
For the Month Ended March 31

Sales (4,000 units × $250)			$1,000,000
Cost of goods sold—at standard*			(675,200)
Gross profit—at standard			$ 324,800
	Unfavorable	**Favorable**	
Variances from standard cost:			
Direct materials price (Exercise 1)		$(2,050)	
Direct materials quantity (Exercise 1)	$ 4,000		
Direct labor rate (Exercise 2)	6,700		
Direct labor time (Exercise 2)	21,000		
Factory overhead controllable (Exercise 3)	3,240		
Factory overhead volume (Exercise 4)	480		
Net variance from standard cost—unfavorable			(33,370)
Gross profit			$ 291,430
*Direct materials (4,000 units × 2 gal. × $20.00)			$160,000
Direct labor (4,000 units × 4 hrs. × $28.00)			448,000
Factory overhead [4,000 units × 4 hrs. × ($3.00 + $1.20)]			67,200
Cost of goods sold at standard			$675,200

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1.

Direct Materials Cost Variance

Price variance:

Direct Materials Price Variance = (Actual Price – Standard Price) × Actual Quantity
= ($32 per lb. – $35 per lb.) × 1,600 lbs.
= $(4,800) Favorable Variance

Quantity variance:

Direct Materials Quantity Variance = (Actual Quantity – Standard Quantity) × Standard Price
= (1,600 lbs. – 1,500 lbs.) × $35 per lb.
= $3,500 Unfavorable Variance

Total direct materials cost variance:

Direct Materials Cost Variance = Direct Materials Quantity Variance + Direct Materials Price Variance
= $3,500 + $(4,800)
= $(1,300) Favorable Variance

2.

Direct Labor Cost Variance

Rate variance:

Direct Labor Rate Variance = (Actual Rate per Hour – Standard Rate per Hour) × Actual Hours
= ($11.80 – $11.00) × 4,500 hrs.
= $3,600 Unfavorable Variance

Time variance:

Direct Labor Time Variance = (Actual Direct Labor Hours – Standard Direct Labor Hours) × Standard Rate per Hour
= (4,500 hrs. – 4,800 hrs.) × $11.00 per hour
= $(3,300) Favorable Variance

Total direct labor cost variance:

Direct Labor Cost Variance = Direct Labor Time Variance + Direct Labor Rate Variance
= $(3,300) + $3,600
= $300 Unfavorable Variance

3. **Factory Overhead Cost Variance**

Variable factory overhead controllable variance:

$$\begin{aligned}\text{Variable Factory Overhead Controllable Variance} &= \text{Actual Variable Factory Overhead} - \text{Budgeted Variable Factory Overhead}\\ &= \$12{,}300 - \$11{,}520^{*}\\ &= \$780 \text{ Unfavorable Variance}\end{aligned}$$

*4,800 hrs. × $2.40 per hour

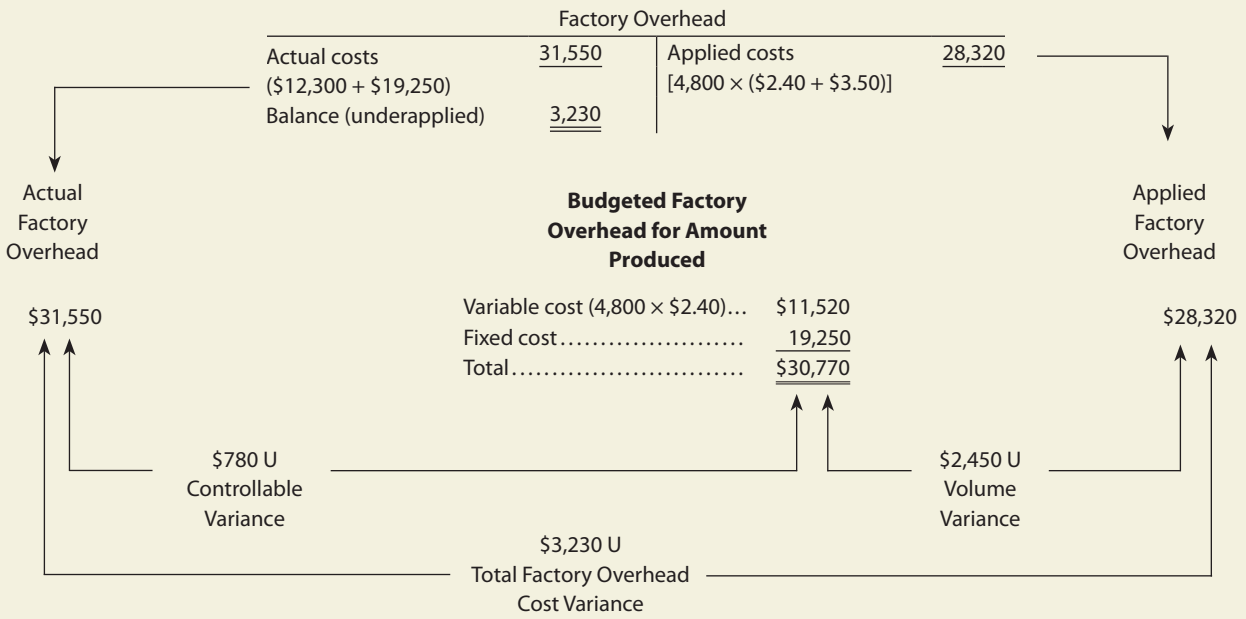
Fixed factory overhead volume variance:

$$\begin{aligned}\text{Fixed Factory Overhead Volume Variance} &= \left(\text{Standard Hours for 100\% of Normal Capacity} - \text{Standard Hours for Actual Units Produced}\right) \times \text{Fixed Factory Overhead Rate}\\ &= (5{,}500 \text{ hrs.} - 4{,}800 \text{ hrs.}) \times \$3.50 \text{ per hr.}\\ &= \$2{,}450 \text{ Unfavorable Variance}\end{aligned}$$

Total factory overhead cost variance:

$$\begin{aligned}\text{Factory Overhead Cost Variance} &= \text{Variable Factory Overhead Controllable Variance} + \text{Fixed Factory Overhead Volume Variance}\\ &= \$780 + \$2{,}450\\ &= \$3{,}230 \text{ Unfavorable Variance}\end{aligned}$$

Alternative Computation of Overhead Variances



Discussion Questions

1. What are the basic objectives in the use of standard costs?
2. What is meant by reporting by the "principle of exceptions," as the term is used in reference to cost control?
3. What are the two variances between the actual cost and the standard cost for direct materials?
4. The materials cost variance report for Nickols Inc. indicates a large favorable materials price variance and a

significant unfavorable materials quantity variance. What might have caused these offsetting variances?

5. a. What are the two variances between the actual cost and the standard cost for direct labor?
   b. Who generally has control over the direct labor cost variances?
6. A new assistant controller recently was heard to remark: "All the assembly workers in this plant are covered by union contracts, so there should be no labor variances." Was the controller's remark correct? Discuss.
7. Would the use of standards be appropriate in a nonmanufacturing setting, such as a fast-food restaurant?
8. a. Describe the two variances between the actual costs and the standard costs for factory overhead.
   b. What is a factory overhead cost variance report?
9. At the end of the period, the factory overhead account has a credit balance of $10,000. (a) Is the total factory cost variance favorable or unfavorable? (b) Are the controllable and volume variances favorable or unfavorable?
10. If variances are recorded in the accounts at the time the manufacturing costs are incurred, what does a debit balance in Direct Materials Price Variance represent?

Basic Exercises



BE 9-1 Direct materials variances **Obj. 3**

Bellingham Company produces a product that requires 2.5 standard pounds per unit. The standard price is $3.75 per pound. If 15,000 units used 36,000 pounds, which were purchased at $4.00 per pound, what is the direct materials (a) price variance, (b) quantity variance, and (c) cost variance?



BE 9-2 Direct labor variances **Obj. 3**

Bellingham Company produces a product that requires 4 standard direct labor hours per unit at a standard hourly rate of $20 per hour. If 15,000 units used 61,800 hours at an hourly rate of $19.85 per hour, what is the direct labor (a) rate variance, (b) time variance, and (c) cost variance?



BE 9-3 Factory overhead controllable variance **Obj. 4**

Bellingham Company produced 15,000 units of product that required 4 standard direct labor hours per unit. The standard variable overhead cost per unit is $0.90 per direct labor hour. The actual variable factory overhead was $52,770. Determine the variable factory overhead controllable variance.



BE 9-4 Factory overhead volume variance **Obj. 4**

Bellingham Company produced 15,000 units of product that required 4 standard direct labor hours per unit. The standard fixed overhead cost per unit is $1.15 per direct labor hour at 58,000 hours, which is 100% of normal capacity. Determine the fixed factory overhead volume variance.



BE 9-5 Standard cost journal entries **Obj. 5**

Bellingham Company produced 15,000 units that require 2.5 standard pounds per unit at a $3.75 standard price per pound. The company actually used 36,000 pounds in production. Journalize the entry to record the standard direct materials used in production.



BE 9-6 Income statement with variances **Obj. 5**

Prepare an income statement through gross profit for Bellingham Company for the month ending March 31 using the variance data from Brief Exercises 1, 2, 3, and 4. Assume Bellingham sold 15,000 units at $172 per unit.

Exercises

SHOW ME HOW

EX 9-1 Standard direct materials cost per unit — Obj. 2

Crazy Delicious Inc. produces chocolate bars. The primary materials used in producing chocolate bars are cocoa, sugar, and milk. The standard costs for a batch of chocolate (5,000 bars) are as follows:

Ingredient	Quantity	Price
Cocoa	500 lbs.	$1.40 per lb.
Sugar	100 lbs.	$0.50 per lb.
Milk	250 gal.	$1.60 per gal.

Determine the standard direct materials cost per bar of chocolate.

SHOW ME HOW

EX 9-2 Standard product cost — Obj. 2

Atlas Furniture Company manufactures designer home furniture. Atlas uses a standard cost system. The direct labor, direct materials, and factory overhead standards for an unfinished dining room table are as follows:

Direct labor:	standard rate	$28.00 per hr.
	standard time per unit	5.0 hrs.
Direct materials (oak):	standard price	$12.00 per bd. ft.
	standard quantity	18 bd. ft.
Variable factory overhead:	standard rate	$2.00 per direct labor hr.
Fixed factory overhead:	standard rate	$3.80 per direct labor hr.

a. Determine the standard cost per dining room table.

b. Why would Atlas Furniture Company use a standard cost system?

✔ b. Direct labor cost variance, $250 U

SHOW ME HOW EXCEL TEMPLATE

EX 9-3 Budget performance report — Obj. 2

Salisbury Bottle Company manufactures plastic two-liter bottles for the beverage industry. The cost standards per 100 two-liter bottles are as follows:

Cost Category	Standard Cost per 100 Two-Liter Bottles
Direct labor	$1.20
Direct materials	6.50
Factory overhead	1.80
Total	$9.50

At the beginning of March, Salisbury's management planned to produce 500,000 bottles. The actual number of bottles produced for March was 525,000 bottles. The actual costs for March of the current year were as follows:

Cost Category	Actual Cost for the Month Ended March 31
Direct labor	$ 6,550
Direct materials	33,800
Factory overhead	9,100
Total	$49,450

a. Prepare the March manufacturing standard cost budget (direct labor, direct materials, and factory overhead) for Salisbury, assuming planned production.

b. Prepare a budget performance report for manufacturing costs, showing the total cost variances for direct materials, direct labor, and factory overhead for March.

c. Interpret the budget performance report.

EX 9-4 Direct materials variances — Obj. 3

✔ a. Price variance, $36,250 U


SHOW ME HOW

The following data relate to the direct materials cost for the production of 50,000 automobile tires:

Actual:	725,000 lbs. at $3.00 per lb.
Standard:	730,000 lbs. at $2.95 per lb.

a. Determine the direct materials price variance, direct materials quantity variance, and total direct materials cost variance.

b. To whom should the variances be reported for analysis and control?

EX 9-5 Direct materials variances — Obj. 3

✔ Quantity variance, $375 U


SHOW ME HOW

De Soto Inc. produces tablet computers. The company uses Thin Film Crystal (TFC) LCD displays for its products. Each tablet uses one display. The company produced 770 tablets during July. However, due to LCD defects, the company actually used 800 LCD displays during July. Each display has a standard cost of $12.50. Eight hundred LCD displays were purchased for July production at a cost of $9,400.

Determine the price variance, quantity variance, and total direct materials cost variance for July.

EX 9-6 Standard direct materials cost per unit from variance data — Obj. 2, 3


SHOW ME HOW

The following data relating to direct materials cost for October of the current year are taken from the records of Good Clean Fun Inc., a manufacturer of organic toys:

Quantity of direct materials used	3,000 lbs.
Actual unit price of direct materials	$5.50 per lb.
Units of finished product manufactured	1,400 units
Standard direct materials per unit of finished product	2 lbs.
Direct materials quantity variance—unfavorable	$1,000
Direct materials price variance—unfavorable	$1,500

Determine the standard direct materials cost per unit of finished product, assuming that there was no inventory of work in process at either the beginning or the end of the month.

EX 9-7 Standard product cost, direct materials variance — Obj. 2, 3

✔ a. $0.60 per lb.


SHOW ME HOW


REAL WORLD

H.J. Heinz Company uses standards to control its materials costs. Assume that a batch of ketchup (7,650 pounds) has the following standards:

	Standard Quantity	Standard Price
Whole tomatoes	5,000 lbs.	$0.75 per lb.
Vinegar	350 gal.	0.90 per gal.
Corn syrup	40 gal.	7.50 per gal.
Salt	125 lbs.	1.80 per lb.

The actual materials in a batch may vary from the standard due to tomato characteristics. Assume that the actual quantities of materials for batch 08-99 were as follows:

4,900 lbs. of tomatoes
375 gal. of vinegar
36 gal. of corn syrup
140 lbs. of salt

a. Determine the standard unit materials cost per pound for a standard batch.

b. Determine the direct materials quantity variance for batch 08-99.

EX 9-8 Direct labor variances — Obj. 3

✔ a. Direct labor rate variance, $(4,225) F


SHOW ME HOW

The following data relate to labor cost for production of 20,000 cellular telephones:

Actual:	8,450 hrs. at $22.50
Standard:	8,400 hrs. at $23.00

a. Determine the direct labor rate variance, direct labor time variance, and total direct labor cost variance.

b. Discuss what might have caused these variances.

EX 9-9 Direct labor variances

Obj. 3, 5

✔ a. Direct labor time variance, $4,800 U



Glacier Bicycle Company manufactures commuter bicycles from recycled materials. The following data for October are available:

Quantity of direct labor used	5,000 hrs.
Actual rate for direct labor	$22.75 per hr.
Bicycles completed in October	800 bicycles
Standard direct labor per bicycle	6.0 hrs.
Standard rate for direct labor	$24.00 per hr.

a. Determine for October the direct labor rate variance, direct labor time variance, and total direct labor cost variance.

b. How much direct labor should be debited to Work in Process?

EX 9-10 Direct labor variances

Obj. 3

✔ a. Cutting Department rate variance, $(19,200) F

Ada Clothes Company produced 40,000 units during April. The Cutting Department used 12,800 direct labor hours at an actual rate of $16.50 per hour. The Sewing Department used 19,600 direct labor hours at an actual rate of $19.25 per hour. Assume there were no work in process inventories in either department at the beginning or end of the month. The standard labor rate is $18.00. The standard labor time for the Cutting and Sewing departments is 0.3 hour and 0.5 hour per unit, respectively.

a. Determine the direct labor rate, direct labor time, and total direct labor cost variance for the (1) Cutting Department and (2) Sewing Department.

b. Interpret your results.

EX 9-11 Direct labor variances for a service company

Obj. 3

✔ a. Direct labor rate variance, $(9.60) F



Mexicali On the Go Inc. owns and operates food trucks (mobile kitchens) throughout the west coast. The company's employees have varying wage levels depending on their experience and length of time with the company. Employees work 8-hour shifts and are assigned to a truck each day based on labor needs to support the daily menu. One of its trucks, Donna's Mobile Fiesta offers a single menu item that changes daily. On May 6, the truck prepared 70 of its most popular item, the Breakfast Enchilada. The following data are available for that day:

Quantity of direct labor used (2 employees, working 8-hour shifts)	16 hrs.
Actual rate for direct labor	$15.40 per hr.
Standard direct labor per meal	0.2 hr.
Standard rate for direct labor	$16.00 per hr.

a. Determine the direct labor rate variance, direct labor time variance, and total direct labor cost variance.

b. Discuss what might have caused these variances.

EX 9-12 Direct materials and direct labor variances

Obj. 3

✔ Direct materials quantity variance, $1,100 U



At the beginning of June, Bezco Toy Company budgeted 5,000 toy action figures to be manufactured in June at standard direct materials and direct labor costs as follows:

Direct materials	$50,000
Direct labor	36,000
Total	$86,000

The standard materials price is $4.00 per pound. The standard direct labor rate is $18.00 per hour. At the end of June, the actual direct materials and direct labor costs were as follows:

Actual direct materials	$49,600
Actual direct labor	34,020
Total	$83,620

There were no direct materials price or direct labor rate variances for June. In addition, assume no changes in the direct materials inventory balances in June. Bezco Toy Company actually produced 4,850 units during June.

Determine the direct materials quantity and direct labor time variances.

EX 9-13 Flexible overhead budget

Obj. 4

✔ Total factory overhead, 22,000 hrs., $443,600

Leno Manufacturing Company prepared the following factory overhead cost budget for the Press Department for October of the current year, during which it expected to require 20,000 hours of productive capacity in the department:

Variable overhead costs:		
Indirect factory labor	$180,000	
Power and light	12,000	
Indirect materials	64,000	
Total variable overhead cost		$256,000
Fixed overhead costs:		
Supervisory salaries	$ 80,000	
Depreciation of plant and equipment	50,000	
Insurance and property taxes	32,000	
Total fixed overhead cost		162,000
Total factory overhead cost		$418,000

Assuming that the estimated costs for November are the same as for October, prepare a flexible factory overhead cost budget for the Press Department for November for 18,000, 20,000, and 22,000 hours of production.

EX 9-14 Flexible overhead budget

Obj. 4

✔ b. $94,500

Wiki Wiki Company has determined that the variable overhead rate is $4.50 per direct labor hour in the Fabrication Department. The normal production capacity for the Fabrication Department is 10,000 hours for the month. Fixed costs are budgeted at $60,000 for the month.

a. Prepare a monthly factory overhead flexible budget for 9,000, 10,000, and 11,000 hours of production.

b. How much overhead would be applied to production if 9,000 hours were used in the department during the month?

EX 9-15 Factory overhead cost variances

Obj. 4

✔ Volume variance, $6,000 U

The following data relate to factory overhead cost for the production of 10,000 computers:

Actual:	Variable factory overhead	$262,000
	Fixed factory overhead	90,000
Standard:	14,000 hrs. at $25	350,000

If productive capacity of 100% was 15,000 hours and the total factory overhead cost budgeted at the level of 14,000 standard hours was $356,000, determine the variable factory overhead controllable variance, fixed factory overhead volume variance, and total factory overhead cost variance. The fixed factory overhead rate was $6.00 per hour.

EX 9-16 Factory overhead cost variances

Obj. 4

✔ a. Controllable variance, $(21,250) F



EXCEL TEMPLATE

Thomas Textiles Corporation began November with a budget for 60,000 hours of production in the Weaving Department. The department has a full capacity of 75,000 hours under normal business conditions. The budgeted overhead at the planned volumes at the beginning of November was as follows:

Variable overhead	$450,000
Fixed overhead	262,500
Total	$712,500

The actual factory overhead was $725,000 for November. The actual fixed factory overhead was as budgeted. During November, the Weaving Department had standard hours at actual production volume of 64,500 hours.

a. Determine the variable factory overhead controllable variance.

b. Determine the fixed factory overhead volume variance.

EX 9-17 Factory overhead variance corrections

Obj. 4

The data related to Shunda Enterprises Inc.'s factory overhead cost for the production of 100,000 units of product are as follows:

Actual:	Variable factory overhead	$458,000
	Fixed factory overhead	494,000
Standard:	132,000 hrs. at $7.30 ($3.50 for variable factory overhead)	963,600

Productive capacity at 100% of normal was 130,000 hours, and the factory overhead cost budgeted at the level of 132,000 standard hours was $956,000. Based on these data, the chief cost accountant prepared the following variance analysis:

Variable factory overhead controllable variance:		
Actual variable factory overhead cost incurred	$ 458,000	
Budgeted variable factory overhead for 132,000 hours	(462,000)	
Variance—favorable		$ (4,000)
Fixed factory overhead volume variance:		
Normal productive capacity at 100%	130,000 hrs.	
Standard for amount produced	(132,000)	
Productive capacity not used	2,000 hrs.	
Standard variable factory overhead rate	× $7.30	
Variance—unfavorable		14,600
Total factory overhead cost variance—unfavorable		$10,600

Identify the errors in the factory overhead cost variance analysis.

EX 9-18 Factory overhead cost variance report

Obj. 4

✔ Net controllable variance, $900 U



EXCEL TEMPLATE

Tannin Products Inc. prepared the following factory overhead cost budget for the Trim Department for July of the current year, during which it expected to use 20,000 hours for production:

Variable overhead costs:		
Indirect factory labor	$46,000	
Power and light	12,000	
Indirect materials	20,000	
Total variable overhead cost		$ 78,000
Fixed overhead costs:		
Supervisory salaries	$54,500	
Depreciation of plant and equipment	40,000	
Insurance and property taxes	35,500	
Total fixed overhead cost		130,000
Total factory overhead cost		$208,000

Tannin has available 25,000 hours of monthly productive capacity in the Trim Department under normal business conditions. During July, the Trim Department actually used 22,000 hours for production. The actual fixed costs were as budgeted. The actual variable overhead for July was as follows:

Actual variable factory overhead costs:	
Indirect factory labor	$49,700
Power and light	13,000
Indirect materials	24,000
Total variable cost	$86,700

Construct a factory overhead cost variance report for the Trim Department for July.

EX 9-19 Recording standards in accounts

Obj. 5

Cioffi Manufacturing Company incorporates standards in its accounts and identifies variances at the time the manufacturing costs are incurred. Journalize the entries to record the following transactions:

a. Purchased 2,450 units of copper tubing on account at $52.00 per unit. The standard price is $48.50 per unit.

b. Used 1,900 units of copper tubing in the process of manufacturing 200 air conditioners. Ten units of copper tubing are required, at standard, to produce one air conditioner.

EX 9-20 Recording standards in accounts **Obj. 5**

The Assembly Department produced 5,000 units of product during March. Each unit required 2.20 standard direct labor hours. There were 11,500 actual hours used in the Assembly Department during March at an actual rate of $17.60 per hour. The standard direct labor rate is $18.00 per hour. Assuming direct labor for a month is paid on the fifth day of the following month, journalize the direct labor in the Assembly Department on March 31.

EX 9-21 Income statement indicating standard cost variances **Obj. 5**

✔ Operating income, $85,900

The following data were taken from the records of Griggs Company for December:

Administrative expenses	$100,800
Cost of goods sold (at standard)	550,000
Direct materials price variance—unfavorable	1,680
Direct materials quantity variance—favorable	(560)
Direct labor rate variance—favorable	(1,120)
Direct labor time variance—unfavorable	490
Variable factory overhead controllable variance—favorable	(210)
Fixed factory overhead volume variance—unfavorable	3,080
Interest expense	2,940
Sales	868,000
Selling expenses	125,000

Prepare an income statement for presentation to management.

Appendix

EX 9-22 Revenue variances

Rockport Industries Inc. gathered the following data for March:

	Planned	Actual
Sales price per unit	$150	$144
Number of units of sales	× 12,500	× 12,900
Total sales	$1,875,000	$1,857,600

a. Compute the revenue price variance.
b. Compute the revenue volume variance.
c. Compute the total revenue variance.

Appendix

EX. 9-23 Revenue variances

Dickinsen Company gathered the following data for December:

	Planned	Actual
Sales price per unit	$5.80	$6.00
Number of units of sales	× 820,000	× 805,000
Total sales	$4,756,000	$4,830,000

a. Compute the revenue price variance.
b. Compute the revenue volume variance.
c. Compute the total revenue variance.

Appendix

EX 9-24 Revenue variances

Rosenberry Company computed the following revenue variances for January:

Revenue price variance	$(350,000) Favorable
Revenue volume variance	50,000 Unfavorable

Assuming that the planned selling price per unit was $10 and that actual sales were 175,000 units, determine the following:

a. Actual selling price of January.
b. Planned number of units that were to be sold in January.

Appendix
EX 9-25 Revenue variances

Lowell Manufacturing Inc. has a normal selling price of $20 per unit and has been selling 125,000 units per month. In November, Lowell Manufacturing decided to lower its price to $19 per unit expecting it can increase the units sold by 16%.

a. Compute the normal revenue with a $20 selling price.

b. Compute the planned revenue with a $19 selling price.

c. Compute the actual revenue for November, assuming 135,000 units were sold in November at $19 per unit.

d. Compute the revenue price variance, assuming 135,000 units were sold in November at $19 per unit.

e. Compute the revenue volume variance, assuming 135,000 units were sold in November at $19 per unit.

f. Analyze and interpret the lowering of the price to $19.

Problems: Series A

PR 9-1A Direct materials and direct labor variance analysis

Obj. 2, 3

✔ c. Direct labor time variance, $3,200 U

SHOW ME HOW

Shasta Fixture Company manufactures faucets in a small manufacturing facility. The faucets are made from brass. Manufacturing has 70 employees. Each employee presently provides 38 hours of labor per week. Information about a production week is as follows:

Standard wage per hr.	$20.00
Standard labor time per faucet	30 min.
Standard number of lbs. of brass	2.5 lbs.
Standard price per lb. of brass	$1.80
Actual price per lb. of brass	$1.95
Actual lbs. of brass used during the week	13,000 lbs.
Number of faucets produced during the week	5,000
Actual wage per hr.	$18.75
Actual hrs. for the week (70 employees × 38 hours)	2,660

Instructions

Determine (a) the standard cost per unit for direct materials and direct labor; (b) the direct materials price variance, direct materials quantity variance, and total direct materials cost variance; and (c) the direct labor rate variance, direct labor time variance, and total direct labor cost variance.

PR 9-2A Flexible budgeting and variance analysis

Obj. 1, 2, 3

✔ 1. a. Direct materials quantity variance, $(625) F

EXCEL TEMPLATE

I Love My Chocolate Company makes dark chocolate and light chocolate. Both products require cocoa and sugar. The following planning information has been made available:

	Standard Amount per Case		
	Dark Chocolate	Light Chocolate	Standard Price per Pound
Cocoa	12 lbs.	8 lbs.	$7.25
Sugar	10 lbs.	14 lbs.	1.40
Standard labor time	0.50 hr.	0.60 hr.	

	Dark Chocolate	Light Chocolate
Planned production	4,700 cases	11,000 cases
Standard labor rate	$15.50 per hr.	$15.50 per hr.

I Love My Chocolate Company does not expect there to be any beginning or ending inventories of cocoa or sugar. At the end of the budget year, I Love My Chocolate Company had the following actual results:

	Dark Chocolate	Light Chocolate
Actual production (cases)	5,000	10,000
	Actual Price per Pound	**Actual Pounds Purchased and Used**
Cocoa	$7.33	140,300
Sugar	1.35	188,000
	Actual Labor Rate	**Actual Labor Hours Used**
Dark chocolate	$15.25 per hr.	2,360
Light chocolate	15.80 per hr.	6,120

Instructions

1. Prepare the following variance analyses for both chocolates and the total, based on the actual results and production levels at the end of the budget year:
   a. Direct materials price, quantity, and total variance.
   b. Direct labor rate, time, and total variance.
2. Why are the standard amounts in part (1) based on the actual production for the year instead of the planned production for the year?

PR 9-3A Direct materials, direct labor, and factory overhead cost variance analysis

Obj. 3, 4

✔ c. Controllable variance, $(4,800) F

EXCEL TEMPLATE

Mackinaw Inc. processes a base chemical into plastic. Standard costs and actual costs for direct materials, direct labor, and factory overhead incurred for the manufacture of 40,000 units of product were as follows:

	Standard Costs	Actual Costs
Direct materials	120,000 lbs. at $3.20 per lb.	118,500 lbs. at $3.25 per lb.
Direct labor	12,000 hrs. at $24.40 per hr.	11,700 hrs. at $25.00 per hr.
Factory overhead	Rates per direct labor hr., based on 100% of normal capacity of 15,000 direct labor hrs.:	
	Variable cost, $8.00	$91,200 variable cost
	Fixed cost, $10.00	$150,000 fixed cost

Each unit requires 0.3 hour of direct labor.

Instructions

Determine (a) the direct materials price variance, direct materials quantity variance, and total direct materials cost variance; (b) the direct labor rate variance, direct labor time variance, and total direct labor cost variance; and (c) the variable factory overhead controllable variance, fixed factory overhead volume variance, and total factory overhead cost variance.

PR 9-4A Factory overhead cost variance report

Obj. 4

✔ Controllable variance, $770 U

EXCEL TEMPLATE

Tiger Equipment Inc., a manufacturer of construction equipment, prepared the following factory overhead cost budget for the Welding Department for May of the current year. The company expected to operate the department at 100% of normal capacity of 8,400 hours.

Variable costs:		
Indirect factory wages	$30,240	
Power and light	20,160	
Indirect materials	16,800	
Total variable cost		$ 67,200
Fixed costs:		
Supervisory salaries	$20,000	
Depreciation of plant and equipment	36,200	
Insurance and property taxes	15,200	
Total fixed cost		71,400
Total factory overhead cost		$138,600

(Continued)

During May, the department operated at 8,860 hours, and the factory overhead costs incurred were indirect factory wages, $32,400; power and light, $21,000; indirect materials, $18,250; supervisory salaries, $20,000; depreciation of plant and equipment, $36,200; and insurance and property taxes, $15,200.

Instructions

Prepare a factory overhead cost variance report for May. To be useful for cost control, the budgeted amounts should be based on 8,860 hours.

PR 9-5A Standards for nonmanufacturing expenses **Obj. 3**

✔ 3. $1,600 U

CodeHead Software Inc. does software development. One important activity in software development is writing software code. The manager of the WordPro Development Team determined that the average software programmer could write 25 lines of code in an hour. The plan for the first week in May called for 4,650 lines of code to be written on the WordPro product. The WordPro Team has five programmers. Each programmer is hired from an employment firm that requires temporary employees to be hired for a minimum of a 40-hour week. Programmers are paid $32.00 per hour. The manager offered a bonus if the team could generate more lines for the week, without overtime. Due to a project emergency, the programmers wrote more code in the first week of May than planned. The actual amount of code written in the first week of May was 5,650 lines, without overtime. As a result, the bonus caused the average programmer's hourly rate to increase to $40.00 per hour during the first week in May.

Instructions

1. If the team generated 4,650 lines of code according to the original plan, what would have been the labor time variance?
2. What was the actual labor time variance as a result of generating 5,650 lines of code?
3. What was the labor rate variance as a result of the bonus?
4. The manager is trying to determine if a better decision would have been to hire a temporary programmer to meet the higher programming demand in the first week of May, rather than paying out the bonus. If another employee was hired from the employment firm, what would have been the labor time variance in the first week?
5. Which decision is better, paying the bonus or hiring another programmer?

Problems: Series B

PR 9-1B Direct materials and direct labor variance analysis **Obj. 2, 3**

✔ c. Rate variance, $(200) F



SHOW ME HOW

Lenni Clothing Co. manufactures clothing in a small manufacturing facility. Manufacturing has 25 employees. Each employee presently provides 40 hours of productive labor per week. Information about a production week is as follows:

Standard wage per hr.	$12.00
Standard labor time per unit	12 min.
Standard number of yds. of fabric per unit	5.0 yds.
Standard price per yd. of fabric	$5.00
Actual price per yd. of fabric	$5.10
Actual yds. of fabric used during the week	26,200 yds.
Number of units produced during the week	5,220
Actual wage per hr.	$11.80
Actual hrs. for the week	1,000 hrs.

Instructions

Determine (a) the standard cost per unit for direct materials and direct labor; (b) the price variance, quantity variance, and total direct materials cost variance; and (c) the rate variance, time variance, and total direct labor cost variance.

PR 9-2B Flexible budgeting and variance analysis

Obj. 1, 2, 3

✔ 1. a. Direct materials price variance, $12,220 U

EXCEL TEMPLATE

I'm Really Cold Coat Company makes women's and men's coats. Both products require filler and lining material. The following planning information has been made available:

	Standard Amount per Unit		
	Women's Coats	**Men's Coats**	**Standard Price per Unit**
Filler	4.0 lbs.	5.20 lbs.	$2.00 per lb.
Liner	7.00 yds.	9.40 yds.	8.00 per yd.
Standard labor time	0.40 hr.	0.50 hr.	

	Women's Coats	**Men's Coats**
Planned production	5,000 units	6,200 units
Standard labor rate	$14.00 per hr.	$13.00 per hr.

I'm Really Cold Coat Company does not expect there to be any beginning or ending inventories of filler and lining material. At the end of the budget year, I'm Really Cold Coat Company experienced the following actual results:

	Women's Coats	**Men's Coats**
Actual production	4,400	5,800

	Actual Price per Unit	**Actual Quantity Purchased and Used**
Filler	$1.90 per lb.	48,000
Liner	8.20 per yd.	85,100

	Actual Labor Rate	**Actual Labor Hours Used**
Women's coats	$14.10 per hr.	1,825
Men's coats	13.30 per hr.	2,800

The expected beginning inventory and desired ending inventory were realized.

Instructions

1. Prepare the following variance analyses for both coats and the total, based on the actual results and production levels at the end of the budget year:
   a. Direct materials price, quantity, and total variance.
   b. Direct labor rate, time, and total variance.
2. Why are the standard amounts in part (1) based on the actual production at the end of the year instead of the planned production at the beginning of the year?

PR 9-3B Direct materials, direct labor, and factory overhead cost variance analysis

Obj. 3, 4

✔ a. Direct materials price variance, $10,100 U

EXCEL TEMPLATE

Road Gripper Tire Co. manufactures automobile tires. Standard costs and actual costs for direct materials, direct labor, and factory overhead incurred for the manufacture of 4,160 tires were as follows:

	Standard Costs	**Actual Costs**
Direct materials	100,000 lbs. at $6.40	101,000 lbs. at $6.50
Direct labor	2,080 hrs. at $15.75	2,000 hrs. at $15.40
Factory overhead	Rates per direct labor hr., based on 100% of normal capacity of 2,000 direct labor hrs.:	
	Variable cost, $4.00	$8,200 variable cost
	Fixed cost, $6.00	$12,000 fixed cost

Each tire requires 0.5 hour of direct labor.

(Continued)

Instructions

Determine (a) the direct materials price variance, direct materials quantity variance, and total direct materials cost variance; (b) the direct labor rate variance, direct labor time variance, and total direct labor cost variance; and (c) the variable factory overhead controllable variance, fixed factory overhead volume variance, and total factory overhead cost variance.

PR 9-4B Factory overhead cost variance report

Obj. 4

✔ Controllable variance, $(1,450) F



EXCEL TEMPLATE

Feeling Better Medical Inc., a manufacturer of disposable medical supplies, prepared the following factory overhead cost budget for the Assembly Department for October of the current year. The company expected to operate the department at 100% of normal capacity of 30,000 hours.

Variable costs:		
Indirect factory wages	$247,500	
Power and light	189,000	
Indirect materials	52,500	
Total variable cost		$489,000
Fixed costs:		
Supervisory salaries	$126,000	
Depreciation of plant and equipment	70,000	
Insurance and property taxes	44,000	
Total fixed cost		240,000
Total factory overhead cost		$729,000

During October, the department operated at 28,500 hours, and the factory overhead costs incurred were indirect factory wages, $234,000; power and light, $178,500; indirect materials, $50,600; supervisory salaries, $126,000; depreciation of plant and equipment, $70,000; and insurance and property taxes, $44,000.

Instructions

Prepare a factory overhead cost variance report for October. To be useful for cost control, the budgeted amounts should be based on 28,500 hours.

PR 9-5B Standards for nonmanufacturing expenses for a service company

Obj. 3

✔ 2. $(161) F

The Radiology Department provides imaging services for Emergency Medical Center. One important activity in the Radiology Department is transcribing digitally recorded analyses of images into a written report. The manager of the Radiology Department determined that the average transcriptionist could type 700 lines of a report in an hour. The plan for the first week in May called for 81,900 typed lines to be written. The Radiology Department has three transcriptionists. Each transcriptionist is hired from an employment firm that requires temporary employees to be hired for a minimum of a 40-hour week. Transcriptionists are paid $23.00 per hour. The manager offered a bonus if the department could type more lines for the week, without overtime. Due to high service demands, the transcriptionists typed more lines in the first week of May than planned. The actual amount of lines typed in the first week of May was 88,900 lines, without overtime. As a result, the bonus caused the average transcriptionist hourly rate to increase to $30.00 per hour during the first week in May.

Instructions

1. If the department typed 81,900 lines according to the original plan, what would have been the labor time variance?
2. What was the labor time variance as a result of typing 88,900 lines?
3. What was the labor rate variance as a result of the bonus?
4. The manager is trying to determine if a better decision would have been to hire a temporary transcriptionist to meet the higher typing demands in the first week of May, rather than paying out the bonus. If another employee was hired from the employment firm, what would have been the labor time variance in the first week?
5. Which decision is better, paying the bonus or hiring another transcriptionist?

Comprehensive Problem 5

Genuine Spice Inc. began operations on January 1 of the current year. The company produces 8-ounce bottles of hand and body lotion called *Eternal Beauty*. The lotion is sold wholesale in 12-bottle cases for $100 per case. There is a selling commission of $20 per case. The January direct materials, direct labor, and factory overhead costs are as follows:

DIRECT MATERIALS

	Cost Behavior	Units per Case	Cost per Unit	Direct Materials Cost per Case
Cream base	Variable	100 ozs.	$0.02	$ 2.00
Natural oils	Variable	30 ozs.	0.30	9.00
Bottle (8-oz.)	Variable	12 bottles	0.50	6.00
				$17.00

DIRECT LABOR

Department	Cost Behavior	Time per Case	Labor Rate per Hour	Direct Labor Cost per Case
Mixing	Variable	20 min.	$18.00	$6.00
Filling	Variable	5	14.40	1.20
		25 min.		$7.20

FACTORY OVERHEAD

	Cost Behavior	Total Cost
Utilities	Mixed	$ 600
Facility lease	Fixed	14,000
Equipment depreciation	Fixed	4,300
Supplies	Fixed	660
		$19,560

Part A—Break-Even Analysis

✔ 2. $55.60

The management of Genuine Spice Inc. wishes to determine the number of cases required to break even per month. The utilities cost, which is part of factory overhead, is a mixed cost. The following information was gathered from the first six months of operation regarding this cost:

Month	Case Production	Utility Total Cost
January	500	$600
February	800	660
March	1,200	740
April	1,100	720
May	950	690
June	1,025	705

Instructions

1. Determine the fixed and variable portions of the utility cost using the high-low method.
2. Determine the contribution margin per case.
3. Determine the fixed costs per month, including the utility fixed cost from part (1).
4. Determine the break-even number of cases per month.

Part B—August Budgets

✔ 6. Bottles purchased, $8,070

During July of the current year, the management of Genuine Spice Inc. asked the controller to prepare August manufacturing and income statement budgets. Demand was expected to be 1,500 cases at $100 per case for August. Inventory planning information is provided as follows:

Finished Goods Inventory:

	Cases	Cost
Estimated finished goods inventory, August 1	300	$12,000
Desired finished goods inventory, August 31	175	7,000

(Continued)

Materials Inventory:

	Cream Base (ozs.)	Oils (ozs.)	Bottles (bottles)
Estimated materials inventory, August 1	250	290	600
Desired materials inventory, August 31	1,000	360	240

There was negligible work in process inventory assumed for either the beginning or end of the month; thus, none was assumed. In addition, there was no change in the cost per unit or estimated units per case operating data from January.

Instructions

5. Prepare the August production budget.
6. Prepare the August direct materials purchases budget.
7. Prepare the August direct labor budget. Round the hours required for production to the nearest hour.
8. Prepare the August factory overhead budget.
9. Prepare the August budgeted income statement, including selling expenses.

Part C—August Variance Analysis

✔ 11. Filling Dept. direct labor time variance, $216 U

✔ 12. $5 U

During September of the current year, the controller was asked to perform variance analyses for August. The January operating data provided the standard prices, rates, times, and quantities per case. There were 1,500 actual cases produced during August, which was 250 more cases than planned at the beginning of the month. Actual data for August were as follows:

	Actual Direct Materials Price per Unit	Actual Direct Materials Quantity per Case
Cream base	$0.016 per oz.	102 ozs.
Natural oils	$0.32 per oz.	31 ozs.
Bottle (8-oz.)	$0.42 per bottle	12.5 bottles

	Actual Direct Labor Rate	Actual Direct Labor Time per Case
Mixing	$18.20	19.50 min.
Filling	14.00	5.60 min.
Actual variable overhead	$305.00	
Normal volume	1,600 cases	

The prices of the materials were different than standard due to fluctuations in market prices. The standard quantity of materials used per case was an ideal standard. The Mixing Department used a higher grade labor classification during the month, thus causing the actual labor rate to exceed standard. The Filling Department used a lower grade labor classification during the month, thus causing the actual labor rate to be less than standard.

Instructions

10. Determine and interpret the direct materials price and quantity variances for the three materials.
11. Determine and interpret the direct labor rate and time variances for the two departments. Round hours to the nearest hour.
12. Determine and interpret the factory overhead controllable variance.
13. Determine and interpret the factory overhead volume variance.
14. Why are the standard direct labor and direct materials costs in the calculations for parts (10) and (11) based on the actual 1,500-case production volume rather than the planned 1,375 cases of production used in the budgets for parts (6) and (7)?

Make a Decision
Service Staffing Variances

MAD 9-1 Analyze Advent Software's staffing variances Obj. 6

Advent Software uses standards to manage the cost of the programming staff. There are two programmer levels, Level 1 and Level 2. Level 1 programmers normally work on the easier projects. Level 1 and Level 2 programmers are paid $25 and $35 per hour, respectively. It has been determined from experience that Level 2 programmers can complete 50 lines of code per hour. If a Level 1 programmer is assigned to a Level 2 task, the programming work will be slower than the Level 2 time standard, but will be accomplished at a lower labor rate.

During a recent week, a Level 2 project was assigned to a Level 1 programmer. The programmer worked 40 hours and completed 1,400 lines of code.

a. Determine the direct labor time variance for this worker.

b. Determine the direct labor rate variance for this worker.

c. Using the information in (a) and (b), is it more cost effective to use a Level 1 worker or a Level 2 worker on a Level 2 project?

MAD 9-2 Analyze Valley Hospital's admissions time variance Obj. 6

Valley Hospital began using standards to evaluate its Admissions Department. The standard was broken into two types of admissions as follows:

Type of Admission	Standard Time to Complete Admission Record
Unscheduled	30 min.
Scheduled	15 min.

The unscheduled admission took longer because name, address, and insurance information needed to be determined and verified at the time of admission. Information was collected on scheduled admissions prior to admitting the patient, thus requiring less time in admissions.

The Admissions Department employs four full-time people for 40 hours per week at $15 per hour. For the most recent week, the department handled 140 unscheduled and 340 scheduled admissions.

a. How much was actually spent on labor for the week?

b. What are the standard hours for the actual volume of work for the week?

c. Compute the direct labor time variance, and report how well the department performed for the week.

d. What are some factors that may cause an unfavorable direct labor time variance for the Admissions Department?

REAL WORLD

MAD 9-3 Analyze the U.S. Postal Service's sorting time variance Obj. 6

One of the operations in the **United States Postal Service** is a mechanical mail sorting operation. In this operation, handwritten letter mail is sorted at a rate of 1.5 letters per second. An operator sitting at a keyboard mechanically sorts the letter from a three-digit code. The manager of the mechanical sorting operation wishes to determine the number of temporary employees to hire for December. The manager estimates that there will be an additional 24,192,000 pieces of mail in December, due to the upcoming holiday season.

Assume that the sorting operators are temporary employees. The union contract requires that temporary employees be hired for one month at a time. Each temporary employee is hired to work 160 hours in the month.

a. How many temporary employees should the manager hire for December?

b. If each temporary employee earns a standard $17 per hour, what would be the direct labor time variance if the actual number of additional letters sorted in December was 23,895,000?

MAD 9-4 Analyze Maywood City Police Department's labor time variance Obj. 6

Maywood City Police uses variance analysis to monitor police staffing. The following table identifies three common police activities, the standard time to perform each activity, and their actual frequency to establish the expected cost to serve these activities.

Police Activity	Standard Hours per Activity	Actual Activities for Year	Total Employee Hours
Theft	0.60	7,000	4,200
Arrest	1.50	18,000	27,000
Patrol activities	0.30	9,000	2,700
			33,900

The police are paid $25 per hour.

The actual amount of hours per activity for the year were as follows:

Police Activity	Actual Hours per Activity
Theft	0.75
Arrest	2.00
Patrol activities	0.40

a. Determine the total budgeted cost to perform the three police activities.

b. Determine the total actual cost to perform the three police activities.

c. Determine the direct labor time variance.

d. What does the time variance suggest?

Take It Further

ETHICS

TIF 9-1 Disagreement over claims processing standards

Dash Riprock is a cost analyst with Safe Insurance Company. Safe is applying standards to its claims payment operations. Claims payment is a repetitive operation that could be evaluated with standards. Dash used time and motion studies to identify an ideal standard of 36 claims processed per hour. The Claims Processing Department manager, Henry Tudor, has rejected this standard and has argued that the standard should be 30 claims processed per hour. Henry and Dash were unable to agree, so they decided to discuss this matter openly at a joint meeting with the Vice President of Operations, who would make a final decision. Prior to the meeting, Dash wrote the following memo to the Vice President:

To: Anne Boleyn, Vice President of Operations

From: Dash Riprock

Re: Standards in the Claims Processing Department

As you know, Henry and I are scheduled to meet with you to discuss our disagreement about the appropriate standards for the Claims Processing Department. I have conducted time and motion studies and have determined that the ideal standard is 36 claims processed per hour. Henry argues that 30 claims processed per hour would be more appropriate. I believe he is trying to "pad" the budget with some slack. I'm not sure what he is trying to get away with, but I believe a tight standard will drive efficiency up in his area. I hope you will agree when we meet with you next week.

Discuss the ethical and professional issues in this situation.



TIF 9-2 Variance interpretation

Some cost problems have been identified in the Assembly Department of Schumann Electronics Co., a consumer electronics company. The department's budget performance report for the last quarter follows:

Schumann Electronics Co.—Assembly Department
Quarterly Budget Performance Report

	Standard Quantity at Standard Rates	Actual Quantity at Standard Rates	Quantity Variances
Direct labor	$157,500	$227,500	$ 70,000 U
Direct materials	297,500	385,000	87,500 U
Total	$455,000	$612,500	$157,500 U

The performance reports from the Purchasing and Fabrication departments are also available for the same period:

Schumann Electronics Co.—Purchasing Department
Quarterly Budget Performance Report

	Actual Quantity at Standard Rates	Actual Quantity at Actual Rates	Price Variance
Direct materials	$437,500	$385,000	$(52,500) F

Schumann Electronics Co.—Fabrication Department
Quarterly Budget Performance Report

	Standard Quantity at Standard Rates	Actual Quantity at Standard Rates	Quantity Variances
Direct labor	$245,000	$203,000	$(42,000) F
Direct materials	140,000	140,000	0
Total	$385,000	$343,000	$(42,000) F

The following are some excerpts from an interview with the Assembly Department supervisor:

Q: What explains the poor performance in your department?

A: Listen, you've got to understand what it's been like in this department recently. Lately, it seems no matter how hard we try, we can't seem to make the standards. I'm not sure what is going on, but we've been having a lot of problems lately.

Q: What kind of problems?

A: Well, for instance, all this quarter we've been requisitioning purchased parts from the materials storeroom, and the parts just haven't been fitting together very well. I'm not sure what is going on, but during most of this quarter, we've had to scrap and sort purchased parts—just to get our assemblies put together. Naturally, all this takes time and material. And that's not all.

Q: Go on.

A: All this quarter, the work we've been receiving from the Fabrication Department has been shoddy. I mean, maybe around 20% of the stuff that comes in from Fabrication just can't be assembled. The fabrication is all wrong. As a result, we've had to scrap and rework a lot of the stuff. Naturally, this has just shot our quantity variances.

As a group, analyze and interpret the variance reports and the comments by the Assembly Department supervisor.

COMMUNICATION

TIF 9-3 Variance interpretation

Vanadium Audio Inc. is a small manufacturer of electronic musical instruments. The plant manager received the following variable factory overhead report for the past month of operations:

	Actual	Budgeted Variable Factory Overhead at Actual Production	Controllable Variance
Supplies	$ 42,000	$ 39,780	$ 2,220 U
Power and light	52,500	50,900	1,600 U
Indirect factory wages	39,100	30,600	8,500 U
Total	$133,600	$121,280	$12,320 U

Actual units produced: 15,000 (90% of practical capacity)

The plant manager is not pleased with the $12,320 unfavorable variable factory overhead controllable variance and has come to discuss the matter with the controller. The following discussion occurred:

Plant Manager: I just received this factory report for the latest month of operations. I'm not very pleased with these figures. Before these numbers go to headquarters, you and I need to reach an understanding.

Controller: Go ahead. What's the problem?

Plant Manager: What's the problem? Well, everything. Look at the variance. It's too large. If I understand the accounting approach being used here, you are assuming that my costs are variable to the units produced. Thus, as the production volume declines, so should these costs. Well, I don't believe these costs are variable at all. I think they are fixed costs. As a result, when we operate below capacity, the costs really don't go down. I'm being penalized for costs I have no control over. I need this report to be redone to reflect this fact. If anything, the difference between actual and budget is essentially a volume variance. Listen, I know that you're a team player. You really need to reconsider your assumptions on this one.

Assume you are the controller. Write a memo responding to the plant manager.

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. MinnOil performs oil changes and other minor maintenance services on cars and trucks. The company advertises that all services are performed within 15 minutes each. On a recent Saturday, 160 cars were serviced, resulting in the following labor variances: rate, $19 unfavorable; efficiency (time), $14 favorable. If MinnOil's standard labor rate is $7 per hour, determine the actual wage rate per hour and the actual hours worked.

	Wage Rate	Hours Worked
a.	$6.55	42.00
b.	$6.67	42.71
c.	$7.45	42.00
d.	$7.50	38.00

2. Marten Company has a cost-benefit policy to investigate any variance that is greater than $1,000 or 10% of budget, whichever is larger. Actual results for the previous month indicate the following:

	Budget	Actual
Direct materials	$100,000	$89,000
Direct labor	50,000	54,000

The company should investigate:

a. neither the materials variance nor the labor variance.
b. the materials variance only.
c. the labor variance only.
d. both the materials variance and the labor variance.

3. Frisco Company recently purchased 108,000 units of raw material for $583,200. Three units of raw materials are budgeted for use in each finished good manufactured, with the raw material standard set at $16.50 for each completed product. Frisco manufactured 32,700 finished units during the period just ended and used 99,200 units of raw material. If management is concerned about the timely reporting of variances to improve cost control and bottom-line performance, the direct materials price variance should be reported as:

   a. $6,050 unfavorable.
   b. $9,920 favorable.
   c. $10,800 unfavorable.
   d. $10,800 favorable.

4. JoyT Company manufactures Maxi Dolls for sale in toy stores. In planning for this year, JoyT estimated variable factory overhead of $600,000 and fixed factory overhead of $400,000. JoyT uses a standard costing system, and factory overhead is allocated to units produced using standard direct labor hours. The level of activity budgeted for this year was 10,000 direct labor hours, and JoyT used 10,300 actual direct labor hours.

   Based on the output accomplished during this year, 9,900 standard direct labor hours should have been used. Actual variable factory overhead was $596,000, and actual fixed factory overhead was $410,000 for the year. Based on this information, the variable factory overhead controllable variance for JoyT for this year was:

   a. $24,000 unfavorable.
   b. $2,000 unfavorable.
   c. $4,000 favorable.
   d. $22,000 favorable.

Pathways Challenge



This is Accounting!

Information/Consequences

Although purchasing agents may be able to control the timing of when they make purchases, they cannot control changes in exchange rates. Thus, it would not be appropriate to hold the purchasing agent accountable for unfavorable change in the exchange rate.

Note that exchange rate fluctuations are normally included within the direct materials price variance. Thus, multinational companies like **Deere & Company (DE)** should carefully investigate direct materials price variances to isolate the effects of foreign currency fluctuations.

Suggested Answer

Chapter

10 Evaluating Decentralized Operations

Principles

Chapter 1 *Introduction to Managerial Accounting*

Developing Information

COST SYSTEMS

Chapter 2 *Job Order Costing*
Chapter 3 *Process Costing*
Chapter 4 *Activity-Based Costing*

COST ALLOCATIONS

Chapter 5 *Support Departments*
Chapter 5 *Joint Costs*

Decision Making

PLANNING AND EVALUATING TOOLS

Chapter 6 *Cost-Volume-Profit Analysis*
Chapter 7 *Variable Costing*
Chapter 8 *Budgeting Systems*
Chapter 9 *Standard Costing and Variances*
Chapter 10 ***Decentralized Operations***
Chapter 11 *Differential Analysis*

STRATEGIC TOOLS

Chapter 12 *Capital Investment Analysis*
Chapter 13 *Lean Manufacturing*
Chapter 13 *Activity Analysis*
Chapter 14 *The Balanced Scorecard*
Chapter 14 *Corporate Social Responsibility*

Caterpillar Inc.

Have you ever wondered why large retail stores like **Macy's (M)**, **JCPenney (JCP)**, and **Kohl's (KSS)** are divided into departments? Organizing into departments allows retailers to provide products and expertise in specialized areas while offering a wide range of products. Departments also allow companies to assign responsibility for financial performance. This information can be used to make product decisions, evaluate operations, and guide company strategy. Strong departmental performance might be attributable to a good department manager, while weak departmental performance may be the result of a product mix that has low customer appeal. By tracking departmental performance, companies can identify and reward excellent performance and take corrective action in departments that are performing poorly.

Like retailers, most businesses organize into operational units, such as divisions and departments. For example, **Caterpillar Inc. (CAT)** manufactures a variety of equipment and machinery and is organized into a number of different segments, including Construction Industries, Resource Industries, Energy & Transportation, and Financial Products. The Construction Industries segment manufactures construction equipment such as tractors, dump trucks, and loaders. The Resource Industries segment makes equipment for the mining industry, such as off-highway and mining trucks. The Energy & Transportation segment manufactures equipment that is used to generate power, such as engines and turbines for power plants and railroads. The Financial Products segment provides financing for Caterpillar products to customers and dealers.

Managers at Caterpillar Inc. are responsible for running their business segment. Each segment is evaluated on segment profit, which excludes certain expense items from the computation of profit that are not within the control of the business segment. The company uses segment profit to determine how to allocate resources between business segments and to plan and control the company's operations.

In this chapter, the role of accounting in assisting managers in planning and controlling organizational units, such as departments, divisions, and stores, is described and illustrated.

Source: www.caterpillar.com.



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Link to Caterpillar . . . . . Pages 463, 464, 465, 468, 472, 473, 475, 479

What's Covered

Evaluating Decentralized Operations

Decentralized Operations
- Advantages (Obj. 1)
- Disadvantages (Obj. 1)

Responsibilty Accounting
- Cost Centers (Obj. 2)
- Profit Centers (Obj. 3)
- Investment Centers (Obj. 4)

Transfer Pricing
- Market Price Approach (Obj. 5)
- Negotiated Price Approach (Obj. 5)
- Cost Price Approach (Obj. 5)

Learning Objectives

Obj. 1 Describe the advantages and disadvantages of decentralized operations.

Obj. 2 Prepare a responsibility accounting report for a cost center.

Obj. 3 Prepare responsibility accounting reports for a profit center.

Obj. 4 Compute and interpret the return on investment and residual income for an investment center.

Obj. 5 Describe and illustrate how the market price, negotiated price, and cost price approaches to transfer pricing may be used by decentralized segments of a business.

Analysis for Decision Making

Obj. 6 Describe and illustrate the use of profit margin, investment turnover, and ROI in evaluating whether a company should expand through franchised or owner-operated stores.

Objective 1
Describe the advantages and disadvantages of decentralized operations.

Centralized and Decentralized Operations

In a *centralized* company, all major planning and operating decisions are made by top management. For example, a one-person, owner–manager-operated company is centralized because all plans and decisions are made by one person. In a small owner–manager-operated business, centralization may be desirable. This is because the owner–manager's close supervision ensures that the business will be operated in the way the owner–manager wishes.

In a *decentralized* company, managers of separate divisions or units are delegated operating responsibility. The division (unit) managers are responsible for planning and controlling the operations of their divisions. Divisions are often structured around products, customers, or regions.

The proper amount of decentralization for a company depends on the company's unique circumstances. For example, in some companies, division managers have authority over all operations, including fixed asset purchases. In other companies, division managers have authority over profits but not fixed asset purchases.

Advantages of Decentralization

For large companies, it is difficult for top management to:

- Maintain daily contact with all operations, and
- Maintain operating expertise in all product lines and services

In such cases, delegating authority to managers closest to the operations usually results in better decisions. These managers often anticipate and react to operating data more quickly than could top management. These managers can also focus their attention on becoming "experts" in their area of operation.

Decentralized operations provide excellent training for managers. Delegating responsibility allows managers to develop managerial experience early in their careers. This helps a company retain managers, some of whom may be later promoted to top management positions.

Managers of decentralized operations often work closely with customers. As a result, they tend to identify with customers and, thus, are often more creative in suggesting operating and product improvements. This helps create good customer relations.

Caterpillar uses a decentralized network of over a thousand dealers to sell its products.

Link to Caterpillar

Disadvantages of Decentralization

A primary disadvantage of decentralized operations is that decisions made by one manager may negatively affect the profits of the company. For example, managers of divisions whose products compete with one another might start a price war that decreases the profits of both divisions and, thus, the overall company.

Another disadvantage of decentralized operations is that assets and expenses may be duplicated across divisions. For example, each manager of a product line might have a separate sales force and office support staff.

Pathways Challenge



This is Accounting!

Economic Activity

A modern management theory entitled "organizational architecture" addresses the complexity of measuring and evaluating employee performance. The theory has the following three components:

- Decision rights: How companies delegate decisions (decentralized or centralized decision making).
- Performance measure: How companies measure employee performance.
- Incentives: How companies encourage employees to act in ways benefiting the company.

The preceding three components make up three "legs" of the organizational architecture "stool." As the length of one leg of the stool is adjusted (for example, by decentralizing an organization), the other legs must also be adjusted or the organization will be out of balance.

To illustrate, a plane of a major U.S. airline was grounded in the afternoon and needed repairs, but the closest qualified mechanic was at an airport in another city. The mechanic's repair supervisor refused to send the mechanic to do the repair that afternoon, because the mechanic would probably incur a hotel charge. The charge would have to be paid for out of the supervisor's budget. Instead, the supervisor waited until early the next morning to send the mechanic thus avoiding a hotel charge. As a result, the airline lost tens of thousands of dollars in revenues while the plane sat idle, waiting for repairs.

Critical Thinking/Judgment

Were the three legs of the organizational architecture stool out of balance?
How were the repairs decision rights delegated to repair supervisors (centralized or decentralized)?
Assess the performance measurement and incentives of the repair supervisor.
What could be done to correct this situation?

Sources: M. Hammer and J. Champy, *Reengineering the Corporation*, Harper Business, New York, NY, 1993; J. Brickley, C. Smith, and J. Zimmerman, *Managerial Economics and Organizational Architecture*, McGraw Hill/Irwin, New York, NY, 2007.

Suggested answer at end of chapter.

The advantages and disadvantages of decentralization are summarized in Exhibit 1.

Exhibit 1
Advantages and Disadvantages of Decentralized Operations

Advantages of Decentralization

- Allows managers closest to the operations to make decisions
- Provides excellent training for managers
- Allows managers to become experts in their area of operation
- Helps retain managers
- Improves creativity and customer relations

Disadvantages of Decentralization

- Decisions made by managers may negatively affect the profits of the company
- Duplicates assets and expenses

Responsibility Accounting

In a decentralized business, accounting assists managers in evaluating and controlling their areas of responsibility, called *responsibility centers*. **Responsibility accounting** is the process of measuring and reporting operating data by responsibility center.

Three types of responsibility centers are as follows:

- *Cost centers*, which have responsibility over costs
- *Profit centers*, which have responsibility over revenues and costs
- *Investment centers*, which have responsibility over revenues, costs, and investment in assets

Link to Caterpillar **Caterpillar**'s corporate headquarters are located in Peoria, Illinois.

Why It Matters

Dover Corporation: Many Pieces, One Picture

Dover Corporation (DOV) has grown over 45 years by acquiring more than 100 different manufacturing companies within a variety of industries. Dover uses a highly decentralized operating strategy. For example, of Dover's 30,000 employees, only about 50 employees staff the headquarters. Thus, almost all of the employees work within the 100 operating companies. The primary benefit of this approach is giving the operating companies room to respond to threats and opportunities without the bureaucratic hindrance of a centralized structure. As a result, the operating company presidents have unusual levels of autonomy. As stated by the company, "Dover company presidents set the direction of their own companies, make their own decisions, and nurture and grow their own organizations." The presidents are evaluated using metrics similar to those discussed in this chapter to keep the businesses aligned to the performance objectives of the overall organization.

Source: Dover Corporation Website, Dover's Culture and Operating Philosophy.

Objective 2
Prepare a responsibility accounting report for a cost center.

Responsibility Accounting for Cost Centers

A **cost center** manager has responsibility for controlling costs. For example, the supervisor of the Power Department has responsibility for the costs of providing power. A cost center manager does not make decisions concerning sales or the amount of fixed assets invested in the center.

Cost centers may vary in size from a small department to an entire manufacturing plant. In addition, cost centers may exist within other cost centers. For example, an entire university or college could be viewed as a cost center, and each college and department within the university could also be a cost center, as shown in Exhibit 2.

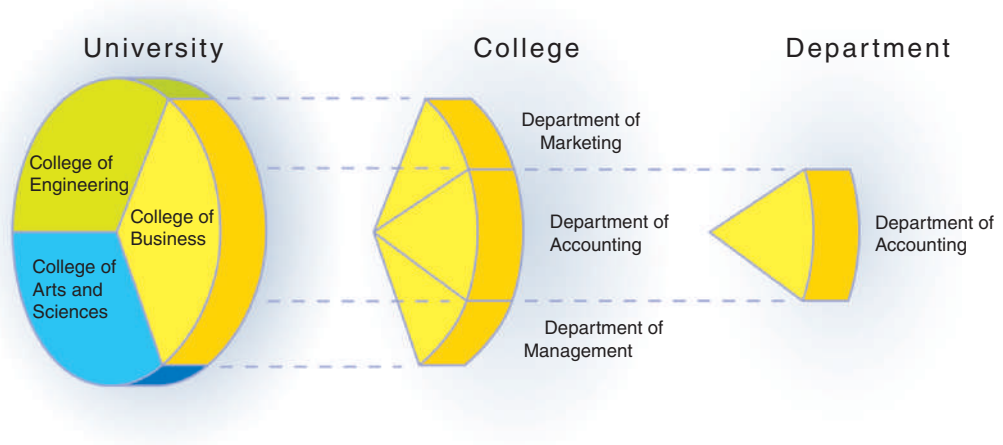


Exhibit 2
Cost Centers in a University

Responsibility accounting for cost centers focuses on the controlling and reporting of costs. Budget performance reports that report budgeted and actual costs are normally prepared for each cost center.

Caterpillar's "Corporate Services" group performs support services for its operating segments and is organized as a cost center.

Link to Caterpillar

Exhibit 3 illustrates budget performance reports for the following cost centers:

- Vice President, Production
- Manager, Plant A
- Supervisor, Department 1—Plant A

Exhibit 3 shows how cost centers are often linked together within a company. For example, the budget performance report for Department 1—Plant A supports the report for Plant A, which supports the report for the vice president of production.

The reports in Exhibit 3 show the budgeted costs and actual costs along with the differences. Each difference is classified as either *over* budget or *under* budget. Such reports allow cost center managers to focus on areas of significant differences.

For example, the supervisor for Department 1 of Plant A can focus on why the materials cost was over budget. The supervisor might discover that excess materials were scrapped. This could be due to such factors as machine malfunctions, improperly trained employees, or low-quality materials.

As shown in Exhibit 3, responsibility accounting reports are usually more summarized for higher levels of management. For example, the budget performance report for the manager of Plant A shows only administration and departmental data. This report enables the plant manager to identify the departments responsible for major differences. Likewise, the report for the vice president of production summarizes the cost data for each plant.

Exhibit 3 Responsibility Accounting Reports for Cost Centers

Budget Performance Report
Vice President, Production
For the Month Ended October 31

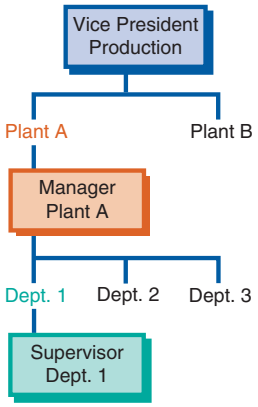
	Actual	Budget	Over Budget	(Under) Budget
Administration	$ 19,700	$ 19,500	$ 200	
Plant A	470,330	467,475	2,855	
Plant B	394,300	395,225		$(925)
	$884,330	$882,200	$3,055	$(925)

Budget Performance Report
Manager, Plant A
For the Month Ended October 31

	Actual	Budget	Over Budget	(Under) Budget
Administration	$ 17,350	$ 17,500		$(150)
Department 1	111,280	109,725	$1,555	
Department 2	192,600	190,500	2,100	
Department 3	149,100	149,750		(650)
	$470,330	$467,475	$3,655	$(800)

Budget Performance Report
Supervisor, Department 1—Plant A
For the Month Ended October 31

	Actual	Budget	Over Budget	(Under) Budget
Factory wages	$ 58,000	$ 58,100		$(100)
Materials	34,225	32,500	$1,725	
Supervisory salaries	6,400	6,400		
Power and light	5,690	5,750		(60)
Depreciation of plant and equipment	4,000	4,000		
Maintenance	1,990	2,000		(10)
Insurance and property taxes	975	975		
	$111,280	$109,725	$1,725	$(170)



Check Up Corner 10-1 Cost Center Responsibility Measures

Delinco Tech Inc. manufactures corrosion-resistant water pumps and fluid meters. Its Commercial Products Division is organized as a cost center. The division's budget for the month ended July 31 is as follows (in thousands):

Materials	$140,000
Factory wages	77,000
Supervisor salaries	15,500
Utilities	8,700
Depreciation of plant equipment	9,000
Maintenance	3,200
Insurance	750
Property taxes	800
	$254,950

During July, actual costs incurred in the Commercial Products Division were as follows:

Materials	$152,000
Factory wages	77,800
Supervisor salaries	15,500
Utilities	8,560
Depreciation of plant equipment	9,000
Maintenance	3,025
Insurance	750
Property taxes	820
	$267,455

Prepare a budget performance report for the director of the Commercial Products Division for July.

Solution:

The report shows the budgeted costs and actual costs along with the differences.

Budget Performance Report
Director, Commercial Products Division
For the Month Ended July 31

	Actual	Budget	Over Budget	(Under) Budget
Materials	$152,000	$140,000	$12,000	
Factory wages	77,800	77,000	800	
Supervisor salaries	15,500	15,500		
Utilities	8,560	8,700		$(140)
Depreciation of plant equipment	9,000	9,000		
Maintenance	3,025	3,200		(175)
Insurance	750	750		
Property taxes	820	800	20	
	$267,455	$254,950	$12,820	$(315)

The report allows cost center managers to focus on areas of significant differences.

Each difference is classified as *over* budget or *under* budget.

Check Up Corner

Objective 3
Prepare responsibility accounting reports for a profit center.

Responsibility Accounting for Profit Centers

A **profit center** manager has the responsibility and authority for making decisions that affect revenues and costs and, thus, profits. Profit centers may be divisions, departments, or products.

The manager of a profit center does not make decisions concerning the fixed assets invested in the center. However, profit centers are an excellent training assignment for new managers.

Responsibility accounting for profit centers focuses on reporting revenues, expenses, and operating income. Thus, responsibility accounting reports for profit centers take the form of income statements.

The profit center income statement should include only revenues and expenses that are controlled by the manager. **Controllable revenues** are revenues earned by the profit center. **Controllable expenses** are costs that can be influenced (controlled) by the decisions of profit center managers.

Support Department Allocations

The controllable expenses of profit centers include *direct operating expenses* such as sales salaries and utility expenses. In addition, a profit center may incur expenses provided by internal centralized *support departments*. Examples of such support departments include the following:

- Research and Development
- Legal
- Telecommunications
- Information and Computer Systems
- Facilities Management
- Purchasing
- Advertising
- Payroll Accounting
- Transportation
- Human Resources

Link to Caterpillar

Caterpillar's research and development is conducted at its Tech Center in Mossville, Illinois.

Support department allocations are *indirect* expenses to a profit center. They are similar to the expenses that would be incurred if the profit center purchased the services from outside the company. A profit center manager has control over support department expenses if the manager is free to choose how much service is used. In such cases, **support department allocations** are assigned to profit centers based on the usage of the service by each profit center.[1]

To illustrate, Nova Entertainment Group (NEG), a diversified entertainment company, is used. NEG has the following two operating divisions organized as profit centers:

- Theme Park Division
- Movie Production Division

The revenues and direct operating expenses for the two divisions follow. The operating expenses consist of direct expenses, such as the wages and salaries of a division's employees.

	Theme Park Division	Movie Production Division
Revenues	$6,000,000	$2,500,000
Operating expenses	2,495,000	405,000

[1] Support department cost allocation methods are discussed in Chapter 5, "Support Department and Joint Cost Allocation." To simplify, the direct method is illustrated in this chapter.

NEG's support departments and the expenses they incurred for the year ended December 31, 20Y8, are as follows:

Purchasing	$400,000
Payroll Accounting	255,000
Legal	250,000
Total	$905,000

A cost driver for each support department is used to allocate support department expenses to the Theme Park and Movie Production divisions. The cost driver for each support department is a measure of the services performed. For NEG, the support department cost drivers are as follows:

Department	Cost Driver
Purchasing	Number of purchase requisitions
Payroll Accounting	Number of payroll checks
Legal	Number of billed hours

The use of services by the Theme Park and Movie Production divisions is as follows:

	Service Usage		
Division	**Purchasing**	**Payroll Accounting**	**Legal**
Theme Park	25,000 purchase requisitions	12,000 payroll checks	100 billed hrs.
Movie Production	15,000	3,000	900
Total	40,000 purchase requisitions	15,000 payroll checks	1,000 billed hrs.

The rates at which services are allocated to each division are called *support department allocation rates*. These rates are computed as follows:

$$\text{Support Department Allocation Rate} = \frac{\text{Support Department Expense}}{\text{Total Support Department Usage}}$$

NEG's support department allocation rates are computed as follows:

$$\text{Purchasing Allocation Rate} = \frac{\$400{,}000}{40{,}000 \text{ purchase requisitions}} = \$10 \text{ per purchase requisition}$$

$$\text{Payroll Allocation Rate} = \frac{\$255{,}000}{15{,}000 \text{ payroll checks}} = \$17 \text{ per payroll check}$$

$$\text{Legal Allocation Rate} = \frac{\$250{,}000}{1{,}000 \text{ billed hrs.}} = \$250 \text{ per hr.}$$

The services used by each division are multiplied by the support department allocation rates to determine the support department allocations for each division, computed as follows:

$$\text{Support Department Allocation} = \text{Service Usage} \times \text{Support Department Allocation Rate}$$

Exhibit 4 illustrates the support department allocations and related computations for NEG's Theme Park and Movie Production divisions.

The differences in the support department allocations between the two divisions can be explained by the nature of their operations and, thus, usage of services. For example, the Theme Park Division employs many part-time employees who are paid weekly. As a result, the Theme Park Division requires 12,000 payroll checks and incurs a $204,000 payroll service department allocation (12,000 × $17). In contrast, the Movie Production Division has more permanent employees who are paid monthly. Thus, the Movie Production Division requires only 3,000 payroll checks and incurs a payroll support department allocation of $51,000 (3,000 × $17).

Exhibit 4
Support Department Allocations to NEG Divisions

Nova Entertainment Group
Support Department Allocations to NEG Divisions
For the Year Ended December 31, 20Y8

Support Department	Theme Park Division	Movie Production Division
Purchasing (Note A)	$250,000	$150,000
Payroll Accounting (Note B)	204,000	51,000
Legal (Note C)	25,000	225,000
Total support department allocations	$479,000	$426,000

Note A:
25,000 purchase requisitions × $10 per purchase requisition = $250,000
15,000 purchase requisitions × $10 per purchase requisition = $150,000
Note B:
12,000 payroll checks × $17 per check = $204,000
3,000 payroll checks × $17 per check = $51,000
Note C:
100 hours × $250 per hour = $25,000
900 hours × $250 per hour = $225,000

Profit Center Reporting

The divisional income statements for NEG are shown in Exhibit 5.

Exhibit 5
Divisional Income Statements—NEG

Nova Entertainment Group
Divisional Income Statements
For the Year Ended December 31, 20Y8

	Theme Park Division	Movie Production Division
Revenues*	$ 6,000,000	$2,500,000
Operating expenses	(2,495,000)	(405,000)
Operating income before support department allocations	$ 3,505,000	$2,095,000
Support department allocations:		
Purchasing	$ (250,000)	$ (150,000)
Payroll Accounting	(204,000)	(51,000)
Legal	(25,000)	(225,000)
Total support department allocations	$ (479,000)	$ (426,000)
Operating income	$ 3,026,000	$1,669,000

*For a profit center that sells products, the income statement would show: Sales – Cost of goods sold = Gross profit. The operating expenses would be deducted from the gross profit to arrive at operating income before support department allocations.

In evaluating the profit center manager, operating income should be compared over time to a budget. However, it should not be compared across profit centers because the profit centers are usually different in terms of size, products, and customers.

Check Up Corner 10-2 Profit Center Responsibility Reporting

Johnson Company has two divisions, East and West, that operate as profit centers. Sales, cost of goods sold, and selling expenses for the two divisions for the year ended December 31 are as follows:

	East Division	West Division
Sales	$3,000,000	$8,000,000
Cost of goods sold	1,650,000	4,200,000
Selling expenses	850,000	1,850,000

In addition, the company has two support departments, Legal and Tech Support.

The support department expenses for the year ended December 31 are as follows:

Legal Department	Tech Support Department
$350,000	$250,000

The Legal Department costs are allocated to user divisions based on the number of hours of service, and the Tech Support Department costs are allocated to user divisions based on the number of computers. The usage of service by the two divisions is as follows:

	Legal	Tech Support
East Division	500 hours	80 computers
West Division	1,500	120
Total	2,000 hours	200 computers

Prepare income statements for the year ended December 31, showing operating income for the two divisions. Use two column headings: East and West.

Solution:

Johnson Company
Divisional Income Statements
For the Year Ended December 31

	East	West	
Sales	$ 3,000,000	$ 8,000,000	
Cost of goods sold	(1,650,000)	(4,200,000)	
Gross profit	$ 1,350,000	$ 3,800,000	
Selling expenses	(850,000)	(1,850,000)	
Operating income before support departments allocations	$ 500,000	$ 1,950,000	
Support department allocations:			500 hours × $175 per hour*
Legal	$ (87,500)	$ (262,500)	1,500 hours × $175 per hour*
Tech Support	(100,000)	(150,000)	120 computers × $1,250 per computer**
Total support department allocations	$ (187,500)	$ (412,500)	
Operating income	$ 312,500	$ 1,537,500	

80 computers × $1,250 per computer**

*Legal Department Rate = $\frac{\$350,000}{2,000 \text{ hours}} = \$175$ per hour of service

**Tech Support Department Rate = $\frac{\$250,000}{200 \text{ computers}} = \$1,250$ per computer

Check Up Corner

Objective 4
Compute and interpret the return on investment and residual income for an investment center.

Responsibility Accounting for Investment Centers

An **investment center** manager has the responsibility and the authority to make decisions that affect not only costs and revenues but also the assets invested in the center. Investment centers are often used in diversified companies organized by divisions. In such cases, the divisional manager has authority similar to that of a chief operating officer or president of a company.

Link to Caterpillar

Caterpillar has four group presidents that are responsible for the operations of each of its four major segments: Construction, Resource, Energy & Transportation, and Financial Products. A fifth group president is responsible for three smaller operating segments.

Because investment center managers have responsibility for revenues and expenses, *operating income* is part of investment center reporting. In addition, because the manager has responsibility for the assets invested in the center, the following two additional measures of performance are used:

- Return on investment
- Residual income

To illustrate, DataLink Inc., a cellular phone company with three regional divisions, is used. Condensed divisional income statements for the Northern, Central, and Southern divisions of DataLink are shown in Exhibit 6.

Exhibit 6
Divisional Income Statements—DataLink Inc.

DataLink Inc.
Divisional Income Statements
For the Year Ended December 31, 20Y8

	Northern Division	Central Division	Southern Division
Revenues	$ 560,000	$ 672,000	$ 750,000
Operating expenses	(336,000)	(470,400)	(562,500)
Operating income before support department allocations	$ 224,000	$ 201,600	$ 187,500
Support department allocations	(154,000)	(117,600)	(112,500)
Operating income	$ 70,000	$ 84,000	$ 75,000

Using only operating income, the Central Division is the most profitable division. However, operating income does not reflect the amount of assets invested in each center. For example, the Central Division could have twice as many assets as the Northern Division. For this reason, performance measures that consider the amount of invested assets, such as the return on investment and residual income, are used.

Return on Investment

Because investment center managers control the amount of assets invested in their centers, they should be evaluated based on the use of these assets. One measure that considers the

amount of assets invested is the **return on investment (ROI)** or *return on assets*. It is computed as follows:

$$\text{Return on Investment (ROI)} = \frac{\text{Operating Income}}{\text{Invested Assets}}$$

The return on investment is useful because the three factors subject to control by divisional managers (revenues, expenses, and invested assets) are considered. The higher the return on investment, the better the division is using its assets to generate income. In effect, the return on investment measures the income (return) on each dollar invested. As a result, the return on investment can be used as a common basis for comparing divisions with each other.

To illustrate, the invested assets of DataLink's three divisions are as follows:

	Invested Assets
Northern Division	$350,000
Central Division	700,000
Southern Division	500,000

Using the operating income for each division shown in Exhibit 6, the return on investment for each division is computed as follows:

Northern Division:

$$\text{Return on Investment} = \frac{\text{Operating Income}}{\text{Invested Assets}} = \frac{\$70,000}{\$350,000} = 20\%$$

Central Division:

$$\text{Return on Investment} = \frac{\text{Operating Income}}{\text{Invested Assets}} = \frac{\$84,000}{\$700,000} = 12\%$$

Southern Division:

$$\text{Return on Investment} = \frac{\text{Operating Income}}{\text{Invested Assets}} = \frac{\$75,000}{\$500,000} = 15\%$$

Although the Central Division generated the largest operating income, its return on investment (12%) is the lowest. Hence, relative to the assets invested, the Central Division is the least profitable division. In comparison, the return on investment of the Northern Division is 20%, and the Southern Division is 15%.

Based upon recent financial statements, the return on investment for each of **Caterpillar**'s four segments was as follows:

Link to Caterpillar

Construction	Resource	Energy & Transportation	Financial Products
30.7%	(14.6)%	28.6%	2.1%

To analyze differences in the return on investment across divisions, the **DuPont formula** for the return on investment is often used.[2] The DuPont formula views the return on investment as the product of the following two factors:

- **Profit margin**, which is the ratio of operating income to sales.
- **Investment turnover**, which is the ratio of sales to invested assets.

[2] The DuPont formula was created by a financial executive of **E. I. du Pont de Nemours and Company (DD)** in 1919.

Using the DuPont formula, the return on investment is expressed as follows:

$$\text{Return on Investment} = \text{Profit Margin} \times \text{Investment Turnover}$$

$$\text{Return on Investment} = \frac{\text{Operating Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Assets}}$$

The DuPont formula is useful in evaluating divisions. This is because the profit margin and the investment turnover reflect the following underlying operating relationships of each division:

- Profit margin indicates *operating profitability* by computing the profit earned on each sales dollar.
- Investment turnover indicates *operating efficiency* by computing the number of sales dollars generated by each dollar of invested assets.

If a division's profit margin increases, and all other factors remain the same, the division's return on investment will increase. For example, a division might add more profitable products to its sales mix and, thus, increase its operating income, profit margin, and return on investment.

If a division's investment turnover increases, and all other factors remain the same, the division's return on investment will increase. For example, a division might attempt to increase sales through special sales promotions and thus increase operating efficiency, investment turnover, and return on investment.

The return on investment, profit margin, and investment turnover operate in relationship to one another. Specifically, more income can be earned by either increasing the investment turnover, increasing the profit margin, or both.

Using the DuPont formula yields the same return on investment for each of DataLink's divisions, computed as follows:

$$\text{Return on Investment} = \frac{\text{Operating Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Assets}}$$

Northern Division:

$$\text{Return on Investment} = \frac{\$70{,}000}{\$560{,}000} \times \frac{\$560{,}000}{\$350{,}000} = 12.5\% \times 1.6 = 20\%$$

Central Division:

$$\text{Return on Investment} = \frac{\$84{,}000}{\$672{,}000} \times \frac{\$672{,}000}{\$700{,}000} = 12.5\% \times 0.96 = 12\%$$

Southern Division:

$$\text{Return on Investment} = \frac{\$75{,}000}{\$750{,}000} \times \frac{\$750{,}000}{\$500{,}000} = 10\% \times 1.5 = 15\%$$

The Northern and Central divisions have the same profit margins of 12.5%. However, the Northern Division's investment turnover of 1.6 is larger than that of the Central Division's turnover of 0.96. By using its invested assets more efficiently, the Northern Division's return on investment of 20% is 8 percentage points higher than the Central Division's return on investment of 12%.

The Southern Division's profit margin of 10% and investment turnover of 1.5 are lower than those of the Northern Division. The product of these factors results in a return on investment of 15% for the Southern Division, compared to 20% for the Northern Division.

Even though the Southern Division's profit margin is lower than the Central Division's, its higher turnover of 1.5 results in a return on investment of 15%, which is greater than the Central Division's return on investment of 12%.

Based upon recent financial statements, the profit margin, investment turnover, and return on investment (ROI) for each of **Caterpillar**'s four segments were as follows:

Link to Caterpillar

	Construction	Resource	Energy & Transportation	Financial Products
Profit margin	10.5%	(17.4)%	13.1%	23.5%
Investment turnover	2.92	0.84	2.18	0.09
ROI	30.7%	(14.6)%	28.6%	2.1%

To increase the return on investment, the profit margin and investment turnover for a division may be analyzed. For example, assume that the Northern Division is in a highly competitive industry in which the profit margin cannot be easily increased. As a result, the division manager might focus on increasing the investment turnover.

To illustrate, assume that the revenues of the Northern Division could be increased by $56,000 through increasing operating expenses, such as advertising, to $385,000. The Northern Division's operating income will increase from $70,000 to $77,000, computed as follows:

Revenues ($560,000 + $56,000)	$ 616,000
Operating expenses	(385,000)
Operating income before support department allocations	$ 231,000
Support department allocations	(154,000)
Operating income	$ 77,000

The return on investment for the Northern Division, using the DuPont formula, is recomputed as follows:

$$\text{Return on Investment} = \frac{\$77{,}000}{\$616{,}000} \times \frac{\$616{,}000}{\$350{,}000} = 12.5\% \times 1.76 = 22\%$$

Although the Northern Division's profit margin remains the same (12.5%), the investment turnover has increased from 1.6 to 1.76, an increase of 10% (0.16 ÷ 1.6). The 10% increase in investment turnover increases the return on investment by 10% (from 20% to 22%).

The return on investment is also useful in deciding where to invest additional assets or expand operations. For example, DataLink should give priority to expanding operations in the Northern Division because it earns the highest return on investment. In other words, an investment in the Northern Division will return 20 cents (20%) on each dollar invested. In contrast, investments in the Central and Southern divisions will earn only 12 cents and 15 cents, respectively, per dollar invested.

A disadvantage of the return on investment as a performance measure is that it may lead divisional managers to reject new investments that could be profitable for the company as a whole. To illustrate, assume the following returns on investment for the Northern Division of DataLink:

Current return on investment	20%
Minimum acceptable return on investment set by top management	10%
Expected return on investment for new project	14%

If the manager of the Northern Division invests in the new project, the Northern Division's overall return on investment will decrease from 20% due to averaging. Thus, the division manager might decide to reject the project, even though the new project's expected return on investment of 14% exceeds DataLink's minimum acceptable return on investment of 10%.

Why It Matters

CONCEPT CLIP

Coca-Cola Company: Go West Young Man

A major decision early in the history of **Coca-Cola (KO)** was to expand outside of the United States to the rest of the world. As a result, Coca-Cola is known today the world over. What is revealing is how this decision has impacted the revenues and profitability of Coca-Cola across its international and North American segments. The following table shows the percent of revenues and percent of operating income from the international and North American geographic segments.

	Revenues	Operating Income
International segments	58.4%	65.6%
North American segment	41.6	34.4
Total	100%	100%

The first column shows that the international segments provide over 58% of the revenues, while North America provides almost 42% of the revenues. However, the operating income tells a different story. More than 65% of Coca-Cola's profitability comes from international segments. Given the revenue segmentation, this suggests that the international profit margins must be higher than the North American profit margin. Indeed this is the case, as can be seen in the following table:

	Profit Margin
International average	48.4%
North America	24.2%

The average profit margin for all the international segments is two times as large as the North American segment. These results reflect the heart of the Coca-Cola marketing strategy. In international markets, Coca-Cola is able to charge relatively higher prices due to high demand and less competition as compared to the North American market.

Source: The Coca-Cola Company, *Form 10-K for the Fiscal Year Ended December 31, 2017.*

Residual Income

Residual income is useful in overcoming some of the disadvantages of the return on investment. **Residual income** is the excess of operating income over a minimum acceptable operating income, as shown in Exhibit 7.

Exhibit 7
Residual Income

Operating income	$ XXX
Minimum acceptable operating income as a percent of invested assets	(XXX)
Residual income	$ XXX

The minimum acceptable operating income is computed by multiplying the company minimum return on investment by the invested assets. The minimum rate is set by top management, based on such factors as the cost of financing.

To illustrate, assume that DataLink Inc. has established 10% as the minimum acceptable return on investment for divisional assets. The residual incomes for the three divisions are shown in Exhibit 8.

Exhibit 8
Residual Income—DataLink, Inc.

	Northern Division	Central Division	Southern Division
Operating income	$ 70,000	$ 84,000	$ 75,000
Minimum acceptable operating income as a percent of invested assets:			
$350,000 × 10%	(35,000)		
$700,000 × 10%		(70,000)	
$500,000 × 10%			(50,000)
Residual income	$ 35,000	$ 14,000	$ 25,000

As shown in Exhibit 8, the Northern Division has more residual income ($35,000) than the other divisions, even though it has the least amount of operating income ($70,000). This is because the invested assets are less for the Northern Division than for the other divisions.

The major advantage of residual income as a performance measure is that it considers the minimum acceptable return on investment, invested assets, and the operating income for each division. In doing so, residual income encourages division managers to maximize operating income in excess of the minimum. This provides an incentive to accept any project that is expected to have a return on investment in excess of the minimum.

To illustrate, assume the following returns on investment for the Northern Division of DataLink:

Current return on investment	20%
Minimum acceptable return on investment set by top management	10%
Expected return on investment for new project	14%

If the manager of the Northern Division is evaluated on new projects using only the return on investment, the division manager might decide to reject the new project. This is because investing in the new project will decrease Northern's current return on investment of 20%. While this helps the division maintain its high ROI, it hurts the company as a whole because the expected return on investment of 14% exceeds DataLink's minimum acceptable return on investment of 10%.

In contrast, if the manager of the Northern Division is evaluated using residual income, the new project would probably be accepted because it will increase the Northern Division's residual income. In this way, residual income supports both divisional and overall company objectives.

Check Up Corner 10-3 Investment Center Performance Measures

Yummy Foods Company is a diversified company with three divisions organized as investment centers. Condensed data taken from the records of the three divisions for the year ended December 31 are as follows:

	Snack Goods	Canned Foods	Frozen Foods
Revenues	$ 784,000	$ 940,800	$1,050,000
Operating expenses	(470,400)	(700,000)	(562,500)
Operating income before support department allocations	$ 313,600	$ 240,800	$ 487,500
Support department allocations	(219,520)	(99,680)	(382,500)
Operating income	$ 94,080	$ 141,120	$ 105,000
Invested assets	$ 448,000	$ 940,800	$ 750,000

a. Using the DuPont formula, for return on investment compute the profit margin, investment turnover, and return on investment for each division.
b. Determine the residual income for each division, assuming a minimum acceptable return on investment is 14%.

(Continued)

Solution:

a.

	Return on Investment	=	Profit Margin	×	Investment Turnover
Snack Goods Division	21.0%	=	12.0%	×	1.75
Canned Foods Division	15.0%	=	15.0%	×	1.00
Frozen Foods Division	14.0%	=	10.0%	×	1.40

The Snack Goods Division has the highest return on investment.

Profit Margin

	Snack Goods	Canned Foods	Frozen Foods
Operating income	$ 94,080	$141,120	$ 105,000
Sales	÷784,000	÷940,800	÷1,050,000
Profit margin	12.0%	15.0%	10.0%

The Canned Foods Division has the highest operating income.

Investment Turnover

	Snack Goods	Canned Foods	Frozen Foods
Sales	$784,000	$940,800	$1,050,000
Invested assets	÷448,000	÷940,800	÷ 750,000
Investment turnover	1.75	1.00	1.40

b.

	Residual Income	=	Operating Income	–	Minimum Acceptable Operating Income
Snack Goods Division	$31,360	=	$94,080	–	$62,720
Canned Foods Division	$9,408	=	$141,120	–	$131,712
Frozen Foods Division	$0	=	$105,000	–	$105,000

The Snack Goods Division has the highest residual income.

	Snack Goods	Canned Foods	Frozen Foods
Invested assets	$448,000	$940,800	$750,000
Minimum acceptable return	× 14%	× 14%	× 14%
Minimum acceptable operating income	$ 62,720	$131,712	$105,000

Check Up Corner

Transfer Pricing

Objective 5
Describe and illustrate how the market price, negotiated price, and cost price approaches to transfer pricing may be used by decentralized segments of a business.

When divisions transfer products or render services to each other, a **transfer price** is used to charge for the products or services.[3] Because transfer prices will affect a division's financial performance, setting a transfer price is a sensitive matter for the managers of both the selling and buying divisions.

Three common approaches to setting transfer prices are as follows:

- Market price approach
- Negotiated price approach
- Cost price approach

Transfer prices may be used for cost, profit, or investment centers. The objective of setting a transfer price is to motivate managers to behave in a manner that will increase the overall company income. As will be illustrated, however, transfer prices may be misused in such a way that overall company income suffers.

In recent financial statements, **Caterpillar** reported $2,902 million of revenues among its four segments.

Link to Caterpillar

Transfer prices can be set as low as the variable cost per unit or as high as the market price. Often, transfer prices are negotiated at some point between variable cost per unit and market price. Exhibit 9 shows the possible range of transfer prices.

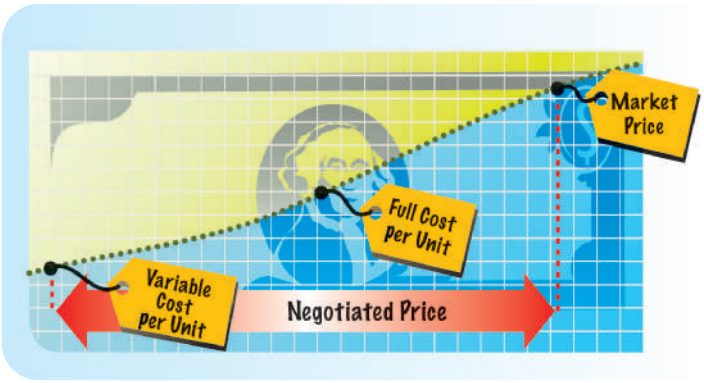


Exhibit 9
Commonly Used Transfer Prices

To illustrate, Wilson Company, a packaged snack food company with no support departments, is used. Wilson has two operating divisions (Eastern and Western) that are organized as investment centers. Condensed income statements for Wilson, assuming no transfers between divisions, are shown in Exhibit 10.

[3] The discussion in this chapter highlights the essential concepts of transfer pricing. In-depth discussion of transfer pricing can be found in advanced texts.

Exhibit 10
Income Statements—No Transfers Between Divisions

Wilson Company
Income Statements
For the Year Ended December 31, 20Y1

	Eastern Division	Western Division	Total Company
Sales:			
50,000 units × $20 per unit	$1,000,000		$ 1,000,000
20,000 units × $40 per unit		$ 800,000	800,000
Total sales			$ 1,800,000
Expenses:			
Variable:			
50,000 units × $10 per unit	$ (500,000)		$ (500,000)
20,000 units × $30* per unit		$(600,000)	(600,000)
Fixed	(300,000)	(100,000)	(400,000)
Total expenses	$ (800,000)	$(700,000)	$(1,500,000)
Operating income	$ 200,000	$ 100,000	$ 300,000

*$20 of the $30 per unit represents materials costs, and the remaining $10 per unit represents other variable conversion expenses incurred within the Western Division.

Market Price Approach

Using the **market price approach**, the transfer price is the price at which the product or service transferred could be sold to outside buyers. If an outside market exists for the product or service transferred, the current market price may be a proper transfer price.

Transfer Price = Market Price

To illustrate, assume that materials used by Wilson in producing snack food in the Western Division are currently purchased from an outside supplier at $20 per unit. The same materials are produced by the Eastern Division. The Eastern Division is operating at full capacity of 50,000 units and can sell all it produces to either the Western Division or to outside buyers.

A transfer price of $20 per unit (the market price) has no effect on the Eastern Division's income or total company income. The Eastern Division will earn revenues of $20 per unit on all its production and sales, regardless of who buys its product.

Likewise, the Western Division will pay $20 per unit for materials (the market price). Thus, the use of the market price as the transfer price has no effect on the Western Division's income or total company income.

In this situation, the use of the market price as the transfer price is proper. The condensed divisional income statements for Wilson would be the same as shown in Exhibit 10.

Negotiated Price Approach

If unused or excess capacity exists in the supplying division (the Eastern Division), and the transfer price is equal to the market price, total company profit may not be maximized. This is because the manager of the Western Division will be indifferent toward purchasing materials from the Eastern Division or from outside suppliers. That is, in both cases the Western Division manager pays $20 per unit (the market price). As a result, the Western Division may purchase the materials from outside suppliers.

If, however, the Western Division purchases the materials from the Eastern Division, the difference between the market price of $20 and the variable costs of the Eastern Division of $10 per unit (from Exhibit 10) can cover fixed costs and contribute to overall company profits. Thus, the Western Division manager should be encouraged to purchase the materials from the Eastern Division.

The **negotiated price approach** allows the managers to agree (negotiate) among themselves on a transfer price. The only constraint is that the transfer price be less than the market price but greater than the supplying division's variable costs per unit, as follows:

Variable Costs per Unit < Transfer Price < Market Price

To illustrate, assume that instead of a capacity of 50,000 units, the Eastern Division's capacity is 70,000 units. In addition, assume that the Eastern Division can continue to sell only 50,000 units to outside buyers.

A transfer price less than $20 would encourage the manager of the Western Division to purchase from the Eastern Division. This is because the Western Division is currently purchasing its

materials from outside suppliers at a cost of $20 per unit. Thus, its materials cost would decrease, and its operating income would increase.

At the same time, a transfer price above the Eastern Division's variable costs per unit of $10 would encourage the manager of the Eastern Division to supply materials to the Western Division. In doing so, the Eastern Division's operating income would also increase.

Exhibit 11 illustrates the divisional and company income statements, assuming that the Eastern and Western division managers agree to a transfer price of $15.

The Eastern Division increases its sales by $300,000 (20,000 units × $15 per unit) to $1,300,000. As a result, the Eastern Division's operating income increases by $100,000 ($300,000 sales – $200,000 variable costs) to $300,000, as shown in Exhibit 11.

Exhibit 11
Income Statements—Negotiated Transfer Price

Wilson Company
Income Statements
For the Year Ended December 31, 20Y1

	Eastern Division	Western Division	Total Company
Sales:			
50,000 units × $20 per unit	$ 1,000,000		$ 1,000,000
20,000 units × $15 per unit	300,000		300,000
20,000 units × $40 per unit		$ 800,000	800,000
Total sales	$ 1,300,000	$ 800,000	$ 2,100,000
Expenses:			
Variable:			
70,000 units × $10 per unit	$ (700,000)		$ (700,000)
20,000 units × $25* per unit		$(500,000)	(500,000)
Fixed	(300,000)	(100,000)	(400,000)
Total expenses	$(1,000,000)	$(600,000)	$(1,600,000)
Operating income	$ 300,000	$ 200,000	$ 500,000

*$10 of the $25 represents variable conversion expenses incurred solely within the Western Division, and $15 per unit represents the transfer price per unit from the Eastern Division.

The increase of $100,000 in the Eastern Division's income can also be computed as follows:

$$\text{Increase in Eastern (Supplying) Division's Operating Income} = (\text{Transfer Price} - \text{Variable Cost per Unit}) \times \text{Units Transferred}$$

$$= (\$15 - \$10) \times 20{,}000 \text{ units} = \$100{,}000$$

The Western Division's materials cost decreases by $5 per unit ($20 – $15) for a total of $100,000 (20,000 units × $5 per unit). Thus, the Western Division's operating income increases by $100,000 to $200,000, as shown in Exhibit 11.

The increase of $100,000 in the Western Division's income can also be computed as follows:

$$\text{Increase in Western (Purchasing) Division's Operating Income} = (\text{Market Price} - \text{Transfer Price}) \times \text{Units Transferred}$$

$$= (\$20 - \$15) \times 20{,}000 \text{ units} = \$100{,}000$$

Comparing Exhibits 10 and 11 shows that Wilson's operating income increased by $200,000, computed as follows:

	Operating Income		
	No Units Transferred (Exhibit 10)	20,000 Units Transferred at $15 per Unit (Exhibit 11)	Increase (Decrease)
Eastern Division	$200,000	$300,000	$100,000
Western Division	100,000	200,000	100,000
Wilson Company	$300,000	$500,000	$200,000

In the preceding illustration, any negotiated transfer price between $10 and $20 is acceptable, as shown in the following formula:

$$\text{Variable Costs per Unit} < \text{Transfer Price} < \text{Market Price}$$
$$\$10 < \text{Transfer Price} < \$20$$

Any transfer price within this range will increase the overall operating income for Wilson by $200,000. However, the increases in the Eastern and Western divisions' operating income will vary depending on the transfer price.

To illustrate, a transfer price of $16 would increase the Eastern Division's operating income by $120,000, computed as follows:

$$\text{Increase in Eastern (Supplying) Division's Operating Income} = (\text{Transfer Price} - \text{Variable Cost per Unit}) \times \text{Units Transferred}$$
$$= (\$16 - \$10) \times 20{,}000 \text{ units} = \$120{,}000$$

A transfer price of $16 would increase the Western Division's operating income by $80,000, computed as follows:

$$\text{Increase in Western (Purchasing) Division's Operating Income} = (\text{Market Price} - \text{Transfer Price}) \times \text{Units Transferred}$$
$$= (\$20 - \$16) \times 20{,}000 \text{ units} = \$80{,}000$$

With a transfer price of $16, Wilson Company's operating income still increases by $200,000, which consists of the Eastern Division's increase of $120,000 plus the Western Division's increase of $80,000.

As shown, a negotiated price provides each division manager with an incentive to negotiate the transfer of materials. At the same time, the overall company's operating income will also increase. However, the negotiated approach only applies when the supplying division has excess capacity. In other words, the supplying division cannot sell all its production to outside buyers at the market price.

Check Up Corner 10-4 Transfer Pricing

The materials used by the South Division of Eagle Company are currently purchased from outside suppliers at $30 per unit. These same materials are produced by Eagle's North Division. Operating income assuming no transfers between divisions is $1,200,000 for the North Division and $1,360,000 for the South Division.

The North Division has unused capacity and can produce the materials needed by the South Division at a variable cost of $15 per unit. The two divisions have recently negotiated a transfer price of $22 per unit for 30,000 units.

Based on the agreed upon transfer price, with no reduction in the North Division's current sales:

a. How much would the North Division's operating income increase?
b. How much would the South Division's operating income increase?
c. How much would Eagle Company's operating income increase?

Solution:

a. Increase in North (Supplying) Division's Operating Income = (Transfer Price – Variable Cost per Unit) × Units Transferred

= ($22 – $15) × 30,000 units = $210,000

b. Increase in South (Purchasing) Division's Operating Income = (Market Price – Transfer Price) × Units Transferred

= ($30 – $22) × 30,000 units = $240,000

c.

	Operating Income		
	No Units Transferred	**30,000 Units Transferred**	**Increase (Decrease)**
North Division	$1,200,000	$1,410,000	$210,000
South Division	1,360,000	1,600,000	240,000
Eagle Company	$2,560,000	$3,010,000	$450,000

Eagle company's operating income will increase by $450,000; the sum of the income increases for the North Division ($210,000) and the South Division ($240,000).

Check Up Corner

Cost Price Approach

Under the **cost price approach**, cost is used to set transfer prices. A variety of costs may be used in this approach, including the following:

- Total product cost per unit
- Variable product cost per unit

If total product cost per unit is used, direct materials, direct labor, and factory overhead are included in the transfer price. If variable product cost per unit is used, the fixed factory overhead cost is excluded from the transfer price.

Actual costs or standard (budgeted) costs may be used in applying the cost price approach. If actual costs are used, inefficiencies of the producing (supplying) division are transferred to the purchasing division. Thus, there is little incentive for the producing (supplying) division to control costs. For this reason, most companies use standard costs in the cost price approach. In this way, differences between actual and standard costs remain with the producing (supplying) division for cost control purposes.

The cost price approach is most often used when the responsibility centers are organized as cost centers. When the responsibility centers are organized as profit or investment centers, the cost price approach is normally not used.

For example, using the cost price approach when the supplying division is organized as a profit center ignores the supplying division manager's responsibility for earning profits. In this case, using the cost price approach prevents the supplying division from reporting any profit (revenues – costs) on the units transferred. As a result, the division manager has little incentive to transfer units to another division, even though it may be in the best interests of the company.



Ethics: Do It!

The Ethics of Transfer Prices

Transfer prices allow large multinational companies to minimize taxes by shifting taxable income from countries with high tax rates to countries with low taxes. For example, a British company will pay U.S. taxes on income from its U.S. division, and British taxes on income from its British division. Because this company can set its own transfer price, it can minimize its overall tax bill by setting a high transfer price when transferring goods to the United States. This increases cost of goods sold for the highly taxed U.S. division and increases sales for the lesser taxed British division. The overall result is a lower tax bill for the multinational company as a whole. In recent years, government tax authorities like the Internal Revenue Service (IRS) have become concerned with tax avoidance through transfer price manipulation. In response, many countries now have guidelines for setting transfer prices that assure that transfer prices are not subject to manipulation for tax purposes.

Source: L. Eden and L. M. Smith, "The Ethics of Transfer Pricing," unpublished working paper, Texas A&M University, 2011.

Analysis for Decision Making

Franchise Operations

Objective 6
Describe and illustrate the use of profit margin, investment turnover, and ROI in evaluating whether a company should expand through franchised or owner-operated stores.

Franchising is a popular method of expanding a brand, concept, product, or service offering. A **franchise** is the right or license granted to an individual or group to market a company's goods or services. The **franchisor** is the entity that provides the franchise, while the **franchisee** is the entity that pays for the franchise. The franchise fee is often expressed as a percent of revenues earned by the franchisee. In addition, the franchisee invests in the property and equipment to deliver the franchised product or service. The franchisor often provides support in start-up, advertising, management development, business systems, and supplier relationships. The benefits to a franchisee are instant access to a recognized brand, established customer base, and

working business systems. The main benefit to the franchisor is an ability to expand the brand without investing significantly in property and equipment.

From the franchisor's perspective, the return on investment for franchised operations should be increased by the low investment. Thus, the DuPont formula should show a healthy profit margin combined with a high investment turnover. To illustrate, **Hilton Worldwide Holdings, Inc. (HLT)**, has both company-operated and franchised hotel operations. In a recent year, Hilton had 141 company-operated hotels and 4,781 franchised hotels around the world. Clearly, Hilton emphasizes franchised operations. Segment disclosures with some assumptions regarding owned and franchised operations are as follows (in millions):

	Company-Operated	Franchised
Revenues	$4,126	$1,701
Operating expenses	3,100	0
General and administrative expenses*		616
Property, plant, and equipment**	8,037	893

*Assume all the general and administrative expenses support franchised operations, since less than 3% of hotel properties are company-operated.
** Total property, plant, and equipment is $8,930. Assume 10% of total property, plant, and equipment support administrative (franchised) operations, while the remaining 90% consist of owned hotel properties.

The return on investment (ROI) using the DuPont formula for both segments is as follows:

$$\text{Return on Investment} = \text{Profit Margin} \times \text{Investment Turnover}$$

$$\text{Return on Investment} = \frac{\text{Operating Income}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Invested Assets}}$$

Company-Operated Hotels:

$$\text{Return on Investment} = \frac{\$1,026^{1}}{\$4,126} \times \frac{\$4,126}{\$8,037}$$
$$= 24.9\% \times 0.51$$
$$= 12.7\% \text{ (rounded)}$$

Franchised Hotels:

$$\text{Return on Investment} = \frac{\$1,085^{2}}{\$1,701} \times \frac{\$1,701}{\$893}$$
$$= 63.8\% \times 1.90$$
$$= 121.2\% \text{ (rounded)}$$

[1] $4,126 – $3,100
[2] $1,701 – $616

Under these assumptions, franchised hotels provide a superior ROI compared to company-operated hotels. The superior performance is caused by both a stronger profit margin and a higher investment turnover. The ROI will often favor franchised operations in this way. This is likely the reason for Hilton's decision to emphasize franchised operations.

Make a Decision Franchise Operations

Analyze Kelly Kitchens (MAD 10-1)

Analyze Panera Bread Company (MAD 10-2)

Analyze Papa John's International, Inc. (MAD 10-3)

Compare Panera Bread and Papa John's (MAD 10-4)

Analyze McDonald's Corporation (MAD 10-5)

Make a Decision

Let's Review

Chapter Summary

1. In a centralized business, all major planning and operating decisions are made by top management. In a decentralized business, these responsibilities are delegated to unit managers. Decentralization may be more effective because operational decisions are made by the managers closest to the operations.
2. Cost centers limit the responsibility and authority of managers to decisions related to the costs of their unit. The primary tools for planning and controlling are budgets and budget performance reports.
3. In a profit center, managers have the responsibility and authority to make decisions that affect both revenues and costs. Responsibility reports for a profit center usually show operating income for the unit.
4. In an investment center, the unit manager has the responsibility and authority to make decisions that affect the unit's revenues, expenses, and assets invested in the center. Two measures are commonly used to assess investment center performance: return on investment (ROI) and residual income. These measures are often used to compare investment center performance.
5. When divisions within a company transfer products or provide services to each other, a transfer price is used to charge for the products or services. Transfer prices should be set so that the overall company income is increased when goods are transferred between divisions. One of three approaches is typically used to establish transfer prices: market price, negotiated price, or cost price.
6. Franchising is a popular method of expanding a brand, concept, product, or service offering. The benefits to a franchisee are instant access to a recognized brand, established customer base, and working business systems. The main benefit to the franchisor is an ability to expand the brand without investing significantly in property and equipment. The return on investment from franchised operations is normally high for the franchisor with a healthy profit margin and a high investment turnover.

Key Terms

controllable expenses (468)
controllable revenues (468)
cost center (464)
cost price approach (483)
DuPont formula (473)
franchise (483)
franchisee (483)
franchisor (483)
investment center (472)
investment turnover (473)
market price approach (480)
negotiated price approach (480)
profit center (468)
profit margin (473)
residual income (476)
responsibility accounting (464)
return on investment (ROI) (473)
support department allocations (468)
transfer price (479)

Practice

Multiple-Choice Questions

1. When the manager has the responsibility and authority to make decisions that affect costs and revenues but no responsibility for or authority over assets invested in the department, the department is called a(n):
   a. cost center.
   b. profit center.
   c. investment center.
   d. support department.
2. The Accounts Payable Department has expenses of $600,000 and makes 150,000 payments to the various vendors who provide products and services to the divisions. Division A has operating income of $900,000 before support department allocations and requires 60,000 payments to vendors. If the Accounts Payable Department is treated as a support department, what is Division A's operating income?
   a. $300,000
   b. $900,000
   c. $660,000
   d. $540,000

3. Division A of Kern Co. has sales of $350,000, cost of goods sold of $200,000, operating expenses of $30,000, and invested assets of $600,000. What is the return on investment for Division A?
   a. 20%
   b. 25%
   c. 33%
   d. 40%
4. Division L of Liddy Co. has a return on investment of 24% and an investment turnover of 1.6. What is the profit margin?
   a. 6%
   b. 15%
   c. 24%
   d. 38%
5. Which approach to transfer pricing uses the price at which the product or service transferred could be sold to outside buyers?
   a. Cost price approach
   b. Negotiated price approach
   c. Market price approach
   d. Standard cost approach

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Budgetary performance for cost center — Obj. 2

Caroline Company's costs were over budget by $319,000. The company is divided into West and East regions. The East Region's costs were under budget by $47,500. Determine the amount that the West Region's costs were over or under budget.

2. Support department allocations — Obj. 3

The centralized employee travel department of Camtro Company has expenses of $528,000. The department has serviced a total of 6,000 travel reservations for the period. The Southeast Division has made 2,400 reservations during the period, and the Pacific Northwest Division has made 3,600 reservations. How much should each division be allocated for travel services?

3. Operating income for profit center — Obj. 3

Using the data for Camtro Company from Exercise 2 along with the following data, determine the divisional operating income for the Southeast and Pacific Northwest divisions:

	Southeast Division	Pacific Northwest Division
Sales	$1,155,000	$1,204,000
Cost of goods sold	590,800	658,000
Selling expenses	231,000	252,000

4. Profit margin, investment turnover, and ROI — Obj. 4

Cash Company has operating income of $112,500, invested assets of $750,000, and sales of $1,875,000. Use the DuPont formula to compute the return on investment and show (a) the profit margin, (b) the investment turnover, and (c) the return on investment.

5. Residual income — Obj. 4

The Consumer Division of Hernandez Company has operating income of $90,000 and assets of $450,000. The minimum acceptable return on assets is 10%. What is the residual income for the division?

6. Transfer pricing — Obj. 5

The materials used by the North Division of Horton Company are currently purchased from outside suppliers at $60 per unit. These same materials are produced by Horton's South Division. The South Division can produce the materials needed by the North Division at a variable cost of $42 per unit. The division is currently producing 200,000 units and has capacity of 250,000 units. The two divisions have recently negotiated a transfer price of $52 per unit for 30,000 units. By how much will each division's operating income increase as a result of this transfer?

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Quinn Company has two divisions, Domestic and International. Invested assets and condensed income statement data for each division for the year ended December 31, 20Y9, are as follows:

	Domestic Division	International Division
Revenues	$675,000	$480,000
Operating expenses	450,000	372,400
Support department allocations	90,000	50,000
Invested assets	600,000	384,000

Instructions

1. Prepare condensed income statements for the past year for each division.
2. Using the DuPont formula, determine the profit margin, investment turnover, and return on investment for each division.
3. If management's minimum acceptable return on investment is 10%, determine the residual income for each division.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **b** The manager of a profit center (answer b) has responsibility for and authority over costs and revenues. If the manager has responsibility for only costs, the department is called a cost center (answer a). If the responsibility and authority extend to the investment in assets as well as costs and revenues, it is called an investment center (answer c). A support department (answer d) provides services to other departments. A support department could be a cost center, a profit center, or an investment center.

2. **c** $600,000 ÷ 150,000 = $4 per payment. Division A anticipates 60,000 payments or $240,000 (60,000 × $4) in support department allocations from the Accounts Payable Department. Operating income is thus $900,000 – $240,000, or $660,000. Answer a assumes that all support department costs are assigned to Division A, which would be incorrect, since Division A does not use all of the Accounts Payable service. Answer b incorrectly assumes that there are no support department allocations from Accounts Payable. Answer d incorrectly determines the Accounts Payable transfer rate from Division A's operating income.

3. **a** The return on investment for Division A is 20% (answer a), computed as follows:

$$\text{Return on Investment} = \frac{\text{Operating Income}}{\text{Invested Assets}}$$

$$= \frac{\$350{,}000 - \$200{,}000 - \$30{,}000}{\$600{,}000} = 20\%$$

4. **b** The profit margin for Division L of Liddy Co. is 15% (answer b), computed as follows:

$$\text{Return on Investment} = \text{Profit Margin} \times \text{Investment Turnover}$$
$$24\% = \text{Profit Margin} \times 1.6$$
$$15\% = \text{Profit Margin}$$

5. **c** The market price approach (answer c) to transfer pricing uses the price at which the product or service transferred could be sold to outside buyers. The cost price approach (answer a) uses cost as the basis for setting transfer prices. The negotiated price approach (answer b) allows managers of decentralized units to agree (negotiate) among themselves as to the proper transfer price. The standard cost approach (answer d) is a version of the cost price approach that uses standard costs in setting transfer prices.

Exercises

1. $366,500 over budget ($319,000 + $47,500)

2. Southeast Division Support Department Allocation for Travel Department:
$211,200 = 2,400 billed reservations × ($528,000 ÷ 6,000 reservations)

   Pacific Northwest Division Support Department Allocation for Travel Department:
$316,800 = 3,600 billed reservations × ($528,000 ÷ 6,000 reservations)

3.

	Southeast Division	Pacific Northwest Division
Sales	$1,155,000	$1,204,000
Cost of goods sold	(590,800)	(658,000)
Gross profit	$ 564,200	$ 546,000
Selling expenses	(231,000)	(252,000)
Operating income before support department allocations	$ 333,200	$ 294,000
Support department allocations	(211,200)	(316,800)
Operating income (loss)	$ 122,000	$ (22,800)

4. a. Profit Margin = $112,500 ÷ $1,875,000 = 6.0%
   b. Investment Turnover = $1,875,000 ÷ $750,000 = 2.5
   c. Return on Investment = 6.0% × 2.5 = 15.0%

5.

Operating income	$ 90,000
Minimum acceptable operating income as a percent of assets ($450,000 × 10%)	(45,000)
Residual income	$ 45,000

6. Increase in South (Supplying) Division's Operating Income = (Transfer Price – Variable Cost per Unit) × Units Transferred
   = ($52 – $42) × 30,000 units = $300,000

   Increase in North (Purchasing) Division's Operating Income = (Market Price – Transfer Price) × Units Transferred
   = ($60 – $52) × 30,000 units = $240,000

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1.

Quinn Company
Divisional Income Statements
For the Year Ended December 31, 20Y9

	Domestic Division	International Division
Revenues	$ 675,000	$ 480,000
Operating expenses	(450,000)	(372,400)
Operating income before support department allocations	$ 225,000	$ 107,600
Support department allocations	(90,000)	(50,000)
Operating income	$ 135,000	$ 57,600

2. Return on Investment = Profit Margin × Investment Turnover

$$\text{Return on Investment} = \frac{\text{Operating Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Assets}}$$

$$\text{Domestic Division: ROI} = \frac{\$135{,}000}{\$675{,}000} \times \frac{\$675{,}000}{\$600{,}000}$$

$$= 20\% \times 1.125$$

$$= 22.5\%$$

$$\text{International Division: ROI} = \frac{\$57{,}600}{\$480{,}000} \times \frac{\$480{,}000}{\$384{,}000}$$

$$= 12\% \times 1.25$$

$$= 15\%$$

3. Domestic Division: $75,000 [$135,000 – (10% × $600,000)]
International Division: $19,200 [$57,600 – (10% × $384,000)]

Discussion Questions

1. Differentiate between centralized and decentralized operations.
2. Differentiate between a profit center and an investment center.
3. REAL WORLD **Weyerhaeuser Co. (WY)** developed a system that allocates support department costs to user divisions on the basis of actual services consumed by the division. Here are a number of Weyerhaeuser's activities in its central Financial Services Department:
   - Payroll
   - Accounts payable
   - Accounts receivable
   - Database administration—report preparation

   For each activity, identify an activity base that could be used to allocate user divisions for service.
4. What is the major shortcoming of using operating income as a performance measure for investment centers?
5. In a decentralized company in which the divisions are organized as investment centers, how could a division be considered the least profitable even though it earned the largest amount of operating income?
6. How does using the return on investment facilitate comparability between divisions of decentralized companies?
7. (a) Explain how return on investment might lead a divisional manager to reject new investments that could be profitable for the company as a whole. (b) How can this disadvantage be overcome?
8. What is the objective of transfer pricing?
9. When is the negotiated price approach preferred over the market price approach in setting transfer prices?
10. When using the negotiated price approach to transfer pricing, within what range should the transfer price be established?

Basic Exercises

SHOW ME HOW

BE 10-1 Budgetary performance for cost center — Obj. 2

Vinton Company's costs were under budget by $36,000. The company is divided into North and South regions. The North Region's costs were over budget by $45,000. Determine the amount that the South Region's costs were over or under budget.

SHOW ME HOW

BE 10-2 Support department allocations — Obj. 3

The centralized computer technology department of Hardy Company has expenses of $320,000. The department has provided a total of 4,000 hours of service for the period. The Retail Division has used 2,750 hours of computer technology service during the period, and the Commercial Division has used 1,250 hours of computer technology service. How much should each division be allocated for computer technology department services?

SHOW ME HOW

BE 10-3 Operating income for profit center — Obj. 3

Using the data for Hardy Company from Brief Exercise 2 along with the following data, determine the divisional operating income for the Retail Division and the Commercial Division:

	Retail Division	Commercial Division
Sales	$2,150,000	$1,200,000
Cost of goods sold	1,300,000	800,000
Selling expenses	150,000	175,000

SHOW ME HOW

BE 10-4 Profit margin, investment turnover, and ROI — Obj. 4

Briggs Company has operating income of $36,000, invested assets of $180,000, and sales of $720,000. Use the DuPont formula to compute the return on investment and show (a) the profit margin, (b) the investment turnover, and (c) the return on investment.

SHOW ME HOW

BE 10-5 Residual income — Obj. 4

The Commercial Division of Galena Company has operating income of $12,680,000 and assets of $74,500,000. The minimum acceptable return on assets is 12%. What is the residual income for the division?

SHOW ME HOW

BE 10-6 Transfer pricing — Obj. 5

The materials used by the Multinomah Division of Isbister Company are currently purchased from outside suppliers at $90 per unit. These same materials are produced by the Pembroke Division. The Pembroke Division can produce the materials needed by the Multinomah Division at a variable cost of $75 per unit. The division is currently producing 120,000 units and has capacity of 150,000 units. The two divisions have recently negotiated a transfer price of $82 per unit for 15,000 units. By how much will each division's income increase as a result of this transfer?

Exercises

EX 10-1 Budget performance reports for cost centers

Obj. 2

✔ a. (c) $300,000



SHOW ME HOW

Partially completed budget performance reports for Delmar Company, a manufacturer of light duty motors, follow:

Delmar Company
Budget Performance Report—Vice President, Production
For the Month Ended June 30

Plant	Actual	Budget	Over Budget	(Under) Budget
Eastern Region	$4,200,000	$4,250,000		$(50,000)
Central Region	6,175,000	6,200,000		(25,000)
Western Region	(g)	(h)	$ (i)	
	$ (j)	$ (k)	$ (l)	$(75,000)

Delmar Company
Budget Performance Report—Manager, Western Region Plant
For the Month Ended June 30

Department	Actual	Budget	Over Budget	(Under) Budget
Chip Fabrication	$ (a)	$ (b)	$ (c)	
Electronic Assembly	2,575,000	2,500,000	75,000	
Final Assembly	1,640,000	1,700,000		$(60,000)
	$ (d)	$ (e)	$ (f)	$(60,000)

Delmar Company
Budget Performance Report—Supervisor, Chip Fabrication
For the Month Ended June 30

Cost	Actual	Budget	Over Budget	(Under) Budget
Factory wages	$1,450,000	$1,200,000	$250,000	
Materials	1,575,000	1,600,000		$(25,000)
Power and light	945,000	900,000	45,000	
Maintenance	330,000	300,000	30,000	
	$4,300,000	$4,000,000	$325,000	$(25,000)

a. Complete the budget performance reports by determining the correct amounts for the lettered spaces.

b. Compose a memo to Randi Wilkes, vice president of production for Delmar Company, explaining the performance of the production division for June.

EX 10-2 Divisional income statements

Obj. 3

✔ Commercial Division operating income, $1,170,000

The following data were summarized from the accounting records for Ruiz Industries Inc. for the year ended November 30, 20Y8:

Cost of goods sold:		Support department allocations:	
Commercial Division	$3,400,000	Commercial Division	$800,000
Residential Division	1,800,000	Residential Division	200,000
Administrative expenses:		Sales:	
Commercial Division	$750,000	Commercial Division	$6,120,000
Residential Division	375,000	Residential Division	2,850,000

Prepare divisional income statements for Ruiz Industries Inc.

EX 10-3 Support department allocations and cost drivers — Obj. 3

For each of the following support departments, identify a cost driver that could be used for allocating the support department costs to the profit center:

a. Legal
b. Duplication services
c. Electronic data processing
d. Central purchasing
e. Telecommunications
f. Accounts receivable

EX 10-4 Cost drivers for support department allocations — Obj. 3

✔ c. 2

For each of the following support departments, select the cost driver listed that is most appropriate for allocating support department costs to responsible units:

Support Department	Cost Driver
a. Accounts Receivable	1. Number of conference attendees
b. Central Purchasing	2. Number of computers
c. Computer Support	3. Number of employees trained
d. Conferences	4. Number of cell phone minutes used
e. Employee Travel	5. Number of purchase requisitions
f. Payroll Accounting	6. Number of sales invoices
g. Telecommunications	7. Number of payroll checks
h. Training	8. Number of travel claims

EX 10-5 Cost department allocations — Obj. 3

✔ b. Residential payroll, $32,640



In divisional income statements prepared for Demopolis Company, the Payroll Department costs are charged back to user divisions on the basis of the number of payroll distributions, and the Purchasing Department costs are charged back on the basis of the number of purchase requisitions. The Payroll Department had expenses of $64,560, and the Purchasing Department had expenses of $40,000 for the year. The following annual data for Residential, Commercial, and Government Contract divisions were obtained from corporate records:

	Residential	Commercial	Government Contract
Sales	$2,000,000	$3,250,000	$2,900,000
Number of employees:			
Weekly payroll (52 weeks per year)	400	250	150
Monthly payroll	80	30	10
Number of purchase requisitions per year	7,500	3,000	2,000

a. Determine the total amount of payroll checks and purchase requisitions processed per year by the company and each division.

b. Using the cost driver information in (a), determine the annual amount of payroll and purchasing costs allocated to the Residential, Commercial, and Government Contract divisions from payroll and purchasing services.

c. Why does the Residential Division have a larger support department allocation than the other two divisions, even though its sales are lower?

EX 10-6 Support department allocations and cost drivers — Obj. 3

✔ b. Help desk, $7,125

Varney Corporation, a manufacturer of electronics and communications systems, allocates Computing and Communications Services Department (CCS) costs to profit centers. The following table lists

the types of services and cost drivers for each service. The table also includes the budgeted cost and quantity for each service for August.

CCS Services	Cost Drivers	Budgeted Cost	Budgeted Quantity of Services
Help desk	Number of calls	$ 90,000	3,600
Network center	Number of devices	120,000	1,500
Electronic mail	Number of user accounts	160,000	5,000
Smartphone support	Number of smartphones issued	72,000	4,000

One of the profit centers for Varney Corporation is the Communication Systems (COMM) division. Assume the following information for COMM:

- COMM has 2,500 employees, of whom 20% are office employees.
- All of the office employees have been issued a smartphone, and 95% of them have a computer on the network.
- One hundred percent of the employees with a computer also have an email account.
- The average number of help desk calls for August was 0.6 call per individual with a computer.
- There are 400 additional printers, servers, and peripherals on the network beyond the personal computers.

a. Compute the service allocation rate for each of CCS's services for August.

b. Compute the allocation of CCS's services to COMM for August.

EX 10-7 Divisional income statements with support department allocations

Obj. 3

✔ Consumer Division's operating income, $1,635,000


SHOW ME HOW


EXCEL TEMPLATE

Horton Technology has two divisions, Consumer and Commercial, and two corporate support departments, Tech Services and Purchasing. The corporate expenses for the year ended December 31, 20Y7, are as follows:

Tech Services Department	$1,170,000
Purchasing Department	450,000
Other corporate administrative expenses	800,000
Total expense	$2,420,000

The other corporate administrative expenses include officers' salaries and other expenses required by the corporation. The Tech Services Department allocates costs to the divisions based on the number of computers in the department, and the Purchasing Department allocates costs to the divisions based on the number of purchase orders for each department. The services used by the two divisions are as follows:

	Tech Services	Purchasing
Consumer Division	1,100 computers	4,000 purchase orders
Commercial Division	700	8,000
Total	1,800 computers	12,000 purchase orders

The support department allocations of the Tech Services Department and the Purchasing Department are considered controllable by the divisions. Corporate administrative expenses are not considered controllable by the divisions. The revenues, cost of goods sold, and operating expenses for the two divisions are as follows:

	Consumer	Commercial
Revenues	$15,500,000	$33,250,000
Cost of goods sold	10,000,000	15,800,000
Operating expenses	3,000,000	1,750,000

Prepare the divisional income statements for the two divisions.

EX 10-8 Corrections to support department allocations for a service company

Obj. 3

✔ b. Operating income, Cargo Division, $280,000

Rocky Mountain Airlines Inc. has two divisions organized as profit centers, the Passenger Division and the Cargo Division. The following divisional income statements were prepared:

Rocky Mountain Airlines Inc.
Divisional Income Statements
For the Year Ended December 31, 20Y9

	Passenger Division	Cargo Division
Revenues	$ 4,200,000	$ 4,200,000
Operating expenses	(2,700,000)	(3,500,000)
Operating income before support department allocations	$ 1,500,000	$ 700,000
Support department allocations:		
Training	$ (180,000)	$ (180,000)
Flight scheduling	(275,000)	(275,000)
Reservations	(375,000)	(375,000)
Total support department allocations	$ (830,000)	$ (830,000)
Operating income (loss)	$ 670,000	$ (130,000)

The support department allocation rates for the support department costs were based on revenues. Because the revenues of the two divisions were the same, the support department allocations to each division were also the same.

The following additional information is available:

	Passenger Division	Cargo Division	Total
Number of personnel trained	600	200	800
Number of flights	1,000	1,500	2,500
Number of reservations requested	30,000	0	30,000

a. Does the operating income (loss) for the two divisions accurately measure performance? Explain.

b. Correct the divisional income statements, using appropriate support department cost drivers.

EX 10-9 Profit center responsibility reporting

Obj. 3

✔ Operating income, Summer Sports Division, $2,790,000

SHOW ME HOW EXCEL TEMPLATE

Championship Sports Inc. operates two divisions—the Winter Sports Division and the Summer Sports Division. The following income and expense accounts were provided from the trial balance as of December 31, 20Y9, the end of the fiscal year, after all adjustments, including those for inventories, were recorded and posted:

Sales—Winter Sports Division	$ 8,900,000
Sales—Summer Sports Division	16,400,000
Cost of Goods Sold—Winter Sports Division	5,000,000
Cost of Goods Sold—Summer Sports Division	9,000,000
Sales Expense—Winter Sports Division	650,000
Sales Expense—Summer Sports Division	1,200,000
Administrative Expense—Winter Sports Division	800,000
Administrative Expense—Summer Sports Division	1,450,000
Advertising Expense	1,090,000
Transportation Expense	192,000
Accounts Receivable Collection Expense	68,000
Warehouse Expense	1,800,000

The bases to be used in allocating expenses, together with other information, are as follows:

a. Advertising expense—incurred at headquarters, allocated to divisions on the basis of usage: Winter Sports Division, $375,000; Summer Sports Division, $715,000.

b. Transportation expense—allocated to divisions at a rate of $4.00 per bill of lading: Winter Sports Division, 17,500 bills of lading; Summer Sports Division, 30,500 bills of lading.

c. Accounts receivable collection expense—incurred at headquarters, allocated to divisions at a rate of $1.00 per invoice: Winter Sports Division, 25,000 sales invoices; Summer Sports Division, 43,000 sales invoices.

d. Warehouse expense—allocated to divisions on the basis of floor space used in storing division products: Winter Sports Division, 60,000 square feet; Summer Sports Division, 90,000 square feet.

Prepare a divisional income statement with two column headings: Winter Sports Division and Summer Sports Division. Provide supporting computations for support department allocations.

EX 10-10 Return on investment

Obj. 4

✔ a. Retail, 24%



SHOW ME HOW

The operating income and the amount of invested assets in each division of Conley Industries are as follows:

	Operating Income	Invested Assets
Retail Division	$ 9,600,000	$40,000,000
Commercial Division	12,100,000	55,000,000
Internet Division	6,480,000	36,000,000

a. Compute the return on investment for each division.

b. Which division is the most profitable per dollar invested?

EX 10-11 Residual income

Obj. 4

✔ a. Commercial Division, $3,850,000



SHOW ME HOW

Based on the data in Exercise 10 assume that management has established a 15% minimum acceptable return for invested assets.

a. Determine the residual income for each division.

b. Which division has the most residual income?

EX 10-12 Determining missing items in return on investment computation

Obj. 4

✔ d. 3.00

One item is omitted from each of the following computations of the return on investment:

Return on Investment	=	Profit Margin	×	Investment Turnover
13.2%	=	6%	×	(a)
(b)	=	10%	×	1.80
10.5%	=	(c)	×	1.50
15.0%	=	5%	×	(d)
(e)	=	12%	×	1.10

Determine the missing items, identifying each by the appropriate letter.

EX 10-13 Profit margin, investment turnover, and return on investment

Obj. 4

✔ a. ROI, 27.2%



SHOW ME HOW

The condensed income statement for the Consumer Products Division of Tri-State Industries Inc. is as follows (assuming no support department allocations):

Sales	$ 230,000,000
Cost of goods sold	(126,500,000)
Gross profit	$ 103,500,000
Administrative expenses	(64,400,000)
Operating income	$ 39,100,000

The manager of the Consumer Products Division is considering ways to increase the return on investment.

a. Using the DuPont formula for return on investment, determine the profit margin, investment turnover, and return on investment of the Consumer Products Division, assuming that $143,750,000 of assets have been invested in the Consumer Products Division.

b. If expenses could be reduced by $3,450,000 without decreasing sales, what would be the impact on the profit margin, investment turnover, and return on investment for the Consumer Products Division?

EX 10-14 Return on investment

Obj. 4

✔ a. Media Networks ROI, 23.5%



The Walt Disney Company (DIS) has four business segments, described as follows:

- **Media Networks:** Television and radio
- **Parks and Resorts:** Resorts, including Disneyland
- **Studio Entertainment:** Motion pictures, musical recordings, and stage plays
- **Consumer Products & Interactive Media:** Character merchandising, Disney stores, books, and games

Disney recently reported segment operating income, revenue, and invested assets (in millions) as follows:

	Operating Income	Revenue	Invested Assets
Media Networks	$7,755	$23,689	$32,706
Parks and Resorts	3,298	16,974	28,275
Studio Entertainment	2,703	9,441	15,359
Consumer Products & Interactive Media	1,965	5,528	9,332

a. Use the DuPont formula to determine the return on investment for the four Disney segments. Round percentages to one decimal place and investment turnover to two decimal places.

b. How do the four segments differ in their profit margin, investment turnover, and return on investment?

EX 10-15 Determining missing items in return and residual income computations

Obj. 4

✔ c. $54,000

Data are presented in the following table of returns on investment and residual incomes:

Invested Assets	Operating Income	Return on Investment	Minimum Return on Investment	Minimum Acceptable Operating Income	Residual Income
$1,200,000	$198,000	(a)	12%	(b)	(c)
$ 800,000	(d)	(e)	(f)	$120,000	$40,000
$ 750,000	(g)	14%	(h)	$ 90,000	(i)
$1,800,000	$441,000	(j)	15%	(k)	(l)

Determine the missing items, identifying each item by the appropriate letter.

EX 10-16 Determining missing items from computations

Obj. 4

✔ a. (e) $300,000

Data for the North, South, East, and West divisions of Free Bird Company are as follows:

	Sales	Operating Income	Invested Assets	Return on Investment	Profit Margin	Investment Turnover
North	$860,000	(a)	(b)	17.5%	7.0%	(c)
South	(d)	$51,300	(e)	(f)	4.5%	3.8
East	$1,020,000	(g)	$680,000	15.0%	(h)	(i)
West	$1,120,000	$89,600	$560,000	(j)	(k)	(l)

a. Determine the missing items, identifying each by the letters (a) through (l). Round percentages and investment turnover to one decimal place.

b. Determine the residual income for each division, assuming that the minimum acceptable return on investment established by management is 12%.

c. Which division is the most profitable in terms of (1) return on investment and (2) residual income?

EX 10-17 Decision on transfer pricing

Obj. 5

✔ a. $33,750,000

Materials used by the Instrument Division of Ziegler Inc. are currently purchased from outside suppliers at a cost of $1,350 per unit. However, the same materials are available from the Components Division. The Components Division has unused capacity and can produce the materials needed by the Instrument Division at a variable cost of $900 per unit.

a. If a transfer price of $1,000 per unit is established and 75,000 units of materials are transferred, with no reduction in the Components Division's current sales, how much would Ziegler Inc.'s total operating income increase?

b. How much would the Instrument Division's operating income increase?

c. How much would the Components Division's operating income increase?

EX 10-18 Decision on transfer pricing

Obj. 5

✔ b. $11,250,000

Based on Ziegler Inc.'s data in Exercise 17, assume that a transfer price of $1,200 has been established and that 75,000 units of materials are transferred, with no reduction in the Components Division's current sales.

a. How much would Ziegler Inc.'s total operating income increase?

b. How much would the Instrument Division's operating income increase?

c. How much would the Components Division's operating income increase?

d. If the negotiated price approach is used, what would be the range of acceptable transfer prices and why?

Problems: Series A

EXCEL TEMPLATE

PR 10-1A Budget performance report for a cost center

Obj. 2

GHT Tech Inc. sells electronics over the Internet. The Consumer Products Division is organized as a cost center. The budget for the Consumer Products Division for the month ended January 31 is as follows:

Customer service salaries	$ 546,840
Insurance and property taxes	114,660
Distribution salaries	872,340
Marketing salaries	1,028,370
Engineer salaries	836,850
Warehouse wages	586,110
Equipment depreciation	183,792
Total	$4,168,962

During January, the costs incurred in the Consumer Products Division were as follows:

Customer service salaries	$ 602,350
Insurance and property taxes	110,240
Distribution salaries	861,200
Marketing salaries	1,085,230
Engineer salaries	820,008
Warehouse wages	562,632
Equipment depreciation	183,610
Total	$4,225,270

(Continued)

Instructions

1. Prepare a budget performance report for the director of the Consumer Products Division for the month of January.
2. For which costs might the director be expected to request supplemental reports?

PR 10-2A Profit center responsibility reporting for a service company — Obj. 3

✔ 1. Operating income, West Division, $341,650

SHOW ME HOW EXCEL TEMPLATE

Red Line Railroad Inc. has three regional divisions organized as profit centers. The chief executive officer (CEO) evaluates divisional performance, using operating income as a percent of revenues. The following quarterly income and expense accounts were provided from the trial balance as of December 31:

Revenues—East	$1,400,000
Revenues—West	2,000,000
Revenues—Central	3,200,000
Operating Expenses—East	800,000
Operating Expenses—West	1,350,000
Operating Expenses—Central	1,900,000
Corporate Expenses—Shareholder Relations	300,000
Corporate Expenses—Customer Support	320,000
Corporate Expenses—Legal	500,000
General Corporate Officers' Salaries	1,200,000

The company operates three support departments: Shareholder Relations, Customer Support, and Legal. The Shareholder Relations Department conducts a variety of services for shareholders of the company. The Customer Support Department is the company's point of contact for new service, complaints, and requests for repair. The department believes that the number of customer contacts is a cost driver for this work. The Legal Department provides legal services for division management. The department believes that the number of hours billed is a cost driver for this work. The following additional information has been gathered:

	East	West	Central
Number of customer contacts	1,500	2,800	5,700
Number of hours billed	750	1,750	1,500

Instructions

1. Prepare quarterly income statements showing operating income for the three divisions. Use three column headings: East, West, and Central.
2. Identify the most successful division according to the profit margin. Round to the nearest whole percent.
3. Provide a recommendation to the CEO for a better method for evaluating the performance of the divisions. In your recommendation, identify the major weakness of the present method.

PR 10-3A Divisional income statements and return on investment analysis — Obj. 4

✔ 2. Cereal Division ROI, 10.0%

EXCEL TEMPLATE

The Crunchy Granola Company is a diversified food company that specializes in all natural foods. The company has three operating divisions organized as investment centers. Condensed data taken from the records of the three divisions for the year ended June 30, 20Y7, are as follows:

	Cereal Division	Snack Cake Division	Retail Bakeries Division
Sales	$25,000,000	$8,000,000	$9,750,000
Cost of goods sold	16,670,000	5,575,000	6,795,000
Operating expenses	7,330,000	1,945,000	2,272,500
Invested assets	10,000,000	4,000,000	6,500,000

The management of The Crunchy Granola Company is evaluating each division as a basis for planning a future expansion of operations.

Instructions

1. Prepare condensed divisional income statements for the three divisions, assuming that there were no support department allocations.

2. Using the DuPont formula for return on investment, compute the profit margin, investment turnover, and return on investment for each division. Round percentages and the investment turnover to one decimal place.
3. If available funds permit the expansion of operations of only one division, which of the divisions would you recommend for expansion, based on parts (1) and (2)? Explain.

PR 10-4A Effect of proposals on divisional performance

Obj. 4

✔ 1. ROI, 16.8%

EXCEL TEMPLATE

A condensed income statement for the Commercial Division of Maxell Manufacturing Inc. for the year ended December 31, 20Y9, is as follows:

Sales	$ 3,500,000
Cost of goods sold	(2,480,000)
Gross profit	$ 1,020,000
Operating expenses	(600,000)
Operating income	$ 420,000
Invested assets	$ 2,500,000

Assume that the Commercial Division received no allocations from support departments. The president of Maxell Manufacturing has indicated that the division's return on a $2,500,000 investment must be increased to at least 21% by the end of the next year if operations are to continue. The division manager is considering the following three proposals:

Proposal 1: Transfer equipment with a book value of $312,500 to other divisions at no gain or loss and lease similar equipment. The annual lease payments would exceed the amount of depreciation expense on the old equipment by $105,000. This increase in expense would be included as part of the cost of goods sold. Sales would remain unchanged.

Proposal 2: Purchase new and more efficient machining equipment and thereby reduce the cost of goods sold by $560,000 after considering the effects of depreciation expense on the new equipment. Sales would remain unchanged, and the old equipment, which has no remaining book value, would be scrapped at no gain or loss. The new equipment would increase invested assets by an additional $1,875,000 for the year.

Proposal 3: Reduce invested assets by discontinuing a product line. This action would eliminate sales of $595,000, reduce cost of goods sold by $406,700, and reduce operating expenses by $175,000. Assets of $1,338,000 would be transferred to other divisions at no gain or loss.

Instructions

1. Using the DuPont formula for return on investment, determine the profit margin, investment turnover, and return on investment for the Commercial Division for the past year.
2. Prepare condensed estimated income statements and compute the invested assets for each proposal.
3. Using the DuPont formula for return on investment, determine the profit margin, investment turnover, and return on investment for each proposal. Round the investment turnover and return on investment to one decimal place.
4. Which of the three proposals would meet the required 21% return on investment?
5. If the Commercial Division were in an industry where the profit margin could not be increased, how much would the investment turnover have to increase to meet the president's required 21% return on investment?

PR 10-5A Divisional performance analysis and evaluation

Obj. 4

✔ 2. Business Division ROI, 23.0%

SHOW ME HOW EXCEL TEMPLATE

The vice president of operations of Recycling Industries is evaluating the performance of two divisions organized as investment centers. Invested assets and condensed income statement data for the past year for each division are as follows:

	Business Division	Consumer Division
Sales	$42,800,000	$56,000,000
Cost of goods sold	23,500,000	30,500,000
Operating expenses	11,424,800	14,300,000
Invested assets	34,240,000	70,000,000

(Continued)

Instructions

1. Prepare condensed divisional income statements for the year ended December 31, 20Y8, assuming that there were no support department allocations.
2. Using the DuPont formula for return on investment, determine the profit margin, investment turnover, and return on investment for each division. Round percentages to one decimal place and the investment turnover to two decimal places.
3. If management desires a minimum acceptable return on investment of 10%, determine the residual income for each division.
4. Discuss the evaluation of the two divisions, using the performance measures determined in parts (1), (2), and (3).

PR 10-6A Transfer pricing

Obj. 5

✔ 3. Total operating income, $1,759,680

EXCEL TEMPLATE

Garcon Inc. manufactures electronic products, with two operating divisions, Consumer and Commercial. Condensed divisional income statements, which involve no intracompany transfers and which include a breakdown of expenses into variable and fixed components, are as follows:

Garcon Inc.
Divisional Income Statements
For the Year Ended December 31, 20Y2

	Consumer Division	Commercial Division	Total
Sales:			
14,400 units × $144 per unit	$ 2,073,600		$ 2,073,600
21,600 units × $275 per unit		$ 5,940,000	5,940,000
Total sales	$ 2,073,600	$ 5,940,000	$ 8,013,600
Expenses:			
Variable:			
14,400 units × $104 per unit	$(1,497,600)		$(1,497,600)
21,600 units × $193* per unit		$(4,168,800)	(4,168,800)
Fixed	(200,000)	(520,000)	(720,000)
Total expenses	$(1,697,600)	$(4,688,800)	$(6,386,400)
Operating income	$ 376,000	$ 1,251,200	$ 1,627,200

*$150 of the $193 per unit represents materials costs, and the remaining $43 per unit represents other variable conversion expenses incurred within the Commercial Division.

The Consumer Division is presently producing 14,400 units out of a total capacity of 17,280 units. Materials used in producing the Commercial Division's product are currently purchased from outside suppliers at a price of $150 per unit. The Consumer Division is able to produce the materials used by the Commercial Division. Except for the possible transfer of materials between divisions, no changes are expected in sales and expenses.

Instructions

1. Would the market price of $150 per unit be an appropriate transfer price for Garcon Inc.? Explain.
2. If the Commercial Division purchases 2,880 units from the Consumer Division, rather than externally, at a negotiated transfer price of $115 per unit, how much would the operating income of each division and the total company operating income increase?
3. Prepare condensed divisional income statements for Garcon Inc. based on the data in part (2).
4. If a transfer price of $126 per unit is negotiated, how much would the operating income of each division and the total company operating income increase?
5. a. What is the range of possible negotiated transfer prices that would be acceptable for Garcon Inc.?
   b. Assuming that the managers of the two divisions cannot agree on a transfer price, what price would you suggest as the transfer price?

Problems: Series B

EXCEL TEMPLATE

PR 10-1B Budget performance report for a cost center — Obj. 2

The Eastern District of Adelson Inc. is organized as a cost center. The budget for the Eastern District of Adelson Inc. for the month ended December 31 is as follows:

Sales salaries	$ 819,840
System administration salaries	448,152
Customer service salaries	152,600
Billing salaries	98,760
Maintenance	271,104
Depreciation of plant and equipment	92,232
Insurance and property taxes	41,280
Total	$1,923,968

During December, the costs incurred in the Eastern District were as follows:

Sales salaries	$ 818,880
System administration salaries	447,720
Customer service salaries	183,120
Billing salaries	98,100
Maintenance	273,000
Depreciation of plant and equipment	92,232
Insurance and property taxes	41,400
Total	$1,954,452

Instructions

1. Prepare a budget performance report for the manager of the Eastern District of Adelson for the month of December.
2. For which costs might the manager be expected to request supplemental reports?

✔ 1. Operating income, West Region, $820,800

SHOW ME HOW EXCEL TEMPLATE

PR 10-2B Profit center responsibility reporting for a service company — Obj. 3

Thomas Railroad Company organizes its three divisions, the North (N), South (S), and West (W) regions, as profit centers. The chief executive officer (CEO) evaluates divisional performance, using operating income as a percent of revenues. The following quarterly income and expense accounts were provided from the trial balance as of December 31:

Revenues—N Region	$3,780,000
Revenues—S Region	5,673,000
Revenues—W Region	5,130,000
Operating Expenses—N Region	2,678,500
Operating Expenses—S Region	4,494,890
Operating Expenses—W Region	3,770,050
Corporate Expenses—Dispatching	182,000
Corporate Expenses—Equipment Management	1,200,000
Corporate Expenses—Treasurer's	734,000
General Corporate Officers' Salaries	1,380,000

The company operates three support departments: the Dispatching Department, the Equipment Management Department, and the Treasurer's Department. The Dispatching Department manages the scheduling and releasing of completed trains. The Equipment Management Department manages the railroad cars inventories. It makes sure the right freight cars are at the right place at the right time. The Treasurer's Department conducts a variety of services for the company as a whole. The following additional information has been gathered:

	North	South	West
Number of scheduled trains	650	1,105	845
Number of railroad cars in inventory	6,000	8,400	9,600

(Continued)

Instructions

1. Prepare quarterly income statements showing operating income for the three regions. Use three column headings: North, South, and West.
2. Identify the most successful region according to the profit margin.
3. Provide a recommendation to the CEO for a better method for evaluating the performance of the regions. In your recommendation, identify the major weakness of the present method.

PR 10-3B Divisional income statements and return on investment analysis

Obj. 4

✔ 2. Mutual Fund Division, ROI, 22.4%

EXCEL TEMPLATE

E.F. Lynch Company is a diversified investment company with three operating divisions organized as investment centers. Condensed data taken from the records of the three divisions for the year ended June 30, 20Y8, are as follows:

	Mutual Fund Division	Electronic Brokerage Division	Investment Banking Division
Fee revenue	$4,140,000	$3,360,000	$4,560,000
Operating expenses	2,980,800	3,091,200	3,739,200
Invested assets	5,175,000	1,120,000	3,800,000

The management of E.F. Lynch Company is evaluating each division as a basis for planning a future expansion of operations.

Instructions

1. Prepare condensed divisional income statements for the three divisions, assuming that there were no support department allocations.
2. Using the DuPont formula for return on investment, compute the profit margin, investment turnover, and return on investment for each division. Round percentages and the investment turnover to one decimal place.
3. If available funds permit the expansion of operations of only one division, which of the divisions would you recommend for expansion, based on parts (1) and (2)? Explain.

PR 10-4B Effect of proposals on divisional performance

Obj. 4

✔ 3. Proposal 3 ROI, 16.0%

EXCEL TEMPLATE

A condensed income statement for the Electronics Division of Gihbli Industries Inc. for the year ended December 31, 20Y9, is as follows:

Sales	$1,575,000
Cost of goods sold	(891,000)
Gross profit	$ 684,000
Operating expenses	(558,000)
Operating income	$ 126,000
Invested assets	$1,050,000

Assume that the Electronics Division received no allocations from support departments.

The president of Gihbli Industries Inc. has indicated that the division's return on a $1,050,000 investment must be increased to at least 20% by the end of the next year if operations are to continue. The division manager is considering the following three proposals:

Proposal 1: Transfer equipment with a book value of $300,000 to other divisions at no gain or loss and lease similar equipment. The annual lease payments would be less than the amount of depreciation expense on the old equipment by $31,400. This decrease in expense would be included as part of the cost of goods sold. Sales would remain unchanged.

Proposal 2: Reduce invested assets by discontinuing a product line. This action would eliminate sales of $180,000, reduce cost of goods sold by $119,550, and reduce operating expenses by $60,000. Assets of $112,500 would be transferred to other divisions at no gain or loss.

Proposal 3: Purchase new and more efficient machinery and thereby reduce the cost of goods sold by $189,000 after considering the effects of depreciation expense on the new equipment. Sales would remain unchanged, and the old machinery, which has no remaining book value, would be scrapped at no gain or loss. The new machinery would increase invested assets by $918,750 for the year.

Instructions

1. Using the DuPont formula for return on investment, determine the profit margin, investment turnover, and return on investment for the Electronics Division for the past year. Round percentages and investment turnover to one decimal place.
2. Prepare condensed estimated income statements and compute the invested assets for each proposal.
3. Using the DuPont formula for return on investment, determine the profit margin, investment turnover, and return on investment for each proposal. Round percentages and investment turnover to one decimal place.
4. Which of the three proposals would meet the required 20% return on investment?
5. If the Electronics Division were in an industry where the profit margin could not be increased, how much would the investment turnover have to increase to meet the president's required 20% return on investment? Round to one decimal place.

PR 10-5B Divisional performance analysis and evaluation

Obj. 4

✔ 2. Road Bike Division ROI, 12.0%


SHOW ME HOW


EXCEL TEMPLATE

The vice president of operations of Free Ride Bike Company is evaluating the performance of two divisions organized as investment centers. Invested assets and condensed income statement data for the past year for each division are as follows:

	Road Bike Division	Mountain Bike Division
Sales	$1,728,000	$1,760,000
Cost of goods sold	1,380,000	1,400,000
Operating expenses	175,200	236,800
Invested assets	1,440,000	800,000

Instructions

1. Prepare condensed divisional income statements for the year ended December 31, 20Y7, assuming that there were no support department allocations.
2. Using the DuPont formula for return on investment, determine the profit margin, investment turnover, and return on investment for each division. Round percentages and the investment turnover to one decimal place.
3. If management's minimum acceptable return on investment is 10%, determine the residual income for each division.
4. Discuss the evaluation of the two divisions, using the performance measures determined in parts (1), (2), and (3).

PR 10-6B Transfer pricing

Obj. 5

✔ 3. Navigational Systems Division, $179,410


EXCEL TEMPLATE

Exoplex Industries Inc. is a diversified aerospace company, including two operating divisions, Semiconductors and Navigational Systems. Condensed divisional income statements, which involve no intracompany transfers and include a breakdown of expenses into variable and fixed components, are as follows:

Exoplex Industries Inc.
Divisional Income Statements
For the Year Ended December 31, 20Y8

	Semiconductors Division	Navigational Systems Division	Total
Sales:			
2,240 units × $396 per unit	$ 887,040		$ 887,040
3,675 units × $590 per unit		$ 2,168,250	2,168,250
Total sales	$ 887,040	$ 2,168,250	$ 3,055,290
Expenses:			
Variable:			
2,240 units × $232 per unit	$(519,680)		$ (519,680)
3,675 units × $472* per unit		$(1,734,600)	(1,734,600)
Fixed	(220,000)	(325,000)	(545,000)
Total expenses	$(739,680)	$(2,059,600)	$(2,799,280)
Operating income	$ 147,360	$ 108,650	$ 256,010

*$432 of the $472 per unit represents materials costs, and the remaining $40 per unit represents other variable conversion expenses incurred within the Navigational Systems Division.

(Continued)

The Semiconductors Division is presently producing 2,240 units out of a total capacity of 2,820 units. Materials used in producing the Navigational Systems Division's product are currently purchased from outside suppliers at a price of $432 per unit. The Semiconductors Division is able to produce the components used by the Navigational Systems Division. Except for the possible transfer of materials between divisions, no changes are expected in sales and expenses.

Instructions

1. Would the market price of $432 per unit be an appropriate transfer price for Exoplex Industries Inc.? Explain.
2. If the Navigational Systems Division purchases 580 units from the Semiconductors Division, rather than externally, at a negotiated transfer price of $310 per unit, how much would the operating income of each division and total company operating income increase?
3. Prepare condensed divisional income statements for Exoplex Industries Inc. based on the data in part (2).
4. If a transfer price of $340 per unit is negotiated, how much would the operating income of each division and total company operating income increase?
5. a. What is the range of possible negotiated transfer prices that would be acceptable for Exoplex Industries Inc.?
   b. Assuming that the managers of the two divisions cannot agree on a transfer price, what price would you suggest as the transfer price?

Make a Decision
Franchise Operations

MAD 10-1 Analyze Kelly Kitchens — Obj. 6

Kelly Kitchens operates both franchised and company-operated restaurants under the brand name Kelly Kitchens. Operating income, sales, and invested assets for both segments are provided as follows:

	Company-Operated	Franchised
Operating income	$ 180,000	$192,000
Sales	600,000	240,000
Invested assets	1,500,000	150,000

a. Determine the profit margin for company-operated and franchised restaurants. Round to the nearest whole percent.

b. Determine the investment turnover for company-operated and franchised restaurants. Round to two decimal places.

c. Use the DuPont formula to determine the return on investment for company-operated and franchised restaurants.

d. Kelly Kitchens is expanding to the Midwest. How would you advise management regarding the use of company-operated versus franchised restaurants in the expansion?

MAD 10-2 Analyze Panera Bread Company — Obj. 6

REAL WORLD

Panera Bread Company (PNRA) operates over 2,000 bakery-cafe locations throughout the United States and Canada and serves over 9 million customers per week. Panera's operations are divided into the following segments:

- Company-Operated Bakery-Cafes
- Franchised Bakery-Cafes
- Fresh Dough and Other Products

The Fresh Dough and Other Products segment supplies fresh dough, produce, tuna, and other products to the company-operated and franchised cafes. Recent data (in millions) for each of these segments are as follows:

	Company-Operated Cafes	Franchised Cafes	Fresh Dough
Revenues	$2,434	$155	$408
Operating income	398	150	28
Invested assets	943	18	87

a. Determine the profit margin for each segment. Round to one decimal place.

b. Determine the investment turnover for each segment. Round to two decimal places.

c. Use the DuPont formula to determine the return on investment for each segment. Round to one decimal place.

d. Which segment has the highest profit margin, investment turnover, and return on investment? Explain why.

e. If franchised cafes are more profitable, why would Panera operate company-owned cafes?

MAD 10-3 Analyze Papa John's International, Inc. Obj. 6

REAL WORLD

Papa John's International, Inc. (PZZA), operates over 5,000 restaurants in the United States and 45 countries. The company operates primarily as a franchisor with 4,353 franchised restaurants and 744 company-operated restaurants. Recent data (in millions) for the company-operated and North America franchised restaurants are as follows:

	Restaurants	
	Company-Operated	North America Franchised
Sales	$816	$103
Operating income	75	92
Invested assets	225	10

a. Determine the profit margin for each segment. Round to one decimal place.

b. Determine the investment turnover for each segment. Round to two decimal places.

c. Use the DuPont formula to determine the return on investment for each segment. Round to one decimal place.

d. Analyze and interpret the results of (a), (b), and (c).

MAD 10-4 Compare Panera Bread and Papa John's Obj. 6

REAL WORLD

Compare **Panera Bread (PNRA)** and **Papa John's (PZZA)** using your computations from MAD 10-2 and MAD 10-3.

MAD 10-5 Analyze McDonald's Corporation Obj. 6

REAL WORLD

McDonald's Corporation (MCD) operates company-owned and franchised restaurants in over 100 countries. The company operates primarily as a franchisor with approximately 85% of its current restaurants operated by franchisees. McDonald's goal is to franchise approximately 95% of its restaurants in the long term.

McDonald's operations are divided into the following segments:

- United States: Restaurants throughout the United States
- International Lead Markets: Restaurants in Australia, Canada, France, Germany, and the United Kingdom
- High Growth Markets: Restaurants in China, Italy, Korea, Poland, Russia, Spain, and Switzerland
- Foundational Markets & Corporate: Restaurants not contained in the preceding segments plus corporate activities

(Continued)

McDonald's believes that the High Growth segment has significant potential for rapid growth and expansion. Recent data (in millions) for the first three primary segments are as follows:

	United States	International Lead	High Growth
Sales	$ 8,253	$7,223	$6,161
Operating income	3,769	2,838	1,049
Invested assets	11,961	9,113	5,209

a. Determine the profit margin for each of the three segments. Round to one decimal place.

b. Determine the investment turnover for the three segments. Round to two decimal places.

c. Use the DuPont formula to determine the return on investment for the three segments. Round to one decimal place.

d. Analyze and interpret the results of (a), (b), and (c).

Take It Further

ETHICS

TIF 10-1 Transfer price among divisions

Sembotix Company has several divisions including a Semiconductor Division that sells semiconductors to both internal and external customers. The company's X-ray Division uses semiconductors as a component in its final product and is evaluating whether to purchase them from the Semiconductor Division or from an external supplier. The market price for semiconductors is $100 per 100 semiconductors. Dave Bryant is the controller of the X-ray Division, and Howard Hillman is the controller of the Semiconductor Division. The following conversation took place between Dave and Howard:

Dave: I hear you are having problems selling semiconductors out of your division. Maybe I can help.

Howard: You've got that right. We're producing and selling at about 90% of our capacity to outsiders. Last year, we were selling 100% of capacity. Would it be possible for your division to pick up some of our excess capacity? After all, we are part of the same company.

Dave: What kind of price could you give me?

Howard: Well, you know as well as I that we are under strict profit responsibility in our divisions, so I would expect to get market price, $100 for 100 semiconductors.

Dave: I'm not so sure we can swing that. I was expecting a price break from a "sister" division.

Howard: Hey, I can only take this "sister" stuff so far. If I give you a price break, our profits will fall from last year's levels. I don't think I could explain that. I'm sorry, but I must remain firm—market price. After all, it's only fair—that's what you would have to pay from an external supplier.

Dave: Fair or not, I think we'll pass. Sorry we couldn't have helped.

Is Dave behaving unethically by trying to force the Semiconductor Division into a price break? Comment on Howard's reactions.

TEAM ACTIVITY

TIF 10-2 Support department allocation

The Customer Service Department of Door Industries Inc. asked the Publications Department to prepare a brochure for its training program. The Publications Department delivered the brochures and charged the Customer Service Department a rate that was 25% higher than could be obtained from an outside printing company. The policy of the company required the Customer Service Department to use the internal publications group for brochures. The Publications Department claimed that it had a drop in demand for its services during the fiscal year, so it had to charge higher prices in order to recover its payroll and fixed costs.

As a team, recommend how the cost of the brochure should be transferred to the Customer Service Department.

COMMUNICATION

TIF 10-3 Support department allocation

The Norse Division of Gridiron Concepts Inc. experienced significant revenue and profit growth from 20Y4 to 20Y6 as shown in the following divisional income statements:

Gridiron Concepts Inc.
Divisional Income Statements, Norse Division
For the Three Years Ended December 31, 20Y6

	20Y4	20Y5	20Y6
Sales	$ 1,470,000	$ 2,100,000	$ 2,450,000
Cost of goods sold	(1,064,000)	(1,498,000)	(1,680,000)
Gross profit	$ 406,000	$ 602,000	$ 770,000
Operating expenses	(185,500)	(224,000)	(231,000)
Operating income	$ 220,500	$ 378,000	$ 539,000
Invested assets	$ 735,000	$ 1,500,000	$ 3,500,000

There are no support department allocations, and the division operates as an investment center that must maintain a 15% return on invested assets.

Determine the profit margin, investment turnover, and return on investment for the Norse Division for 20Y4–20Y6. Based on your computations, write a brief memo to the president of Gridiron Concepts Inc., Knute Holz, evaluating the division's performance.

TIF 10-4 Evaluating divisional performance

The three divisions of Yummy Foods are Snack Goods, Cereal, and Frozen Foods. The divisions are structured as investment centers. The following responsibility reports were prepared for the three divisions for the prior year:

	Snack Goods	Cereal	Frozen Foods
Revenues	$ 2,200,000	$ 2,520,000	$2,100,000
Operating expenses	(1,366,600)	(1,122,000)	(976,800)
Operating income before support department allocations	$ 833,400	$ 1,398,000	$1,123,200
Support department allocations:			
Promotion	$ (300,000)	$ (600,000)	$ (468,000)
Legal	(137,400)	(243,600)	(235,200)
Total service department charges	$ (437,400)	$ (843,600)	$ (703,200)
Operating income	$ 396,000	$ 554,400	$ 420,000
Invested assets	$ 2,000,000	$ 1,680,000	$1,750,000

a. Which division is making the best use of invested assets and should be given priority for future capital investments?

b. Assuming that the minimum acceptable return on new projects is 19%, would all investments that produce a return in excess of 19% be accepted by the divisions? Explain.

c. Identify opportunities for improving the company's financial performance.

TIF 10-5 Evaluating divisional performance

Last Resort Industries Inc. is a privately held diversified company with five separate divisions organized as investment centers. A condensed income statement for the Specialty Products Division for the past year, assuming no support department allocations, along with asset information is as follows:

Last Resort Industries Inc.—Specialty Products Division
Income Statement
For the Year Ended December 31, 20Y5

Sales	$ 32,400,000
Cost of goods sold	(24,300,000)
Gross profit	$ 8,100,000
Operating expenses	(3,240,000)
Operating income	$ 4,860,000
Invested assets	$ 27,000,000

(Continued)

The manager of the Specialty Products Division was recently presented with the opportunity to add an additional product line, which would require invested assets of $14,400,000. A projected income statement for the new product line is as follows:

New Product Line
Projected Income Statement
For the Year Ended December 31, 20Y6

Sales	$12,960,000
Cost of goods sold	(7,500,000)
Gross profit	$ 5,460,000
Operating expenses	(3,127,200)
Operating income	$ 2,332,800

The Specialty Products Division currently has $27,000,000 in invested assets, and Last Resort Industries Inc.'s overall return on investment, including all divisions, is 10%. Each division manager is evaluated on the basis of divisional return on investment. A bonus is paid, in $8,000 increments, for each whole percentage point that the division's return on investment exceeds the company average.

The president is concerned that the manager of the Specialty Products Division rejected the addition of the new product line, even though all estimates indicated that the product line would be profitable and would increase overall company income. You have been asked to analyze the possible reasons the Specialty Products Division manager rejected the new product line.

a. Determine the return on investment for the Specialty Products Division for the past year.

b. Determine the Specialty Products Division manager's bonus for the past year.

c. Determine the estimated return on investment for the new product line. Round percentages to one decimal place and the investment turnover to two decimal places.

d. Why might the manager of the Specialty Products Division decide to reject the new product line? Support your answer by determining the projected return on investment for 20Y6, assuming that the new product line was launched in the Specialty Products Division and 20Y6 actual operating results were similar to those of 20Y5.

e. Suggest an alternative performance measure for motivating division managers to accept new investment opportunities that would increase the overall company income and return on investment.

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Sara Bellows, manager of the telecommunication sales team, has the following department budget:

Billings – long distance	$350,000
Billings – phone card	75,000
Billings – toll free	265,000

Her responsibility center is **best** described as a(n):

   a. cost center.
   b. revenue center.
   c. profit center.
   d. investment center.

2. Most firms allocate corporate and other support costs to divisions and departments for all of the following reasons **except** to:

   a. remind profit center managers that earnings must be adequate to cover some share of the indirect costs.
   b. stimulate profit center managers to put pressure on central managers to control service costs.
   c. create competition between divisions and departments and their managers.
   d. fix accountability and evaluate profit centers.

3. Manhattan Corporation has several divisions that operate as decentralized profit centers. At the present time, the Fabrication Division has excess capacity of 5,000 units with respect to the UT-371 circuit board, a popular item in many digital applications. Information about the circuit board follows.

Market price	$48
Variable selling/distribution costs on external sales	5
Variable manufacturing cost	21
Fixed manufacturing cost	10

Manhattan's Electronic Assembly Division wants to purchase 4,500 circuit boards. It can purchase the boards in the marketplace for $46 or buy them internally from the Fabrication Division. The Electronic Assembly Division's management feels that if the second alternative is pursued, a price concession is justified, given that both divisions are part of the same firm. The **best** process to determine the price ultimately charged by the Fabrication Division to the Electronic Assembly Division for the circuit board is to:

   a. have top management specify the price.
   b. establish the price through an arbitration committee.
   c. establish the price through negotiations between the managers of the two divisions.
   d. set the price equal to the price that would be charged if the Fabrication Division had no excess capacity.

4. Morrison's Plastics Division, a profit center, sells its products to external customers as well as to other internal profit centers. Which one of the following circumstances would justify the Plastics Division selling a product internally to another profit center at a price that is below the market-based transfer price?

   a. The buying unit has excess capacity.
   b. The selling unit is operating at full capacity.
   c. Routine sales commissions and collection costs would be avoided.
   d. The profit centers' managers are evaluated on the basis of unit operating income.

Pathways Challenge



This is Accounting!

Information/Consequences

Yes, the three legs of the organizational architecture stool were out of balance. As a result, the airline lost tens of thousands of dollars in revenues.

Decision rights regarding repair work were delegated (decentralized) to repair supervisors at airports.

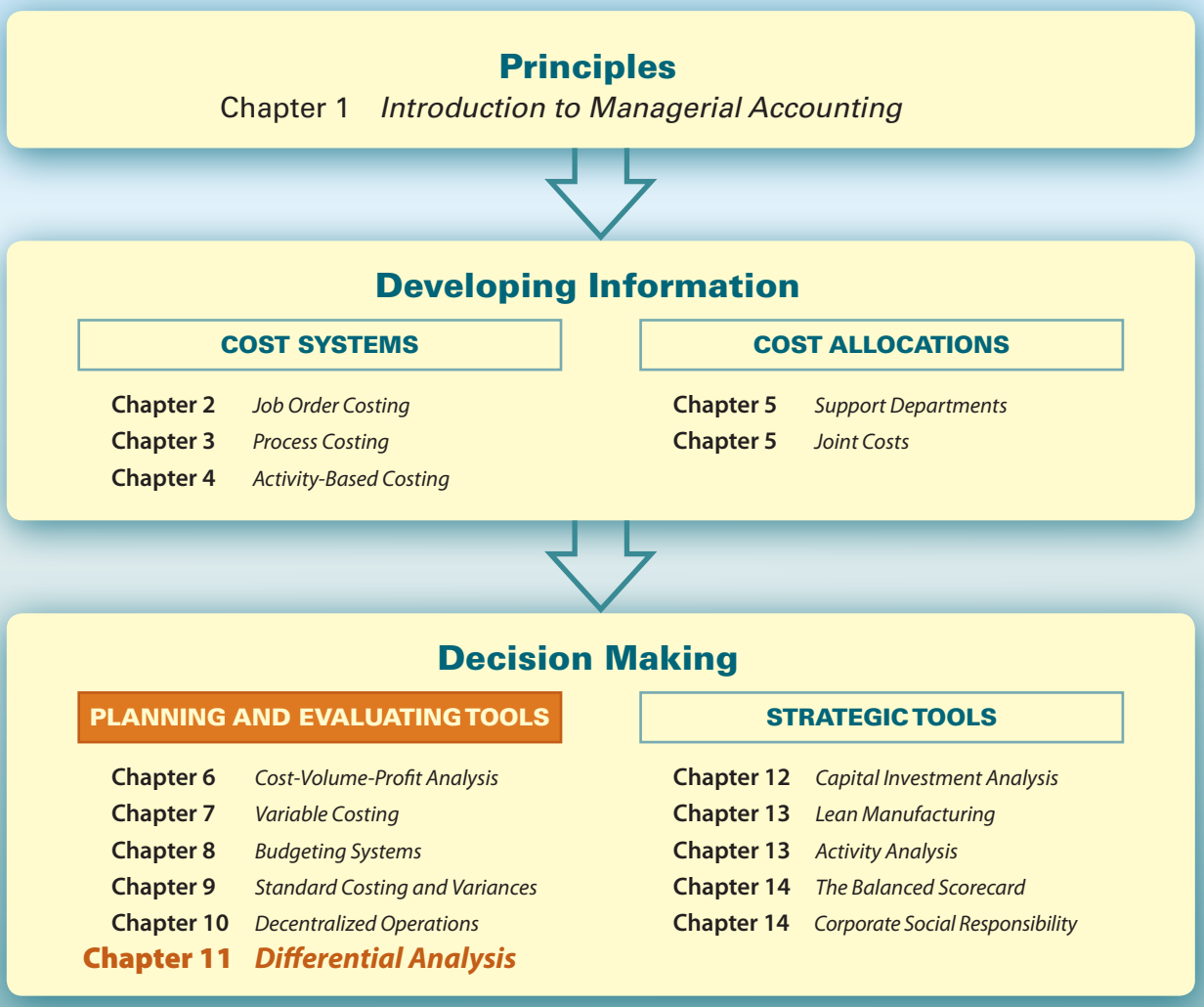
Performance measurement of repair supervisors was based (in part) on their ability to stay within the budget, which could affect their performance reviews, promotions, and pay raises. Thus, the repair supervisor had incentives to do something that was bad for the overall airline.

The airline could change (rebalance) the organizational architecture in several ways. First, the airline could centralize the decision rights regarding mechanic assignments. Second, the airline could keep the decision rights delegated, but give repair supervisors incentives based (in part) on minimizing plane downtime. Third, the airline could allow repair supervisors to "write off" costs of repair work done at other airports, transferring these costs to top management or to the airport where repairs were needed.

Suggested Answer

Chapter

11 Differential Analysis and Product Pricing



Facebook, Inc.

Many of the decisions that you make depend on comparing the estimated costs of alternatives. The payoff from such comparisons is described in the following report from a University of Michigan study:

Richard Nisbett and two colleagues quizzed Michigan faculty members and university seniors on such questions as how often they walk out on a bad movie, refuse to finish a bad meal, start over on a weak term paper, or abandon a research project that no longer looks promising. They believe that people who cut their losses this way are following sound economic rules: calculating the net benefits of alternative courses of action, writing off past costs that can't be recovered, and weighing the opportunity to use future time and effort more profitably elsewhere.

Among students, those who have learned to use cost-benefit analysis frequently are apt to have far better grades than their Scholastic Aptitude Test scores would have predicted. Again, the more economics courses the students have, the more likely they are to apply cost-benefit analysis outside the classroom.

Dr. Nisbett concedes that for many Americans, cost-benefit rules often appear to conflict with such traditional principles as "never give up" and "waste not, want not."

Managers must also evaluate the costs and benefits of alternative actions. **Facebook (FB)**, the largest social networking site in the world, was cofounded by Mark Zuckerberg in 2004. Since then, it has grown to more than 1 billion users and made Zuckerberg a multibillionaire. Such growth involves decisions about where to expand. For example, expanding the site to new languages and countries involves software programming, marketing, and computer hardware costs. The benefits include adding new users to Facebook.

Analysis of the benefits and costs might lead Facebook to expand in some languages before others. For example, such an analysis might lead Facebook to expand in Swedish before it expands in Tok Pisin (the language of Papua New Guinea).

In this chapter, differential analysis, which reports the effects of decisions on total revenues and costs, is discussed. Practical approaches to setting product prices are also described and illustrated. Finally, how production bottlenecks influence pricing and other decisions is also discussed.

Source: Alan L. Otten, "Economic Perspective Produces Steady Yields," from People Patterns, *The Wall Street Journal*, March 31,1992, p. B1.



BLOOMBERG/GETTY IMAGES

Link to Facebook . . . . . Pages 512, 514, 516, 517, 518, 519, 522, 523

What's Covered

Differential Analysis and Product Pricing

Differential Analysis
- Lease or Sell (Obj. 1)
- Discontinue a Segment or Product (Obj. 1)
- Make or Buy (Obj. 1)
- Replace Equipment (Obj. 1)
- Process or Sell (Obj. 1)
- Accept Business at a Special Price (Obj. 1)

Normal Product Pricing
- Product Cost Method (Obj. 2)
- Target Costing (Obj. 2)

Managing Production Bottlenecks
- Contribution Margin Analysis (Obj. 3)
- Pricing Implications (Obj. 3)

Learning Objectives

Obj. 1 Prepare differential analysis reports for a variety of managerial decisions.

Obj. 2 Determine the selling price of a product, using the product cost method.

Obj. 3 Describe and illustrate the managing of manufacturing bottlenecks.

Analysis for Decision Making

Obj. 4 Describe and illustrate the use of yield pricing for a service business.

Appendix

Obj. App. Determine the selling price of a product using the total and variable cost methods.

Objective 1
Prepare differential analysis reports for a variety of managerial decisions.

Differential Analysis

Managerial decision making involves choosing between alternative courses of action. A commonly used decision-making process used in business is differential analysis. **Differential analysis**, sometimes called *incremental analysis*, analyzes differential revenues and costs in order to determine the differential impact on profit of two alternative courses of action.

Differential revenue is the amount of increase or decrease in revenue that is expected from a course of action compared to an alternative. **Differential cost** is the amount of increase or decrease in cost that is expected from a course of action as compared to an alternative. **Differential profit (loss)** is the difference between the differential revenue and differential costs. Differential profit indicates that a decision is expected to increase income, while a differential loss indicates the decision is expected to decrease income.

Link to Facebook

Facebook's purchase of **WhatsApp** in 2014 was estimated to yield differential profit.

To illustrate, assume that on July 11 Bryant Restaurants is deciding whether to replace some of its customer seating (tables) with a salad bar. Exhibit 1 illustrates differential analysis for this decision.

Exhibit 1
Differential Analysis—Bryant Restaurants

Differential Analysis
Tables (Alternative 1) or Salad Bar (Alternative 2)
July 11

	Tables (Alternative 1)	Salad Bar (Alternative 2)	Differential Effects (Alternative 2)
Revenues	$100,000	$120,000	$20,000
Costs	(60,000)	(65,000)	(5,000)
Profit (loss)	$ 40,000	$ 55,000	$15,000

The differential analysis in Exhibit 1 is prepared in three columns, where positive amounts indicate the differential effect is to increase profit and income and negative amounts indicate the effect is to decrease profit and income. The first column is the revenues, costs, and profit (loss) for maintaining floor space for tables (Alternative 1). The second column is the revenues, costs, and profit (loss) for using that floor space for a salad bar (Alternative 2). The third column is the differential revenues, costs, and profit (loss) of one alternative over the other.

In Exhibit 1, the salad bar (Alternative 2) is being considered over keeping the existing tables (Alternative 1). The differential revenue of a salad bar over tables is $20,000 ($120,000 – $100,000). Because the salad bar would increase revenue and profit, it is entered as a positive $20,000 in the Differential Effects column. The differential cost of a salad bar over tables is $5,000 ($65,000 – $60,000). Because the salad bar would increase costs and decrease profit, the $5,000 is entered as a negative $(5,000) in the Differential Effects column. The differential effect of a salad bar over tables is determined by subtracting the differential costs from the differential revenues in the Differential Effects column. In Exhibit 1, the differential profit of a salad bar is $15,000 ($20,000 – $5,000).

The preceding differential revenue, costs, and profit can also be determined as follows:

Differential revenue:		
Revenue from Salad Bar	$ 120,000	
Revenue from Tables	(100,000)	
Differential increase in revenue of Salad Bar		$20,000
Differential costs:		
Costs of Salad Bar	$ 65,000	
Costs of Tables	(60,000)	
Differential increase in costs of Salad Bar		(5,000)
Differential profit of Salad Bar		$15,000

Based upon the differential analysis, Bryant Restaurants should decide to replace some of its tables with a salad bar. Doing so will increase its profit and income by $15,000.

Over time, Bryant Restaurants should review its decision based upon actual revenues and costs. If the actual revenues and costs differ significantly from those shown in Exhibit 1, another differential analysis should be performed.

In this chapter, differential analysis is illustrated for the following common decisions:

- Leasing or selling equipment
- Discontinuing an unprofitable segment
- Manufacturing or purchasing a needed part
- Replacing fixed assets
- Selling a product or processing further
- Accepting additional business at a special price

Link to Facebook

Facebook used differential analyses in deciding to own data centers in Iowa, North Carolina, Oregon, and Lulea, Sweden, but to lease (rent) data centers in California and Virginia.

Lease or Sell

Management may lease or sell a piece of equipment that is no longer needed. This may occur when a company changes its manufacturing process and can no longer use the equipment in the manufacturing process. In making a decision, differential analysis can be used.

To illustrate, assume that on June 22 of the current year, Marcus Company is considering leasing or selling the following equipment:

Cost of equipment	$ 200,000
Accumulated depreciation	(120,000)
Book value	$ 80,000
Lease (Alternative 1):	
Total revenue for five-year lease	$ 160,000
Total estimated repair, insurance, and property tax expenses during life of lease	35,000
Residual value at end of fifth year of lease	0
Sell (Alternative 2):	
Sales price	$ 100,000
Commission on sales	6%

Exhibit 2 shows the differential analysis of whether to lease (Alternative 1) or sell (Alternative 2) the equipment.

Exhibit 2
Differential Analysis—Lease or Sell Equipment

Differential Analysis
Lease Equipment (Alternative 1) or Sell Equipment (Alternative 2)
June 22

	Lease Equipment (Alternative 1)	Sell Equipment (Alternative 2)	Differential Effects (Alternative 2)
Revenues	$160,000	$100,000	$(60,000)
Costs	(35,000)	(6,000)	29,000
Profit (loss)	$125,000	$ 94,000	$(31,000)

If the equipment is sold, differential revenues will decrease by $60,000, differential costs will decrease by $29,000, and the differential effect on profit and income is a decrease of $31,000. Thus, the decision should be to lease the equipment.

Exhibit 2 includes only the differential revenues and differential costs associated with the lease-or-sell decision. The $80,000 book value ($200,000 – $120,000) of the equipment is a *sunk cost* and is not considered in the differential analysis. **Sunk costs** are costs that have been incurred in the past, cannot be recouped, and are not relevant to future decisions. That is, the $80,000 is not affected regardless of which decision is made. For example, if the $80,000 were included in Exhibit 2, the costs for each alternative would both increase by $80,000, but the differential effect on profit and income of $(31,000) would remain unchanged.

To simplify, the following factors were not considered in Exhibit 2:

- Differential revenue from investing funds
- Differential income tax

Differential revenue, such as interest revenue, could arise from investing the cash created by the two alternatives. Differential income tax could also arise from differences in income. These factors are discussed in Chapter 12.

Discontinue a Segment or Product

A product, department, branch, territory, or other segment of a business may be generating losses. As a result, management may consider discontinuing (eliminating) the product or segment. In such cases, it may be incorrectly assumed that the total company income will increase by eliminating the operating loss.

Discontinuing the product or segment usually eliminates all of the product's or segment's variable costs. Such costs include direct materials, direct labor, variable factory overhead, and sales commissions. However, fixed costs such as depreciation, insurance, and property taxes may not be eliminated. Thus, it is possible for total company income to decrease rather than increase if the unprofitable product or segment is discontinued.

To illustrate, the income statement for Battle Creek Cereal Co. is shown in Exhibit 3. As shown in Exhibit 3, Bran Flakes incurred an operating loss of $(11,000). Because Bran Flakes has incurred annual losses for several years, management is considering discontinuing it.

Exhibit 3
Income (Loss) by Product

Battle Creek Cereal Co.
Condensed Income Statement
For the Year Ended August 31, 20Y8

	Corn Flakes	Toasted Oats	Bran Flakes	Total Company
Sales	$ 500,000	$ 400,000	$100,000	$1,000,000
Cost of goods sold:				
Variable costs	$(220,000)	$(200,000)	$ (60,000)	$ (480,000)
Fixed costs	(120,000)	(80,000)	(20,000)	(220,000)
Total cost of goods sold	$(340,000)	$(280,000)	$ (80,000)	$ (700,000)
Gross profit	$ 160,000	$ 120,000	$ 20,000	$ 300,000
Operating expenses:				
Variable expenses	$ (95,000)	$ (60,000)	$ (25,000)	$ (180,000)
Fixed expenses	(25,000)	(20,000)	(6,000)	(51,000)
Total operating expenses	$(120,000)	$ (80,000)	$ (31,000)	$ (231,000)
Operating income (loss)	$ 40,000	$ 40,000	$ (11,000)	$ 69,000

However, the differential analysis dated September 29, 20Y8, in Exhibit 4 indicates that to discontinue Bran Flakes (Alternative 2) actually decreases profit and operating income by $15,000, even though it incurs a net loss of $(11,000). This is because discontinuing Bran Flakes has no effect on fixed costs and expenses.

Exhibit 4 only considers the short-term (one-year) effects of discontinuing Bran Flakes. When discontinuing a product or segment, long-term effects should also be considered. For example, employee morale and productivity might suffer if employees have to be laid off or relocated.

Exhibit 4
Differential Analysis—Continue or Discontinue Bran Flakes

Differential Analysis
Continue Bran Flakes (Alternative 1) or Discontinue Bran Flakes (Alternative 2)
September 29, 20Y8

	Continue Bran Flakes (Alternative 1)	Discontinue Bran Flakes (Alternative 2)	Differential Effects (Alternative 2)
Revenues	$100,000	$ 0	$(100,000)
Costs:			
Variable	(85,000)		85,000
Fixed	(26,000)	(26,000)	0
Profit (loss)	$ (11,000)	$(26,000)	$ (15,000)

Link to Facebook

Facebook reports its financial results by geographic area (United States and Rest of the World), but does not have separate business segments.

Make or Buy

Companies often manufacture products made up of components that are assembled into a final product. For example, an automobile manufacturer assembles tires, radios, motors, interior seats, transmissions, and other parts into a finished automobile. In such cases, the manufacturer must decide whether to make a part or purchase it from a supplier.

Differential analysis can be used to decide whether to make or buy a part. The analysis is similar whether management is considering making a part that is currently being purchased or purchasing a part that is currently being made.

To illustrate, assume that an automobile manufacturer has been purchasing instrument panels for $240 a unit. The factory is currently operating at 80% of capacity, and no major increase in production is expected in the near future. The cost per unit of manufacturing an instrument panel internally is estimated on February 15 as follows:

Direct materials	$ 80
Direct labor	80
Variable factory overhead	52
Fixed factory overhead	68
Total cost per unit	$280

If the make price of $280 is simply compared with the buy price of $240, the decision is to buy the instrument panel. However, if unused capacity could be used in manufacturing the part, only the variable factory overhead costs would increase.

The differential analysis for this make (Alternative 1) or buy (Alternative 2) decision is shown in Exhibit 5. Revenue is not affected by this decision, thus no revenue line is shown in Exhibit 5. The remaining lines show the cost per unit under each alternative. The fixed factory overhead cannot be eliminated by purchasing the panels. Thus, both alternatives include the fixed factory overhead. The differential analysis indicates there is a loss of $(28) per unit from buying the instrument panels. Thus, the instrument panels should be manufactured.

Differential Analysis
Make (Alternative 1) or Buy (Alternative 2) Panels
February 15

	Make Panels (Alternative 1)	Buy Panels (Alternative 2)	Differential Effects (Alternative 2)
Unit costs:			
Purchase price	$ 0	$240	$(240)
Direct materials	80	0	80
Direct labor	80	0	80
Variable factory overhead	52	0	52
Fixed factory overhead	68	68	0
Total unit costs	$280	$308	$ (28)

Exhibit 5
Differential Analysis—Make or Buy Instrument Panels

Other factors should also be considered in the analysis. For example, productive capacity used to make the instrument panel would not be available for other production. The decision may also affect the future business relationship with the instrument panel supplier. For example, if the supplier provides other parts, the company's decision to make instrument panels might jeopardize the timely delivery of other parts.

Rather than develop its own virtual reality technology, **Facebook** purchased **Oculus VR, LLC**, a privately held company, in 2014.

Link to Facebook

Pathways Challenge



This is Accounting!

Economic Activity

Companies such as **Apple Inc. (AAPL)** need to decide whether to make or buy products or services on a regular basis. For example, initially Apple bought map data for use on its iPhones from **Alphabet (GOOG)**. Alphabet, however, began marketing its own line of Android smartphones with voice-directed, turn-by-turn navigation, a feature that Alphabet would not sell to others, including Apple. As a result, Apple decided to make its own mapping app and stopped contracting with Alphabet.

Critical Thinking/Judgment

What accounting factors would Apple have considered in deciding to make its own mapping app rather than buy these services from Alphabet?

What nonaccounting factors may have influenced Apple's decision?

Suggested answer at end of chapter.

Sources: Tim Bajaran, "The Real Reason Why Apple Dropped Google Maps," *Tech.pinions* (https://techpinions.com/the-real-reason-why-apple-dropped-google-maps/10725), September 28, 2012 and Charles Arthur, "Why Did Apple Drop Google's Maps on the iPhone and iPad?" *The Guardian* (www.theguardian.com/technology/2012/nov/05/apple-google-maps-iphone-dropped), November 7, 2012.

Replace Equipment

The usefulness of a fixed asset may decrease before it is worn out. For example, old equipment may no longer be as efficient as new equipment.

Differential analysis can be used for decisions to replace fixed assets such as equipment and machinery. The analysis normally focuses on the costs of continuing to use the old equipment versus replacing the equipment. The book value of the old equipment is a sunk cost and, thus, is irrelevant.

To illustrate, assume that on November 28 of the current year, a business is considering replacing an old machine with a new machine:

Old Machine:	
Book value	$100,000
Estimated annual variable manufacturing costs	225,000
Estimated selling price	25,000
Estimated remaining useful life	5 years
New Machine:	
Purchase price of new machine	$250,000
Estimated annual variable manufacturing costs	150,000
Estimated residual value	0
Estimated useful life	5 years

The differential analysis for whether to continue with the old machine (Alternative 1) or replace the old machine with a new machine (Alternative 2) is shown in Exhibit 6.

Exhibit 6
Differential Analysis—Continue with or Replace Old Equipment

Differential Analysis
Continue with (Alternative 1) or Replace (Alternative 2) Machine
November 28

	Continue with Old Machine (Alternative 1)	Replace Old Machine (Alternative 2)	Differential Effects (Alternative 2)
Revenues:			
Proceeds from sale of old machine	$ 0	$ 25,000	$ 25,000
Costs:			
Purchase price	0	(250,000)	(250,000)
Variable manufacturing costs (5 years)	(1,125,000)	(750,000)	375,000
Profit (loss)	$(1,125,000)	$(975,000)	$ 150,000

As shown in Exhibit 6, there is five-year differential effect on profit and income of $150,000 (or $30,000 per year) from replacing the machine. Thus, the decision should be to purchase the new machine and sell the old machine.

Link to Facebook

Facebook used cash to purchase $1,812 million of property and equipment in 2014.

Other factors are often important in equipment replacement decisions. For example, differences between the remaining useful life of the old equipment and the estimated life of the new equipment could exist. In addition, the new equipment might improve the overall quality of the product and, thus, increase sales.

The time value of money and other uses for the cash needed to purchase the new equipment could also affect the decision to replace equipment.[1] The revenue that is forgone from an alternative

[1] The time value of money in purchasing equipment (capital assets) is discussed in Chapter 12.

use of an asset, such as cash, is called an **opportunity cost**. Although the opportunity cost is not recorded in the accounting records, it is useful in analyzing alternative courses of action.

Process or Sell

During manufacturing, a product normally progresses through various stages or processes. In some cases, a product can be sold at an intermediate stage of production, or it can be processed further and then sold.

Differential analysis can be used to decide whether to sell a product at an intermediate stage or to process it further. In doing so, the differential revenues and costs from further processing are compared. The costs of producing the intermediate product do not change, regardless of whether the intermediate product is sold or processed further.

To illustrate, assume that a business produces kerosene as an intermediate product as follows:

Kerosene:	
Batch size	4,000 gallons
Cost of producing kerosene	$2,400 per batch
Selling price	$2.50 per gallon

The kerosene can be processed further to yield gasoline as follows:

Gasoline:	
Input batch size	4,000 gallons
Less evaporation (20%)	(800) (4,000 × 20%)
Output batch size	3,200 gallons
Cost of producing gasoline	$3,050 per batch
Selling price	$3.50 per gallon

Exhibit 7 shows the differential analysis dated October 1 for whether to sell kerosene (Alternative 1) or process it further into gasoline (Alternative 2).

As shown in Exhibit 7, there is additional profit of $550 per batch from further processing the kerosene into gasoline. Therefore, the decision should be to process the kerosene further into gasoline.

Exhibit 7
Differential Analysis—Sell Kerosene or Process into Gasoline

Differential Analysis
Sell Kerosene (Alternative 1) or Process into Gasoline (Alternative 2)
October 1

	Sell Kerosene (Alternative 1)	Process into Gasoline (Alternative 2)	Differential Effects (Alternative 2)
Revenues per batch	$10,000*	$11,200**	$1,200
Costs per batch	(2,400)	(3,050)	(650)
Profit (loss) per batch	$ 7,600	$ 8,150	$ 550

*4,000 gallons × $2.50
**(4,000 gallons – 800 gallons) × $3.50

Facebook provides advertising and other services to its customers and does not manufacture a product.

Link to Facebook

Accept Business at a Special Price

A company may be offered the opportunity to sell its products at prices other than normal prices. For example, an exporter may offer to sell a company's products overseas at special discount prices.

Differential analysis can be used to decide whether to accept additional business at a special price. The differential revenue from accepting the additional business is compared to the differential costs of producing and delivering the product to the customer.

The differential costs of accepting additional business depend on whether the company is operating at less than capacity. If the company is operating at less than full capacity, then the additional production does not increase fixed manufacturing costs. However, selling and administrative expenses may change because of the additional business.

To illustrate, assume that B-Ball Inc. manufactures basketballs as follows:

Monthly productive capacity	12,500 basketballs
Current monthly sales	10,000 basketballs
Normal (domestic) selling price	$30.00 per basketball
Manufacturing costs:	
Variable costs	$12.50 per basketball
Fixed costs	7.50
Total manufacturing costs	$20.00 per basketball

On March 10 of the current year, B-Ball Inc. received an offer from an exporter for 5,000 basketballs at $18 each. Production can be spread over three months without interfering with normal production or incurring overtime costs. Pricing policies in the domestic market will not be affected.

As shown in Exhibit 8, a differential analysis on whether to reject the order (Alternative 1) or accept the order (Alternative 2) shows that the special order should be accepted. The special business is accepted even though the sales price of $18 per unit is less than the manufacturing cost of $20 per unit because the fixed costs are not affected by the decision and are, thus, omitted from the analysis.

Exhibit 8
Differential Analysis—Accept Business at a Special Price

Differential Analysis
Reject Order (Alternative 1) or Accept Order (Alternative 2)
March 10

	Reject Order (Alternative 1)	Accept Order (Alternative 2)	Differential Effects (Alternative 2)
Revenues	$0	$ 90,000*	$ 90,000
Costs:			
Variable manufacturing costs	0	(62,500)**	(62,500)
Profit (loss)	$0	$ 27,500	$ 27,500

*5,000 units × $18
**5,000 units × $12.50 variable cost per unit

Proposals to sell products at special prices often require additional considerations. For example, special prices in one geographic area may result in price reductions in other areas, with the result that total company sales revenues decrease. Manufacturers must also conform to the Robinson-Patman Act, which prohibits price discrimination within the United States unless price differences can be justified by different costs.

Why It Matters

60% Off!

Priceline.com (PCLN) was founded in the late 1990s and has become a successful survivor of the Internet revolution. Priceline offers deep discounts of up to 60% for travel services, such as hotels and flights. How does it work? For hotel services, Priceline has arrangements with hotels to provide deeply discounted rooms. These rooms are resold to customers on Priceline's website. Why do hotels provide rooms at such a large discount? If the hotel has unused rooms, the variable cost of an incremental guest is low relative to the fixed cost of the room. During low occupancy times, any price greater than the variable cost of providing the room can add to the profitability of the hotel. Thus, hotels view Priceline as an additional source of profit from filling unused rooms during low demand periods.

Check Up Corner 11-1 Differential Analysis

For the three cases that follow, prepare a differential analysis.

Case A (Discontinue a Product): Product K has revenue of $65,000, variable cost of goods sold of $50,000, variable selling expenses of $12,000, and fixed costs of $25,000, creating a loss from operations of $(22,000).

Required: Prepare a differential analysis dated February 22 to determine whether to continue Product K (Alternative 1) or discontinue Product K (Alternative 2), assuming fixed costs are unaffected by the decision.

Case B (Make vs. Buy): A company manufactures a component of a product for $80 per unit, including fixed costs of $25 per unit. The component could be purchased from an outside supplier for $60 per unit, plus $5 per unit freight.

Required: Prepare a differential analysis dated November 2 to determine whether the company should make (Alternative 1) or buy (Alternative 2), assuming fixed costs are unaffected by the decision.

Case C (Sell or Process Further): Product T is produced for $2.50 per gallon. Product T can be sold without additional processing for $3.50 per gallon, or processed further into Product V at an additional total cost of $0.70 per gallon. Product V can be sold for $4.00 per gallon.

Required: Prepare a differential analysis dated April 8 to determine whether to sell Product T (Alternative 1) or process it further into Product V (Alternative 2).

Solution:

Case A (Discontinue a Product):

Differential Analysis
Continue K (Alternative 1) or Discontinue K (Alternative 2)
February 22

	Continue Product K (Alternative 1)	Discontinue Product K (Alternative 2)	Differential Effects (Alternative 2)
Revenues	$ 65,000	$ 0	$(65,000)
Costs:			
Variable	(62,000)*	0	62,000
Fixed	(25,000)	(25,000)	0
Profit (loss)	$(22,000)	$(25,000)	$ (3,000)

*$50,000 Variable cost of goods sold + $12,000 Variable selling expenses

If Product K is discontinued, revenues and variable costs will be zero.

If Product K is discontinued, fixed costs remain at $25,000.

The effect on profit of discontinuing Product K is the difference between the differential revenues of $(65,000) and differential costs of $62,000.

Discontinuing Product K (Alternative 2) decreases profit and income by $(3,000). As a result, Product K should **not** be discontinued.

Case B (Make vs. Buy):

Differential Analysis
Make Component (Alternative 1) or Buy Component (Alternative 2)
November 2

	Make Component (Alternative 1)	Buy Component (Alternative 2)	Differential Effects (Alternative 2)
Unit costs:			
Purchase price	$ 0	$60	$(60)
Freight	0	5	(5)
Variable costs ($80 – $25)	55	0	55
Fixed factory overhead	25	25	0
Total unit costs	$80	$90	$(10)

Variable costs to purchase, which are the differential costs of Alternative 2.

Differential effect on costs is the difference between the variable costs to purchase (differential cost of Alternative 2) and the variable costs to manufacture (differential cost of Alternative 1).

Variable cost to manufacture, which is the differential cost of Alternative 1.

Fixed factory overhead costs cannot be eliminated if the component is purchased.

The differential cost of buying the component ($65 per unit) is $10 per unit more than the differential cost of making the component ($55 per unit). Therefore, the component should be manufactured.

(Continued)

Case C (Sell or Process Further):

Differential Analysis
Sell Product T (Alternative 1) or Process Further into Product V (Alternative 2)
April 8

	Sell Product T (Alternative 1)	Process Further into Product V (Alternative 2)	Differential Effects (Alternative 2)
Revenues, per unit	$ 3.50	$ 4.00	$ 0.50
Costs, per unit	(2.50)	(3.20)*	(0.70)
Profit (loss), per unit	$ 1.00	$ 0.80	$(0.20)

*$2.50 + $0.70

Differential revenue from processing further into Product V (Alternative 2).

Differential costs from processing further into Product V (Alternative 2).

Product V can be sold for $4.00 ($0.50 more than Product T).

It costs a total of $3.20 to make Product V ($2.50 to produce Product T and an additional $0.70 to process Product T into Product V).

Processing further into Product V reduces profit and income by $(0.20) per unit. Therefore, Product T should **not** be processed further into Product V.

Check Up Corner

Objective 2
Determine the selling price of a product, using the product cost method.

Setting Normal Product Selling Prices

The *normal* selling price is the target selling price to be achieved in the long term. The normal selling price must be set high enough to cover all costs and expenses (fixed and variable) and provide a reasonable profit. Otherwise, the business will not survive.

In contrast, in deciding whether to accept additional business at a special price, only differential costs are considered. Any price greater than the differential costs will increase profits in the short term. However, in the long term, products are sold at normal prices rather than special prices.

Managers can use one of two market methods to determine selling price:

- Demand-based method
- Competition-based method

The **demand-based method** sets the price according to the demand for the product. If there is high demand for the product, then the price is set high. Likewise, if there is a low demand for the product, then the price is set low.

The **competition-based method** sets the price according to the price offered by competitors. For example, if a competitor reduces the price, then management adjusts the price to meet the competition. The market-based pricing approaches are discussed in greater detail in marketing courses.

Link to Facebook

Facebook's prices are affected by its competitors such as **Google**.

Managers can use one of three cost-plus methods to determine the selling price:

- Product cost method
- Total cost method
- Variable cost method

The product cost method is illustrated in this section. The total cost and variable cost methods are illustrated in the appendix to this chapter.

Facebook generates advertising revenue based upon the number of clicks, impressions displayed, or number of actions taken by people. Facebook establishes prices for its customers for each of these options.

Link to Facebook

Cost-Plus Methods

Cost-plus methods determine the normal selling price by estimating a cost amount per unit and adding a markup, computed as follows:

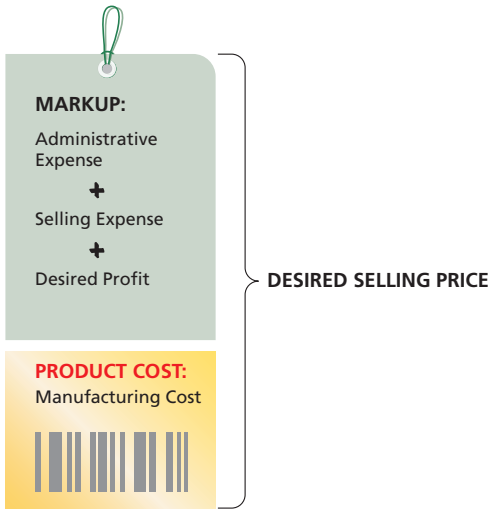
Normal Selling Price = Cost Amount per Unit + Markup

Management determines the markup based on the desired profit for the product. The markup must be sufficient to earn the desired profit plus cover any costs and expenses that are not included in the cost amount.

Product Cost Method

Under the **product cost method**, the costs of manufacturing the product, termed the *product costs*, are included in the cost amount per unit to which the markup is added. Estimated selling expenses, administrative expenses, and desired profit are included in the markup. The markup per unit is added to the product cost per unit to determine the normal selling price as shown in Exhibit 9.

Exhibit 9
Product Cost Method



Why It Matters

CONCEPT CLIP

Dynamic Pricing

Hotels and airlines were the first to dynamically adjust prices based on real-time demand. Thus, hotel rates and airfares were less expensive on the weekend than on busier weekdays. Dynamic pricing has since migrated into many other areas of product and service delivery. **Uber**'s cab fares adjust dynamically to ride demand. A ride during rush hour is more expensive than one in the middle of the day. The **Indianapolis Zoo** began dynamic pricing admission tickets so that cold, rainy days had an admission price as low as $8, while pleasant summer days had an admission price as high as $30. Prior to dynamic pricing, the zoo charged $18 for every admission. Since introducing dynamic pricing, revenues have increased by 12%. A seven-mile stretch of highway around Dallas can vary tolls from $0.90 to $4.50 depending on traffic patterns. **SeaWorld Entertainment** dynamically prices admissions based on daily demand. **Kohl's** now employs electronic price tags that can remotely adjust prices for hours, rather than days, depending upon real-time foot traffic and demand. Most **Major League Baseball** teams dynamically price admission tickets. It would seem dynamic pricing is here to stay, as information technology allows companies greater visibility to demand.

Source: Jack Nicas, "The Price You Pay Depends on the Time and Day," *The Wall Street Journal*, December 14, 2015, p. B1.

The product cost method is applied using the following steps:

- Step 1. Estimate the total product cost as follows:

Product costs:	
Direct materials	$XXX
Direct labor	XXX
Factory overhead	XXX
Total product cost	$XXX

- Step 2. Estimate the total selling and administrative expenses.
- Step 3. Divide the total product cost by the number of units expected to be produced and sold to determine the total product cost per unit, computed as follows:

$$\text{Product Cost per Unit} = \frac{\text{Total Product Cost}}{\text{Estimated Units Produced and Sold}}$$

- Step 4. Compute the markup percentage as follows:

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Selling and Administrative Expenses}}{\text{Total Product Cost}}$$

The numerator of the markup percentage is the desired profit plus the total selling and administrative expenses. These expenses must be included in the markup percentage because they are not included in the cost amount to which the markup is added.

The desired profit is normally computed based on a return on assets as follows:

$$\text{Desired Profit} = \text{Desired Return} \times \text{Total Assets}$$

- Step 5. Determine the markup per unit by multiplying the markup percentage times the product cost per unit as follows:

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Product Cost per Unit}$$

- Step 6. Determine the normal selling price by adding the markup per unit to the product cost per unit as follows:

Product cost per unit	$XXX
Markup per unit	XXX
Normal selling price per unit	$XXX

Illustration

The product cost method is illustrated for determining the price of calculators produced by **Digital Solutions Inc.** Assume the following data for 100,000 calculators that Digital Solutions Inc. expects to produce and sell during the current year:

Manufacturing costs:	
Direct materials ($3.00 × 100,000)	$ 300,000
Direct labor ($10.00 × 100,000)	1,000,000
Factory overhead	200,000
Total product (manufacturing) costs	$1,500,000
Selling and administrative expenses	170,000
Total cost	$1,670,000
Total assets	$ 800,000
Desired return	20%

The normal selling price of $18.30 is determined under the product cost method as follows:

- Step 1. Total product cost: $1,500,000
- Step 2. Total selling and administrative expenses: $170,000
- Step 3. Total product cost per unit: $15.00

$$\text{Total Cost per Unit} = \frac{\text{Total Product Cost}}{\text{Estimated Units Produced and Sold}} = \frac{\$1{,}500{,}000}{100{,}000 \text{ units}} = \$15.00 \text{ per unit}$$

- Step 4. Markup percentage: 22%

$$\text{Desired Profit} = \text{Desired Return} \times \text{Total Assets} = 20\% \times \$800{,}000 = \$160{,}000$$

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Selling and Administrative Expenses}}{\text{Total Product (Manufacturing) Costs}}$$

$$= \frac{\$160{,}000 + \$170{,}000}{\$1{,}500{,}000} = \frac{\$330{,}000}{\$1{,}500{,}000} = 22\%$$

- Step 5. Markup per unit: $3.30

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Product Cost per Unit}$$
$$= 22\% \times \$15.00 = \$3.30 \text{ per unit}$$

- Step 6. Normal selling price: $18.30

Total product cost per unit	$15.00
Markup per unit	3.30
Normal selling price per unit	$18.30

Product cost estimates, rather than actual costs, may be used in computing the markup. Management should be careful, however, when using estimated or standard costs in applying the cost-plus approach. Specifically, estimates should be based on normal (attainable) operating levels and not theoretical (ideal) levels of performance. In product pricing, the use of estimates based on ideal operating performance could lead to setting product prices too low.

Target Costing Method

Target costing is a method of setting prices that combines market-based pricing with a cost-reduction emphasis. Under target costing, a future selling price is anticipated, using the demand or competition-based methods. The target cost is then determined by subtracting a desired profit from the expected selling price, computed as follows:

$$\text{Target Cost} = \text{Expected Selling Price} - \text{Desired Profit}$$



Ethics: Don't Do It!

Price Fixing

Federal law prevents companies competing in similar markets from sharing cost and price information, or what is commonly termed "price fixing." For example, the Federal Trade Commission (FTC) brought a suit against **U-Haul** for releasing company-wide memorandums to its managers telling them to encourage competitors to match U-Haul price increases. Commenting on the case, the chairman of the FTC stated, "It's a bedrock principle that you can't conspire with your competitors to fix prices, and shouldn't even try."

Source: Edward Wyatt, "U-Haul to Settle with Trade Agency in Case on Truck Rental Price-Fixing," *The New York Times*, June 10, 2010, p. B3.

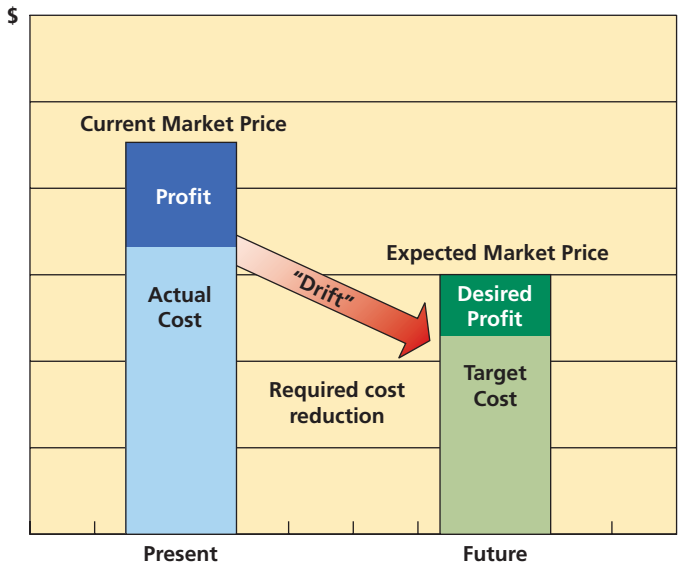
Target costing tries to reduce costs as shown in Exhibit 10. The bar at the left in Exhibit 10 shows the actual cost and profit that can be earned during the current period. The bar at the right shows that the market price is expected to decline in the future. The target cost is estimated as the difference between the expected market price and the desired profit.

The target cost is normally less than the current cost. Thus, managers must try to reduce costs from the design and manufacture of the product. The planned cost reduction is sometimes referred to as the cost drift. Costs can be reduced in a variety of ways such as the following:

- Simplifying the design
- Reducing the cost of direct materials
- Reducing the direct labor costs
- Eliminating waste

Target costing is especially useful in highly competitive markets such as the market for personal computers. Such markets require continual product cost reductions to remain competitive.

Exhibit 10
Target Cost Method



Check Up Corner 11-2 Setting Product Selling Prices

SMB Company recently began production of a new product, Q, which required an investment of $2,500,000 in assets. The costs of producing and selling 100,000 units of Product Q are estimated as follows:

Variable costs:	
Direct materials	$18 per unit
Direct labor	16
Factory overhead	6
Selling and administrative expenses	4
Total variable costs	$44 per unit

Fixed costs:	
Factory overhead	$1,200,000
Selling and administrative expenses	600,000

Using the cost-plus approach to product pricing, a 12% return on invested assets is required.

a. Determine the amount of desired profit from the production and sale of Product Q.

b. Using the product cost method, determine (1) the cost per unit, (2) the markup percentage, and (3) the selling price.

c. If the market price for a similar product is estimated at $61, compute the reduction in manufacturing cost per unit needed to maintain (1) the desired profit [from part (a)] and (2) the existing selling and administrative expenses under target costing.

Solution:

a.

Invested assets	$2,500,000
Required return	× 12%
Desired profit	$ 300,000

b. 1. Product costs:

Direct materials	$1,800,000	← $18 per unit × 100,000 units
Direct labor	1,600,000	← $16 per unit × 100,000 units
Variable factory overhead	600,000	← $ 6 per unit × 100,000 units
Fixed factory overhead	1,200,000	
Total product (manufacturing) costs	$5,200,000	
Number of units produced	÷ 100,000	
Product cost per unit	$ 52.00	

From Part (a); Fixed Selling & Admin. Expenses; Variable Selling & Admin. Expenses

2. Markup Percentage $= \dfrac{\text{Desired Profit + Total Selling and Administrative Expenses}}{\text{Total Product (Manufacturing) Costs}}$

$= \dfrac{\$300{,}000 + \$600{,}000 + (\$4 \times 100{,}000 \text{ units})}{\$5{,}200{,}000}$

$= \dfrac{\$300{,}000 + \$600{,}000 + \$400{,}000}{\$5{,}200{,}000}$

$= \dfrac{\$1{,}300{,}000}{\$5{,}200{,}000} = 25\%$

The markup percentage is multiplied by the cost per unit to determine the markup.

3.

Cost per unit	$52	
Markup	13	← $52 × 25%
Selling price	$65	

c.

	Current	Desired	
Selling price	$65	$61	
Costs:			
Variable selling and administrative expenses per unit	$ 4	$ 4	← S&A expenses do not vary across scenarios.
Fixed selling and administrative expenses per unit	6	6	
Existing product (manufacturing) costs per unit [from part (b)]	52		
Target product (manufacturing) cost per unit		48	← To generate $3 profit in the desired scenario, product (manufacturing) cost per unit must be reduced by the $4 desired drop in selling price, or $52 – $4.
Total costs	$62	$58	
Profit	$ 3	$ 3	

In target costing, the objective is to create the same profit in the desired scenario as in the current scenario.

Check Up Corner

Production Bottlenecks

Objective 3
Describe and illustrate the managing of manufacturing bottlenecks.

A **production bottleneck** (or *constraint*) is a point in the manufacturing process where the demand for the company's product exceeds the ability to produce the product. The **theory of constraints (TOC)** is a manufacturing strategy that focuses on reducing the influence of bottlenecks on production processes.

Managing Bottlenecks

When a company has a production bottleneck in its production process, it should attempt to maximize its profits, subject to the production bottleneck. In doing so, the unit contribution margin of each product per production bottleneck constraint is used.

To illustrate, assume that PrideCraft Tool Company makes three products: A, B, and C. All three products are processed through a heat treatment operation, which hardens the steel tools. PrideCraft Tool's heat treatment process is operating at full capacity and is a production bottleneck. The product unit contribution margin and the number of hours of heat treatment used by each type of tool are as follows:

	Product A	Product B	Product C
Unit selling price	$130	$140	$160
Unit variable cost	40	40	40
Unit contribution margin	$ 90	$100	$120
Heat treatment hours per unit	1 hr.	4 hrs.	8 hrs.

Product C appears to be the most profitable product because its unit contribution margin of $120 is the greatest. However, the unit contribution margin can be misleading in a production bottleneck operation.

In a production bottleneck operation, the best measure of profitability is the unit contribution margin per bottleneck constraint. For PrideCraft Tool, the bottleneck constraint is heat treatment process hours. Therefore, the unit contribution margin per bottleneck constraint is expressed as follows:

$$\text{Unit Contribution Margin per Production Bottleneck Hour} = \frac{\text{Unit Contribution Margin}}{\text{Heat Treatment Hours per Unit}}$$

The unit contribution per bottleneck hour for each of the products produced by PrideCraft Tool is computed as follows:

Product A

$$\text{Unit Contribution Margin per Bottleneck Hour} = \frac{\$90}{1 \text{ hr.}} = \$90 \text{ per hr.}$$

Product B

$$\text{Unit Contribution Margin per Bottleneck Hour} = \frac{\$100}{4 \text{ hrs.}} = \$25 \text{ per hr.}$$

Product C

$$\text{Unit Contribution Margin per Bottleneck Hour} = \frac{\$120}{8 \text{ hrs.}} = \$15 \text{ per hr.}$$

Product A produces the highest unit contribution margin per bottleneck hour (heat treatment) of $90 per hour. In contrast, Product C has the largest contribution margin per unit of $120 but has the smallest unit contribution margin per bottleneck hour of $15 per hour. Thus, Product A is the most profitable product per bottleneck hour and is the one that should be emphasized in the market.

Pricing Bottleneck Products

In the preceding illustration, Product A is the most profitable product per bottleneck hour. As a result, if one product is to be produced, it should be Product A. But, what about Products B and C?

Customers may expect a combination of products from a company. For example, even though Product A is the most profitable, PrideCraft Tool's customers may also want Products B and C. In these situations, Products B and C should be comparably priced to Product A or the production process for the other products should be adjusted so that they consume less of the bottleneck.

To illustrate, if the price of Product C were increased to $720 ($90 × 8 hrs.), Product C would produce a unit contribution margin of $90 per hour. Alternatively, the manufacturing process for Product C could be adjusted to reduce its consumption of the bottleneck.

Analysis for Decision Making

Yield Pricing in Service Businesses

Objective 4
Describe and illustrate the use of yield pricing for a service business.

Service businesses, compared to manufacturing or retail businesses, often have larger fixed costs because they require significant property, plant, and equipment to deliver the service. Examples include airlines, railroads, hotels, universities, and utility companies. Due to the large fixed costs, many service companies have a low variable cost per unit. For example, the additional variable cost of an additional guest in a hotel is small relative to the total cost of the service. High-fixed-cost service businesses often charge different prices to different customers, depending upon their utilization of fixed capacity. During periods when the demand on fixed capacity is high, prices are higher. During periods when the demand for fixed capacity is low, prices are lower. For example, a hotel with frequent business guests will charge lower prices during the weekend, when demand for rooms is lower, than on weekdays when demand for rooms is higher.

In addition, high-capacity-cost service businesses will offer attractive prices to customers who reserve a portion of fixed capacity early and will penalize customers for reserving a portion of fixed capacity late. It is more difficult for a business to manage scheduled capacity if everyone tries to schedule at the last minute. This is why booking a flight early provides better pricing than booking late. These practices are termed "yield pricing" and are common in many high-fixed-cost service businesses.

Yield pricing is a type of "accepting business at a special price" differential analysis. To illustrate, Alpine Airline provides flight services between Atlanta and Dallas. Assume an analysis reveals the following fixed and variable costs for a flight:

	Fixed Costs per Flight	Variable Costs per Passenger
Plane depreciation	$10,400	
Crew salaries	1,000	
Fuel	3,000	$12
Ground salaries	2,000	8
Airport fees	2,000	
Passenger services		15
Total	$18,400	$35

Alpine's variable cost per passenger is not large. This is because many of the costs do not vary by changing the number of seats sold on a flight. For example, the number of crewmembers per flight is fixed and does not vary with the seats sold on a flight.

Assume the plane has a capacity of 200 seats, of which 170 have been sold at an average ticket price of $150. The contribution margin for each passenger is as follows:

$$\begin{aligned}\text{Contribution Margin per Passenger} &= \text{Ticket Price} - \text{Variable Cost per Passenger}\\ &= \$150 - \$35\\ &= \$115\end{aligned}$$

The break-even number of seats per flight is:

$$\begin{aligned}\text{Break-Even Seats per Flight} &= \frac{\text{Fixed Costs per Flight}}{\text{Contribution Margin per Passenger}}\\ &= \frac{\$18,400}{\$115}\\ &= 160 \text{ seats}\end{aligned}$$

Thus, each flight is earning a profit, since the actual seats sold (170) exceed the break-even number of seats (160).

To attract customers to its 30 unsold seats, Alpine offers a 50% discounted ticket for standby passengers. Assuming 10 standby passengers purchase the discounted ticket, Alpine will have additional income based on the contribution margin of these seats, determined as follows:

Discounted ticket price (50% × $150)	$ 75
Variable cost per passenger	(35)
Contribution margin per standby passenger	$ 40
Number of standby passengers per flight	× 10
Income from standby passengers per flight	$400

Make a Decision Yield Pricing in Service Businesses

Analyze Pacific Airways (MAD 11-1)

Analyze Cityscape Hotels (MAD 11-2)

Analyze Valley Power Company (MAD 11-3)

Analyze Atlantis Cruise Lines (MAD 11-4)

Make a Decision

Objective App
Determine the selling price of a product using the total and variable cost methods.

Appendix Total and Variable Cost Methods to Setting Normal Price

Recall from the chapter that cost-plus methods determine the normal selling price by estimating a cost amount per unit and adding a markup, as follows:

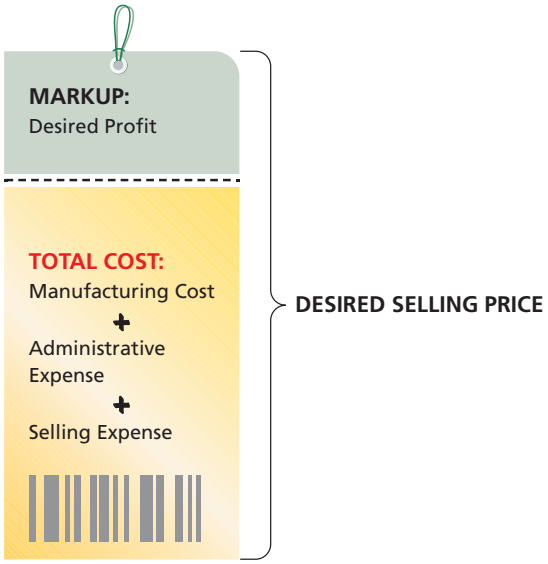
Normal Selling Price = Cost Amount per Unit + Markup

Management determines the markup based on the desired profit for the product. The markup should be sufficient to earn the desired profit plus cover any cost and expenses that are not included in the cost amount. The product cost method was discussed in the chapter, and the total and variable cost methods are discussed in this appendix.

Total Cost Method

As shown in Exhibit 11, under the **total cost method**, manufacturing cost plus the selling and administrative expenses are included in the total cost per unit. The markup per unit is then computed and added to the total cost per unit to determine the normal selling price.

Exhibit 11
Total Cost Method



The total cost method is applied using the following steps:

- Step 1. Estimate the total manufacturing cost as follows:

Manufacturing costs:	
Direct materials	$XXX
Direct labor	XXX
Factory overhead	XXX
Total manufacturing cost	$XXX

- Step 2. Estimate the total selling and administrative expenses.
- Step 3. Estimate the total cost as follows:

Total manufacturing costs	$XXX
Selling and administrative expenses	XXX
Total cost	$XXX

- Step 4. Divide the total cost by the number of units expected to be produced and sold to determine the total cost per unit, as follows:

$$\text{Total Cost per Unit} = \frac{\text{Total Cost}}{\text{Estimated Units Produced and Sold}}$$

- Step 5. Compute the markup percentage as follows:

$$\text{Markup Percentage} = \frac{\text{Desired Profit}}{\text{Total Cost}}$$

The desired profit is normally computed based on a return on assets as follows:

$$\text{Desired Profit} = \text{Desired Return} \times \text{Total Assets}$$

- Step 6. Determine the markup per unit by multiplying the markup percentage times the total cost per unit as follows:

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Total Cost per Unit}$$

- Step 7. Determine the normal selling price by adding the markup per unit to the total cost per unit as follows:

Total cost per unit	$XXX
Markup per unit	XXX
Normal selling price per unit	$XXX

To illustrate, assume the following data for 100,000 calculators that **Digital Solutions Inc.** expects to produce and sell during the year:

Manufacturing costs:		
Direct materials ($3.00 × 100,000)		$ 300,000
Direct labor ($10.00 × 100,000)		1,000,000
Factory overhead:		
Variable costs ($1.50 × 100,000)	$150,000	
Fixed costs	50,000	
Total factory overhead		200,000
Total manufacturing cost		$1,500,000
Selling and administrative expenses:		
Variable expenses ($1.50 × 100,000)	$150,000	
Fixed costs	20,000	
Total selling and administrative expenses		170,000
Total cost		$1,670,000
Desired return		20%
Total assets		$ 800,000

Using the total cost method, the normal selling price of $18.30 is determined as follows:

- Step 1. Total manufacturing cost: $1,500,000
- Step 2. Total selling and administrative expenses: $170,000
- Step 3. Total cost: $1,670,000
- Step 4. Total cost per unit: $16.70

$$\text{Total Cost per Unit} = \frac{\text{Total Cost}}{\text{Estimated Units Produced and Sold}} = \frac{\$1,670,000}{100,000 \text{ units}} = \$16.70 \text{ per unit}$$

- Step 5. Markup percentage: 9.6% (rounded)

$$\text{Desired Profit} = \text{Desired Return} \times \text{Total Assets} = 20\% \times \$800,000 = \$160,000$$

$$\text{Markup Percentage} = \frac{\text{Desired Profit}}{\text{Total Cost}} = \frac{\$160,000}{\$1,670,000} = 9.6\% \text{ (rounded)}$$

- Step 6. Markup per unit: $1.60

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Total Cost per Unit}$$
$$= 9.6\% \times \$16.70 = \$1.60 \text{ per unit (rounded)}$$

- Step 7. Normal selling price: $18.30

Total cost per unit	$16.70
Markup per unit	1.60
Normal selling price per unit	$18.30

The ability of the selling price of $18.30 to generate the desired profit of $160,000 is illustrated by the income statement that follows:

Digital Solutions Inc.
Income Statement
For the Year Ended December 31, 20Y8

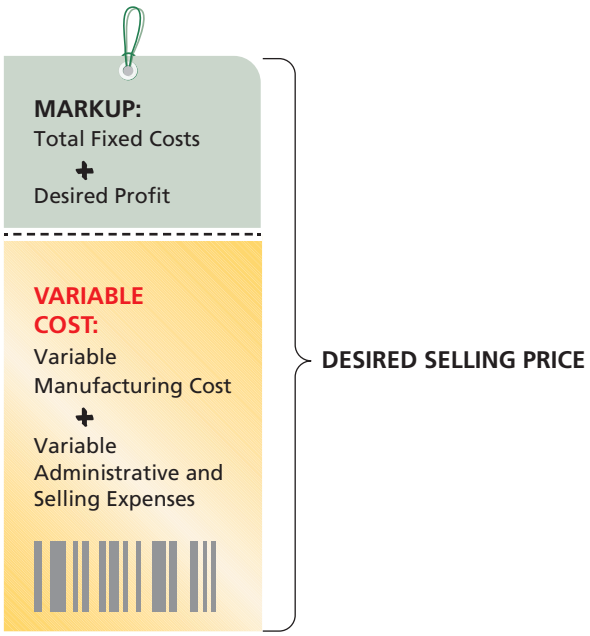
Sales (100,000 units × $18.30)		$ 1,830,000
Expenses:		
Variable (100,000 units × $16.00)	$1,600,000	
Fixed ($50,000 + $20,000)	70,000	
Total expenses		(1,670,000)
Operating income		$ 160,000

The total cost method is often used by contractors who sell products to government agencies. This is because in many cases government contractors are required by law to be reimbursed for their products on a total-cost-plus-profit basis.

Variable Cost Method

As shown in Exhibit 12, under the **variable cost method**, only variable costs are included in the cost amount per unit to which the markup is added. All variable manufacturing costs, as well as variable selling and administrative expenses, are included in the cost amount. Fixed manufacturing costs, fixed selling and administrative expenses, and desired profit are included in the markup. The markup per unit is then added to the variable cost per unit to determine the normal selling price.

Exhibit 12
Variable Cost Method



The variable cost method is applied using the following steps:

- Step 1. Estimate the total variable product cost as follows:

Variable product costs:	
Direct materials	$XXX
Direct labor	XXX
Variable factory overhead	XXX
Total variable product cost	$XXX

- Step 2. Estimate the total variable selling and administrative expenses.
- Step 3. Determine the total variable cost as follows:

Total variable product cost	$XXX
Total variable selling and administrative expenses	XXX
Total variable cost	$XXX

- Step 4. Compute the variable cost per unit as follows:

$$\text{Variable Cost per Unit} = \frac{\text{Total Variable Cost}}{\text{Estimated Units Produced and Sold}}$$

- Step 5. Compute the markup percentage as follows:

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Fixed Costs and Expenses}}{\text{Total Variable Cost}}$$

The numerator of the markup percentage is the desired profit plus the total fixed costs (fixed factory overhead) and expenses (selling and administrative). These fixed costs and expenses must be included in the markup percentage because they are not included in the cost amount to which the markup is added.

As illustrated for the total and product cost methods, the desired profit is normally computed based on a return on assets as follows:

$$\text{Desired Profit} = \text{Desired Return} \times \text{Total Assets}$$

- Step 6. Determine the markup per unit by multiplying the markup percentage times the variable cost per unit as follows:

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Variable Cost per Unit}$$

- Step 7. Determine the normal selling price by adding the markup per unit to the variable cost per unit as follows:

Variable cost per unit	$XXX
Markup per unit	XXX
Normal selling price per unit	$XXX

To illustrate, assume the same data for the production and sale of 100,000 calculators by **Digital Solutions Inc.** as in the preceding example. The normal selling price of $18.30 is determined under the variable cost method as follows:

- Step 1. Total variable product cost: $1,450,000

Variable product costs:	
Direct materials ($3.00 × 100,000)	$ 300,000
Direct labor ($10.00 × 100,000)	1,000,000
Variable factory overhead ($1.50 × 100,000)	150,000
Total variable product cost	$1,450,000

- Step 2. Total variable selling and administrative expenses: $150,000 ($1.50 × 100,000)
- Step 3. Total variable cost: $1,600,000 ($1,450,000 + $150,000)
- Step 4. Variable cost per unit: $16.00

$$\text{Variable Cost per Unit} = \frac{\text{Total Variable Cost}}{\text{Estimated Units Produced and Sold}} = \frac{\$1{,}600{,}000}{100{,}000 \text{ units}} = \$16.00 \text{ per unit}$$

- Step 5. Markup percentage: 14.4% (rounded)

$$\text{Desired Profit} = \text{Desired Return} \times \text{Total Assets} = 20\% \times \$800{,}000 = \$160{,}000$$

$$\text{Markup Percentage} = \frac{\text{Desired Profit} + \text{Total Fixed Costs and Expenses}}{\text{Total Variable Cost}}$$

$$= \frac{\$160{,}000 + \$50{,}000 + \$20{,}000}{\$1{,}600{,}000} = \frac{\$230{,}000}{\$1{,}600{,}000}$$

$$= 14.4\% \text{ (rounded)}$$

- Step 6. Markup per unit: $2.30

$$\text{Markup per Unit} = \text{Markup Percentage} \times \text{Variable Cost per Unit}$$
$$= 14.4\% \times \$16.00 = \$2.30 \text{ per unit (rounded)}$$

- Step 7. Normal selling price: $18.30

Variable cost per unit	$16.00
Markup per unit	2.30
Normal selling price per unit	$18.30

Let's Review

Chapter Summary

1. Differential analyses for various decisions are illustrated in the chapter. Each analysis focuses on the differential effects of revenues and expenses on profit (loss) for alternative courses of action.
2. The three cost methods commonly used in applying the cost-plus approach to product pricing are the product cost, total cost (appendix), and variable cost (appendix) methods. Target costing combines market-based methods with a cost-reduction emphasis.
3. Managing a production bottleneck focuses on the relative profitability of a product given the bottleneck. This profitability is measured by dividing the product's unit contribution margin by the bottleneck hours per unit.
4. Yield pricing is a type of differential pricing that accepts business at differing prices in order to maximize revenues from the business's fixed capacity. It is often used by service businesses that have large fixed costs due to large investments in property, plant, and equipment, such as airlines and hotels. These businesses charge high prices when demand is high and low prices when demand is low. Low prices are also available for reserving early, and higher prices are charged for reserving late.

Key Terms

competition-based method (522)
cost-plus methods (523)
demand-based method (522)
differential analysis (512)
differential cost (512)
differential profit (loss) (512)
differential revenue (512)
opportunity cost (519)
product cost method (523)
production bottleneck (527)
sunk costs (514)
target costing (525)
theory of constraints (TOC) (527)
total cost method (530)
variable cost method (533)
yield pricing (529)

Practice

Multiple-Choice Questions

1. Johnston Company is considering discontinuing a product. The costs of the product consist of $20,000 fixed costs and $15,000 variable costs. The variable operating expenses related to the product total $4,000. What is the differential cost of discontinuing the product?
   a. $19,000
   b. $15,000
   c. $35,000
   d. $39,000
2. Madden Company is considering disposing of equipment that was originally purchased for $200,000 and has $150,000 accumulated depreciation to date. The same equipment would cost $310,000 to replace. What is the sunk cost?
   a. $50,000
   b. $150,000
   c. $200,000
   d. $310,000
3. Hancock Inc. is considering spending $100,000 for a new grinding machine. This amount could be invested to yield a 12% return. What is the opportunity cost?
   a. $112,000
   b. $88,000
   c. $12,000
   d. $100,000
4. Which method of setting normal product selling prices includes administrative and selling expenses in the markup that is added to the cost amount?
   a. Target costing method
   b. Demand-based method
   c. Product cost method
   d. Competition-based method

5. Twitchell Industries produces three products. All of the products use a furnace operation, which is a production bottleneck. The following data are available:

	Product 1	Product 2	Product 3
Unit volume—May	1,000	1,500	1,000
Per-unit data:			
Sales price	$ 35	$ 33	$ 29
Variable cost	(15)	(15)	(15)
Contribution margin	$ 20	$ 18	$ 14
Furnace hours	4 hrs.	3 hrs.	2 hrs.

Which product is most profitable and should be emphasized in June's advertising campaign?

a. Product 1
b. Product 2
c. Product 3
d. The products are equally profitable.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Lease or sell — Obj. 1

Claxon Company owns a machine with a cost of $305,000 and accumulated depreciation of $65,000 that can be sold for $262,000, less a 5% sales commission. Alternatively, the machine can be leased by Claxon Company for three years for a total of $272,000, at the end of which there is no residual value. In addition, the repair, insurance, and property tax expense that would be incurred by Claxon Company on the machine would total $21,600 over the three years. Prepare a differential analysis on January 12 as to whether Claxon Company should lease (Alternative 1) or sell (Alternative 2) the machine.

2. Discontinue a segment — Obj. 1

Product TS-20 has revenue of $102,000, variable cost of goods sold of $52,500, variable selling expenses of $21,500, and fixed costs of $35,000, creating a loss from operations of $(7,000). Prepare a differential analysis as of September 12 to determine if Product TS-20 should be continued (Alternative 1) or discontinued (Alternative 2), assuming fixed costs are unaffected by the decision.

3. Make or buy — Obj. 1

A restaurant bakes its own bread for a cost of $165 per unit (100 loaves), including fixed costs of $43 per unit. A proposal is offered to purchase bread from an outside source for $110 per unit, plus $15 per unit for delivery. Prepare a differential analysis dated August 16 to determine whether the company should make (Alternative 1) or buy (Alternative 2) the bread, assuming fixed costs are unaffected by the decision.

4. Replace equipment — Obj. 1

A machine with a book value of $126,000 has an estimated six-year life. A proposal is offered to sell the old machine for $84,000 and replace it with a new machine at a cost of $145,000. The new machine has a six-year life with no residual value. The new machine would reduce annual direct labor costs from $55,000 to $43,000. Prepare a differential analysis dated February 18 on whether to continue with the old machine (Alternative 1) or replace the machine (Alternative 2).

5. Process or sell — Obj. 1

Product T is produced for $5.90 per pound. Product T can be sold without additional processing for $7.10 per pound, or processed further into Product U at an additional cost of $0.74 per pound. Product U can be sold for $8.00 per pound. Prepare a differential analysis dated August 2 on whether to sell Product T (Alternative 1) or process further into Product U (Alternative 2).

6. Accept business at special price **Obj. 1**

Product R is normally sold for $52 per unit. A special price of $42 is offered for the export market. The variable production cost is $30 per unit. An additional export tariff of 30% of revenue must be paid for all export products. Assume there is sufficient capacity for the special order. Prepare a differential analysis dated October 23 on whether to reject (Alternative 1) or accept (Alternative 2) the special order.

7. Product cost markup percentage **Obj. 2**

Magna Lighting Inc. produces and sells lighting fixtures. An entry light has a total cost of $125 per unit, of which $80 is product cost and $45 is selling and administrative expenses. In addition, the total cost of $125 is made up of $90 variable cost and $35 fixed cost. The desired profit is $55 per unit. Determine the markup percentage on product cost.

8. Bottleneck profit **Obj. 3**

Product A has a unit contribution margin of $24. Product B has a unit contribution margin of $30. Product A requires four testing hours, while Product B requires six testing hours. Determine the most profitable product, assuming the testing is a bottleneck constraint.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Inez Company recently began production of a new product, a digital clock, which required the investment of $1,600,000 in assets. The costs of producing and selling 80,000 units of the digital clock are estimated as follows:

Variable costs:	
Direct materials	$10.00 per unit
Direct labor	6.00
Factory overhead	4.00
Selling and administrative expenses	5.00
Total variable costs	$25.00 per unit
Fixed costs:	
Factory overhead	$800,000
Selling and administrative expenses	400,000

Inez Company is currently considering establishing a selling price for the digital clock. The president of Inez Company has decided to use the cost-plus approach to product pricing and has indicated that the digital clock must earn a 10% return on invested assets.

Instructions

1. Determine the amount of desired profit from the production and sale of the digital clock.
2. Assuming that the product cost method is used, determine (a) the cost amount per unit, (b) the markup percentage, and (c) the selling price of the digital clock.
3. Under what conditions should Inez Company consider using activity-based costing rather than a single factory overhead allocation rate in allocating factory overhead to the digital clock?
4. Assume the market price for similar digital clocks was estimated at $38. Compute the reduction in manufacturing cost per unit needed to maintain the desired profit and existing selling and administrative expenses under target costing.

5. Assume that for the current year, the selling price of the digital clock was $42 per unit. To date, 60,000 units have been produced and sold, and analysis of the domestic market indicates that 15,000 additional units are expected to be sold during the remainder of the year. On August 7, Inez Company received an offer from Wong Inc. for 4,000 units of the digital clock at $28 each. Wong Inc. will market the units in Korea under its own brand name, and no selling and administrative expenses associated with the sale will be incurred by Inez Company. The additional business is not expected to affect the domestic sales of the digital clock, and the additional units could be produced during the current year, using existing capacity. Prepare a differential analysis dated August 7 to determine whether to reject (Alternative 1) or accept (Alternative 2) the special order from Wong.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **a** Differential cost is the amount of increase or decrease in cost that is expected from a particular course of action compared with an alternative. For Johnston Company, the differential cost is $19,000 (answer a). This is the total of the variable product cost ($15,000) and the variable operating expenses ($4,000), which would not be incurred if the product is discontinued.

2. **a** A sunk cost is not affected by later decisions. For Madden Company, the sunk cost is the $50,000 (answer a) book value of the equipment, which is equal to the original cost of $200,000 (answer c) less the accumulated depreciation of $150,000 (answer b). The original cost of the equipment of $200,000 (answer c) is the sunk cost immediately after the equipment was purchased. However, the sunk cost as of the date of the decision is the remaining book value of the equipment. The replacement cost of $310,000 (answer d) is not a sunk cost since it would be incurred in the future.

3. **c** The amount of income that could have been earned from the best available alternative to a proposed use of cash is the opportunity cost. For Hancock Inc., the opportunity cost is 12% times $100,000, or $12,000 (answer c).

4. **c** The product cost method (answer c) includes administrative and selling expenses in the markup that is added to the product cost amount. The target costing method (answer a) anticipates a future selling price and then determines the target cost by subtracting the desired markup (profit). The demand-based method (answer b) sets the price based upon the demand for the product. The competition-based method (answer d) sets the price based upon that offered by competitors.

5. **c** Product 3 has the highest unit contribution margin per bottleneck hour of $7 ($14 ÷ 2 hrs.). Product 1 (answer a) has the largest contribution margin per unit of $20, but the lowest unit contribution margin per bottleneck hour of $5 ($20 ÷ 4 hrs.) so it is the least profitable product in the constrained environment. Product 2 (answer b) has the highest total profitability in May of $27,000 (1,500 units × $18), but this does not suggest that it has the highest profit potential. Product 2's unit contribution margin per bottleneck hour of $6 ($18 ÷ 3 hrs.) is between Products 1 and 3. Answer d is not true since the products have different profit potential in terms of their unit contribution margin per bottleneck hour.

Exercises

1.

Differential Analysis
Lease (Alt. 1) or Sell (Alt. 2) Machine
January 12

	Lease Machine (Alternative 1)	Sell Machine (Alternative 2)	Differential Effects (Alternative 2)
Revenues	$272,000	$262,000	$(10,000)
Costs	(21,600)	(13,100)*	8,500
Profit (loss)	$250,400	$248,900	$ (1,500)

*$262,000 × 5%

Claxon Company should lease the machine.

2.

Differential Analysis
Continue (Alt. 1) or Discontinue (Alt. 2) Product TS-20
September 12

	Continue Product TS-20 (Alternative 1)	Discontinue Product TS-20 (Alternative 2)	Differential Effects (Alternative 2)
Revenue	$102,000	$ 0	$(102,000)
Costs:			
Variable cost of goods sold	(52,500)	0	52,500
Variable selling and admin. expenses	(21,500)	0	21,500
Fixed costs	(35,000)	(35,000)	0
Profit (loss)	$ (7,000)	$(35,000)	$ (28,000)

Product TS-20 should be continued.

3.

Differential Analysis
Make (Alt. 1) or Buy (Alt. 2) Bread
August 16

	Make Bread (Alternative 1)	Buy Bread (Alternative 2)	Differential Effects (Alternative 2)
Unit costs:			
Purchase price	$ 0	$110	$(110)
Delivery	0	15	(15)
Variable costs ($165 – $43)	122	0	122
Fixed factory overhead	43	43	0
Total unit costs	$165	$168	$ (3)

The company should make the bread.

4.

Differential Analysis
Continue with (Alt. 1) or Replace (Alt. 2) Old Machine
February 18

	Continue with Old Machine (Alternative 1)	Replace Old Machine (Alternative 2)	Differential Effects (Alternative 2)
Revenues:			
Proceeds from sale of old machine	$ 0	$ 84,000	$ 84,000
Costs:			
Purchase price	0	(145,000)	(145,000)
Direct labor (6 years)	(330,000)[1]	(258,000)[2]	72,000
Profit (loss)	$(330,000)	$(319,000)	$ 11,000

[1]$55,000 × 6 years

[2]$43,000 × 6 years

The company should replace the old machine.

5.

Differential Analysis
Sell Product T (Alt. 1) or Process Further into Product U (Alt. 2)
August 2

	Sell Product T (Alternative 1)	Process Further into Product U (Alternative 2)	Differential Effects (Alternative 2)
Revenues, per unit	$ 7.10	$ 8.00	$ 0.90
Costs, per unit	(5.90)	(6.64)*	(0.74)
Profit (loss), per unit	$ 1.20	$ 1.36	$ 0.16

*$5.90 + $0.74

The company should process further into Product U.

6.

Differential Analysis
Reject Order (Alt. 1) or Accept Order (Alt. 2)
October 23

	Reject Order (Alternative 1)	Accept Order (Alternative 2)	Differential Effects (Alternative 2)
Revenues, per unit	$0.00	$ 42.00	$ 42.00
Costs:			
Variable manufacturing costs, per unit	0.00	(30.00)	(30.00)
Export tariff, per unit	0.00	(12.60)*	(12.60)
Profit (loss), per unit	$0.00	$ (0.60)	$ (0.60)

*$42.00 × 30%

The company should not accept the special order.

7. $$\text{Markup Percentage on Product Cost} = \frac{\text{Desired Profit} + \text{Total Selling and Administrative Expenses}}{\text{Total Product Cost}}$$

$$= \frac{\$55 + \$45}{\$80^*} = 125\%$$

*$125 – $45

8.

	Product A	Product B
Unit contribution margin	$24	$30
Testing hours per unit	÷ 4	÷ 6
Unit contribution margin per production bottleneck hour	$ 6	$ 5

Product A is the most profitable in using bottleneck resources.

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1. $160,000 ($1,600,000 × 10%)
2. a. Total manufacturing costs:

Variable ($20 × 80,000 units)	$1,600,000
Fixed factory overhead	800,000
Total	$2,400,000

Cost amount per unit: $2,400,000 ÷ 80,000 units = $30.00

b. $$\text{Markup Percentage} = \frac{\text{Desired Profit + Total Selling and Administrative Expenses}}{\text{Total Product Cost}}$$

$$= \frac{\$160{,}000 + \$400{,}000 + (\$5 \times 80{,}000 \text{ units})}{\$2{,}400{,}000}$$

$$= \frac{\$160{,}000 + \$400{,}000 + \$400{,}000}{\$2{,}400{,}000}$$

$$= \frac{\$960{,}000}{\$2{,}400{,}000} = 40\%$$

c.

Cost amount per unit	$30.00
Markup ($30 × 40%)	12.00
Selling price	$42.00

3. Inez should consider using activity-based costing for factory overhead allocation when the product and manufacturing operations are complex. For example, if the digital clock was introduced as one among many different consumer digital products, then it is likely these products will consume factory activities in different ways. If this is combined with complex manufacturing and manufacturing support processes, then it is likely a single overhead allocation rate will lead to distorted factory overhead allocation. Specifically, the digital clock is a new product. Thus, it is likely that it will consume more factory overhead than existing stable and mature products. In this case, a single rate would result in the digital clock being undercosted compared to results using activity-based rates for factory overhead allocation.

4.

Current selling price	$ 42
Expected selling price	(38)
Required reduction in manufacturing cost to maintain same profit	$ 4

Revised revenue and cost figures:

	Current	Desired
Selling price	$ 42	$ 38
Costs:		
Variable selling and administrative expenses per unit	$ (5)	$ (5)
Fixed selling and administrative expenses per unit ($400,000 ÷ 80,000 units)	(5)	(5)
Existing manufacturing cost per unit [part (2)]	(30)	
Target manufacturing cost per unit ($30 – $4)		(26)
Total costs	$(40)	$(36)
Profit	$ 2	$ 2

5.

Differential Analysis—Wong Inc. Special Order
Reject (Alternative 1) or Accept (Alternative 2)
Order August 7

	Reject Order (Alternative 1)	Accept Order (Alternative 2)	Differential Effects (Alternative 2)
Revenues	$0	$112,000*	$112,000
Costs:			
Variable manufacturing costs	0	(80,000)**	(80,000)
Profit (loss)	$0	$ 32,000	$ 32,000

*4,000 units × $28 per unit

**4,000 units × $20 per unit

The proposal should be accepted.

Discussion Questions

1. Explain the meaning of (a) differential revenue, (b) differential cost, and (c) differential profit (loss).
2. A company could sell a building for $250,000 or lease it for $2,500 per month. What would need to be considered in determining if the lease option would be preferred?
3. A chemical company has a commodity-grade and premium-grade product. Why might the company elect to process the commodity-grade product further to the premium-grade product?
4. A company accepts incremental business at a special price that exceeds the variable cost. What other issues must the company consider in deciding whether to accept the business?
5. A company fabricates a component at a cost of $6.00. A supplier offers to supply the same component for $5.50. Under what circumstances is it reasonable to purchase from the supplier?
6. REAL WORLD Many fast-food restaurant chains, such as **McDonald's (MCD)**, will occasionally discontinue restaurants in their system. What are some financial considerations in deciding to eliminate a store?
7. In the long run, the normal selling price must be set high enough to cover what factors?
8. Although the cost-plus approach to product pricing may be used by management as a general guideline, what are some examples of other factors that managers should also consider in setting product prices?
9. How does the target cost method differ from cost-plus approaches?
10. What is the appropriate measure of a product's value when a firm is operating under production bottlenecks?

Basic Exercises

SHOW ME HOW

BE 11-1 Lease or sell **Obj. 1**

Plymouth Company owns equipment with a cost of $600,000 and accumulated depreciation of $375,000 that can be sold for $300,000, less a 4% sales commission. Alternatively, Plymouth Company can lease the equipment for four years for a total of $320,000, at the end of which there is no residual value. In addition, the repair, insurance, and property tax expense that would be incurred by Plymouth Company on the equipment would total $40,000 over the four-year lease. Prepare a differential analysis on August 7 as to whether Plylmouth Company should lease (Alternative 1) or sell (Alternative 2) the equipment.

SHOW ME HOW

BE 11-2 Discontinue a segment **Obj. 1**

Product Tango has revenue of $1,150,000, variable cost of goods sold of $850,000, variable selling expenses of $275,000, and fixed costs of $125,000, creating an operating loss of $(100,000). Prepare a differential analysis as of February 13 to determine if Product Tango should be continued (Alternative 1) or discontinued (Alternative 2), assuming fixed costs are unaffected by the decision.

SHOW ME HOW

BE 11-3 Make or buy **Obj. 1**

A company manufactures various-sized plastic bottles for its medicinal product. The manufacturing cost for small bottles is $55 per unit (100 bottles), including fixed costs of $12 per unit. A proposal is offered to purchase small bottles from an outside source for $36 per unit, plus $3 per unit for freight. Prepare a differential analysis dated January 25 to determine whether the company should make (Alternative 1) or buy (Alternative 2) the bottles, assuming fixed costs are unaffected by the decision.

SHOW ME HOW

BE 11-4 Replace equipment **Obj. 1**

A machine with a book value of $80,000 has an estimated five-year life. A proposal is offered to sell the old machine for $50,500 and replace it with a new machine at a cost of $75,000. The new machine has a five-year life with no residual value. The new machine would reduce annual direct labor costs from $11,200 to $7,400. Prepare a differential analysis dated April 11 on whether to continue with the old machine (Alternative 1) or replace the old machine (Alternative 2).

SHOW ME HOW

BE 11-5 Process or sell **Obj. 1**

Product J19 is produced for $11 per gallon. Product J19 can be sold without additional processing for $18 per gallon, or processed further into Product R33 at an additional cost of $7 per gallon. Product R33 can be sold for $24 per gallon. Prepare a differential analysis dated April 30 on whether to sell Product J19 (Alternative 1) or process further into Product R33 (Alternative 2).

SHOW ME HOW

BE 11-6 Accept business at special price **Obj. 1**

Product A is normally sold for $9.60 per unit. A special price of $7.20 is offered for the export market. The variable production cost is $5.00 per unit. An additional export tariff of 15% of revenue must be paid for all export products. Assume there is sufficient capacity for the special order. Prepare a differential analysis dated March 16 on whether to reject (Alternative 1) or accept (Alternative 2) the special order.

SHOW ME HOW

BE 11-7 Product cost markup percentage **Obj. 2**

Green Thumb Garden Tools Inc. produces and sells home and garden tools and equipment. A lawnmower has a total cost of $230 per unit, of which $160 is product cost and $70 is selling and administrative expenses. In addition, the total cost of $230 is made up of $120 variable cost and $110 fixed cost. The desired profit is $58 per unit. Determine the markup percentage on product cost.

SHOW ME HOW

BE 11-8 Bottleneck profit **Obj. 3**

Product K has a unit contribution margin of $120. Product L has a unit contribution margin of $100. Product K requires five furnace hours, while Product L requires four furnace hours. Determine the most profitable product, assuming the furnace is a bottleneck constraint.

Exercises

✔ a. Differential loss from selling, $(6,400)

SHOW ME HOW

EX 11-1 Differential analysis for a lease or sell decision **Obj. 1**

Burlington Construction Company is considering selling excess machinery with a book value of $115,000 (original cost of $275,000 less accumulated depreciation of $160,000) for $90,000, less a 6% brokerage commission. Alternatively, the machinery can be leased for a total of $100,000, for four years, after which it is expected to have no residual value. During the period of the lease, Burlington Construction Company's costs of repairs, insurance, and property tax expenses are expected to be $9,000.

a. Prepare a differential analysis dated January 15 to determine whether Burlington Construction Company should lease (Alternative 1) or sell (Alternative 2) the machinery.

b. On the basis of the data presented, would it be advisable to lease or sell the machinery? Explain.

EX 11-2 Differential analysis for a lease or buy decision — Obj. 1

✔ Differential cost from buying, $(15,300)

SHOW ME HOW

Laredo Corporation is considering new equipment. The equipment can be purchased from an overseas supplier for $120,000. The freight and installation costs for the equipment are $1,500. If purchased, annual repairs and maintenance are estimated to be $2,200 per year over the six-year useful life of the equipment. Alternatively, Laredo Corporation can lease the equipment from a domestic supplier for $25,000 per year for six years, with no additional costs. Prepare a differential analysis dated March 15 to determine whether Laredo Corporation should lease (Alternative 1) or purchase (Alternative 2) the equipment. *Hint:* This is a "lease or *buy*" decision, which must be analyzed from the perspective of the equipment user, as opposed to the equipment owner.

EX 11-3 Differential analysis for a discontinued product — Obj. 1

✔ a. Differential loss, $(1,440,000)

SHOW ME HOW

A condensed income statement by product line for Warrick Beverage Inc. indicated the following for Mango Cola for the past year:

Sales	$ 15,000,000
Cost of goods sold	(10,800,000)
Gross profit	$ 4,200,000
Operating expenses	(8,000,000)
Operating loss	$ (3,800,000)

It is estimated that 30% of the cost of goods sold represents fixed factory overhead costs and that 25% of the operating expenses are fixed. Because Mango Cola is only one of many products, the fixed costs will not be materially affected if the product is discontinued.

a. Prepare a differential analysis dated February 29 to determine whether Mango Cola should be continued (Alternative 1) or discontinued (Alternative 2).

b. Should Mango Cola be retained? Explain.

EX 11-4 Differential analysis for a discontinued product — Obj. 1

✔ a. Alternative 2 loss, $(12,900)

EXCEL TEMPLATE

The condensed product-line income statement for Rhinebeck Company for the month of October is as follows:

Rhinebeck Company
Product-Line Income Statement
For the Month Ended October 31

	Hats	Gloves	Mufflers
Sales	$ 71,000	$105,700	$ 45,000
Cost of goods sold	(32,600)	(42,300)	(27,000)
Gross profit	$ 38,400	$ 63,400	$ 18,000
Selling and administrative expenses	(27,400)	(42,800)	(25,000)
Operating income (loss)	$ 11,000	$ 20,600	$ (7,000)

Fixed costs are 20% of the cost of goods sold and 30% of the selling and administrative expenses. Rhinebeck Company assumes that fixed costs would not be materially affected if the Gloves line were discontinued.

a. Prepare a differential analysis dated October 31 to determine if Mufflers should be continued (Alternative 1) or discontinued (Alternative 2).

b. Should the Mufflers line be retained? Explain.

EX 11-5 Segment analysis for a service company — Obj. 1

✔ c. Estimated contribution margin, Advisor Services, $1,016

REAL WORLD

Charles Schwab Corporation (SCHW) is one of the more innovative brokerage and financial service companies in the United States. The company recently provided information about its major business segments as follows (in millions):

	Investor Services	Advisor Services
Revenues	$5,411	$2,067
Operating income	2,031	962
Depreciation	180	54

a. How does a brokerage company like Schwab define the Investor Services and Advisor Services segments? Use the Internet to develop your answer.

b. Provide a specific example of a variable and fixed cost in the Investor Services segment.

c. Estimate the contribution margin for each segment, assuming depreciation represents the majority of fixed costs.

d. If Schwab decided to sell its Advisor Services accounts to another company, estimate how much operating income would decline.

EX 11-6 Decision to discontinue a product

Obj. 1

On the basis of the following data, the general manager of Hawkeye Shoes Inc. decided to discontinue Children's Shoes because it reduced operating income by $30,000. What is the flaw in this decision, if it is assumed fixed costs would not be materially affected by the discontinuance?

Hawkeye Shoes Inc.
Product-Line Income Statement
For the Year Ended November 30, 20Y8

	Children's Shoes	Men's Shoes	Women's Shoes	Total
Sales	$ 280,000	$ 300,000	$ 500,000	$1,080,000
Costs of goods sold:				
Variable costs	$(135,000)	$(150,000)	$(220,000)	$ (505,000)
Fixed costs	(45,000)	(60,000)	(120,000)	(225,000)
Total cost of goods sold	$(180,000)	$(210,000)	$(340,000)	$ (730,000)
Gross profit	$ 100,000	$ 90,000	$ 160,000	$ 350,000
Selling and adminstrative expenses:				
Variable selling and admin. expenses	$(100,000)	$ (45,000)	$ (95,000)	$ (240,000)
Fixed selling and admin. expenses	(30,000)	(20,000)	(25,000)	(75,000)
Total selling and admin. expenses	$(130,000)	$ (65,000)	$(120,000)	$ (315,000)
Operating income (loss)	$ (30,000)	$ 25,000	$ 40,000	$ 35,000

EX 11-7 Make-or-buy decision

Obj. 1

✔ a. Differential loss from buying, $(1.00) per case

SHOW ME HOW EXCEL TEMPLATE

Somerset Computer Company has been purchasing carrying cases for its portable computers at a purchase price of $24 per unit. The company, which is currently operating below full capacity, charges factory overhead to production at the rate of 40% of direct labor cost. The unit costs to produce comparable carrying cases are expected to be as follows:

Direct materials	$ 8.00
Direct labor	12.00
Factory overhead (40% of direct labor)	4.80
Total cost per unit	$24.80

If Somerset Computer Company manufactures the carrying cases, fixed factory overhead costs will not increase and variable factory overhead costs associated with the cases are expected to be 25% of the direct labor costs.

a. Prepare a differential analysis dated April 30 to determine whether the company should make (Alternative 1) or buy (Alternative 2) the carrying case.

b. On the basis of the data presented, would it be advisable to make the carrying cases or to continue buying them? Explain.

EX 11-8 Make-or-buy decision for a service company

Obj. 1

EXCEL TEMPLATE

The Theater Arts Guild of Dallas (TAG-D) employs five people in its Publication Department. These people lay out pages for pamphlets, brochures, magazines, and other publications for the TAG-D productions. The pages are delivered to an outside company for printing. The company is considering an outside publication service for the layout work. The outside service is quoting

(Continued)

a price of $13 per layout page. The budget for the Publication Department for the current year is as follows:

Salaries	$224,000
Benefits	36,000
Supplies	21,000
Office expenses	39,000
Office depreciation	28,000
Computer depreciation	24,000
Total	$372,000

The department expects to lay out 24,000 pages for the current year. The Publication Department office space and equipment would be used for future administrative needs, if the department's function were purchased from the outside.

a. Prepare a differential analysis dated February 22 to determine whether TAG-D should lay out pages internally (Alternative 1) or purchase layout services from the outside (Alternative 2).

b. On the basis of your analysis in part (a), should the page layout work be purchased from an outside company? Explain.

c. What additional considerations might factor into the decision making?

EX 11-9 Machine replacement decision — Obj. 1

SHOW ME HOW

A company is considering replacing an old piece of machinery, which cost $400,000 and has $175,000 of accumulated depreciation to date, with a new machine that has a purchase price of $550,000. The old machine could be sold for $250,000. The annual variable production costs associated with the old machine are estimated to be $72,500 per year for eight years. The annual variable production costs for the new machine are estimated to be $24,000 per year for eight years.

a. Prepare a differential analysis dated May 29 to determine whether to continue with (Alternative 1) or replace (Alternative 2) the old machine.

b. What is the sunk cost in this situation?

EX 11-10 Differential analysis for machine replacement — Obj. 1

✔ a. Differential loss, $(2,500)

EXCEL TEMPLATE

Boyer Digital Components Company assembles circuit boards by using a manually operated machine to insert electronic components. The original cost of the machine is $60,000, the accumulated depreciation is $24,000, its remaining useful life is five years, and its residual value is negligible. On May 4 of the current year, a proposal was made to replace the present manufacturing procedure with a fully automatic machine that has a purchase price of $180,000. The automatic machine has an estimated useful life of five years and no significant residual value. For use in evaluating the proposal, the accountant accumulated the following annual data on present and proposed operations:

	Present Operations	Proposed Operations
Sales	$205,000	$205,000
Direct materials	$ 72,000	$ 72,000
Direct labor	51,000	—
Power and maintenance	5,000	18,000
Taxes, insurance, etc.	1,500	4,000
Selling and administrative expenses	45,000	45,000
Total expenses	$174,500	$139,000

a. Prepare a differential analysis dated May 4 to determine whether to continue with (Alternative 1) or replace (Alternative 2) the old machine. Prepare the analysis over the useful life of the new machine.

b. Based only on the data presented, should the proposal be accepted?

c. What are some of the other factors that should be considered before a final decision is made?

SHOW ME HOW

EX 11-11 Sell or process further

Obj. 1

Calgary Lumber Company incurs a cost of $315 per hundred board feet (hbf) in processing certain "rough-cut" lumber, which it sells for $440 per hbf. An alternative is to produce a "finished cut" at a total processing cost of $465 per hbf, which can be sold for $600 per hbf. Prepare a differential analysis dated March 15 on whether to sell rough-cut lumber (Alternative 1) or process further into finished-cut lumber (Alternative 2).

EX 11-12 Sell or process further

Obj. 1

✔ Differential profit of processing into Decaf, $2,850

EXCEL TEMPLATE

Dakota Coffee Company produces Columbian coffee in batches of 7,500 pounds. The standard quantity of materials required in the process is 7,500 pounds, which cost $6.00 per pound. Columbian coffee can be sold without further processing for $9.80 per pound. Columbian coffee can also be processed further to yield Decaf Columbian, which can be sold for $11.60 per pound. The processing into Decaf Columbian requires additional processing costs of $6,300 per batch. The additional processing will also cause a 5% loss of product due to evaporation.

a. Prepare a differential analysis dated December 11 on whether to sell regular Columbian (Alternative 1) or process further into Decaf Columbian (Alternative 2).

b. Should Dakota Coffee Company sell Columbian coffee or process further and sell Decaf Columbian? Explain.

c. Determine the price of Decaf Columbian that would cause neither an advantage nor a disadvantage for processing further and selling Decaf Columbian.

EX 11-13 Decision on accepting additional business

Obj. 1

✔ a. Differential profit, $54,000

Homestead Jeans Co. has an annual plant capacity of 65,000 units, and current production is 45,000 units. Monthly fixed costs are $54,000, and variable costs are $29 per unit. The present selling price is $42 per unit. On November 12 of the current year, the company received an offer from Dawkins Company for 18,000 units of the product at $32 each. Dawkins Company will market the units in a foreign country under its own brand name. The additional business is not expected to affect the domestic selling price or quantity of sales of Homestead Jeans Co.

a. Prepare a differential analysis dated November 12 on whether to reject (Alternative 1) or accept (Alternative 2) the Dawkins order.

b. Briefly explain the reason why accepting this additional business will increase operating income.

c. What is the minimum price per unit that would produce a positive contribution margin?

EX 11-14 Accepting business at a special price

Obj. 1

Box Elder Power Company expects to operate at 85% of productive capacity during May. The total manufacturing costs for May for the production of 40,000 batteries are budgeted as follows:

Direct materials	$240,000
Direct labor	100,000
Variable factory overhead	32,000
Fixed factory overhead	150,000
Total manufacturing costs	$522,000

The company has an opportunity to submit a bid for 5,000 batteries to be delivered by May 31 to a government agency. If the contract is obtained, it is anticipated that the additional activity will not interfere with normal production during May or increase the selling or administrative expenses. What is the unit cost below which Box Elder Power Company should not go in bidding on the government contract?

EX 11-15 Decision on accepting additional business

Obj. 1

✔ a. Differential revenues, $15,000,000

SHOW ME HOW EXCEL TEMPLATE

Talladega Tire and Rubber Company has capacity to produce 500,000 tires. Talladega presently produces and sells 400,000 tires for the North American market at a price of $200 per tire. Talladega is evaluating a special order from a European automobile company, Autobahn Motors. Autobahn is offering to buy 100,000 tires for $150 per tire. Talladega's accounting system indicates that the total cost per tire is as follows:

Direct materials	$ 75
Direct labor	20
Factory overhead (70% variable)	30
Selling and administrative expenses (60% variable)	18
Total	$143

Talladega pays a selling commission equal to 3% of the selling price on North American orders, which is included in the variable portion of the selling and administrative expenses. However, this special order would not have a sales commission. If the order was accepted, the tires would be shipped overseas for an additional shipping cost of $3 per tire. In addition, Autobahn has made the order conditional on receiving European safety certification. Talladega estimates that this certification would cost $400,000.

a. Prepare a differential analysis dated July 31 on whether to reject (Alternative 1) or accept (Alternative 2) the special order from Autobahn Motors.

b. What is the minimum price per unit that would be financially acceptable to Talladega?

EX 11-16 Product cost method of product pricing

Obj. 2

✔ b. $40

SHOW ME HOW

La Femme Accessories Inc. produces women's handbags. The cost of producing 800 handbags is as follows:

Direct materials	$18,000
Direct labor	8,500
Factory overhead	5,500
Total manufacturing cost	$32,000

The selling and administrative expenses are $17,000. The management desires a profit equal to 22% of invested assets of $250,000.

a. Determine the amount of desired profit from the production and sale of 800 handbags.

b. Determine the product cost per unit for the production of 800 handbags.

c. Determine the product cost markup percentage for handbags.

d. Determine the selling price of handbags.

EX 11-17 Product cost method of product costing

Obj. 2

✔ d. $325

Smart Stream Inc. uses the product cost method of applying the cost-plus approach to product pricing. The costs of producing and selling 10,000 cell phones are as follows:

Variable costs per unit:		Fixed costs:	
Direct materials	$150	Factory overhead	$350,000
Direct labor	25	Selling and admin. exp.	140,000
Factory overhead	40		
Selling and administrative expenses	25		
Total variable cost per unit	$240		

Smart Stream desires a profit equal to a 30% return on invested assets of $1,200,000.

a. Determine the amount of desired profit from the production and sale of 10,000 cell phones.
b. Determine the product cost per unit for the production of 10,000 cell phones.
c. Determine the product cost markup percentage for cell phones.
d. Determine the selling price of cell phones.

REAL WORLD

EX 11-18 Target costing **Obj. 2**

Toyota Motor Corporation (TM) uses target costing. Assume that Toyota marketing personnel estimate that the competitive selling price for the Camry in the upcoming model year will need to be $27,000. Assume further that the Camry's total unit cost for the upcoming model year is estimated to be $22,500 and that Toyota requires a 20% profit margin on selling price (which is equivalent to a 25% markup on total cost).

a. What price will Toyota establish for the Camry for the upcoming model year?
b. What impact will target costing have on Toyota, given the assumed information?

EX 11-19 Target costing **Obj. 2**

✔ b. $30

Instant Image Inc. manufactures color laser printers. Model J20 presently sells for $460 and has a product cost of $230, as follows:

Direct materials	$175
Direct labor	40
Factory overhead	15
Total	$230

It is estimated that the competitive selling price for color laser printers of this type will drop to $400 next year. Instant Image has established a target cost to maintain its historical markup percentage on product cost. Engineers have provided the following cost-reduction ideas:

1. Purchase a plastic printer cover with snap-on assembly, rather than with screws. This will reduce the amount of direct labor by 15 minutes per unit.
2. Add an inspection step that will add six minutes per unit of direct labor but reduce the materials cost by $20 per unit.
3. Decrease the cycle time of the injection molding machine from four minutes to three minutes per part. Forty percent of the direct labor and 48% of the factory overhead are related to running injection molding machines.

The direct labor rate is $30 per hour.

a. Determine the target cost for Model J20, assuming that the historical markup on product cost and selling price are maintained.
b. Determine the required cost reduction.
c. Evaluate the three engineering improvements together to determine if the required cost reduction (drift) can be achieved.

EX 11-20 Product decisions under bottlenecked operations **Obj. 3**

Mill Metals Inc. has three grades of metal product, Type 5, Type 10, and Type 20. Financial data for the three grades are as follows:

	Type 5	Type 10	Type 20
Revenues	$ 43,000	$ 49,000	$ 56,500
Variable cost	$(34,000)	$(28,000)	$(26,500)
Fixed cost	(8,000)	(8,000)	(8,000)
Total cost	$(42,000)	$(36,000)	$(34,500)
Operating income	$ 1,000	$ 13,000	$ 22,000
Number of units	÷ 5,000	÷ 5,000	÷ 5,000
Operating income per unit	$ 0.20	$ 2.60	$ 4.40

(*Continued*)

Mill's operations require all three grades to be melted in a furnace before being formed. The furnace runs 24 hours a day, 7 days a week, and is a production bottleneck. The furnace hours required per unit of each product are as follows:

Type 5:	6 hours
Type 10:	6 hours
Type 20:	12 hours

The Marketing Department is considering a new marketing and sales campaign.

Which product should be emphasized in the marketing and sales campaign in order to maximize profitability?

EX 11-21 Product decisions under bottlenecked operations

Obj. 3

✔ a. Total operating income, $269,000

Youngstown Glass Company manufactures three types of safety plate glass: large, medium, and small. All three products have high demand. Thus, Youngstown Glass is able to sell all the safety glass that it can make. The production process includes an autoclave operation, which is a pressurized heat treatment. The autoclave is a production bottleneck. Total fixed costs are $85,000 for the company as a whole. In addition, the following information is available about the three products:

	Large	Medium	Small
Unit selling price	$ 184	$ 160	$100
Unit variable cost	(130)	(120)	(76)
Unit contribution margin	$ 54	$ 40	$ 24
Autoclave hours per unit	3	2	1
Total process hours per unit	5	4	2
Budgeted units of production	3,000	3,000	3,000

a. Determine the contribution margin by glass type and the total company operating income for the budgeted units of production.

b. Prepare an analysis showing which product is the most profitable per bottleneck hour.

Appendix

EX 11-22 Total cost method of product pricing

✔ b. 12.46%

Based on the data presented in Exercise 17, assume that Smart Stream Inc. uses the total cost method of applying the cost-plus approach to product pricing.

a. Determine the total costs and the total cost amount per unit for the production and sale of 10,000 cellular phones.

b. Determine the total cost markup percentage (rounded to two decimal places) for cellular phones.

c. Determine the selling price of cellular phones. Round markup to the nearest dollar.

Appendix

EX 11-23 Variable cost method of product pricing

✔ b. 35.42%

Based on the data presented in Exercise 17, assume that Smart Stream Inc. uses the variable cost method of applying the cost-plus approach to product pricing.

a. Determine the variable costs and the variable cost amount per unit for the production and sale of 10,000 cellular phones.

b. Determine the variable cost markup percentage (rounded to two decimal places) for cellular phones.

c. Determine the selling price of cellular phones. Round markup to the nearest dollar.

Problems: Series A

PR 11-1A Differential analysis involving opportunity costs

Obj. 1

✔ 3. $1,450,000

EXCEL TEMPLATE

On August 1, Rantoul Stores Inc. is considering leasing a building and purchasing the necessary equipment to operate a retail store. Alternatively, the company could use the funds to invest in $1,000,000 of 4% U.S. Treasury bonds that mature in 15 years. The bonds could be purchased at face value. The following data have been assembled:

Cost of store equipment	$1,000,000
Life of store equipment	15 years
Estimated residual value of store equipment	$50,000
Yearly costs to operate the store, excluding depreciation of store equipment	$200,000
Yearly expected revenues—years 1–6	$300,000
Yearly expected revenues—years 7–15	$400,000

Instructions

1. Prepare a differential analysis as of August 1 presenting the proposed operation of the store for the 15 years (Alternative 1) as compared with investing in U.S. Treasury bonds (Alternative 2).
2. Based on the results disclosed by the differential analysis, should the proposal be accepted?
3. If the proposal is accepted, what would be the total estimated operating income of the store for the 15 years?

PR 11-2A Differential analysis for machine replacement proposal

Obj. 1

EXCEL TEMPLATE

Lexigraphic Printing Company is considering replacing a machine that has been used in its factory for four years. Relevant data associated with the operations of the old machine and the new machine, neither of which has any estimated residual value, are as follows:

Old Machine	
Cost of machine, 10-year life	$89,000
Annual depreciation (straight-line)	8,900
Annual manufacturing costs, excluding depreciation	23,600
Annual nonmanufacturing operating expenses	6,100
Annual revenue	74,200
Current estimated selling price of machine	29,700

New Machine	
Purchase price of machine, six-year life	$119,700
Annual depreciation (straight-line)	19,950
Estimated annual manufacturing costs, excluding depreciation	6,900

Annual nonmanufacturing operating expenses and revenue are not expected to be affected by purchase of the new machine.

Instructions

1. Prepare a differential analysis as of April 30 comparing operations using the present machine (Alternative 1) with operations using the new machine (Alternative 2). The analysis should indicate the total differential profit that would result over the six-year period if the new machine is acquired.
2. List other factors that should be considered before a final decision is reached.


SHOW ME HOW


EXCEL TEMPLATE

PR 11-3A Differential analysis for sales promotion proposal

Obj. 1

Kankakee Cosmetics Company is planning a one-month campaign for December to promote sales of one of its two cosmetics products. A total of $150,000 has been budgeted for advertising, contests, redeemable coupons, and other promotional activities. The following data have been assembled for their possible usefulness in deciding which of the products to select for the campaign:

	Moisturizer	Perfume
Unit selling price	$ 35	$ 55
Unit production costs:		
Direct materials	$(12)	$(20)
Direct labor	(8)	(10)
Variable factory overhead	(3)	(6)
Fixed factory overhead	(2)	(6)
Total unit production costs	$(25)	$(42)
Unit variable selling expenses	(2)	(3)
Unit fixed selling expenses	(2)	(8)
Total unit costs	$(29)	$(53)
Operating income per unit	$ 6	$ 2

No increase in facilities would be necessary to produce and sell the increased output. It is anticipated that 40,000 additional units of moisturizer or 30,000 additional units of perfume could be sold from the campaign without changing the unit selling price of either product.

Instructions

1. Prepare a differential analysis as of November 2 to determine whether to promote moisturizer (Alternative 1) or perfume (Alternative 2).
2. The sales manager had tentatively decided to promote moisturizer estimating that operating income would be increased by $90,000 ($6 operating income per unit times 40,000 units for a total of $240,000, less promotion expenses of $150,000). The manager also believed that the selection of perfume would reduce operating income by $90,000 ($2 operating income per unit times 30,000 units for a total of $60,000, less promotion expenses of $150,000). State briefly your reasons for supporting or opposing the tentative decision.

PR 11-4A Differential analysis for further processing

Obj. 1

✔ 1. Raw sugar profit, $23,800

The management of Dominican Sugar Company is considering whether to process further raw sugar into refined sugar. Refined sugar can be sold for $2.20 per pound, and raw sugar can be sold without further processing for $1.40 per pound. Raw sugar is produced in batches of 42,000 pounds by processing 100,000 pounds of sugar cane, which costs $0.35 per pound of cane. Refined sugar will require additional processing costs of $0.50 per pound of raw sugar, and 1.25 pounds of raw sugar will produce 1 pound of refined sugar.

Instructions

1. Prepare a differential analysis as of March 24 to determine whether to sell raw sugar (Alternative 1) or process further into refined sugar (Alternative 2).
2. Briefly report your recommendations.

PR 11-5A Product pricing and profit analysis with bottleneck operations

Obj. 3

✔ 1. High Grade, $10

EXCEL TEMPLATE

Hercules Steel Company produces three grades of steel: high, good, and regular grade. Each of these products (grades) has high demand in the market, and Hercules is able to sell as much as it can produce of all three. The furnace operation is a bottleneck in the process and is running at 100% of capacity. Hercules wants to improve steel operation profitability. The variable conversion cost is $15 per process hour. The fixed cost is $200,000. In addition, the cost analyst was able to determine the following information about the three products:

	High Grade	Good Grade	Regular Grade
Budgeted units produced	5,000	5,000	5,000
Total process hours per unit	12	11	10
Furnace hours per unit	4	3	2.5
Unit selling price	$280	$270	$250
Direct materials cost per unit	$90	$84	$80

The furnace operation is part of the total process for each of these three products. Thus, for example, 4.0 of the 12.0 hours required to process High Grade steel are associated with the furnace.

Instructions

1. Determine the unit contribution margin for each product.
2. Provide an analysis to determine the relative product profitability, assuming that the furnace is a bottleneck.

Appendix

PR 11-6A Product pricing using the cost-plus approach methods; differential analysis for accepting additional business

✔ 2. b. Markup percentage, 44%

Crystal Displays Inc. recently began production of a new product, flat panel displays, which required the investment of $1,500,000 in assets. The costs of producing and selling 5,000 units of flat panel displays are estimated as follows:

Variable costs per unit:		Fixed costs:	
Direct materials	$120	Factory overhead	$250,000
Direct labor	30	Selling and administrative expenses	150,000
Factory overhead	50		
Selling and administrative expenses	35		
Total variable cost per unit	$235		

Crystal Displays Inc. is currently considering establishing a selling price for flat panel displays. The president of Crystal Displays has decided to use the cost-plus approach to product pricing and has indicated that the displays must earn a 15% return on invested assets.

Instructions

1. Determine the amount of desired profit from the production and sale of flat panel displays.
2. Assuming that the product cost method is used, determine (a) the cost amount per unit, (b) the markup percentage, and (c) the selling price of flat panel displays.
3. (*Appendix*) Assuming that the total cost method is used, determine (a) the cost amount per unit, (b) the markup percentage (rounded to two decimal places), and (c) the selling price of flat panel displays. Round markup to nearest whole dollar.
4. (*Appendix*) Assuming that the variable cost method is used, determine (a) the cost amount per unit, (b) the markup percentage (rounded to two decimal places), and (c) the selling price of flat panel displays. Round markup to nearest whole dollar.
5. Comment on any additional considerations that could influence establishing the selling price for flat panel displays.
6. Assume that as of August 1, 3,000 units of flat panel displays have been produced and sold during the current year. Analysis of the domestic market indicates that 2,000 additional units are expected to be sold during the remainder of the year at the normal product price determined under the product cost method. On August 3, Crystal Displays Inc. received an offer

(*Continued*)

from Maple Leaf Visual Inc. for 800 units of flat panel displays at $225 each. Maple Leaf Visual Inc. will market the units in Canada under its own brand name, and no variable selling and administrative expenses associated with the sale will be incurred by Crystal Displays Inc. The additional business is not expected to affect the domestic sales of flat panel displays, and the additional units could be produced using existing factory, selling, and administrative capacity.

a. Prepare a differential analysis of the proposed sale to Maple Leaf Visual Inc.

b. Based on the differential analysis in part (a), should the proposal be accepted?

Problems: Series B

PR 11-1B Differential analysis involving opportunity costs — Obj. 1

✔ 3. $525,000



EXCEL TEMPLATE

On July 1, Coastal Distribution Company is considering leasing a building and buying the necessary equipment to operate a public warehouse. Alternatively, the company could use the funds to invest in $740,000 of 5% U.S. Treasury bonds that mature in 14 years. The bonds could be purchased at face value. The following data have been assembled:

Cost of equipment	$740,000
Life of equipment	14 years
Estimated residual value of equipment	$75,000
Yearly costs to operate the warehouse, excluding depreciation of equipment	$175,000
Yearly expected revenues—years 1–7	$280,000
Yearly expected revenues—years 8–14	$240,000

Instructions

1. Prepare a differential analysis as of July 1 presenting the proposed operation of the warehouse for the 14 years (Alternative 1) as compared with investing in U.S. Treasury bonds (Alternative 2).
2. Based on the results disclosed by the differential analysis, should the proposal be accepted?
3. If the proposal is accepted, what is the total estimated operating income of the warehouse for the 14 years?

PR 11-2B Differential analysis for machine replacement proposal — Obj. 1



EXCEL TEMPLATE

Flint Tooling Company is considering replacing a machine that has been used in its factory for two years. Relevant data associated with the operations of the old machine and the new machine, neither of which has any estimated residual value, are as follows:

Old Machine	
Cost of machine, eight-year life	$38,000
Annual depreciation (straight-line)	4,750
Annual manufacturing costs, excluding depreciation	12,400
Annual nonmanufacturing operating expenses	2,700
Annual revenue	32,400
Current estimated selling price of the machine	12,900

New Machine	
Cost of machine, six-year life	$57,000
Annual depreciation (straight-line)	9,500
Estimated annual manufacturing costs, exclusive of depreciation	3,400

Annual nonmanufacturing operating expenses and revenue are not expected to be affected by purchase of the new machine.

Instructions

1. Prepare a differential analysis as of November 8 comparing operations using the present machine (Alternative 1) with operations using the new machine (Alternative 2). The analysis should indicate the differential profit that would result over the six-year period if the new machine is acquired.
2. List other factors that should be considered before a final decision is reached.

PR 11-3B Differential analysis for sales promotion proposal

Obj. 1

✔ 1. Differential revenues, $105,000


SHOW ME HOW


EXCEL TEMPLATE

Sole Mates Inc. is planning a one-month campaign for July to promote sales of one of its two shoe products. A total of $100,000 has been budgeted for advertising, contests, redeemable coupons, and other promotional activities. The following data have been assembled for their possible usefulness in deciding which of the products to select for the campaign:

	Tennis Shoes	Walking Shoes
Unit selling price	$ 85	$100
Unit production costs:		
Direct materials	$(19)	$ (32)
Direct labor	(8)	(12)
Variable factory overhead	(7)	(5)
Fixed factory overhead	(16)	(11)
Total unit production costs	$(50)	$ (60)
Unit variable selling expenses	(6)	(10)
Unit fixed selling expenses	(20)	(15)
Total unit costs	$(76)	$ (85)
Operating income per unit	$ 9	$ 15

No increase in facilities would be necessary to produce and sell the increased output. It is anticipated that 7,000 additional units of tennis shoes or 7,000 additional units of walking shoes could be sold without changing the unit selling price of either product.

Instructions

1. Prepare a differential analysis as of June 19 to determine whether to promote tennis shoes (Alternative 1) or walking shoes (Alternative 2).
2. The sales manager had tentatively decided to promote walking shoes, estimating that operating income would be increased by $5,000 ($15 operating income per unit for 7,000 units, less promotion expenses of $100,000). The manager also believed that the selection of tennis shoes would reduce operating income by $37,000 ($9 operating income per unit for 7,000 units, less promotion expenses of $100,000). State briefly your reasons for supporting or opposing the tentative decision.

PR 11-4B Differential analysis for further processing

Obj. 1

✔ 1. Ingot income, $35,500

The management of International Aluminum Co. is considering whether to process aluminum ingot further into rolled aluminum. Rolled aluminum can be sold for $2,200 per ton, and ingot can be sold without further processing for $1,100 per ton. Ingot is produced in batches of 80 tons by smelting 500 tons of bauxite, which costs $105 per ton of bauxite. Rolled aluminum will require additional processing costs of $620 per ton of ingot, and 1.25 tons of ingot will produce 1 ton of rolled aluminum (due to trim losses).

Instructions

1. Prepare a differential analysis as of February 5 to determine whether to sell aluminum ingot (Alternative 1) or process further into rolled aluminum (Alternative 2).
2. Briefly report your recommendations.

PR 11-5B Product pricing and profit analysis with bottleneck operations

Obj. 3

✔ 1. Ethylene, $15



EXCEL TEMPLATE

Wilmington Chemical Company produces three products: ethylene, butane, and ester. Each of these products has high demand in the market, and Wilmington Chemical is able to sell as much as it can produce of all three. The reaction operation is a bottleneck in the process and is running at 100% of capacity. Wilmington wants to improve chemical operation profitability. The variable conversion cost is $10 per process hour. The fixed cost is $400,000. In addition, the cost analyst was able to determine the following information about the three products:

	Ethylene	Butane	Ester
Budgeted units produced	9,000	9,000	9,000
Total process hours per unit	4.0	4.0	3.0
Reactor hours per unit	1.5	1.0	0.5
Unit selling price	$170	$155	$130
Direct materials cost per unit	$115	$88	$85

The reaction operation is part of the total process for each of these three products. Thus, for example, 1.5 of the 4.0 hours required to process ethylene is associated with the reactor.

Instructions

1. Determine the unit contribution margin for each product.
2. Provide an analysis to determine the relative product profitabilities, assuming that the reactor is a bottleneck.

Appendix

PR 11-6B Product pricing using the cost-plus approach methods; differential analysis for accepting additional business

✔ 2. b. Markup percentage, 30%

Night Glow Inc. recently began production of a new product, the halogen light, which required the investment of $600,000 in assets. The costs of producing and selling 10,000 halogen lights are estimated as follows:

Variable costs per unit:		Fixed costs:	
Direct materials	$32	Factory overhead	$180,000
Direct labor	12	Selling and administrative expenses	80,000
Factory overhead	8		
Selling and administrative expenses	7		
Total variable cost per unit	$59		

Night Glow Inc. is currently considering establishing a selling price for the halogen light. The president of Night Glow Inc. has decided to use the cost-plus approach to product pricing and has indicated that the halogen light must earn a 10% return on invested assets.

Instructions

1. Determine the amount of desired profit from the production and sale of the halogen light.
2. Assuming that the product cost method is used, determine (a) the cost amount per unit, (b) the markup percentage, and (c) the selling price of the halogen light.
3. (*Appendix*) Assuming that the total cost method is used, determine (a) the cost amount per unit, (b) the markup percentage (rounded to two decimal places), and (c) the selling price of the halogen light. Round markup to the nearest whole dollar.
4. (*Appendix*) Assuming that the variable cost method is used, determine (a) the cost amount per unit, (b) the markup percentage (rounded to two decimal places), and (c) the selling price of the halogen light. Round markup to nearest whole dollar.
5. Comment on any additional considerations that could influence establishing the selling price for the halogen light.
6. Assume that as of September 1, 7,000 units of halogen light have been produced and sold during the current year. Analysis of the domestic market indicates that 3,000 additional units of the halogen light are expected to be sold during the remainder of the year at the normal product price determined under the product cost method. On September 5, Night Glow Inc. received an offer from Tokyo Lighting Inc. for 1,600 units of the halogen light at

$57 each. Tokyo Lighting Inc. will market the units in Japan under its own brand name, and no variable selling and administrative expenses associated with the sale will be incurred by Night Glow Inc. The additional business is not expected to affect the domestic sales of the halogen light, and the additional units could be produced using existing productive, selling, and administrative capacity.

a. Prepare a differential analysis of the proposed sale to Tokyo Lighting Inc.

b. Based on the differential analysis in part (a), should the proposal be accepted?

Make a Decision
Yield Pricing in Service Businesses

MAD 11-1 Analyze Pacific Airways — Obj. 4

Pacific Airways provides air travel services between Los Angeles and Seattle. Cost information per flight is as follows:

	Fixed Costs per Flight	Variable Costs per Passenger
Plane depreciation	$ 9,500	
Crew salaries	900	
Fuel	2,500	$18
Ground salaries	1,100	12
Airport fees	2,100	
Passenger services		10
Total	$16,100	$40

Each flight has a capacity of 150 seats, with an average of 125 seats sold per flight at an average ticket price of $180. Assume Pacific Airways is considering a new service that would provide tickets at half price. Passengers would need to fly standby to receive the discount, but would be provided a flight for a given day of travel. An analysis revealed that an average of 8 existing passengers would use the new discounted tickets for travel. In addition, 15 new passengers would be attracted to the offer.

a. Determine the contribution margin per passenger for the full-priced ticket.

b. Determine the break-even number of seats sold per flight.

c. Determine the contribution margin per passenger for discounted tickets.

d. Should Pacific Airways offer the discounted ticket plan? Answer the question by computing the incremental contribution margin per flight for the plan.

MAD 11-2 Analyze Cityscape Hotels — Obj. 4

Cityscape Hotels has 200 rooms available in a major metropolitan city. The hotel is able to attract business customers during the weekdays and leisure customers during the weekend. However, the leisure customers on weekends occupy fewer rooms than do business customers on weekdays. Thus, Cityscape plans to provide special weekend pricing to attract additional leisure customers. A hotel room is priced at $180 per room night. The cost of a hotel room night includes the following:

	Cost per Room Night (at normal occupancy)
Housekeeping service	$ 23
Utilities	7
Amenities	3
Hotel depreciation	55
Hotel staff (excluding housekeeping)	42
Total	$130

(Continued)

The special weekend price is proposed for $120 per room night. At this price, it is anticipated that average occupancy for the weekend (Friday, Saturday, and Sunday) will increase from 30% to 50% of available rooms.

a. What is the contribution margin for a room night under the normal pricing if only the hotel depreciation and hotel staff (excluding housekeeping) are assumed fixed for all occupancy levels?

b. Determine the contribution margin for a room night under the proposed weekend pricing.

c. Prepare a differential analysis showing the differential profit for an average weekend between the existing (Alternative 1) and discount (Alternative 2) price plans.

d. Should management accept the proposed weekend pricing plan? Explain.

MAD 11-3 Analyze Valley Power Company

Obj. 4

Valley Power Company uses natural gas to create steam to spin turbines to generate electricity. The costs of the power plant, including depreciation, taxes, and insurance, are fixed to generating electricity. The costs of operating personnel, maintenance, and fuel are variable to generating electricity. The fixed and variable costs are expressed in terms of costs per megawatt hour. A megawatt is 1 million watts generated per hour. A kilowatt is one thousand watts generated per hour. The fixed and variable costs per megawatt hour for Valley Power Company are:

Fixed cost per megawatt hour	$ 50
Variable cost per megawatt hour	80
Total cost per megawatt hour	$130

Valley Power Company runs gas turbines at 85% of capacity during the day and at 40% of capacity during the night. Daytime is considered peak demand time, while night is considered off-peak time. Industrial customers are charged $0.15 per kilowatt-hour, regardless of time of use. A new industrial customer is contracting for service from Valley Power. The new customer has the ability to move production to the night shift, and thereby shift electricity demand to the night hours. However, to accomplish this, the new customer expects a discounted price per kilowatt-hour.

a. Determine the operating income per megawatt hour for industrial customers.

b. Determine the contribution margin per megawatt hour for industrial customers.

c. What is the lowest price per kilowatt-hour that Valley Power could offer for off-peak power and maintain a positive contribution margin?

d. What are some other implications in offering a discounted off-peak price to the new customer?

MAD 11-4 Analyze Atlantis Cruise Lines

Obj. 4

Atlantis Cruise Lines offers luxury, one-week cruise packages in the Greek Aegean Sea. The ship has a capacity for 1,200 people. Atlantis averages 1,000 passengers per cruise. The price per passenger is $6,000. Costs associated with a cruise are as follows:

Variable costs per cruise:	
Crew to serve passengers	$1,200,000
Food	1,500,000
Amenity and excursion	400,000
Total variable cost per cruise	$3,100,000
Fixed costs per cruise:	
Crew to run ship	$1,500,000
Depreciation expense	120,000
Fuel	50,000
Total fixed cost per cruise	$1,670,000

Atlantis proposes an early booking program to help increase the number of passengers per cruise. Under the proposed early booking program, the first 300 passengers to book a cruise

will receive a $1,500 discount off the normal price for the cruise. Atlantis expects this program to increase the number of passengers from 1,000 to 1,180 per cruise. The proposed booking program will be launched with $15,000 of advertising per cruise.

a. Determine the operating income for a cruise.
b. Determine the variable cost per passenger for each variable cost item.
c. Determine the contribution margin per passenger.
d. Prepare a differential analysis showing the differential profit per cruise between the existing plan (Alternative 1) and the proposed early booking program (Alternative 2). Is the new booking program financially acceptable?

Take It Further

ETHICS

TIF 11-1 Competitor pricing strategy

Aaron McKinney is a cost accountant for Majik Systems Inc. Martin Dodd, Vice President of Marketing, has asked Aaron to meet with representatives of Majik Systems' major competitor to discuss product cost data. Martin indicates that the sharing of these data will enable Majik Systems to determine a fair and equitable price for its products.

Would it be ethical for Aaron to attend the meeting and share the relevant cost data? Explain your answer.

TEAM ACTIVITY REAL WORLD

TIF 11-2 Real-world company product costs

Product pricing and product costs vary significantly depending on company and industry. Three such companies, their industries, and an associated product are:

Company	Industry	Product
Delta Air Lines (DAL)	Air travel	Airline tickets
Amazon (AMZN)	Internet retailing	Various consumer products
HP Inc. (HPQ)	Computer manufacturer	Computers

In teams of three, assign each person in your group to one of the companies listed. Go to the company's website and determine the following:

a. A product (or service) description.
b. Based on your responses to part (a) along with the description of the company's business, identify the potential costs that are required to sell the product selected in part (a), and categorize them as fixed or variable.

COMMUNICATION

TIF 11-3 Setting a product price

The following conversation took place between Juanita Jackson, Vice President of Marketing, and Les Miles, Controller of Diamond Computer Company:

Juanita: I am really excited about our new computer coming out. I think it will be a real market success.

Les: I'm really glad you think so. I know that our success will be determined by our price. If our price is too high, our competitors will be the ones with the market success.

Juanita: Don't worry about it. We'll just mark our product cost up by 25%, and it will all work out. I know we'll make money at those markups. By the way, what does the estimated product cost look like?

(Continued)

Les: Well, there's the rub. The product cost looks as if it's going to come in at around $1,200. With a 25% markup, that will give us a selling price of $1,500.

Juanita: I see your concern. That's a little high. Our research indicates that computer prices are dropping and that this type of computer should be selling for around $1,250 when we release it to the market.

Les: I'm not sure what to do.

Juanita: Let me see if I can help. How much of the $1,200 is fixed cost?

Les: About $200.

Juanita: There you go. The fixed cost is sunk. We don't need to consider it in our pricing decision. If we reduce the product cost by $200, the new price with a 25% markup would be right at $1,250. Boy, I was really worried for a minute there. I knew something wasn't right.

Write a brief memo from Les Miles to Juanita Jackson (a) responding to her solution to the pricing problem, and (b) explaining how target costing could be used to solve the problem.

TIF 11-4 Decision on accepting additional business

A manager of Varden Sporting Goods Company is considering accepting an order from an overseas customer. This customer has requested an order for 20,000 dozen golf balls at a price of $22 per dozen. The variable cost to manufacture a dozen golf balls is $18 per dozen. The full cost is $25 per dozen. Varden has a normal selling price of $35 per dozen. Varden's plant has just enough excess capacity on the second shift to make the overseas order.

What are some considerations in accepting or rejecting this order?

TIF 11-5 Accepting service business at a special price

REAL WORLD

If you are not familiar with **Priceline.com Inc. (PCLN)**, check out its website. Assume that an individual "names a price" of $85 on Priceline.com for a room in Nashville, Tennessee, on August 22. Assume that August 22 is a Saturday with low expected room demand at a **Marriott International, Inc. (MAR)**, hotel in Nashville, so there is excess room capacity. The fully allocated cost per room per day is assumed from hotel records as follows:

Housekeeping labor cost*	$ 38
Hotel depreciation expense	43
Cost of room supplies (soap, paper, etc.)	8
Laundry labor and material cost*	10
Cost of desk staff	6
Utility cost (mostly air conditioning)	5
Total cost per room per day	$110

*Both housekeeping and laundry staff include many part-time workers so that the workload is variable to demand.

Should Marriott accept the customer's $85 bid? Why or why not?

TIF 11-6 Identifying product cost distortion

Peachtree Beverage Company manufactures soft drinks. Information about two products is as follows:

	Volume	Sales Price per Case	Gross Profit per Case
Jamaican Punch	10,000 cases	$30	$12
King Kola	800,000 cases	30	12

It is known that both products have the same direct materials and direct labor costs per case. Peachtree Beverage allocates factory overhead to products by using a single plant-wide factory

overhead rate, based on direct labor cost. Additional information about the two products is as follows:

Jamaican Punch: Requires extensive process preparation and sterilization prior to processing. The ingredients are from Jamaica, requiring complex import controls. The formulation is complex, and it is thus difficult to maintain quality. Finally, the product is produced in small production run sizes.

King Kola: Requires minor process preparation and sterilization prior to processing. The ingredients are acquired locally. The formulation is simple, and it is easy to maintain quality. Finally, the product is produced in large production run sizes.

Explain the weakness in the per-case product profitability report in light of the additional data.

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. In differential cost analysis, which one of the following **best** fits the description of a sunk cost?
   a. Direct materials required in the manufacture of a table
   b. Purchasing department costs incurred in acquiring material
   c. Cost of the forklift driver to move the material to the manufacturing floor
   d. Cost of a large crane used to move materials

2. Johnson Company manufactures a variety of shoes and has received a special one-time-only order directly from a wholesaler. Johnson has sufficient idle capacity to accept the special order to manufacture 15,000 pairs of sneakers at a price of $7.50 per pair. Johnson's normal selling price is $11.50 per pair of sneakers. Variable manufacturing costs are $5.00 per pair and fixed manufacturing costs are $3.00 per pair. Johnson's variable selling expense for its normal line of sneakers is $1.00 per pair. What would be the effect on Johnson's operating income if the company accepted the special order?
   a. Decrease by $60,000
   b. Increase by $22,500
   c. Increase by $37,500
   d. Increase by $52,500

3. Aril Industries is a multiproduct company that currently manufactures 30,000 units of Part 730 each month for use in production. The facilities now being used to produce Part 730 have fixed monthly overhead costs of $150,000 and a theoretical capacity to produce 60,000 units per month. If Aril were to buy Part 730 from an outside supplier, the facilities would be idle, and 40% of fixed costs would continue to be incurred. There are no alternative uses for the facilities. The variable production costs of Part 730 are $11 per unit. Fixed overhead is allocated based on planned production levels.

   If Aril Industries continues to use 30,000 units of Part 730 each month, it would realize a net benefit by purchasing Part 730 from an outside supplier only if the supplier's unit price is less than:
   a. $12.00.
   b. $12.50.
   c. $13.00.
   d. $14.00.

4. Oakes Inc. manufactured 40,000 gallons of Mononate and 60,000 gallons of Beracyl in a joint production process, incurring $250,000 of joint costs. Oakes allocates joint costs based on the physical volume of each product produced. Mononate and Beracyl can each be sold at the split-off point in a semifinished state or, alternatively, processed further. Additional data about the two products are as follows:

	Mononate	Beracyl
Sales price per gallon at split-off	$7	$15
Sales price per gallon if processed further	$10	$18
Variable production costs if processed further	$125,000	$115,000

An assistant in the company's cost accounting department was overheard saying "...that when both joint and separable costs are considered, the firm has no business processing either product beyond the split-off point. The extra revenue is simply not worth the effort." Which of the following strategies should be recommended for Oakes?

	Mononate	Beracyl
a.	Sell at split-off	Sell at split-off
b.	Sell at split-off	Process further
c.	Process further	Sell at split-off
d.	Process further	Process further

Pathways Challenge



This is Accounting!

Information/Consequences

Apple (APPL) compared the cost of buying the **Alphabet (GOOG)** mapping app against the cost of making its own mapping app. In addition, Apple considered the loss of sales to Alphabet's smartphones because of the lack of voice-directed, turn-by-turn navigation, which Alphabet would not provide to Apple. Finally, Apple considered the loss of sales that would occur if its own in-house iPhone app was of inferior quality.

By making its own app, Apple had access to location data collected from its iPhone users. These data would prove valuable for product marketing. Apple was also concerned about the growing popularity of Android phones. Apple was worried that its market share could drop significantly if Android phones had an important feature that Apple phones did not.

Suggested Answer

Chapter

12 Capital Investment Analysis

Principles

Chapter 1 *Introduction to Managerial Accounting*

Developing Information

COST SYSTEMS

Chapter 2 *Job Order Costing*
Chapter 3 *Process Costing*
Chapter 4 *Activity-Based Costing*

COST ALLOCATIONS

Chapter 5 *Support Departments*
Chapter 5 *Joint Costs*

Decision Making

PLANNING AND EVALUATING TOOLS

Chapter 6 *Cost-Volume-Profit Analysis*
Chapter 7 *Variable Costing*
Chapter 8 *Budgeting Systems*
Chapter 9 *Standard Costing and Variances*
Chapter 10 *Decentralized Operations*
Chapter 11 *Differential Analysis*

STRATEGIC TOOLS

Chapter 12 ***Capital Investment Analysis***
Chapter 13 *Lean Manufacturing*
Chapter 13 *Activity Analysis*
Chapter 14 *The Balanced Scorecard*
Chapter 14 *Corporate Social Responsibility*

Vail Resorts, Inc.

Why are you paying tuition, studying this text, and spending time and money on a higher education? Most people believe that the money and time spent now will return them more earnings in the future. That is, the cost of higher education is an investment in your future earning ability. How would you know if this investment is worth it?

One method would be for you to compare the cost of a higher education against the estimated increase in your future earning power. The bigger the difference between your expected future earnings and the cost of your education, the better the investment. A business also evaluates its investments in fixed assets by comparing the initial cost of the investment to its future earnings and cash flows.

For example, **Vail Resorts, Inc. (MTN)**, is one of the largest ski resort owner-operators in the world. It is known for its Vail, Breckenridge, and Keystone ski resorts, among others. A ski resort requires significant investments in property and equipment. Thus, Vail Resorts routinely makes major investments in new or improved amenities, lodging, retail, lifts, snowmaking and grooming equipment, and technology infrastructure. These investments are evaluated by their ability to enhance cash flows.

In this chapter, the methods used to make investment decisions, which may involve thousands, millions, or even billions of dollars, are described and illustrated. The similarities and differences among the most commonly used methods of evaluating investment proposals, as well as the benefits of each method, are emphasized. Factors that can complicate the analysis are also discussed.



STEVE BOICE/SHUTTERSTOCK.COM

Link to Vail Resorts . . . . . Pages 566, 568, 570, 575, 582, 583

What's Covered

Capital Investment Analysis

Capital Investments
- Nature (Obj. 1)
- Importance (Obj. 1)
- Evaluation Methods (Obj. 1)

Methods Not Using Present Values
- Average Rate of Return Method (Obj. 2)
- Cash Payback Method (Obj. 2)

Methods Using Present Values
- Present Value Concepts (Obj. 3)
- Net Present Value Method (Obj. 3)
- Internal Rate of Return Method (Obj. 3)

Additional Considerations
- Complicating Factors (Obj. 4)
- Capital Rationing (Obj. 5)

Learning Objectives

Obj. 1 Describe the nature and importance of capital investment analysis.

Obj. 2 Evaluate capital investment proposals, using the average rate of return and cash payback methods.

Obj. 3 Evaluate capital investment proposals, using the net present value and internal rate of return methods.

Obj. 4 Describe factors that complicate capital investment analysis.

Obj. 5 Describe and diagram the capital rationing process.

Analysis for Decision Making

Obj. 6 Describe and illustrate the use of sensitivity and expected value analyses in evaluating capital investment proposals.

Objective 1
Describe the nature and importance of capital investment analysis.

Nature of Capital Investment Analysis

Companies use capital investment analysis to evaluate long-term investments. **Capital investment analysis** (or *capital budgeting*) is the process by which management plans, evaluates, and controls investments in fixed assets. Capital investments use funds and affect operations for many years and must earn a reasonable rate of return. Thus, capital investment decisions are some of the most important decisions that management makes.

Capital investment evaluation methods can be grouped into the following categories:

Methods That Do Not Use Present Values

- Average rate of return method
- Cash payback method

Methods That Use Present Values

- Net present value method
- Internal rate of return method

The two methods that use present values consider the time value of money. The **time value of money concept** recognizes that a dollar today is worth more than a dollar tomorrow because today's dollar can earn interest.

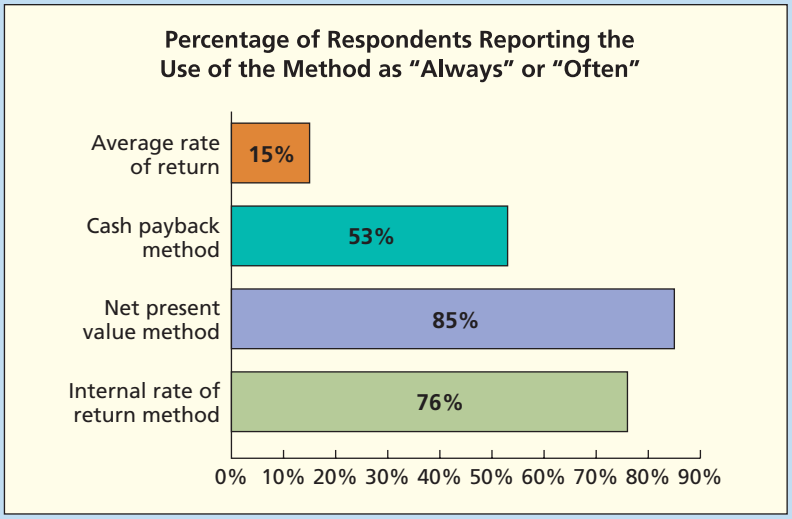
Link to Vail Resorts

In 2014, **Vail Resorts, Inc.**, purchased the Park City Mountain Resort and ski area in Park City, Utah, for $182.5 million.

Why It Matters CONCEPT CLIP

Business Use of Investment Analysis Methods

A survey of chief financial officers of large U.S. companies reported their use of the four investment methods as follows:



Source: Patricia A. Ryan and Glenn P. Ryan, "Capital Budgeting Practice of the Fortune 1000: How Have Things Changed?" *Journal of Business and Management* (Winter 2002).

Methods Not Using Present Values

Objective 2
Evaluate capital investment proposals, using the average rate of return and cash payback methods.

The methods not using present values are often useful in evaluating capital investment proposals that have relatively short useful lives. In such cases, the timing of the cash flows (the time value of money) is less important.

Because the methods not using present values are easy to use, they are often used to screen proposals. Minimum standards for accepting proposals are set, and proposals not meeting these standards are dropped. If a proposal meets the minimum standards, it may be subject to further analysis using the present value methods.

Average Rate of Return Method

The **average rate of return**, sometimes called the *accounting rate of return*, measures the average income as a percent of the average investment. The average rate of return is computed as follows:

$$\text{Average Rate of Return} = \frac{\text{Average Annual Income}}{\text{Average Investment}}$$

In the preceding equation, the numerator is the average of the annual income expected to be earned from the investment over its life, after deducting depreciation. The denominator is the average investment (book value) over the life of the investment. Assuming straight-line depreciation, the average investment is computed as follows:

$$\text{Average Investment} = \frac{\text{Initial Cost} + \text{Residual Value}}{2}$$

To illustrate, assume that management is evaluating the purchase of a new machine as follows:

Cost of new machine	$500,000
Residual value	0
Expected total income from machine	200,000
Expected useful life	4 years

The average annual income expected from the machine is $50,000 ($200,000 ÷ 4 years). The average investment is $250,000, computed as follows:

$$\text{Average Investment} = \frac{\text{Initial Cost} + \text{Residual Value}}{2} = \frac{\$500{,}000 + \$0}{2} = \$250{,}000$$

The average rate of return on the average investment is 20%, computed as follows:

$$\text{Average Rate of Return} = \frac{\text{Average Annual Income}}{\text{Average Investment}} = \frac{\$50{,}000}{\$250{,}000} = 20\%$$

The average rate of return of 20% should be compared to the minimum rate of return required by management. If the average rate of return equals or exceeds the minimum rate, the machine should be purchased or considered for further analysis.

Several capital investment proposals can be ranked by their average rates of return. The higher the average rate of return, the more desirable the proposal.

note:
The average rate of return method considers the amount of income earned over the life of a proposal.

The average rate of return has the following three advantages:

- It is easy to compute.
- It includes the entire amount of income earned over the life of the proposal.
- It emphasizes accounting income, which is often used by investors and creditors in evaluating management performance.

The average rate of return has the following two disadvantages:

- It does not directly consider the expected cash flows from the proposal.
- It does not directly consider the timing of the expected cash flows.

Link to Vail Resorts

Vail Resorts' average rate of return on its property, plant, and equipment is slightly more than 10%.

Cash Payback Method

A capital investment uses cash and must return cash in the future to be successful. The expected period of time between the date of an investment and the recovery in cash of the amount invested is the **cash payback period**.

When annual net cash inflows are equal, the cash payback period is computed as follows:

$$\text{Cash Payback Period} = \frac{\text{Initial Cost}}{\text{Annual Net Cash Inflow}}$$

To illustrate, assume that management is evaluating the purchase of the following new machine:

Cost of new machine	$200,000
Cash revenues from machine per year	50,000
Expenses of machine per year, including depreciation	30,000
Depreciation per year	20,000

To simplify, the revenues and expenses other than depreciation are assumed to be in cash. Hence, the net cash inflow per year from use of the machine is as follows:

Net cash flow per year:	
Cash revenues from machine	$ 50,000
Cash expenses of machine	(10,000)*
Net cash inflow per year	$ 40,000
*Expenses of machine, including depreciation	$ 30,000
Depreciation expense	(20,000)
Cash expenses of machine	$ 10,000

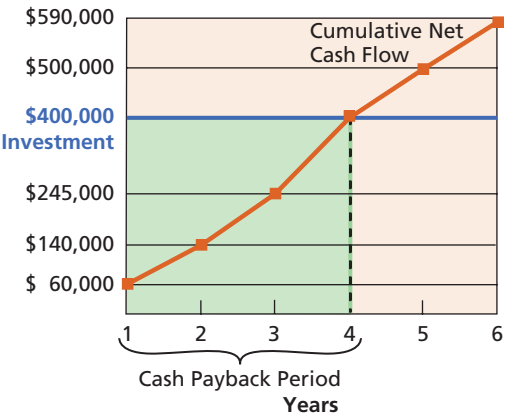
The time required for the net cash flow to equal the cost of the new machine is the payback period. Thus, the cash payback period for the investment is five years, computed as follows:

$$\text{Cash Payback Period} = \frac{\text{Initial Cost}}{\text{Annual Net Cash Inflow}} = \frac{\$200{,}000}{\$40{,}000} = 5 \text{ years}$$

In the preceding illustration, the annual net cash inflows are equal ($40,000 per year). When the annual net cash inflows are not equal, the cash payback period is determined by adding the annual net cash inflows until the cumulative total equals the initial cost of the proposed investment.

To illustrate, assume that a proposed investment has an initial cost of $400,000. The annual and cumulative net cash inflows over the proposal's six-year life are as follows:

Year	Net Cash Flow	Cumulative Net Cash Flow
1	$ 60,000	$ 60,000
2	80,000	140,000
3	105,000	245,000
4	155,000	400,000
5	100,000	500,000
6	90,000	590,000



The cumulative net cash flow at the end of Year 4 equals the initial cost of the investment, $400,000. Thus, the payback period is four years.

If the initial cost of the proposed investment had been $450,000, the cash payback period would occur during Year 5. Because $100,000 of net cash flow is expected during Year 5, the additional $50,000 to increase the cumulative total to $450,000 occurs halfway through the year ($50,000 ÷ $100,000). Thus, the cash payback period would be 4½ years.[1]

A short cash payback period is desirable. This is because the sooner cash is recovered, the sooner it can be reinvested in other projects. In addition, there is less chance of losses from changing economic or business conditions. A short cash payback period is also desirable for quickly repaying any debt used to purchase the investment.

The cash payback method has the following two advantages:

- It is simple to use and understand.
- It analyzes cash flows.

The cash payback method has the following two disadvantages:

- It ignores cash flows occurring after the payback period.
- It does not use present value concepts in valuing cash flows occurring in different periods.

[1] Unless otherwise stated, net cash inflows are received uniformly throughout the year.

Link to Vail Resorts

The ski operations are seasonal in nature and typically run from mid-November to mid-April. To increase cash flows, **Vail Resorts** promotes nonski activities in the summer months, including sightseeing, mountain biking, and zip tours.

Check Up Corner 12-1 Capital Investment Analysis Not Using Present Value

Tyme Manufacturing Inc. is evaluating a capital investment proposal for a new machine. The new machine has a cost of $230,000, an expected useful life of six years, and a residual value of $20,000. Information on expected annual revenues and expenses associated with the machine is as follows:

Revenue from machine	$125,000
Expenses of machine, other than depreciation	75,000
Depreciation expense	35,000

All revenues and expenses are in cash, except for depreciation expense. Determine the following:

a. The average rate of return, and
b. The cash payback period.

Solution:

	Average Annual	
	Income	**Cash Flow**
Cash revenues from machine	$125,000	$125,000
Cash expenses from machine	(75,000)	(75,000)
Depreciation expense	(35,000)	
Average annual income	$ 15,000	
Net cash inflow per year		$ 50,000

Depreciation is not included in determining cash flow because it is a noncash expense.

a. Average Rate of Return:

$$\text{Average Investment} = \frac{\text{Initial Cost} + \text{Residual Value}}{2} = \frac{\$230{,}000 + \$20{,}000}{2} = \$125{,}000$$

$$\text{Average Rate of Return} = \frac{\text{Average Annual Income}}{\text{Average Investment}} = \frac{\$15{,}000}{\$125{,}000} = 12\%$$

b. Cash Payback Period:

$$\text{Cash Payback Period} = \frac{\text{Initial Cost}}{\text{Annual Net Cash Inflow}} = \frac{\$230{,}000}{\$50{,}000} = 4.6 \text{ years}$$

Check Up Corner

Objective 3
Evaluate capital investment proposals, using the net present value and internal rate of return methods.

Methods Using Present Values

An investment in fixed assets may be viewed as purchasing a series of net cash flows over a period of time. The timing of when the net cash flows will be received is important in determining the value of a proposed investment.

Present value methods use the amount and timing of the net cash flows in evaluating an investment. The two methods of evaluating capital investments using present values are as follows:

- Net present value method
- Internal rate of return method

Present Value Concepts

Both the net present value and the internal rate of return methods use the following two **present value concepts**:

- Present value of an amount
- Present value of an annuity

Present Value of an Amount If you were given the choice, would you prefer to receive $1 now or $1 three years from now? You should prefer to receive $1 now, because you could invest the $1 and earn interest for three years. As a result, the amount you would have after three years would be greater than $1.

To illustrate, assume that you have $1 to invest as follows:

Amount to be invested	$1
Period to be invested	3 years
Interest rate	12%

After one year, the $1 earns interest of $0.12 ($1 × 12%) and, thus, will grow to $1.12 ($1 × 1.12). In the second year, the $1.12 earns 12% interest of $0.134 ($1.12 × 12%) and, thus, will grow to $1.254 ($1.12 × 1.12) by the end of the second year. This process of interest earning interest is called *compounding*. By the end of the third year, your $1 investment will grow to $1.404 as shown in Exhibit 1.

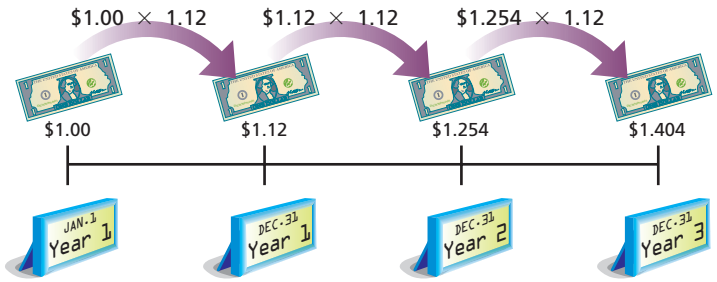


Exhibit 1
Compound Amount of $1 for Three Periods at 12%

On January 1, Year 1, what is the present value of $1.404 to be received on December 31, Year 3? This is a present value question. The answer can be determined with the aid of a present value of $1 table. For example, the partial table in Exhibit 2 indicates that the present value of $1 to be received in three years with earnings compounded at the rate of 12% per year is 0.712.[2]

Present Value of $1 at Compound Interest

Year	6%	10%	12%	15%	20%
1	0.943	0.909	0.893	0.870	0.833
2	0.890	0.826	0.797	0.756	0.694
3	0.840	0.751	0.712	0.658	0.579
4	0.792	0.683	0.636	0.572	0.482
5	0.747	0.621	0.567	0.497	0.402
6	0.705	0.564	0.507	0.432	0.335
7	0.665	0.513	0.452	0.376	0.279
8	0.627	0.467	0.404	0.327	0.233
9	0.592	0.424	0.361	0.284	0.194
10	0.558	0.386	0.322	0.247	0.162

Exhibit 2
Partial Present Value of $1 Table

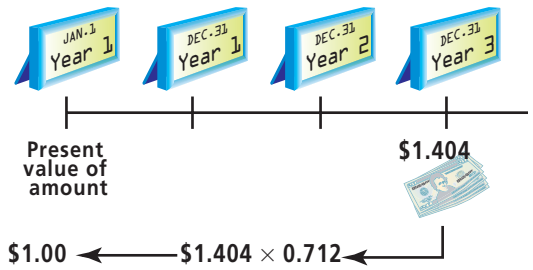
[2] The present value factors in the table are rounded to three decimal places. More complete tables of present values are in Appendix A.

Multiplying 0.712 by $1.404 yields $1 as follows:

Present Value		Amount to Be Received in 3 Years		Present Value Factor for $1 to Be Received in 3 Years (from Exhibit 2)
$1	=	$1.404	×	0.712

That is, the present value of $1.404 to be received in three years using a compound interest rate of 12% is $1, as shown in Exhibit 3.[3]

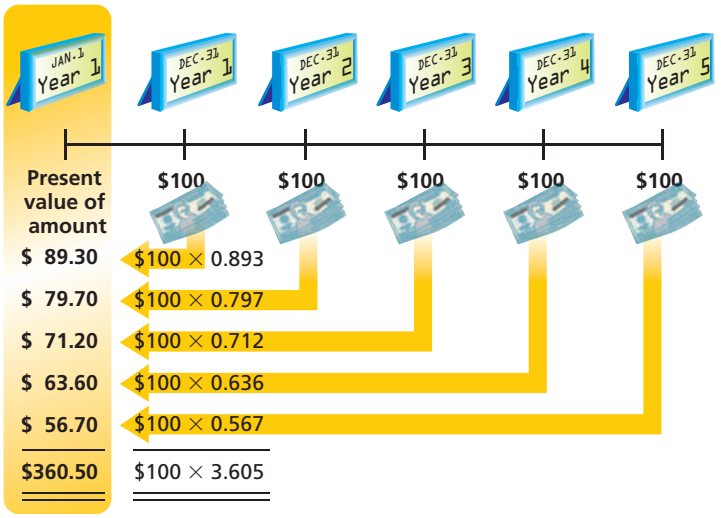
Exhibit 3
Present Value of an Amount of $1.404



Present Value of an Annuity An **annuity** is a series of equal net cash flows at fixed time intervals. Annuities are very common in business. Cash payments for monthly rent, salaries, and bond interest are all examples of annuities. The **present value of an annuity** is the amount of cash needed today to yield a series of equal net cash flows at fixed time intervals in the future.

To illustrate, the present value of a $100 annuity for five periods at 12% could be determined by using the present value factors in Exhibit 2. Each $100 net cash flow could be multiplied by the present value of $1 at a 12% factor for the appropriate period and summed to determine a present value of $360.50, as shown in Exhibit 4.

Exhibit 4
Present Value of a $100 Amount for Five Consecutive Periods



Using a present value of an annuity table is a simpler approach. Exhibit 5 is a partial table of present value annuity factors.[4]

[3] The present value of an amount can also be determined using a present value formula as shown in the online appendix "Computing Present Values."
[4] The present value factors in the table are rounded to three decimal places. More complete tables of present values are in Appendix A.

Exhibit 5
Partial Present Value of an Annuity Table

Present Value of an Annuity of $1 at Compound Interest					
Year	**6%**	**10%**	**12%**	**15%**	**20%**
1	0.943	0.909	0.893	0.870	0.833
2	1.833	1.736	1.690	1.626	1.528
3	2.673	2.487	2.402	2.283	2.106
4	3.465	3.170	3.037	2.855	2.589
5	4.212	3.791	3.605	3.353	2.991
6	4.917	4.355	4.111	3.785	3.326
7	5.582	4.868	4.564	4.160	3.605
8	6.210	5.335	4.968	4.487	3.837
9	6.802	5.759	5.328	4.772	4.031
10	7.360	6.145	5.650	5.019	4.192

The present value factors in the table shown in Exhibit 5 are the sum of the present value of $1 factors in Exhibit 2 for the number of annuity periods. Thus, 3.605 in the annuity table (Exhibit 5) is the sum of the five present value of $1 factors at 12% from Exhibit 2, computed as follows:

	Present Value Factor for $1 (Exhibit 2)
Present value factor for $1 for 1 year @12%	0.893
Present value factor for $1 for 2 years @12%	0.797
Present value factor for $1 for 3 years @12%	0.712
Present value factor for $1 for 4 years @12%	0.636
Present value factor for $1 for 5 years @12%	0.567
Present value factor for an annuity of $1 for 5 years (from Exhibit 5)	3.605

Multiplying $100 by 3.605 yields $360.50 as follows:

Present Value		**Amount to Be Received Annually for 5 Years**		**Present Value Factor for an Annuity of $1 to Be Received for 5 Years (Exhibit 5)**
$360.50	=	$100	×	3.605

Thus, $360.50 is the same amount that was determined in the preceding illustration by five successive multiplications.[5]

Net Present Value Method and Index

The net present value method and present value index are often used in combination, as we illustrate in this section.

Net Present Value Method

The **net present value method** compares the amount to be invested with the present value of the net cash inflows. It is sometimes called the *discounted cash flow method*.

The interest rate (return) used in net present value analysis is the company's minimum desired rate of return. This rate, sometimes termed the *hurdle rate*, is based on such factors as the purpose of the investment and the cost of obtaining funds for the investment. If the present value of the cash inflows equals or exceeds the amount to be invested, the proposal is desirable.

[5] The present value of an annuity can also be determined using a present value formula as shown in the online appendix "Computing Present Values."

note:
The net present value method compares an investment's initial cash outflow with the present value of its cash inflows.

To illustrate, assume the following data for a proposed investment in new equipment:

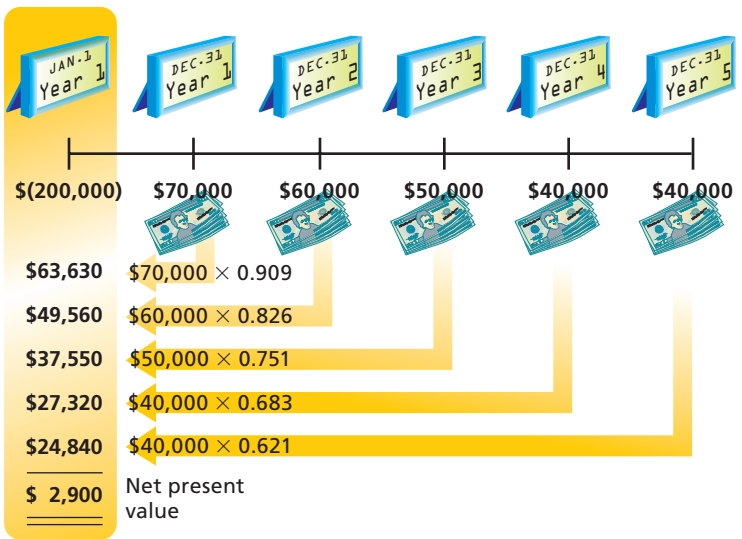
Cost of new equipment	$200,000
Expected useful life	5 years
Minimum desired rate of return	10%
Expected cash flows to be received each year:	
Year 1	$ 70,000
Year 2	60,000
Year 3	50,000
Year 4	40,000
Year 5	40,000
Total expected cash flows	$260,000

The present value of the net cash flow for each year is computed by multiplying the net cash flow for the year by the present value factor of $1 for that year, as follows:

Year	Present Value of $1 at 10%	×	Net Cash Flow	=	Present Value of Net Cash Flow
1	0.909		$ 70,000		$ 63,630
2	0.826		60,000		49,560
3	0.751		50,000		37,550
4	0.683		40,000		27,320
5	0.621		40,000		24,840
Total			$260,000		$ 202,900
Amount to be invested					(200,000)
Net present value					$ 2,900

The preceding computations are also graphically illustrated in Exhibit 6.

Exhibit 6
Present Value of Equipment Cash Flows



The net present value of $2,900 indicates that the purchase of the new equipment is expected to recover the investment and provide more than the minimum rate of return of 10%. Thus, the purchase of the new equipment is desirable.

The net present value method has the following three advantages:

- It considers the cash flows of the investment.
- It considers the time value of money.
- It can rank projects with equal lives, using the present value index.

The net present value method has the following two disadvantages:

- It has more complex computations than methods that don't use present value.
- It assumes the cash flows can be reinvested at the minimum desired rate of return, which may not be valid.

Vail Resorts uses present values in determining the value of assets and liabilities acquired in business acquisitions.

Source: Vail Resorts, Inc., *Form 10-K for the Fiscal Year Ended July 31, 2015*.

Link to Vail Resorts

Present Value Index When capital investment funds are limited and the proposals involve different investments, a ranking of the proposals can be prepared by using a present value index. The **present value index** is computed as follows:

$$\text{Present Value Index} = \frac{\text{Total Present Value of Net Cash Flow}}{\text{Amount to Be Invested}}$$

The present value index for the investment in the preceding illustration is 1.0145, computed as follows:

$$\text{Present Value Index} = \frac{\$202{,}900}{\$200{,}000} = 1.0145$$

Assume that a company is considering three proposals. The net present value and the present value index for each proposal are as follows:

	Proposal A	Proposal B	Proposal C
Total present value of net cash flow	$ 107,000	$ 86,400	$ 86,400
Amount to be invested	(100,000)	(80,000)	(90,000)
Net present value	$ 7,000	$ 6,400	$ (3,600)
Present value index:			
Proposal A ($107,000 ÷ $100,000)	1.07		
Proposal B ($86,400 ÷ $80,000)		1.08	
Proposal C ($86,400 ÷ $90,000)			0.96

Pathways Challenge



This is Accounting!

Economic Activity

In 2014, **Vail Resorts, Inc. (MTN)**, purchased Park City Mountain Resort for $182.5 million. Vail also announced that it would invest another $115 million for resort upgrades, which included $50 million to link the Park City Mountain Resort to Vail's neighboring Canyons Resort. This would create one of the largest ski resorts in the United States, with over 7,000 acres of skiable terrain.

Interestingly, the opportunity to purchase the Park City Mountain Resort arose because the previous owners missed the deadline to renew their 20-year lease of the property by two days. The unexpected option to purchase the resort led top management to engage in capital budgeting analyses to see if the massive expenditures necessary for the purchase and upgrade of the Park City Mountain Resort would pay off.

Critical Thinking/Judgment

What estimates would be needed for Vail to perform a net present value analysis of whether to buy the Park City Mountain Resort?
What uncertainties would Vail have to consider about these estimates?
What metrics are available to external stakeholders for use in assessing Vail's capital budgeting decisions?

Suggested answer at end of chapter.

Source: http://news.vailresorts.com/corporate/vail-resorts-investment-improvements-2015.htm.

A project will have a present value index greater than 1 when the net present value is positive. This is the case for Proposals A and B. When the net present value is negative, the present value index will be less than 1, as is the case for Proposal C.

Although Proposal A has the largest net present value, the present value indexes indicate that it is not as desirable as Proposal B. That is, Proposal B returns $1.08 present value per dollar invested, whereas Proposal A returns only $1.07. Proposal B requires an investment of $80,000, compared to an investment of $100,000 for Proposal A. The possible use of the $20,000 difference between Proposals A and B investments should also be considered before making a final decision.

Internal Rate of Return Method

The **internal rate of return (IRR) method** uses present value concepts to compute the rate of return from a capital investment proposal based on its expected net cash flows. This method, sometimes called the *time-adjusted rate of return method*, starts with the proposal's net cash flows and works backward to estimate the proposal's expected rate of return.

To illustrate, assume that management is evaluating the following proposal to purchase new equipment:

Cost of new equipment	$33,530
Yearly expected cash flows to be received	$10,000
Expected life	5 years
Minimum desired rate of return	12%

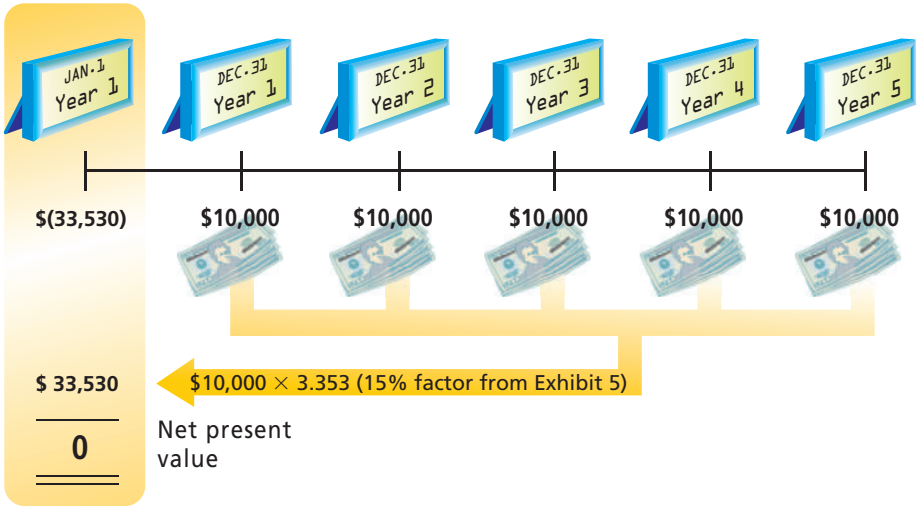
The present value of the net cash flows, using the present value of an annuity table in Exhibit 5, is $2,520, as shown in Exhibit 7.

Exhibit 7
Net Present Value Analysis at 12%

Annual net cash flow (at the end of each of five years)	$ 10,000
Present value factor for an annuity of $1 at 12% for five years (Exhibit 5)	× 3.605
Present value of annual net cash flows	$ 36,050
Amount to be invested	(33,530)
Net present value	$ 2,520

In Exhibit 7, the $36,050 present value of the cash inflows, based on a 12% rate of return, is greater than the $33,530 to be invested. Thus, the internal rate of return must be greater than 12%. Through trial and error, the rate of return equating the $33,530 cost of the investment with the present value of the net cash flows can be determined to be 15%, as shown in Exhibit 8.

Exhibit 8
Present Value of an Annuity at the Internal Rate of Return Rate



When equal annual net cash flows are expected from a proposal, as in the preceding example, the internal rate of return can be determined as follows:[6]

- Step 1. Determine a present value factor for an annuity of $1 as follows:

$$\text{Present Value Factor for an Annuity of \$1} = \frac{\text{Amount to Be Invested}}{\text{Equal Annual Net Cash Flows}}$$

- Step 2. Locate the present value factor determined in Step 1 in the present value of an annuity of $1 table (Exhibit 5) as follows:
  - A. Locate the number of years of expected useful life of the investment in the Year column.
  - B. Proceed horizontally across the table until you find the present value factor computed in Step 1.
- Step 3. Identify the internal rate of return by the heading of the column in which the present value factor in Step 2 is located.

To illustrate, assume that management is evaluating the following proposal to purchase new equipment:

Cost of new equipment	$97,360
Yearly expected cash flows to be received	$20,000
Expected useful life	7 years

The present value factor for an annuity of $1 is 4.868, computed as follows:

$$\text{Present Value Factor for an Annuity of \$1} = \frac{\text{Amount to Be Invested}}{\text{Equal Annual Net Cash Flows}}$$

$$= \frac{\$97,360}{\$20,000} = 4.868$$

Using the partial present value of an annuity of $1 table shown in Exhibit 9 and a period of seven years, the factor 4.868 is related to 10%. Thus, the internal rate of return for this proposal is 10%.

Exhibit 9
Partial Present Value of an Annuity Table

Present Value of an Annuity of $1 at Compound Interest

Year	6%	10% (Step 3)	12%
1	0.943	0.909	0.893
2	1.833	1.736	1.690
3	2.673	2.487	2.402
4	3.465	3.170	3.037
5	4.212	3.791	3.605
6	4.917	Step 2(b) 4.355	4.111
Step 2(a) 7	5.582	4.868	4.564
8	6.210	5.335	4.968
9	6.802	5.759	5.328
10	7.360	6.145	5.650

Step 1: Determine present value factor for an annuity of $1 $= \frac{\$97,360}{\$20,000} = 4.868$

If the minimum acceptable rate of return is 10%, then the proposal is considered acceptable. Several proposals can be ranked by their internal rates of return. The proposal with the highest rate is the most desirable.

The internal rate of return method has the following three advantages:

- It considers the cash flows of the investment.
- It considers the time value of money.
- It ranks proposals based upon the cash flows over their complete useful life, even if the project lives are not the same.

[6] To simplify, equal annual net cash flows are assumed. If the net cash flows are not equal, spreadsheet software can be used to determine the rate of return.

The internal rate of return method has the following two disadvantages:

- It has complex computations, requiring a computer if the periodic cash flows are not equal.
- It assumes the cash received from a proposal can be reinvested at the internal rate of return, which may not be valid.

Check Up Corner 12-2 Net Present Value and Internal Rate of Return Analyses

The management of Broncial Industries Inc. is considering a capital investment project. The net cash flows expected from the project are $50,000 a year for seven years. The project requires an investment of $243,400, and no residual value is expected.

Determine:

a. The net present value for the project, using a minimum rate of return of 6% and the present value of an annuity table appearing in this chapter (Exhibit 5).

b. The present value index. Round to two decimal places.

c. The internal rate of return for the project by (1) computing a present value factor for an annuity of $1 and (2) using the present value of an annuity table appearing in this chapter (Exhibit 5).

Solution:

a. & b.

	Net Present Value	Present Value Index
Annual net cash flows	$ 50,000	$ 50,000
Present value factor for an annuity of $1 at 6% for 7 periods	× 5.582	× 5.582
Total present value of net cash flows	$ 279,100	$279,100
Amount to be invested	(243,400)	÷243,400
a. Net present value	$ 35,700	
b. Present value index		1.15 (rounded)

The project has a positive net present value, which is also indicated by the present value index, which is greater than 1.00.

c. $$\text{Present Value Factor for an Annuity of \$1} = \frac{\text{Amount to Be Invested}}{\text{Equal Annual Net Cash Flows}}$$

$$= \frac{\$243,400}{\$50,000} = 4.868$$

Internal rate of return = 10%

The internal rate of return is the rate of return that equates the present value of equal annual net cash flows to the amount to be invested.

Present Value of an Annuity of $1 at Compound Interest

Year	6%	10%	12%	15%	20%
1	0.943	0.909	0.893	0.870	0.833
2	1.833	1.736	1.690	1.626	1.528
3	2.673	2.487	2.402	2.283	2.106
4	3.465	3.170	3.037	2.855	2.589
5	4.212	3.791	3.605	3.353	2.991
6	4.917	4.355	4.111	3.785	3.326
7	5.582	4.868	4.564	4.160	3.605
8	6.210	5.335	4.968	4.487	3.837
9	6.802	5.759	5.328	4.772	4.031
10	7.360	6.145	5.650	5.019	4.192

Check Up Corner

Why It Matters

Panera Bread Store Rate of Return

Panera Bread (PNRA) owns, operates, and franchises bakery-cafes throughout the United States. A recent annual report to the Securities and Exchange Commission (SEC Form 10-K) allowed the following information to be determined about an average company-owned store:

Operating profit	$ 441,000
Depreciation	171,000
Investment book value	1,300,000

Assume that the operating profit and depreciation will remain unchanged for the next 15 years. Assume operating profit plus depreciation approximates annual net cash flows and that the investment residual value will be zero. The average rate of return on a company-owned store is:

$$\frac{\$441,000}{\$1,300,000 \div 2} = 68\%$$

The internal rate of return is computed by first determining the present factor for an annuity of $1:

$$\text{Present Value Factor for an Annuity of \$1} = \frac{\$1,300,000}{\$441,000 + \$171,000} = 2.12$$

For a period of five years, this factor implies an internal rate of return of more than 20% (from Exhibit 5). However, if we more realistically assumed these cash flows for 15 years, Panera's company-owned stores generate an estimated internal rate of return of over 40% (from a spreadsheet calculation). Clearly, both investment evaluation methods indicate a highly successful business.

Source: Panera Bread, *Form 10-K for the Fiscal Year Ended December 27, 2016.*

Factors That Complicate Capital Investment Analysis

Objective 4
Describe factors that complicate capital investment analysis.

Four widely used methods of evaluating capital investment proposals have been described and illustrated in this chapter. In practice, additional factors such as the following may impact capital investment decisions:

- Income tax
- Proposals with unequal lives
- Leasing versus purchasing
- Uncertainty
- Changes in price levels
- Qualitative factors

Income Tax

The impact of income taxes on capital investment decisions can be material. For example, in determining depreciation for federal income tax purposes, useful lives that are much shorter than the actual useful lives are often used. Also, depreciation for tax purposes often differs from depreciation for financial statement purposes. As a result, the timing of the cash flows for income taxes can have a significant impact on capital investment analysis.[7]

Unequal Proposal Lives

The prior capital investment illustrations assumed that the alternative proposals had the same useful lives. In practice, however, proposals often have different lives.

To illustrate, assume that a company is considering purchasing a new truck or a new computer network. The data for each proposal follow:

	Truck	Computer Network
Cost	$100,000	$100,000
Minimum desired rate of return	10%	10%
Expected useful life	8 years	5 years

[7] The impact of taxes on capital investment analysis is covered in advanced accounting textbooks.

Yearly expected cash flows to be received:		
Year 1	$ 30,000	$ 30,000
Year 2	30,000	30,000
Year 3	25,000	30,000
Year 4	20,000	30,000
Year 5	15,000	35,000
Year 6	15,000	0
Year 7	10,000	0
Year 8	10,000	0
Total	$155,000	$155,000

The expected cash flows and net present value for each proposal are shown in Exhibit 10. Because of the unequal useful lives, however, the net present values in Exhibit 10 are not comparable.

To make the proposals comparable, the useful lives are adjusted to end at the same time. In this illustration, this is done by assuming that the truck will be sold at the end of five years. The selling price (residual value) of the truck at the end of five years is estimated and included in the cash inflows. Both proposals will then cover five years; thus, the net present value analyses will be comparable.

Exhibit 10 Net Present Value Analysis—Unequal Lives of Proposals

	A	B	C	D
1	Truck			
2		Present	Net	Present
3		Value of	Cash	Value of
4	Year	$1 at 10%	Flow	Net Cash Flow
5	1	0.909	$ 30,000	$ 27,270
6	2	0.826	30,000	24,780
7	3	0.751	25,000	18,775
8	4	0.683	20,000	13,660
9	5	0.621	15,000	9,315
10	6	0.564	15,000	8,460
11	7	0.513	10,000	5,130
12	8	0.467	10,000	4,670
13	Total		$155,000	$ 112,060
14				
15	Amount to be invested			(100,000)
16	Net present value			$ 12,060
17				

	A	B	C	D
1	Computer Network			
2		Present	Net	Present
3		Value of	Cash	Value of
4	Year	$1 at 10%	Flow	Net Cash Flow
5	1	0.909	$ 30,000	$ 27,270
6	2	0.826	30,000	24,780
7	3	0.751	30,000	22,530
8	4	0.683	30,000	20,490
9	5	0.621	35,000	21,735
10	Total		$155,000	$ 116,805
11				
12	Amount to be invested			(100,000)
13	Net present value			$ 16,805
14				

Cannot be compared (unequal lives)

Exhibit 11
Net Present Value Analysis—Equalized Lives of Proposals

	A	B	C	D
1	Truck—Revised to 5-Year Life			
2		Present	Net	Present
3		Value of	Cash	Value of
4	Year	$1 at 10%	Flow	Net Cash Flow
5	1	0.909	$ 30,000	$ 27,270
6	2	0.826	30,000	24,780
7	3	0.751	25,000	18,775
8	4	0.683	20,000	13,660
9	5	0.621	15,000	9,315
10	5 (Residual value)	0.621	40,000	24,840
11	Total		$160,000	$ 118,640
12				
13	Amount to be invested			(100,000)
14	Net present value			$ 18,640
15				

Truck Net Present Value Greater than Computer Network Net Present Value by $1,835

Compared (equal lives)

To illustrate, assume that the truck's estimated selling price (residual value) at the end of Year 5 is $40,000. Exhibit 11 shows the truck's revised present value analysis assuming a five-year life.

As shown in Exhibit 11, the net present value for the truck exceeds the net present value for the computer network by $1,835 ($18,640 – $16,805). Thus, the truck is the more attractive of the two proposals.

Check Up Corner 12-3 Net Present Value—Unequal Lives

Acme Company is evaluating two projects with unequal lives. Project 1 requires an original investment of $50,000. The project will yield cash flows of $12,000 per year for five years. Project 1 could be sold at the end of five years for a price of $30,000. Project 2 has a net present value of $8,900 over a five-year life.

a. Determine the net present value of Project 1 over a five-year life, with residual value, assuming a minimum rate of return of 12%.

b. Which project provides the greater net present value?

Solution:

a.

Present value of $12,000 per year at 12% for 5 years	$ 43,260	← [$12,000 × 3.605 (Exhibit 5, 12%, 5 years)]
Present value of $30,000 at 12% at the end of 5 years	17,010	← [$30,000 × 0.567 (Exhibit 2, 12%, 5 years)]
Total present value of Project 1	$ 60,270	
Total cost of Project 1	(50,000)	
Net present value of Project 1	$ 10,270	

b. **Project 1.** Project 1 has a net present value of $10,270, which is greater than the net present value of Project 2, $8,900.

Check Up Corner

Lease Versus Capital Investment

Leasing fixed assets is common in many industries. For example, hospitals often lease medical equipment. Some advantages of leasing a fixed asset include the following:

- The company has use of the fixed asset without spending large amounts of cash to purchase the asset.
- The company eliminates the risk of owning an obsolete asset.
- The company may deduct the annual lease payments for income tax purposes.

A disadvantage of leasing a fixed asset is that it is normally more costly than purchasing the asset. This is because the lessor (owner of the asset) includes in the rental price not only the costs of owning the asset, but also a profit.

The methods of evaluating capital investment proposals illustrated in this chapter can also be used to decide whether to lease or purchase a fixed asset.

Uncertainty

All capital investment analyses rely on factors that are uncertain. For example, estimates of revenues, expenses, and cash flows are uncertain. This is especially true for long-term capital investments. Errors in one or more of the estimates could lead to incorrect decisions. Methods that consider the impact of uncertainty on capital investment analysis are discussed in the Analysis for Decision Making section of this chapter.

Link to Vail Resorts A variety of factors add uncertainty to **Vail Resorts**' operations, including the effects of weather, gas and oil prices, economic conditions, and natural disasters such as forest fires and earthquakes.

Changes in Price Levels

Price levels normally change as the economy improves or deteriorates. General price levels often increase in a rapidly growing economy, which is called **inflation**. During such periods, the rate of return on an investment should exceed the rising price level. If this is not the case, the cash returned on the investment will be less than expected.

Link to Vail Resorts Some of **Vail Resorts**' rental (lease) agreements include increases for inflation that are linked to the Consumer Price Index (CPI).

Price levels may also change for foreign investments. This occurs as currency exchange rates change. **Currency exchange rates** are the rates at which currency in another country can be exchanged for U.S. dollars.

If the amount of local dollars that can be exchanged for one U.S. dollar increases, then the local currency is said to be weakening to the dollar. When a company has an investment in another country where the local currency is weakening, the return on the investment, as expressed in U.S. dollars, is adversely impacted. This is because the expected amount of local currency returned on the investment would purchase fewer U.S. dollars.[8]

Link to Vail Resorts In a recent financial statement, **Vail Resorts** reported a negative foreign currency adjustment of $(132) million.

Why It Matters

If You Build It, They Will Come

A business model describes how an organization delivers products or services to make a profit. Many service companies use what is termed a *network business model*. A network business model connects people and businesses with each other or to a centralized service. Examples of network service businesses include telecommunication, transportation, power and natural gas distribution, cable, satellite, and Internet companies. Network businesses often require significant investment in physical assets in order to create the network. Often, this is described as a *Field of Dreams strategy* (from the movie of that name) because the network can only generate revenue once it is largely built. For example, a cell phone company draws value from having many cell towers linking many callers together. A critical mass of cell towers must be pre-built in order to establish the business. This is risky. As a result, network businesses carefully evaluate capital investments prior to building networks.

[8] Further discussion on accounting for foreign currency transactions is available on the companion website at www.cengagebrain.com.

Qualitative Considerations

Some benefits of capital investments are qualitative in nature and cannot be estimated in dollar terms. However, if a company does not consider qualitative considerations, an acceptable investment proposal could be rejected.

Some examples of qualitative considerations that may influence capital investment analysis include the investment proposal's impact on the following:

- Product quality
- Manufacturing flexibility
- Employee morale
- Manufacturing productivity
- Market (strategic) opportunities

Many qualitative factors may be as important as, if not more important than, quantitative factors.

The mission of **Vail Resorts** is to provide exceptional guest experiences at each of its resorts.

Source: Vail Resorts, Inc., *Form 10-K for the Fiscal Year Ended July 31, 2015*.

Link to Vail Resorts



Ethics: Don't Do It!

Assumption Fudging

The results of any capital budgeting analysis depend on many subjective estimates, such as the cash flows, discount rate, time period, and total investment amount. The results of the analysis should be used to either support or reject a project. Capital budgeting should not be used to justify an assumed net present value. That is, the analyst should not work backwards, filling in assumed numbers that will produce the desired net present value. Such a reverse approach reduces the credibility of the entire process.

Capital Rationing

Objective 5
Describe and diagram the capital rationing process.

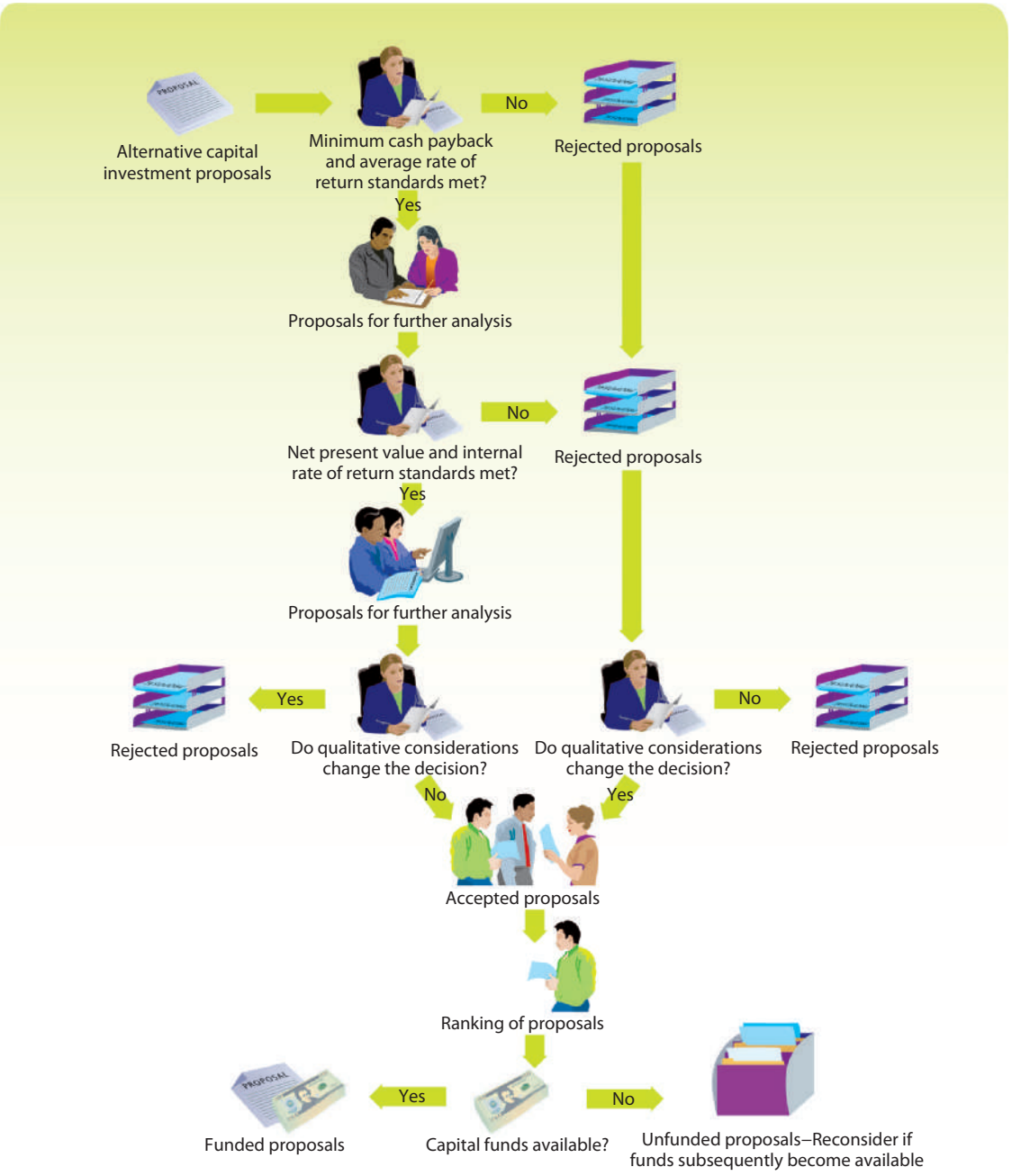
Capital rationing is the process by which management allocates funds among competing capital investment proposals. In this process, management often uses a combination of the methods described in this chapter.

Exhibit 12 illustrates the capital rationing decision process. Alternative proposals are initially screened by establishing minimum standards, using the cash payback and the average rate of return methods. The proposals that survive this screening are further analyzed, using the net present value and internal rate of return methods.

Qualitative factors related to each proposal should also be considered throughout the capital rationing process. For example, new equipment might improve the quality of the product and, thus, increase consumer satisfaction and sales.

At the end of the capital rationing process, accepted proposals are ranked and compared with the funds available. Proposals that are selected for funding are included in the capital expenditures budget. Unfunded proposals may be reconsidered if funds later become available.

Exhibit 12
Capital Rationing Decision Process



Analysis for Decision Making

Objective 6
Describe and illustrate the use of sensitivity and expected value analyses in evaluating capital investment proposals.

Uncertainty: Sensitivity and Expected Value Analyses

One of the complicating factors of capital investment analyses is the uncertainty related to estimating revenues, expenses, and cash flows. This is especially true for long-term capital investments where changes in one or more of the estimates can significantly impact operating income. Two managerial accounting tools useful in considering the uncertainty of estimates are sensitivity analysis and expected value analysis.

Sensitivity Analysis

Sensitivity analysis considers the impact of changing one or more inputs or assumptions on the resulting answer (output) of an analysis. In capital investment analysis, the inputs are normally estimated revenues, expenses, cash flows, useful life, desired rate of return, and residual value of the investment. The initial cost of an investment is normally known, but in some cases, it may also be estimated. For example, an investment may include estimated construction costs.

To illustrate, assume that Bryant Inc. is considering an investment in equipment based upon the following estimates:

Cost of equipment	$2,500,000
Residual value	100,000
Annual net cash inflows	600,000
Useful life	8 years
Desired rate of return	15%

Based upon the preceding data, the net present value of the equipment is computed as follows:

Present value of annual net cash flows ($600,000 × 4.487*)	$ 2,692,200
Present value of residual value ($100,000 × 0.327**)	32,700
Total present value	$ 2,724,900
Amount to be invested	(2,500,000)
Net present value	$ 224,900

*Present value factor of an annuity of $1 at 15% for eight years (Exhibit 5)
**Present value factor of $1 at 15% for eight years (Exhibit 2)

The positive net present value of $224,900 indicates that the investment in the equipment is justified. Assume, however, that there is uncertainty concerning the estimated annual net cash flows, which could be as low as $400,000 per year. As a result, management requests a sensitivity analysis assuming annual net cash flows of $400,000, $500,000, and $600,000. The resulting sensitivity analysis of the net present values of the equipment is as follows:

	Estimated Annual Net Cash Flow		
	$400,000	**$500,000**	**$600,000**
Present value of annual net cash flows (× 4.487)	$ 1,794,800	$ 2,243,500	$ 2,692,200
Present value of residual value	32,700	32,700	32,700
Total present value	$ 1,827,500	$ 2,276,200	$ 2,724,900
Amount to be invested	(2,500,000)	(2,500,000)	(2,500,000)
Net present value	$ (672,500)	$ (223,800)	$ 224,900

The preceding sensitivity analysis indicates that investment in the equipment is not justified if the annual net cash flow is $400,000 or $500,000.

The annual net cash flow necessary to generate a positive net present value can be computed as follows:

(Annual Net Cash Flow × 4.487) + $32,700 – $2,500,000 = 0
Annual Net Cash Flow × 4.487 = $2,500,000 – $32,700
Annual Net Cash Flow × 4.487 = $2,467,300
Annual Net Cash Flow = $2,467,300 ÷ 4.487
Annual Net Cash Flow = $549,877

Annual net cash flows greater than $549,877 will generate a positive net present value. Likewise, assuming annual net cash flows of $600,000, the minimum number of years of useful life necessary to generate a positive net present value can also be determined.

(*Continued*)

Expected Value Analysis

In sensitivity analysis, inputs such as the annual net cash flows, useful life, or residual values are changed to determine the effects on the output (net present value). **Expected value analysis** assigns likelihoods (probabilities) to various inputs, thus incorporating uncertainty directly into the output (answer).

To illustrate, Bryant Inc.'s decision on whether to invest in equipment is used. Specifically, assume that Bryant has assigned the following likelihoods (probabilities) to the possible annual net cash flow:

Annual Net Cash Flow	Probability of Occurring
$600,000	0.70
500,000	0.20
400,000	0.10
	1.00

The **expected value** of the annual net cash flows is determined by multiplying each of the possible annual net cash flows by its probability of occurring, as follows:

Annual Net Cash Flow	×	Probability of Occurring	=	Expected Value
$600,000		0.70		$420,000
500,000		0.20		100,000
400,000		0.10		40,000
Total		1.00		$560,000

The expected value of the annual net cash flows of $560,000 is used to determine the expected net present value of the equipment of $45,420, as follows:

Present value of annual net cash flows ($560,000 × 4.487*)	$ 2,512,720
Present value of residual value ($100,000 × 0.327**)	32,700
Total present value	$ 2,545,420
Amount to be invested	(2,500,000)
Net present value	$ 45,420

*Present value factor of an annuity of $1 at 15% for eight years (Exhibit 5)

**Present value factor of $1 at 15% for eight years (Exhibit 2)

The positive expected net present value of $45,420 justifies investing in the equipment.

By assigning probabilities to the various outcomes, uncertainty is directly incorporated into the analysis. However, the "actual" annual net cash flows will likely differ from the "estimated" annual net cash flows or the "expected value" of the annual net cash flows. In other words, because future events are being estimated, uncertainty cannot be totally eliminated.

Make a Decision Uncertainty: Sensitivity and Expected Value Analyses

Sensitivity analysis: San Lucas Corporation (MAD 12-1)

Expected value analysis: San Lucas Corporation (MAD 12-2)

Sensitivity analysis: Boulder Creek Industries (MAD 12-3)

Expected value analysis: Boulder Creek Industries (MAD 12-4)

Sensitivity analysis: Home Garden Inc. (MAD 12-5)

Expected value analysis: Home Garden Inc. (MAD 12-6)

Make a Decision

Let's Review

Chapter Summary

1. Capital investment analysis is the process by which management plans, evaluates, and controls investments involving fixed assets. Capital investment analysis is important to a business because such investments affect profitability for a long period of time.
2. The average rate of return method measures the expected profitability of an investment in fixed assets. The expected period of time that will pass between the date of an investment and the complete recovery in cash (or equivalent) of the amount invested is the cash payback period.
3. The net present value method computes the net present value of the cash inflows expected from a proposal and compares the result to the amount to be invested. The internal rate of return method uses present values to compute the rate of return from the net cash flows expected from capital investment proposals.
4. Factors that may complicate capital investment analysis include the impact of income tax, unequal lives of alternative proposals, leasing, uncertainty, changes in price levels, and qualitative considerations.
5. Capital rationing refers to the process by which management allocates available investment funds among competing capital investment proposals. A diagram of the capital rationing process appears in Exhibit 12.
6. One of the complicating factors of capital investment analysis is the uncertainty related to estimating revenues, expenses, and cash flows. Sensitivity analysis considers the impact of changing one or more inputs or assumptions on the resulting answer (output) of the analysis. Expected value analysis assigns likelihoods (probabilities) to various inputs, thus incorporating uncertainty directly into the analysis.

Key Terms

annuity (572)
average rate of return (567)
capital investment analysis (566)
capital rationing (583)
cash payback period (568)
currency exchange rate (582)
expected value (586)
expected value analysis (586)
inflation (582)
internal rate of return (IRR) method (576)
net present value method (573)
present value concepts (571)
present value index (575)
present value of an annuity (572)
sensitivity analysis (585)
time value of money concept (566)

Practice

Multiple-Choice Questions

1. Methods of evaluating capital investment proposals that ignore present value include:
   a. average rate of return.
   b. cash payback.
   c. both a and b.
   d. neither a nor b.
2. Management is considering a $100,000 investment in a project with a five-year life and no residual value. If the total income from the project is expected to be $60,000 and straight-line depreciation is used, the average rate of return is:
   a. 12%.
   b. 24%.
   c. 60%.
   d. 75%.

3. The expected period of time that will elapse between the date of a capital investment and the complete recovery of the amount of cash invested is called the:
   a. average rate of return period.
   b. cash payback period.
   c. net present value period.
   d. internal rate of return period.

4. A project that will cost $120,000 is estimated to generate cash flows of $25,000 per year for eight years. What is the net present value of the project, assuming an 11% required rate of return? (Use the present value tables provided in Appendix A.)
   a. $(38,214)
   b. $8,653
   c. $55,180
   d. $75,000

5. A project is estimated to generate cash flows of $40,000 per year for 10 years. The cost of the project is $226,009. What is the internal rate of return for this project?
   a. 8%
   b. 10%
   c. 12%
   d. 14%

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Average rate of return — Obj. 2

Determine the average rate of return for a project that is estimated to yield total income of $170,000 over five years, has a cost of $320,000, and has a $20,000 residual value.

2. Cash payback period — Obj. 2

A project has estimated annual net cash flows of $118,600. It is estimated to cost $616,720. Determine the cash payback period. Round to one decimal place.

3. Net present value — Obj. 3

A project has estimated annual net cash flows of $6,800 for five years and is estimated to cost $23,125. Assume a minimum acceptable rate of return of 12%. Using the present value of an annuity table appearing in Exhibit 5 of this chapter, determine (1) the net present value of the project and (2) the present value index, rounded to two decimal places.

4. Internal rate of return — Obj. 3

A project is estimated to cost $104,328 and provide annual net cash flows of $21,000 for eight years. Determine the internal rate of return for this project, using the present value of an annuity table appearing in Exhibit 5 of this chapter.

5. Net present value—unequal lives — Obj. 4

Project A requires an original investment of $32,600. The project will yield cash flows of $7,000 per year for nine years. Project B has a computed net present value of $3,500 over a six-year life. Project A could be sold at the end of six years for a price of $15,000. (a) Using the present value tables in Exhibits 2 and 5, determine the net present value of Project A over a six-year life, with residual value, assuming a minimum rate of return of 12%. (b) Which project provides the greatest net present value?

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

The capital investment committee of Hopewell Company is currently considering two investments. The estimated operating income and net cash flows expected from each investment are as follows:

	Truck		Equipment	
Year	Operating Income	Net Cash Flow	Operating Income	Net Cash Flow
1	$ 6,000	$ 22,000	$13,000	$ 29,000
2	9,000	25,000	10,000	26,000
3	10,000	26,000	8,000	24,000
4	8,000	24,000	8,000	24,000
5	11,000	27,000	3,000	19,000
	$44,000	$124,000	$42,000	$122,000

Each investment requires $80,000. Straight-line depreciation will be used, and no residual value is expected. The committee has selected a rate of 15% for purposes of the net present value analysis.

Instructions

1. Compute the following:
   a. The average rate of return for each investment.
   b. The net present value for each investment. Use the present value table appearing in Exhibit 2 of this chapter.
2. Why is the net present value of the equipment greater than the truck, even though its average rate of return is less?
3. Prepare a summary for the capital investment committee, advising it on the relative merits of the two investments.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **c** Methods of evaluating capital investment proposals that ignore the time value of money include the average rate of return method (answer a) and the cash payback method (answer b).

2. **b** The average rate of return is 24% (answer b), determined by dividing the expected average annual earnings by the average investment, as follows:

$$\frac{\$60{,}000 \div 5}{(\$100{,}000 + \$0) \div 2} = 24\%$$

3. **b** Of the four methods of analyzing proposals for capital investments, the cash payback period (answer b) refers to the expected period of time required to recover the amount of cash to be invested. The average rate of return (answer a) is a measure of the anticipated profitability of a proposal. The net present value method (answer c) reduces the expected future net cash flows originating from a proposal to their present values. The internal rate of return method (answer d) uses present value concepts to compute the rate of return from the net cash flows expected from the investment.

4. **b** The net present value is determined as follows:

Present value of $25,000 for 8 years at 11% ($25,000 × 5.14612)	$ 128,653
Project cost	(120,000)
Net present value	$ 8,653

5. **c** The internal rate of return for this project is determined by solving for the present value of an annuity factor that when multiplied by $40,000 will equal $226,009. By division, the factor is:

$$\frac{\$226{,}009}{\$40{,}000} = 5.65022$$

In Appendix A in the present value of annuity table, scan along the n = 10 years row until finding the 5.65022 factor. The column for this factor is 12%.

Exercises

1. Estimate average annual income — $34,000 ($170,000 ÷ 5 years)
   Average investment — $170,000 [($320,000 + $20,000) ÷ 2]
   Average rate of return — 20% ($34,000 ÷ $170,000)
2. 5.2 years ($616,720 ÷ $118,600)
3. a. $1,389 [($6,800 × 3.605) – $23,125]
   b. 1.06 ($24,514 ÷ $23,125)
4. 12% [($104,328 ÷ $21,000) = 4.968, the present value of an annuity factor for eight periods at 12%, from Exhibit 5]
5. a.

Present value of $7,000 per year at 12% for 6 years*	$ 28,777
Present value of $15,000 at 12% at the end of 6 years**	7,605
Total present value of Project A	$ 36,382
Total cost of Project A	(32,600)
Net present value of Project A	$ 3,782

*[$7,000 × 4.111 (Exhibit 5, 12%, 6 years)]
**[$15,000 × 0.507 (Exhibit 2, 12%, 6 years)]

   b. Project A. Project A's net present value of $3,782 is more than the net present value of Project B, $3,500.

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1. a. Average rate of return for the truck:

$$\frac{\$44{,}000 \div 5}{(\$80{,}000 + \$0) \div 2} = 22\%$$

Average rate of return for the equipment:

$$\frac{\$42{,}000 \div 5}{(\$80{,}000 + \$0) \div 2} = 21\%$$

b. Net present value analysis:

Year	Present Value Factor for $1 at 15%	Net Cash Flow		Present Value of Net Cash Flow	
		Truck	Equipment	Truck	Equipment
1	0.870	$ 22,000	$ 29,000	$ 19,140	$ 25,230
2	0.756	25,000	26,000	18,900	19,656
3	0.658	26,000	24,000	17,108	15,792
4	0.572	24,000	24,000	13,728	13,728
5	0.497	27,000	19,000	13,419	9,443
Total		$124,000	$122,000	$ 82,295	$ 83,849
Amount to be invested				(80,000)	(80,000)
Net present value				$ 2,295	$ 3,849

2. The equipment has a lower average rate of return than the truck because the equipment's total operating income for the five years is $42,000, which is $2,000 less than the truck's. Even so, the net present value of the equipment is greater than that of the truck because the equipment has higher cash flows in the early years.
3. Both investments exceed the selected rate established for the net present value analysis. The truck has a higher average rate of return, but the equipment offers a larger net present value. Thus, if only one of the two investments can be accepted, the equipment would be the more attractive.

Discussion Questions

1. What are the principal objections to the use of the average rate of return method in evaluating capital investment proposals?
2. Discuss the principal limitations of the cash payback method for evaluating capital investment proposals.
3. Why would the average rate of return differ from the internal rate of return on the same project?
4. Your boss has suggested that a one-year payback period is the same as a 100% average rate of return. Do you agree?
5. Why would the cash payback method understate the attractiveness of a project with a large residual value?
6. Why would the use of the cash payback period for analyzing the financial performance of theatrical releases from a motion picture production studio be supported over the net present value method?
7. A net present value analysis used to evaluate a proposed equipment acquisition indicated a $7,900 net present value. What is the meaning of the $7,900 as it relates to the desirability of the proposal?
8. Two projects have an identical net present value of $9,000. Are both projects equal in desirability?
9. What are the major disadvantages of the use of the net present value method of analyzing capital investment proposals?
10. What are the major disadvantages of the use of the internal rate of return method of analyzing capital investment proposals?
11. What are the major advantages of leasing a fixed asset rather than purchasing it?
12. Give an example of a qualitative factor that should be considered in a capital investment analysis related to acquiring automated factory equipment.

Basic Exercises



BE 12-1 Average rate of return **Obj. 2**

Determine the average rate of return for a project that is estimated to yield total income of $936,000 over eight years, has a cost of $1,200,000, and has a $100,000 residual value.



BE 12-2 Cash payback period **Obj. 2**

A project has estimated annual net cash flows of $42,500. It is estimated to cost $374,000. Determine the cash payback period. Round to one decimal place.



BE 12-3 Net present value **Obj. 3**

A project has estimated annual net cash flows of $80,000 for seven years and is estimated to cost $325,000. Assume a minimum acceptable rate of return of 6%. Using the present value of an annuity table appearing in Exhibit 5 of this chapter, determine (a) the net present value of the project and (b) the present value index, rounded to two decimal places.



BE 12-4 Internal rate of return **Obj. 3**

A project is estimated to cost $463,565 and provide annual net cash flows of $115,000 for nine years. Determine the internal rate of return for this project, using the present value of an annuity table appearing in Exhibit 5 of this chapter.



BE 12-5 Net present value—unequal lives **Obj. 4**

Project 1 requires an original investment of $125,000. The project will yield cash flows of $50,000 per year for 10 years. Project 2 has a computed net present value of $135,000 over an eight-year life. Project 1 could be sold at the end of eight years for a price of $8,000. (a) Using the present value tables in Exhibits 2 and 5, determine the net present value of Project 1 over an eight-year life, with residual value, assuming a minimum rate of return of 12%. (b) Which project provides the greatest net present value?

Exercises

EX 12-1 Average rate of return **Obj. 2**

✔ Project A, 16%



The following data are accumulated by Watershed Inc. in evaluating two competing capital investment proposals:

	Project A	Project Z
Amount of investment	$55,000	$50,000
Useful life	12 years	15 years
Estimated residual value	$5,000	$6,000
Estimated total income over the useful life	$57,600	$63,000

Determine the expected average rate of return for each project.

EX 12-2 Average rate of return—cost savings **Obj. 2**

Maui Fabricators Inc. is considering an investment in equipment that will replace direct labor. The equipment has a cost of $125,000 with a $15,000 residual value and an eight-year life. The equipment will replace one employee who has an average wage of $28,000 per year. In addition, the equipment will have operating and energy costs of $5,150 per year.

Determine the average rate of return on the equipment, giving effect to straight-line depreciation on the investment.

EX 12-3 Average rate of return—new product

Obj. 2

✔ Average annual income, $800,000



SHOW ME HOW

Hana Inc. is considering an investment in new equipment that will be used to manufacture a smartphone. The phone is expected to generate additional annual sales of 10,000 units at $300 per unit. The equipment has a cost of $4,500,000, residual value of $500,000, and a 10-year life. The equipment can only be used to manufacture the phone. The cost to manufacture the phone follows:

Cost per unit:	
Direct labor	$ 18.00
Direct materials	90.00
Factory overhead (including depreciation)	112.00
Total cost per unit	$220.00

Determine the average rate of return on the equipment.

EX 12-4 Determine cash flows

Obj. 2

✔ Year 1: $(65,700)



SHOW ME HOW

Natural Foods Inc. is planning to invest in new manufacturing equipment to make a new garden tool. The new garden tool is expected to generate additional annual sales of 5,000 units at $18 each. The new manufacturing equipment will cost $120,000 and is expected to have a 10-year life and a $17,000 residual value. Selling expenses related to the new product are expected to be 3% of sales revenue. The cost to manufacture the product includes the following on a per-unit basis:

Direct labor	$2.50
Direct materials	3.20
Fixed factory overhead—depreciation	2.40
Variable factory overhead	0.90
Total	$ 9.00

Determine the net cash flows for the first year of the project, Years 2–9, and for the last year of the project.

EX 12-5 Cash payback period for a service company

Obj. 2

✔ Location 1: 6.5 years



SHOW ME HOW

Jane's Clothing Inc. is evaluating two capital investment proposals for a retail outlet, each requiring an investment of $975,000 and each with a seven-year life and expected total net cash flows of $1,050,000. Location 1 is expected to provide equal annual net cash flows of $150,000, and Location 2 is expected to have the following unequal annual net cash flows:

Year 1	$275,000	Year 5	$120,000
Year 2	225,000	Year 6	40,000
Year 3	180,000	Year 7	35,000
Year 4	175,000		

Determine the cash payback period for both location proposals.

EX 12-6 Cash payback method

Obj. 2



EXCEL TEMPLATE

Lily Products Company is considering an investment in one of two new product lines. The investment required for either product line is $540,000. The net cash flows associated with each product are as follows:

Year	Liquid Soap	Body Lotion
1	$170,000	$ 90,000
2	150,000	90,000
3	120,000	90,000
4	100,000	90,000
5	70,000	90,000
6	40,000	90,000
7	40,000	90,000
8	30,000	90,000
Total	$720,000	$720,000

(*Continued*)

a. Recommend a product offering to Lily Products Company, based on the cash payback period for each product line.

b. Why is one product line preferred over the other, even though they both have the same total net cash flows through eight periods?

EX 12-7 Net present value method — Obj. 3

✔ a. NPV, $24,520



The following data are accumulated by Geddes Company in evaluating the purchase of $150,000 of equipment, having a four-year useful life:

	Net Income	Net Cash Flow
Year 1	$42,500	$80,000
Year 2	27,500	65,000
Year 3	12,500	50,000
Year 4	2,500	40,000

a. Assuming that the desired rate of return is 15%, determine the net present value for the proposal. Use the present value table appearing in Exhibit 2 of this chapter.

b. Would management be likely to look with favor on the proposal? Explain.

EX 12-8 Net present value method for a service company — Obj. 3

✔ a. 20Y1, $19,000

Coast-to-Coast Inc. is considering the purchase of an additional delivery vehicle for $70,000 on January 1, 20Y1. The truck is expected to have a five-year life with an expected residual value of $15,000 at the end of five years. The expected additional revenues from the added delivery capacity are anticipated to be $65,000 per year for each of the next five years. A driver will cost $40,000 in 20Y1, with an expected annual salary increase of $2,000 for each year thereafter. The annual operating costs for the truck are estimated to be $6,000 per year.

a. Determine the expected annual net cash flows from the delivery truck investment for 20Y1–20Y5.

b. Compute the net present value of the investment, assuming that the minimum desired rate of return is 12%. Use the present value table appearing in Exhibit 2 of this chapter.

c. Is the additional truck a good investment based on your analysis? Explain.

EX 12-9 Net present value method—annuity for a service company — Obj. 3

✔ a. $9 million



Amenity Hotels Inc. is considering the construction of a new hotel for $50 million. The expected life of the hotel is 25 years, with no residual value. The hotel is expected to earn revenues of $30 million per year. Total expenses, including depreciation, are expected to be $23 million per year. Amenity Hotels' management has set a minimum acceptable rate of return of 14%.

a. Determine the equal annual net cash flows from operating the hotel.

b. Compute the net present value of the new hotel, using the present value of an annuity table found in Appendix A. Round to the nearest million dollars.

c. Does your analysis support construction of the new hotel? Explain.

EX 12-10 Net present value method—annuity — Obj. 3

✔ a. $37,500

Jones Excavation Company is planning an investment of $125,000 for a bulldozer. The bulldozer is expected to operate for 1,000 hours per year for five years. Customers will be charged $90 per hour for bulldozer work. The bulldozer operator costs $30 per hour in wages and benefits. The bulldozer is expected to require annual maintenance costing $7,500. The bulldozer uses fuel that is expected to cost $15 per hour of bulldozer operation.

a. Determine the equal annual net cash flows from operating the bulldozer.

b. Determine the net present value of the investment, assuming that the desired rate of return is 10%. Use the present value of an annuity table appearing in Exhibit 5 of this chapter. Round to the nearest dollar.

c. Should Jones invest in the bulldozer, based on this analysis? Explain.

d. Determine the number of operating hours such that the present value of cash flows equals the amount to be invested. Round all calculations to whole numbers.

EX 12-11 Net present value method for a service company — Obj. 3

✔ a. $130,320,000


REAL WORLD

Carnival (CCL) has recently placed into service some of the largest cruise ships in the world. One of these ships, the *Carnival Breeze*, can hold up to 3,600 passengers, which can cost $750 million to build. Assume the following additional information:

- There will be 340 cruise days per year operated at a full capacity of 3,600 passengers.
- The variable expenses per passenger are estimated to be $100 per cruise day.
- The revenue per passenger is expected to be $280 per cruise day.
- The fixed expenses for running the ship, other than depreciation, are estimated to be $90,000,000 per year.
- The ship has a service life of 10 years, with a residual value of $60,000,000 at the end of 10 years.

a. Determine the annual net cash flow from operating the cruise ship.

b. Determine the net present value of this investment, assuming a 12% minimum rate of return. Use the present value tables appearing in Exhibits 2 and 5 of this chapter in determining your answer.

EX 12-12 Present value index — Obj. 3

✔ a. Des Moines, 0.95

Tasty Doughnuts has computed the net present value for capital expenditure at two locations. Relevant data related to the computation are as follows:

	Des Moines	Cedar Rapids
Total present value of net cash flow	$ 712,500	$ 848,000
Amount to be invested	(750,000)	(800,000)
Net present value	$ (37,500)	$ 48,000

a. Determine the present value index for each proposal.

b. Which location does your analysis support? Explain.

EX 12-13 Net present value method and present value index — Obj. 3

✔ b. Packing machine, 1.55

Diamond & Turf Inc. is considering an investment in one of two machines. The sewing machine will increase productivity from sewing 150 baseballs per hour to sewing 290 per hour. The contribution margin per unit is $0.32 per baseball. Assume that any increased production of baseballs can be sold. The second machine is an automatic packing machine for the golf ball line. The packing machine will reduce packing labor cost. The labor cost saved is equivalent to $21 per hour. The sewing machine will cost $260,000, have an eight-year life, and will operate for 1,800 hours per year. The packing machine will cost $85,000, have an eight-year life, and will operate for 1,400 hours per year. Diamond & Turf seeks a minimum rate of return of 15% on its investments.

a. Determine the net present value for the two machines. Use the present value of an annuity table appearing in Exhibit 5 of this chapter. Round to the nearest dollar.

b. Determine the present value index for the two machines. Round to two decimal places.

c. If Diamond & Turf has sufficient funds for only one of the machines and qualitative factors are equal between the two machines, in which machine should it invest? Explain.

EX 12-14 Average rate of return, cash payback period, net present value method for a service company — Obj. 2, 3

✔ b. 4 years


SHOW ME HOW

Spanish Peaks Railroad Inc. is considering acquiring equipment at a cost of $1,250,000. The equipment has an estimated life of eight years and no residual value. It is expected to provide yearly net cash flows of $312,500. The company's minimum desired rate of return for net present value analysis is 12%.

Compute the following:

a. The average rate of return, giving effect to straight-line depreciation on the investment.

b. The cash payback period.

c. The net present value. Use the present value of an annuity table appearing in Exhibit 5 of this chapter.

EX 12-15 Cash payback period, net present value analysis, and qualitative considerations

Obj. 2, 3, 4

✔ a. 4 years

The plant manager of Shenzhen Electronics Company is considering the purchase of new automated assembly equipment. The new equipment will cost $1,400,000. The manager believes that the new investment will result in direct labor savings of $350,000 per year for 10 years.

a. What is the payback period on this project?

b. What is the net present value, assuming a 10% rate of return? Use the present value of an annuity table appearing in Exhibit 5 of this chapter.

c. What else should the manager consider in the analysis?

EX 12-16 Internal rate of return method

Obj. 3

✔ a. 3.785



The internal rate of return method is used by Testerman Construction Co. in analyzing a capital expenditure proposal that involves an investment of $113,550 and annual net cash flows of $30,000 for each of the six years of its useful life.

a. Determine a present value factor for an annuity of $1, which can be used in determining the internal rate of return.

b. Using the factor determined in part (a) and the present value of an annuity table appearing in Exhibit 5 of this chapter, determine the internal rate of return for the proposal.

EX 12-17 Internal rate of return method for a service company

Obj. 3, 4



Vail Resorts, Inc. (MTN), announced a $415 million expansion of lodging properties, ski lifts, and terrain in Park City, Utah. Assume that this investment is estimated to produce $99 million in equal annual cash flows for each of the first 10 years of the project life.

a. Determine the expected internal rate of return of this project for 10 years, using the present value of an annuity table appearing in Exhibit 5 of this chapter.

b. What are some uncertainties that could reduce the internal rate of return of this project?

EX 12-18 Internal rate of return method—two projects

Obj. 3

✔ a. Delivery truck, 15%

Munch N' Crunch Snack Company is considering two possible investments: a delivery truck or a bagging machine. The delivery truck would cost $43,056 and could be used to deliver an additional 95,000 bags of pretzels per year. Each bag of pretzels can be sold for a contribution margin of $0.45. The delivery truck operating expenses, excluding depreciation, are $1.35 per mile for 24,000 miles per year. The bagging machine would replace an old bagging machine, and its net investment cost would be $61,614. The new machine would require three fewer hours of direct labor per day. Direct labor is $18 per hour. There are 250 operating days in the year. Both the truck and the bagging machine are estimated to have seven-year lives. The minimum rate of return is 13%. However, Munch N' Crunch has funds to invest in only one of the projects.

a. Compute the internal rate of return for each investment. Use the present value of an annuity table appearing in Exhibit 5 of this chapter.

b. Provide a memo to management, with a recommendation.

EX 12-19 Net present value method and internal rate of return method for a service company

Obj. 3

✔ a. ($12,845)

Buckeye Healthcare Corp. is proposing to spend $186,725 on an eight-year project that has estimated net cash flows of $35,000 for each of the eight years.

a. Compute the net present value, using a rate of return of 12%. Use the present value of an annuity table appearing in Exhibit 5 of this chapter.

b. Based on the analysis prepared in part (a), is the internal rate of return (1) more than 12%, (2) 12%, or (3) less than 12%? Explain.

c. Determine the internal rate of return by computing a present value factor for an annuity of $1 and using the present value of an annuity table appearing in Exhibit 5 of this chapter.

EX 12-20 Identify error in capital investment analysis calculations

Obj. 3

Artscape Inc. is considering the purchase of automated machinery that is expected to have a useful life of five years and no residual value. The average rate of return on the average investment has been computed to be 20%, and the cash payback period was computed to be 5.5 years.

Do you see any reason to question the validity of the data presented? Explain.

EX 12-21 Net present value—unequal lives

Obj. 3, 4

✔ Net present value, processing mill, $196,220



EXCEL TEMPLATE

Bunker Hill Mining Company has two competing proposals: a processing mill and an electric shovel. Both pieces of equipment have an initial investment of $750,000. The net cash flows estimated for the two proposals are as follows:

	Net Cash Flow	
Year	Processing Mill	Electric Shovel
1	$310,000	$330,000
2	260,000	325,000
3	260,000	325,000
4	260,000	320,000
5	180,000	
6	130,000	
7	120,000	
8	120,000	

The estimated residual value of the processing mill at the end of Year 4 is $280,000.

Determine which equipment should be favored, comparing the net present values of the two proposals and assuming a minimum rate of return of 15%. Use the present value table appearing in Exhibit 2 of this chapter.

EX 12-22 Net present value—unequal lives

Obj. 3, 4

✔ Net present value, blending equipment, $6,344

Daisy's Creamery Inc. is considering one of two investment options. Option 1 is a $75,000 investment in new blending equipment that is expected to produce equal annual cash flows of $19,000 for each of seven years. Option 2 is a $90,000 investment in a new computer system that is expected to produce equal annual cash flows of $27,000 for each of five years. The residual value of the blending equipment at the end of the fifth year is estimated to be $15,000. The computer system has no expected residual value at the end of the fifth year.

Assume there is sufficient capital to fund only one of the projects. Determine which project should be selected, computing the (a) net present values and (b) present value indexes of the two projects. Assume a minimum rate of return of 10%. Round the present value index to two decimal places. Use the present value tables appearing in Exhibits 2 and 5 of this chapter.

Problems: Series A

PR 12-1A Average rate of return method, net present value method, and analysis for a service company

Obj. 2, 3

✔ 1. a. 30.0%

SHOW ME HOW EXCEL TEMPLATE

The capital investment committee of Arches Landscaping Company is considering two capital investments. The estimated operating income and net cash flows from each investment are as follows:

	Front-End Loader		Greenhouse	
Year	Operating Income	Net Cash Flow	Operating Income	Net Cash Flow
1	$25,000	$ 40,000	$11,250	$ 26,250
2	20,000	35,000	11,250	26,250
3	7,000	22,000	11,250	26,250
4	3,000	18,000	11,250	26,250
5	1,250	16,250	11,250	26,250
Total	$56,250	$131,250	$56,250	$131,250

Each project requires an investment of $75,000. Straight-line depreciation will be used, and no residual value is expected. The committee has selected a rate of 12% for purposes of the net present value analysis.

Instructions

1. Compute the following:
   a. The average rate of return for each investment.
   b. The net present value for each investment. Use the present value table appearing in Exhibit 2 of this chapter. Round present values to the nearest dollar.
2. Prepare a brief report for the capital investment committee, advising it on the relative merits of the two investments.

PR 12-2A Cash payback period, net present value method, and analysis

Obj. 2, 3

✔ 1. b. Plant expansion, $305,040

EXCEL TEMPLATE

Elite Apparel Inc. is considering two investment projects. The estimated net cash flows from each project are as follows:

Year	Plant Expansion	Retail Store Expansion
1	$ 450,000	$ 500,000
2	450,000	400,000
3	340,000	350,000
4	280,000	250,000
5	180,000	200,000
Total	$1,700,000	$1,700,000

Each project requires an investment of $900,000. A rate of 15% has been selected for the net present value analysis.

Instructions

1. Compute the following for each product:
   a. Cash payback period.
   b. The net present value. Use the present value table appearing in Exhibit 2 of this chapter.
2. Prepare a brief report advising management on the relative merits of each project.

PR 12-3A Net present value method, present value index, and analysis for a service company

Obj. 3

✔ 2. Computer network, 1.20

EXCEL TEMPLATE

Continental Railroad Company is evaluating three capital investment proposals by using the net present value method. Relevant data related to the proposals are summarized as follows:

	Maintenance Equipment	Ramp Facilities	Computer Network
Amount to be invested	$8,000,000	$20,000,000	$9,000,000
Annual net cash flows:			
Year 1	4,000,000	12,000,000	6,000,000
Year 2	3,500,000	10,000,000	5,000,000
Year 3	2,500,000	9,000,000	4,000,000

Instructions

1. Assuming that the desired rate of return is 20%, prepare a net present value analysis for each proposal. Use the present value table appearing in Exhibit 2 of this chapter.
2. Determine a present value index for each proposal. Round to two decimal places.
3. Which proposal offers the largest amount of present value per dollar of investment? Explain.

PR 12-4A Net present value method, internal rate of return method, and analysis for a service company

Obj. 3

✔ 1. a. Wind turbines, $82,600

The management of Advanced Alternative Power Inc. is considering two capital investment projects. The estimated net cash flows from each project are as follows:

Year	Wind Turbines	Biofuel Equipment
1	$280,000	$300,000
2	280,000	300,000
3	280,000	300,000
4	280,000	300,000

The wind turbines require an investment of $887,600, while the biofuel equipment requires an investment of $911,100. No residual value is expected from either project.

Instructions

1. Compute the following for each project:
   a. The net present value. Use a rate of 6% and the present value of an annuity table appearing in Exhibit 5 of this chapter.
   b. A present value index. Round to two decimal places.
2. Determine the internal rate of return for each project by (a) computing a present value factor for an annuity of $1 and (b) using the present value of an annuity of $1 table appearing in Exhibit 5 of this chapter.
3. What advantage does the internal rate of return method have over the net present value method in comparing projects?

PR 12-5A Alternative capital investments

Obj. 3, 4

✔ 1. Servers, $11,105

EXCEL TEMPLATE

The investment committee of Sentry Insurance Co. is evaluating two projects, office expansion and upgrade to computer servers. The projects have different useful lives, but each requires an investment of $490,000. The estimated net cash flows from each project are as follows:

	Net Cash Flows	
Year	Office Expansion	Servers
1	$125,000	$165,000
2	125,000	165,000
3	125,000	165,000
4	125,000	165,000
5	125,000	
6	125,000	

(*Continued*)

The committee has selected a rate of 12% for purposes of net present value analysis. It also estimates that the residual value at the end of each project's useful life is $0, but at the end of the fourth year, the office expansion's residual value would be $180,000.

Instructions

1. For each project, compute the net present value. Use the present value of an annuity table appearing in Exhibit 5 of this chapter. Ignore the unequal lives of the projects.
2. For each project, compute the net present value, assuming that the office expansion is adjusted to a four-year life for purposes of analysis. Use the present value table appearing in Exhibit 2 of this chapter.
3. Prepare a report to the investment committee, providing your advice on the relative merits of the two projects.

PR 12-6A Capital rationing decision for a service company involving four proposals

Obj. 2, 3, 5

✔ 5. Proposal C, 1.57



EXCEL TEMPLATE

Renaissance Capital Group is considering allocating a limited amount of capital investment funds among four proposals. The amount of proposed investment, estimated operating income, and net cash flow for each proposal are as follows:

	Investment	Year	Operating Income	Net Cash Flow
Proposal A:	$680,000	1	$ 64,000	$ 200,000
		2	64,000	200,000
		3	64,000	200,000
		4	24,000	160,000
		5	24,000	160,000
			$240,000	$ 920,000
Proposal B:	$320,000	1	$ 26,000	$ 90,000
		2	26,000	90,000
		3	6,000	70,000
		4	6,000	70,000
		5	(44,000)	20,000
			$ 20,000	$340,000
Proposal C:	$108,000	1	$ 33,400	$ 55,000
		2	31,400	53,000
		3	28,400	50,000
		4	25,400	47,000
		5	23,400	45,000
			$142,000	$ 250,000
Proposal D:	$400,000	1	$100,000	$ 180,000
		2	100,000	180,000
		3	80,000	160,000
		4	20,000	100,000
		5	0	80,000
			$300,000	$700,000

The company's capital rationing policy requires a maximum cash payback period of three years. In addition, a minimum average rate of return of 12% is required on all projects. If the preceding standards are met, the net present value method and present value indexes are used to rank the remaining proposals.

Instructions

1. Compute the cash payback period for each of the four proposals.
2. Giving effect to straight-line depreciation on the investments and assuming no estimated residual value, compute the average rate of return for each of the four proposals. Round to one decimal place.

3. Using the following format, summarize the results of your computations in parts (1) and (2). By placing the computed amounts in the first two columns on the left and by placing a check mark in the appropriate column to the right, indicate which proposals should be accepted for further analysis and which should be rejected.

Proposal	Cash Payback Period	Average Rate of Return	Accept for Further Analysis	Reject
A				
B				
C				
D				

4. For the proposals accepted for further analysis in part (3), compute the net present value. Use a rate of 15% and the present value table appearing in Exhibit 2 of this chapter.
5. Compute the present value index for each of the proposals in part (4). Round to two decimal places.
6. Rank the proposals from most attractive to least attractive, based on the present values of net cash flows computed in part (4).
7. Rank the proposals from most attractive to least attractive, based on the present value indexes computed in part (5).
8. Based on the analyses, comment on the relative attractiveness of the proposals ranked in parts (6) and (7).

Problems: Series B

PR 12-1B Average rate of return method, net present value method, and analysis for a service company **Obj. 2, 3**

✔ 1. a. 18.7%

SHOW ME HOW EXCEL TEMPLATE

The capital investment committee of Ellis Transport and Storage Inc. is considering two investment projects. The estimated operating income and net cash flows from each investment are as follows:

	Warehouse		Tracking Technology	
Year	Operating Income	Net Cash Flow	Operating Income	Net Cash Flow
1	$ 61,400	$135,000	$ 34,400	$108,000
2	51,400	125,000	34,400	108,000
3	36,400	110,000	34,400	108,000
4	26,400	100,000	34,400	108,000
5	(3,600)	70,000	34,400	108,000
Total	$172,000	$540,000	$172,000	$540,000

Each project requires an investment of $368,000. Straight-line depreciation will be used, and no residual value is expected. The committee has selected a rate of 15% for purposes of the net present value analysis.

Instructions

1. Compute the following:
   a. The average rate of return for each investment. Round to one decimal place.
   b. The net present value for each investment. Use the present value table appearing in Exhibit 2 of this chapter. Round present values to the nearest dollar.
2. Prepare a brief report for the capital investment committee, advising it on the relative merits of the two projects.

PR 12-2B Cash payback period, net present value method, and analysis for a service company — Obj. 2, 3

✔ 1. b. *Pro Gamer*, $49,465

EXCEL TEMPLATE

Social Circle Publications Inc. is considering two new magazine products. The estimated net cash flows from each product are as follows:

Year	*Sound Cellar*	*Pro Gamer*
1	$ 65,000	$ 70,000
2	60,000	55,000
3	25,000	35,000
4	25,000	30,000
5	45,000	30,000
Total	$220,000	$220,000

Each product requires an investment of $125,000. A rate of 10% has been selected for the net present value analysis.

Instructions

1. Compute the following for each product:
   a. Cash payback period.
   b. The net present value. Use the present value table appearing in Exhibit 2 of this chapter.
2. Prepare a brief report advising management on the relative merits of each of the two products.

PR 12-3B Net present value method, present value index, and analysis for a service company — Obj. 3

✔ 2. Branch office expansion, 0.95

EXCEL TEMPLATE

First United Bank Inc. is evaluating three capital investment projects by using the net present value method. Relevant data related to the projects are summarized as follows:

	Branch Office Expansion	Computer System Upgrade	ATM Kiosk Expansion
Amount to be invested	$420,000	$350,000	$520,000
Annual net cash flows:			
Year 1	200,000	190,000	275,000
Year 2	160,000	180,000	250,000
Year 3	160,000	170,000	250,000

Instructions

1. Assuming that the desired rate of return is 15%, prepare a net present value analysis for each project. Use the present value table appearing in Exhibit 2 of this chapter.
2. Determine a present value index for each project. Round to two decimal places.
3. Which project offers the largest amount of present value per dollar of investment? Explain.

PR 12-4B Net present value method, internal rate of return method, and analysis for a service company — Obj. 3

✔ 1. a. *After Hours*, $100,800

The management of Style Networks Inc. is considering two TV show projects. The estimated net cash flows from each project are as follows:

Year	*After Hours*	*Sun Fun*
1	$320,000	$290,000
2	320,000	290,000
3	320,000	290,000
4	320,000	290,000

After Hours requires an investment of $913,600, while *Sun Fun* requires an investment of $880,730. No residual value is expected from either project.

Instructions

1. Compute the following for each project:
   a. The net present value. Use a rate of 10% and the present value of an annuity table appearing in Exhibit 5 of this chapter.
   b. A present value index. Round to two decimal places.
2. Determine the internal rate of return for each project by (a) computing a present value factor for an annuity of $1 and (b) using the present value of an annuity of $1 table appearing in Exhibit 5 of this chapter.
3. What advantage does the internal rate of return method have over the net present value method in comparing projects?

PR 12-5B Alternative capital investments

Obj. 3, 4

✔ 1. Topeka, $135,600

EXCEL TEMPLATE

The investment committee of Auntie M's Restaurants Inc. is evaluating two restaurant sites. The sites have different useful lives, but each requires an investment of $900,000. The estimated net cash flows from each site are as follows:

	Net Cash Flows	
Year	Wichita	Topeka
1	$310,000	$400,000
2	310,000	400,000
3	310,000	400,000
4	310,000	400,000
5	310,000	
6	310,000	

The committee has selected a rate of 20% for purposes of net present value analysis. It also estimates that the residual value at the end of each restaurant's useful life is $0, but at the end of the fourth year, Wichita's residual value would be $500,000.

Instructions

1. For each site, compute the net present value. Use the present value of an annuity table appearing in Exhibit 5 of this chapter. Ignore the unequal lives of the projects.
2. For each site, compute the net present value, assuming that Wichita is adjusted to a four-year life for purposes of analysis. Use the present value table appearing in Exhibit 2 of this chapter.
3. Prepare a report to the investment committee, providing your advice on the relative merits of the two sites.

PR 12-6B Capital rationing decision for a service company involving four proposals

Obj. 2, 3, 5

✔ 5. Proposal B, 1.13

EXCEL TEMPLATE

Clearcast Communications Inc. is considering allocating a limited amount of capital investment funds among four proposals. The amount of proposed investment, estimated operating income, and net cash flow for each proposal are as follows:

	Investment	Year	Operating Income	Net Cash Flow
Proposal A:	$450,000	1	$ 30,000	$120,000
		2	30,000	120,000
		3	20,000	110,000
		4	10,000	100,000
		5	(30,000)	60,000
			$ 60,000	$510,000
Proposal B:	$200,000	1	$ 60,000	$100,000
		2	40,000	80,000
		3	20,000	60,000
		4	(10,000)	30,000
		5	(20,000)	20,000
			$ 90,000	$290,000

(*Continued*)

	Investment	Year	Operating Income	Net Cash Flow
Proposal C:	$320,000	1	$ 36,000	$100,000
		2	26,000	90,000
		3	26,000	90,000
		4	16,000	80,000
		5	16,000	80,000
			$120,000	$440,000
Proposal D:	$540,000	1	$ 92,000	$200,000
		2	72,000	180,000
		3	52,000	160,000
		4	12,000	120,000
		5	(8,000)	100,000
			$220,000	$760,000

The company's capital rationing policy requires a maximum cash payback period of three years. In addition, a minimum average rate of return of 12% is required on all projects. If the preceding standards are met, the net present value method and present value indexes are used to rank the remaining proposals.

Instructions

1. Compute the cash payback period for each of the four proposals.
2. Giving effect to straight-line depreciation on the investments and assuming no estimated residual value, compute the average rate of return for each of the four proposals. Round to one decimal place.
3. Using the following format, summarize the results of your computations in parts (1) and (2). By placing the computed amounts in the first two columns on the left and by placing a check mark in the appropriate column to the right, indicate which proposals should be accepted for further analysis and which should be rejected.

Proposal	Cash Payback Period	Average Rate of Return	Accept for Further Analysis	Reject
A				
B				
C				
D				

4. For the proposals accepted for further analysis in part (3), compute the net present value. Use a rate of 12% and the present value table appearing in Exhibit 2 of this chapter.
5. Compute the present value index for each of the proposals in part (4). Round to two decimal places.
6. Rank the proposals from most attractive to least attractive, based on the present values of net cash flows computed in part (4).
7. Rank the proposals from most attractive to least attractive, based on the present value indexes computed in part (5).
8.  Based on the analyses, comment on the relative attractiveness of the proposals ranked in parts (6) and (7).

Make a Decision
Uncertainty: Sensitivity and Expected Value Analyses

MAD 12-1 Sensitivity analysis: San Lucas Corporation — Obj. 6

San Lucas Corporation is considering investment in robotic machinery based upon the following estimates:

Cost of robotic machinery	$4,000,000
Residual value	300,000
Useful life	10 years

a. Determine the net present value of the equipment, assuming a desired rate of return of 10% and annual net cash flows of $700,000. Use the present value tables appearing in Exhibits 2 and 5 of this chapter.

b. Determine the net present value of the equipment, assuming a desired rate of return of 10% and annual net cash flows of $500,000, $700,000, and $900,000. Use the present value tables (Exhibits 2 and 5) provided in the chapter in determining your answer.

c. Determine the minimum annual net cash flow necessary to generate a positive net present value, assuming a desired rate of return of 10%. Round to the nearest dollar.

d. Interpret the results of parts (a), (b), and (c).

MAD 12-2 Expected value analysis: San Lucas Corporation — Obj. 6

Assume San Lucas Corporation in MAD 12-1 assigns the following probabilities to the estimated annual net cash flows:

Annual Net Cash Flow	Probability of Occurring
$900,000	0.10
700,000	0.50
500,000	0.40
Total	1.00

a. Compute the expected value of the annual net cash flows.

b. Determine the expected net present value of the equipment, assuming a desired rate of return of 10% and the expected annual net cash flows computed in part (a). Use the present value tables (Exhibits 2 and 5) provided in the chapter in determining your answer.

c. Based on your results in parts (a) and (b), should San Lucas Corporation invest in the equipment?

MAD 12-3 Sensitivity analysis: Boulder Creek Industries — Obj. 6

Boulder Creek Industries is considering an investment in equipment based on the following estimates:

Cost of equipment	$3,000,000
Residual value	200,000
Useful life	10 years

a. Determine the net present value of the equipment, assuming a desired rate of return of 12% and annual net cash flows of $800,000. Use the present value tables appearing in Exhibits 2 and 5 of this chapter.

b. Determine the net present value of the equipment, assuming a desired rate of return of 12% and annual net cash flows of $400,000, $600,000, and $800,000. Use the present value tables (Exhibits 2 and 5) provided in the chapter in determining your answer.

c. Determine the net present value of the equipment, assuming a desired rate of return of 15% and annual net cash flows of $400,000, $600,000, and $800,000. Use the present value tables (Exhibits 2 and 5) provided in the chapter in determining your answer.

(*Continued*)

d. Determine the minimum annual net cash flow necessary to generate a positive net present value, assuming a desired rate of return of 12%. Round to the nearest dollar.

e. Interpret the results of parts (b), (c), and (d).

MAD 12-4 Expected value analysis: Boulder Creek Industries — Obj. 6

Assume Boulder Creek Industries in MAD 12-3 assigns the following probabilities to the estimated annual net cash flows:

Annual Net Cash Flow	Probability of Occurring
$800,000	0.60
600,000	0.25
400,000	0.15
Total	1.00

a. Compute the expected value of the annual net cash flows.

b. Determine the expected net present value of the equipment, assuming a desired rate of return of 12% and expected annual net cash flows computed in part (a). Use the present value tables (Exhibits 2 and 5) provided in the chapter in determining your answer.

c. Based on your results in parts (a) and (b), should Boulder Creek Industries invest in the equipment?

MAD 12-5 Sensitivity analysis: Home Garden Inc. — Obj. 6

Home Garden Inc. is considering the construction of a distribution warehouse in West Virginia to service its east coast stores based on the following estimates:

Construction cost of warehouse	$20,000,000 to $25,000,000
Residual value	$3,000,000
Useful life	25 years
Estimated annual net cost savings	$2,500,000 to $4,000,000

a. Determine the net present value of building the warehouse, assuming a construction cost of $20,000,000, an annual net cost savings of $4,000,000, and a desired rate of return of 14%. Use the present value tables provided in Appendix A.

b. Determine the net present value of building the warehouse, assuming a construction cost of $25,000,000, an annual net cost savings of $2,500,000, and a desired rate of return of 14%. Use the present value tables provided in Appendix A.

c. Interpret the results of parts (a) and (b).

MAD 12-6 Expected value analysis: Home Garden Inc. — Obj. 6

Assume Home Garden Inc. in MAD 12-5 assigns the following probabilities to the estimated construction cost of the warehouse and annual net cash flows:

Construction Cost	Probability of Occurring	Annual Net Cash Flow	Probability of Occurring
$20,000,000	0.55	$4,000,000	0.50
23,000,000	0.30	3,000,000	0.36
25,000,000	0.15	2,500,000	0.14
Total	1.00	Total	1.00

a. Compute the expected value of the construction cost.

b. Compute the expected value of the annual net cash flows.

c. Determine the expected net present value of building the distribution warehouse, assuming a desired rate of return of 14% and using the expected values computed in parts (a) and (b). Use the present value tables provided in Appendix A. Round to the nearest dollar.

d. Based on your results in part (c), should Home Garden Inc. build the distribution warehouse?

Take It Further

ETHICS

TIF 12-1 Capital budgeting assumptions

Danielle Hastings was recently hired as a cost analyst by CareNet Medical Supplies Inc. One of Danielle's first assignments was to perform a net present value analysis for a new warehouse. Danielle performed the analysis and determined a present value index of 0.75. The plant manager, Jerrod Moore, is very intent on purchasing the warehouse because he believes that more storage space is needed. Jerrod asks Danielle into his office and the following conversation takes place:

Jerrod: Danielle, you're new here, aren't you?

Danielle: Yes, I am.

Jerrod: Well, Danielle, I'm not at all pleased with the capital investment analysis that you performed on this new warehouse. I need that warehouse for my production. If I don't get it, where am I going to place our output?

Danielle: Well, we need to get product into our customers' hands.

Jerrod: I agree, and we need a warehouse to do that.

Danielle: My analysis does not support constructing a new warehouse. The numbers don't lie; the warehouse does not meet our investment return targets. In fact, it seems to me that purchasing a warehouse does not add much value to the business. We need to be producing product to satisfy customer orders, not to fill a warehouse.

Jerrod: The headquarters people will not allow me to build the warehouse if the numbers don't add up. You know as well as I that many assumptions go into your net present value analysis. Why don't you relax some of your assumptions so that the financial savings will offset the cost?

Danielle: I'm willing to discuss my assumptions with you. Maybe I overlooked something.

Jerrod: Good. Here's what I want you to do. I see in your analysis that you don't project greater sales as a result of the warehouse. It seems to me that if we can store more goods, then we will have more to sell. Thus, logically, a larger warehouse translates into more sales. If you incorporate this into your analysis, I think you'll see that the numbers will work out. Why don't you work it through and come back with a new analysis. I'm really counting on you on this one. Let's get off to a good start together and see if we can get this project accepted.

What is your advice to Danielle?

TEAM ACTIVITY REAL WORLD

TIF 12-2 Purchase or rent a computer

Divide your team into two groups. In one group, find a local business, such as a copy shop that rents time on desktop computers for an hourly rate. Determine the hourly rate. In the other group, determine the price of a mid-range desktop computer at www.dell.com. Combine this information from the two groups and perform a capital budgeting analysis. Assume that one student will use the computer for 40 hours per semester for the next three years. Also assume that the minimum rate of return is 10%. Use the present value tables provided in Appendix A in performing your analysis. [*Hint:* Use the appropriate present value of an annuity of $1 factor for 5% compounded for six semiannual periods (periods = 6).]

Does your analysis support the student purchasing the computer?

COMMUNICATION

TIF 12-3 Impact of foreign currency rate change

Global Electronics Inc. invested $1,000,000 to build a plant in a foreign country. The labor and materials used in production are purchased locally. The plant expansion was estimated to produce an internal rate of return of 20% in U.S. dollar terms. Due to a currency crisis, the currency exchange rate between the local currency and the U.S. dollar doubled from two local units per U.S. dollar to four local units per U.S. dollar.

(*Continued*)

Write a brief memo to the chief financial officer, Tom Greene, explaining the impact that the currency exchange rate change would have on the project's internal rate of return if (1) the plant produced and sold product in the local economy only, and (2) the plant produced all product locally and exported all product to the United States for sale.

TIF 12-4 Personal investment analysis

A master of accountancy degree at Central University costs $12,000 for an additional fifth year of education beyond the bachelor's degree. Assume that all tuition is paid at the beginning of the year. A student considering this investment must evaluate the present value of cash flows from possessing a graduate degree versus holding only the undergraduate degree. Assume that the average student with an undergraduate degree is expected to earn a salary of $50,000 per year (assumed to be paid at the end of the year) for 10 years. Assume that the average student with a master of accountancy degree is expected to earn a salary of $66,000 per year (assumed to be paid at the end of the year) for nine years after graduation. Assume a minimum rate of return of 10%. Round to the nearest dollar.

a. Determine the net present value of cash flows from an undergraduate degree. Use the present value of an annuity table appearing in Exhibit 5 of this chapter.

b. Determine the net present value of cash flows from a master of accountancy degree, assuming that no salary is earned during the graduate year of schooling.

c. What is the net advantage or disadvantage of pursuing a graduate degree under these assumptions?

TIF 12-5 Qualitative issues in investment analysis

REAL WORLD

CEO, **Worthington Industries (WOR)** (a high-technology steel company): "We try to find the best technology, stay ahead of the competition, and serve the customer. . . . We'll make any investment that will pay back quickly … but if it is something that we really see as a must down the road, payback is not going to be that important."

Chairman of **Amgen Inc. (AMGN)** (a biotech company): "You cannot really run the numbers, do net present value calculations, because the uncertainties are really gigantic. . . . You decide on a project you want to run, and then you run the numbers [as a reality check on your assumptions]. Success in a business like this is much more dependent on tracking rather than on predicting, much more dependent on seeing results over time, tracking and adjusting and readjusting, much more dynamic, much more flexible."

Chief financial officer of **Merck & Co., Inc. (MRK)** (a pharmaceutical company): ". . . at the individual product level—the development of a successful new product requires on the order of $230 million in R&D, spread over more than a decade—discounted cash flow style analysis does not become a factor until development is near the point of manufacturing scale-up effort. Prior to that point, given the uncertainties associated with new product development, it would be lunacy in our business to decide that we know exactly what's going to happen to a product once it gets out."

Explain the role of capital investment analysis for these companies.

TIF 12-6 Net present value of a movie

REAL WORLD

MGM Holdings (MGMB) operates Metro-Goldwyn-Mayer Studios Inc. and is a major producer and distributor of movie and television filmed entertainment. Regarding movies (films), MGM states, "Our feature films are exploited through a series of sequential domestic and international distribution channels, typically beginning with theatrical exhibition. Thereafter, feature films are first made available for home video (online downloads) generally six months after theatrical release; for pay television, one year after theatrical release; and for syndication, approximately three to five years after theatrical release."

Assume that MGM produces a movie (film) during early 20Y5 at a cost of $340 million and releases it halfway through the year. During the last half of 20Y5, the movie earns revenues of $420 million at the box office. The movie requires $90 million of advertising during the release. One year later, by the end of 20Y6, the movie is expected to earn MGM net cash flows from

online downloads of $60 million. By the end of 20Y7, the movie is expected to earn MGM $20 million from pay TV, and by the end of 20Y8, the movie is expected to earn $10 million from syndication.

a. Determine the net present value of the film as of the beginning of 20Y5 if the desired rate of return is 20%. To simplify present value calculations, assume that all annual net cash flows occur at the end of each year. Use the present value table appearing in Exhibit 2 of this chapter. Round to the nearest whole million dollars.

b. Under the assumptions provided here, is the film expected to be financially successful? Explain.

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Foster Manufacturing is analyzing a capital investment project that is forecasted to produce the following cash flows and net income:

Year	After-Tax Cash Flows	Net Income
0	$(20,000)	$ 0
1	6,000	2,000
2	6,000	2,000
3	8,000	2,000
4	8,000	2,000

Using the present value tables provided in Appendix A, the internal rate of return (rounded to the nearest whole percentage) is:

a. 5%.
b. 12%.
c. 14%.
d. 40%.

2. Staten Corporation is considering two mutually exclusive projects. Both require an initial outlay of $150,000 and will operate for five years. The cash flows associated with these projects are as follows:

Year	Project X	Project Y
1	$ 47,000	$ 0
2	47,000	0
3	47,000	0
4	47,000	0
5	47,000	280,000
Total	$235,000	$280,000

Staten's required rate of return is 10%. Using the net present value method and the present value table provided in Appendix A, which of the following actions would you recommend to Staten?

a. Accept Project X and reject Project Y.
b. Accept Project Y and reject Project X.
c. Accept Projects X and Y.
d. Reject Projects X and Y.

3. Allstar Company invests in a project with expected cash inflows of $9,000 per year for four years. All cash flows occur at year-end. The required return on investment is 9%. If the project generates a net present value (NPV) of $3,000, what is the amount of the initial investment in the project? Use the present value tables provided in Appendix A and round to the nearest answer option.
   a. $11,253
   b. $13,236
   c. $26,160
   d. $29,160

4. Foster Manufacturing is analyzing a capital investment project that is forecast to produce the following cash flows and net income:

Year	After-Tax Cash Flows	Net Income
0	$(20,000)	$ 0
1	6,000	2,000
2	6,000	2,000
3	8,000	2,000
4	8,000	2,000

   The payback period of this project will be:
   a. 2.5 years.
   b. 2.6 years.
   c. 3.0 years.
   d. 3.3 years.

Pathways Challenge



This is Accounting!

Information/Consequences

A net present value analysis requires **Vail Resorts, Inc. (MTN)** to estimate the initial investment, the years of expected useful life, the expected additional investment, the yearly returns from additional investments (differential revenues minus differential costs), and the overall desired rate of return.

Significant uncertainty relates to the preceding estimates. For example, weather significantly influences ski revenues (shorter winters mean fewer skiers) as well as the costs for running the resort (low snowfall means more costs incurred using snow machines to provide snow). In addition, the demand for skiing is driven in part by the U.S. and worldwide economy. In hard economic times, fewer people can afford ski vacations.

Vail's financial statements can provide external stakeholders information for assessing the quality of Vail's capital budgeting decisions. For example, Vail reported increasing revenues and profits for each of the three years following its purchase of Park City Mountain Resort. External stakeholders' assessment of Vail's capital budgeting decision was reflected in its stock price, which almost tripled in the three years following Vail's purchase of Park City Mountain Resort.

Suggested Answer

Chapter

13 Lean Manufacturing and Activity Analysis

Principles

Chapter 1 *Introduction to Managerial Accounting*

Developing Information

COST SYSTEMS

Chapter 2 *Job Order Costing*
Chapter 3 *Process Costing*
Chapter 4 *Activity-Based Costing*

COST ALLOCATIONS

Chapter 5 *Support Departments*
Chapter 5 *Joint Costs*

Decision Making

PLANNING AND EVALUATING TOOLS

Chapter 6 *Cost-Volume-Profit Analysis*
Chapter 7 *Variable Costing*
Chapter 8 *Budgeting Systems*
Chapter 9 *Standard Costing and Variances*
Chapter 10 *Decentralized Operations*
Chapter 11 *Differential Analysis*

STRATEGIC TOOLS

Chapter 12 *Capital Investment Analysis*
Chapter 13 ***Lean Manufacturing***
Chapter 13 ***Activity Analysis***
Chapter 14 *The Balanced Scorecard*
Chapter 14 *Corporate Social Responsibility*

Precor Incorporated

When you order the salad bar at the local restaurant, you are able to serve yourself at your own pace. There is no waiting for the waitress to take the order or for the cook to prepare the meal. You are able to move directly to the salad bar and select from various offerings. You might wish to have salad with lettuce, cole slaw, bacon bits, croutons, and salad dressing. The offerings are arranged in a row so that you can build your salad as you move down the salad bar.

Many manufacturers are producing products in much the same way that the salad bar is designed to satisfy each customer's needs. Like customers at the salad bar, products move through a production process as they are built for each customer. Such a process eliminates many sources of waste, which is why it is called *lean*.

Using lean practices can improve performance. For example, when **Precor**, a manufacturer of fitness equipment, used lean principles, it improved its manufacturing operations and achieved the following results:

- Increased on-time shipments from near 40% to above 90%.
- Decreased direct labor costs by 30%.
- Reduced the number of suppliers from 3,000 to under 250.
- Reduced inventory by 40%.
- Reduced warranty claims by almost 60%.

In this chapter, lean practices are described and illustrated. The chapter concludes by describing and illustrating the accounting for quality costs and activity analysis.



BANANASTOCK/FIRST LIGHT

Link to Precor . . . . . Pages 615, 620, 627, 630

What's Covered

Lean Manufacturing and Activity Analysis

Principles of Lean Manufacturing
- Reducing Inventory (Obj. 1)
- Reducing Lead Times (Obj. 1)
- Reducing Setup Time (Obj. 1)
- Product-Oriented Layout (Obj. 1)
- Employee Involvement (Obj. 1)
- Pull Manufacturing (Obj. 1)
- Zero Defects (Obj. 1)
- Supply Chain Management (Obj. 1)

Accounting for Lean Manufacturing
- Fewer Transactions (Obj. 2)
- Combined Accounts (Obj. 2)
- Nonfinancial Performance Measures (Obj. 2)
- Direct Tracing of Overhead (Obj. 2)

Activity Analysis
- Costs of Quality (Obj. 3)
- Quality Activity Analysis (Obj. 3)
- Value-Added Activity Analysis (Obj. 3)
- Process Activity Analysis (Obj. 3)

Learning Objectives

Obj. 1 Describe lean manufacturing practices.

Obj. 2 Describe the implications of lean manufacturing on the accounting system.

Obj. 3 Describe and illustrate activity analysis for improving operations.

Analysis for Decision Making

Obj. 4 Describe and illustrate the use of lean principles and activity analysis in a service or administrative setting.

Objective 1
Describe lean manufacturing practices.

Lean Principles

The **lean enterprise** is a business that produces products or services with high quality, low cost, fast response, and immediate availability. **Lean manufacturing**, sometimes called *just-in-time processing (JIT)*, accomplishes these objectives in a manufacturing setting. Both manufacturing and nonmanufacturing businesses use **lean principles** to accomplish these service and cost objectives. However, these principles will be discussed within the context of lean manufacturing. Lean manufacturing principles are listed and contrasted with traditional manufacturing principles in Exhibit 1.

Exhibit 1 Lean versus Traditional Manufacturing Principles

Issue	Lean Manufacturing	Traditional Manufacturing
Inventory	Reduces inventory.	Increases inventory to protect against process problems.
Lead time	Reduces lead time.	Increases lead time to protect against uncertainty.
Setup time	Reduces setup time.	Disregards setup time as an improvement priority.
Production layout	Emphasizes product-oriented layout.	Emphasizes process-oriented layout.
Role of the employee	Emphasizes team-oriented employee involvement.	Emphasizes work of individuals, following manager instructions.
Production scheduling policy	Emphasizes pull manufacturing.	Emphasizes push manufacturing.
Quality	Emphasizes zero defects.	Tolerates defects.
Suppliers and customers	Emphasizes supply chain management.	Treats suppliers and customers as "arm's-length," independent entities.

Precor was established in 1980 when the company began selling a rowing machine that supported the natural movement of the human body. Precor is currently owned by **Amer Sports Corporation (AMEAS)**.

Link to Precor

Reducing Inventory

Lean manufacturing views inventory as wasteful and unnecessary, and thus emphasizes reducing or eliminating inventory.

Under traditional manufacturing, inventory often hides underlying production problems. For example, if machine breakdowns occur, work in process inventories can be used to keep production running in other departments while the machines are being repaired. Likewise, inventories can be used to hide problems caused by a shortage of trained employees, unreliable suppliers, or poor product quality.

In contrast, lean manufacturing solves and removes production problems. In this way, raw materials, work in process, and finished goods inventories are reduced or eliminated.

The role of inventory in manufacturing can be illustrated using a river, as shown in Exhibit 2. Inventory is the water in a river. The rocks at the bottom of the river are production problems. When the water level (inventory) is high, the rocks (production problems) at the bottom of the river are hidden. As the water level (inventory) drops, the rocks (production problems) become visible, one by one. Lean manufacturing reduces the water level (inventory), exposes the rocks (production problems), and removes the rocks so that the river can flow smoothly.



Exhibit 2
Inventory's Role in Manufacturing



Ethics: Don't Do It

The Inventory Shift

Some managers take a shortcut to reducing inventory by shifting inventory to their suppliers. With this tactic, the hard work of improving processes is avoided. Enlightened managers realize that such tactics often have short-lived savings. Suppliers will eventually increase their prices to compensate for the additional inventory holding costs, thus resulting in no savings. Therefore, shifting a problem doesn't eliminate a problem.

Reducing Lead Times

Lead time, sometimes called *throughput time*, measures the time interval between when a product enters production (started) and when it is completed (finished). That is, lead time measures how long it takes to manufacture a product. To illustrate, in Exhibit 3, if a product enters production at 1:00 P.M. and is completed at 5:00 P.M., the lead time is four hours.

Exhibit 3
Lead Time

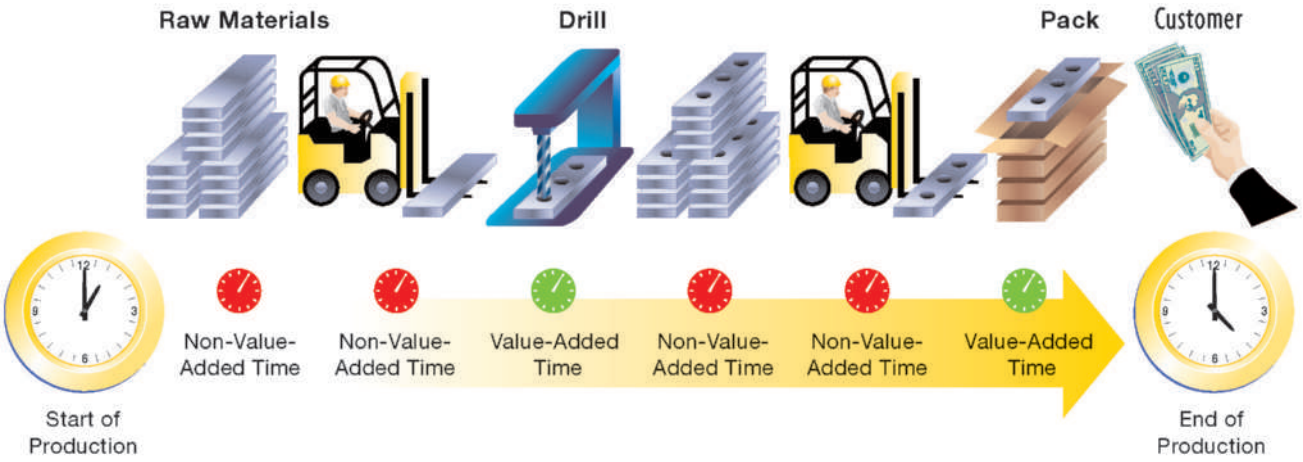


The lead time can be classified as one of the following:

- **Value-added lead time**, which is the time spent in converting raw materials into a finished unit of product
- **Non-value-added lead time**, which is the time spent while the unit of product is waiting to enter the next production process or is moved from one process to another

Exhibit 4 illustrates value-added and non-value-added lead time. The time spent drilling and packing the unit of product is value-added time. The time spent waiting to enter the next process or the time spent moving the unit of product from one process to another is non-value-added time.

Exhibit 4 Components of Lead Time



The **value-added ratio** is computed as follows:

$$\text{Value-Added Ratio} = \frac{\text{Value-Added Lead Time}}{\text{Total Lead Time}}$$

To illustrate, assume that the lead time to manufacture a unit of product is as follows (value-added times are highlighted):

Move raw materials to machining	5 minutes
Machining	35
Move time to assembly	10
Assembly	20
Move time to packing	15
Wait time for packing	30
Packing	10
Total lead time	125 minutes

The value-added ratio for the preceding product is 52%, computed as follows:

$$\text{Value-Added Ratio} = \frac{\text{Value-Added Lead Time}}{\text{Total Lead Time}}$$

$$= \frac{(35 + 20 + 10) \text{ minutes}}{125 \text{ minutes}} = \frac{65 \text{ minutes}}{125 \text{ minutes}} = 52\%$$

A low value-added ratio indicates a poor manufacturing process. A good manufacturing process will reduce non-value-added lead time to a minimum and thus have a high value-added ratio.

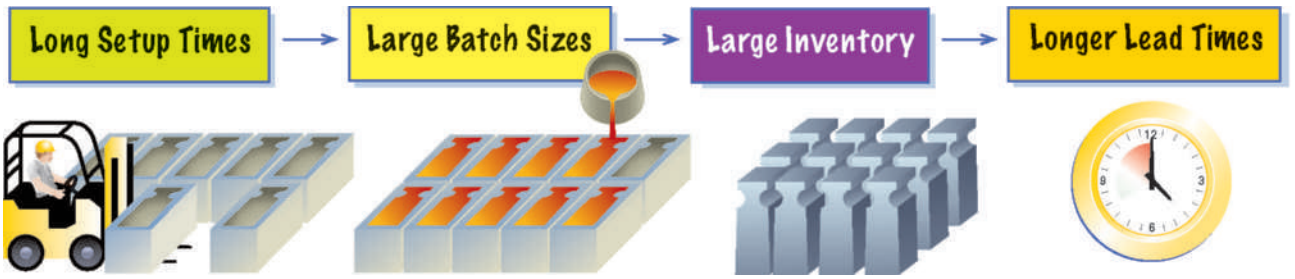
Lean manufacturing reduces or eliminates non-value-added time. In contrast, traditional manufacturing processes may have a value-added ratio as small as 5%.

Reducing Setup Time

A *setup* is the effort spent preparing an operation or process for production. A **batch size** is the amount of production in units of product that is produced after a setup. If setups are long and costly, the batch size for the related production run is normally large. Large batch sizes allow setup costs to be spread over more units and, thus, reduce the cost per unit. However, large batch sizes increase inventory and lead time.

Exhibit 5 shows the relationship between setup times and lead time.

Exhibit 5 Relationship between Setup Times and Lead Time



To help understand the relationship of batch sizes to lead time, consider a group of 10 friends purchasing a ticket at a single-window ticket counter as shown in Exhibit 6.

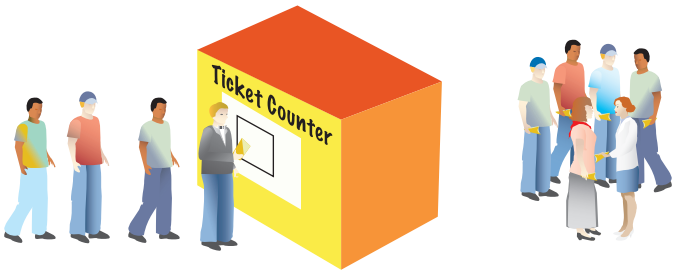


Exhibit 6
Batch Size and Lead Time

The friends are traveling together, so they are like a "batch" of production. If each friend takes 1 minute to purchase a ticket, the other nine friends are either waiting in line, or waiting for the remaining friends to finish. Thus, it takes 10 minutes for all of the friends to receive tickets as a group, but it took only 1 minute for any one friend to actually buy a ticket.

The amount of time each friend is waiting is called within-batch wait time. The total within-batch wait time is computed as follows:

$$\text{Total Within-Batch Wait Time} = (\text{Value-Added Time}) \times (\text{Batch Size} - 1)$$

In this example, the value-added time is the 1 minute to purchase a ticket. So the total within-batch wait time is 9 minutes, computed as follows:

$$\text{Total Within-Batch Wait Time} = 1 \text{ minute} \times (10 - 1) = 9 \text{ minutes}$$

The value-added ratio is 10%, computed as follows:

$$\text{Value-Added Ratio} = \frac{\text{Value-Added Lead Time}}{\text{Total Lead Time}}$$

$$= \frac{1 \text{ minute}}{10 \text{ minutes}} = 10\%$$

Now consider someone buying a ticket without a group of friends present. A single person would only take 1 minute to buy the ticket, with no waiting for friends. In this case, the lead time drops down to 1 minute, or simply the time to purchase the ticket, and the value-added ratio is 100%.

Lean manufacturing emphasizes decreasing setup times in order to reduce the batch size, whereas traditional manufacturing does not treat setup improvement as an important priority. By reducing batch sizes, work in process inventory and within-batch wait time decrease, thus reducing total lead time and increasing the value-added ratio.

To illustrate in a manufacturing setting, assume that Automotive Components Inc. manufactures engine starters as follows (value-added times are highlighted):

	Processing Time per Unit
Move raw materials to Machining	5 minutes
Machining	7
Move time to Assembly	10
Assembly	9
Move time to Testing	10
Testing	8
Total	49 minutes
Batch size	40 units

The total lead time is 985 minutes, computed as follows:

Value-added time (7 + 9 + 8)	24 minutes
Move time (5 + 10 + 10)	25
Total within-batch wait time	936*
Total time	985 minutes

*Total Within-Batch Wait Time = (Value-Added Time) × (Batch Size – 1)
= (7 + 9 + 8) minutes × (40 – 1) = 24 minutes × 39
= 936 minutes

Of the total lead time of 985 minutes, 24 minutes is value-added time and 961 minutes (985 – 24) is non-value-added time. The total non-value-added time of 961 minutes can also be determined as the sum of the total within-batch time of 936 minutes plus the move time of 25 minutes.

Based on the preceding data, the value-added ratio is approximately 2.4%, computed as follows:

$$\text{Value-Added Ratio} = \frac{\text{Value-Added Lead Time}}{\text{Total Lead Time}}$$

$$= \frac{(7 + 9 + 8) \text{ minutes}}{985 \text{ minutes}} = \frac{24 \text{ minutes}}{985 \text{ minutes}} = 2.4\% \text{ (rounded)}$$

Thus, the non-value-added time for Automotive Components Inc. is approximately 97.6% (100% – 2.4%).

Automotive Components can increase its value-added ratio by reducing setups so that the batch size is one unit, called *one-piece flow*. Automotive Components could also move the Machining, Assembly, and Testing activities closer to each other so that the move time could be reduced. With these changes, Automotive Components' value-added ratio would increase.

Why It Matters

P&G's "Pit Stops"

What do **Procter & Gamble (P&G)** and **Formula One** racing have in common? P&G answered this question by realizing that Formula One racing pit stops could teach the company how to more quickly change over from one sized package to another on its packing lines. As a result, P&G videotaped actual Formula One pit stops to identify the principles for conducting a fast setup, as follows:

- Position the tools near their point of use on the line prior to stopping the line, to reduce time going back and forth to the tool room.
- Arrange the tools in the exact order of work, so that no time is wasted looking for a tool.
- Have each employee perform a very specific task during the setup.
- Design the workflow so that employees don't interfere with each other.
- Have each employee in position at the moment the line is stopped.
- Train each employee, and practice, practice, practice.
- Put a stop watch on the setup process.
- Plot improvements over time on a visible chart.

As a result of these changes, P&G was able to reduce pack-line setup time from several hours to 20 minutes. This decrease allowed the company to reduce lead time and to improve the cost performance of the Packing Department.

Pathways Challenge



This is Accounting!

Economic Activity

Examples of lean manufacturing can be found in almost any industry. The concepts surrounding lean manufacturing coalesced between the 1950s and the 1980s at **Toyota Motor Corporation (TM)** under the leadership of Taiichi Ohno. However, lean manufacturing ideas have been around for a long time. In fact, the principles of lean manufacturing are sometimes applied by managers who aren't familiar with the terminology but who are aware of inefficiencies in their production processes. In the 1930s, Vernon Rudolph, founder of **Krispy Kreme Doughnuts, Inc. (KKD)**, is known to have cut a hole in the side of his kitchen to get hot doughnuts to customers more quickly. Over time, Krispy Kreme developed its "Hot Doughnuts Now" strategy, fine tuning the production process and eliminating waste wherever possible.

Critical Thinking/Judgment

Several steps go into making a doughnut. The dough must be mixed, formed into a doughnut shape, allowed to rise, fried in oil, glazed, and cooled. For each of these steps, there is a possibility for wasted time and materials. What methods might a doughnut restaurant like Krispy Kreme use to decrease lead times and wasted materials?

How might move time, which is typically a non-value-added activity, be transformed into a value-added activity at Krispy Kreme?

Suggested answer at end of chapter.

Sources: "A History of Lean Manufacturing," *StrategosInc.com* (http://www.strategosinc.com/just_in_time.htm) and Andy Serwer, "The Hole Story How Krispy Kreme Became the Hottest Brand in America," *Fortune Magazine* (http://archive.fortune.com/magazines/fortune/fortune_archive/2003/07/07/345535/index.htm), July 7, 2003.

Emphasizing Product-Oriented Layout

Manufacturing processes can be organized around a product, which is called a **product-oriented layout** (or *product cells*). Alternatively, manufacturing processes can be organized around a process, which is called a **process-oriented layout**.

Lean manufacturing normally organizes manufacturing around products rather than processes. Organizing work around products reduces:

- Moving materials and products between processes
- Work in process inventory
- Lead time
- Production costs

In addition, a product-oriented layout improves coordination among the various work activities, or operations, of the facility.

Emphasizing Employee Involvement

Traditional manufacturing often values direct labor employees only for their manual labor, whereas lean manufacturing values labor for contributions beyond labor tasks, using employee involvement. **Employee involvement** is a management approach that grants employees the responsibility and authority to make decisions about operations. Employee involvement is often applied in lean manufacturing by organizing employees into *product cells*. Within each product cell, employees are organized as teams where the employees are *cross-trained* to perform any operation within the product cell.

To illustrate, employees learn how to operate several different machines within their product cell. In addition, team members are trained to perform functions traditionally performed by centralized service departments. For example, product cell employees may perform their own equipment maintenance, quality control, housekeeping, and improvement studies.

Link to Precor **Precor** encourages a collaborative, innovative environment for its employees. Precor believes that its employees are its #1 asset.

Emphasizing Pull Manufacturing

Pull manufacturing (or *make to order*) is an important lean practice. In pull manufacturing, products are manufactured only as they are needed by the customer. Products can be thought of as being pulled through the manufacturing process. In other words, the status of the next operation determines when products are moved or produced. If the next operation is busy, production stops so that work in process does not pile up in front of the busy operation. When the next operation is ready, the product is moved to that operation.

A system used in pull manufacturing is *kanban*, which is Japanese for "cards." Electronic cards or containers signal production quantities to be filled by the preceding operation. The cards link the customer's order for a product back through each stage of production. In other words, when a consumer orders a product, a kanban card triggers the manufacture of the product.

In contrast, the traditional approach to manufacturing is based on estimated customer demand. This principle is called **push manufacturing** (or make to stock). In push manufacturing, products are manufactured according to a production schedule that is based upon estimated sales. The schedule "pushes" product into inventory before customer orders are received. As a result, push manufacturers normally have more inventory than pull manufacturers.

Emphasizing Zero Defects

Lean manufacturing attempts to eliminate poor quality. Poor quality creates:

- Scrap
- Rework, which is fixing product made wrong the first time
- Disruption in the production process
- Dissatisfied customers
- Warranty costs and expenses

One way to improve product quality and manufacturing processes is Six Sigma. **Six Sigma** was developed by **Motorola Corporation** [now **Motorola Solutions, Inc. (MSI)**] and consists of five steps: define, measure, analyze, improve, and control (DMAIC).[1] Since its development, Six Sigma has been adopted by thousands of organizations worldwide.

Emphasizing Supply Chain Management

Supply chain management coordinates and controls the flow of materials, services, information, and finances with suppliers, manufacturers, and customers. Supply chain management partners with suppliers using long-term agreements. These agreements ensure that products are delivered with the right quality, at the right cost, at the right time.

To enhance the interchange of information between suppliers and customers, supply chain management often uses:

- **Electronic data interchange (EDI)**, which uses computers to electronically communicate orders, relay information, and make or receive payments from one organization to another
- **Radio frequency identification devices (RFID)**, which are electronic tags (chips) placed on or embedded within products that can be read by radio waves that allow instant monitoring of product location
- **Enterprise resource planning (ERP)** systems, which are used to plan and control internal and supply chain operations

Why It Matters



CONCEPT CLIP

Lean Manufacturing in Action

- **Yamaha Corporation (YAMCY)** manufactures musical instruments such as trumpets, horns, saxophones, clarinets, and flutes using *product-oriented layouts*.
- **Sony Corporation (SNE)** uses *employee involvement* to organize employees into small, four-person teams to completely assemble a camcorder, doing everything from soldering to testing. This team-based approach reduces assembly time from 70 minutes to 15 minutes per camcorder.
- **Kenney Manufacturing Company**, a manufacturer of window shades, estimated that 50% of its window shade process was non-value-added. By using *pull manufacturing* and changing the line layout, it was able to reduce inventory by 82% and lead time by 84%.
- **Motorola Solutions (MSI)** has claimed over $17 billion in savings from *Six Sigma*.
- **Hyundai Motor Company (HYMTF)** will use 20 million RFID tags annually to track automotive parts from its suppliers, providing greater *supply chain* transparency and flexibility.

[1] The term "Six Sigma" refers to a statistical property where a process has less than 3.4 defects per one million items.

Check Up Corner 13-1 Lean Concepts and Lead Time Analysis

I. Lean Concepts

Match the following lean concepts with the appropriate description.

Concept	Description
1. Batch	a. Measures the time interval between when a product enters production and when it is completed.
2. Lead time	b. Manufacturing process that reduces (1) moving materials and products between processes, (2) work in process inventory, (3) lead time, and (4) production costs.
3. Product-oriented layout	c. The effort spent preparing an operation or process for production.
4. Pull manufacturing	d. Products are manufactured only as they are needed by the customer.
5. Setup time	e. The amount of production in units of product that is produced after setup.

II. Lead Time Analysis

The Helping Hands Company manufactures designer gloves. Gloves are manufactured in 50-glove batch sizes, and cut and assembled by the company's workforce. The cutting time is 4 minutes per glove. The assembly time is 6 minutes per glove. It takes 12 minutes to move a batch of gloves from cutting to assembly.

a. For this process, compute (1) the value-added lead time, (2) the non-value-added lead time, and (3) the total lead time.

b. Compute the value-added ratio. Round to one decimal place.

Solution:

I.

1. e
2. a
3. b
4. d
5. c

II.

a. 1. Value-added lead time

Cutting time	4 min.
Assembly time	6
Total value-added lead time	10 min.

2. Non-value-added lead time:

Total within-batch wait time	490 min.
Move time per batch	12
Total non-value-added lead time	502 min.

Total value-added lead time	10 min.
Batch size – 1 (50 gloves per batch − 1)	×49
Total within-batch wait time	490 min.

3. Value-added lead time (from Part a.1.) 10 min.
   Non-value-added lead time (from Part a. 2.) 502 min.
   Total lead time 512 min.

b. Value-added ratio: $\frac{10 \text{ min.}}{512 \text{ min.}} = 2.0\%$ (rounded)

A low value-added ratio such as this indicates a poor manufacturing process.

Check Up Corner

Lean Accounting

Objective 2
Describe the implications of lean manufacturing on the accounting system.

In lean manufacturing, the accounting system reflects the lean philosophy. Such systems are called **lean accounting**, and have the following characteristics:

- *Fewer transactions*. There are fewer transactions to record, thus simplifying the accounting system.
- *Combined accounts*. All in-process work is combined with raw materials to form a new account, **Raw and In Process (RIP) Inventory**. Direct labor is also combined with other costs to form a new account titled **Conversion Costs**.
- *Nonfinancial performance measures*. Nonfinancial performance measures are emphasized.
- *Direct tracing of overhead*. Indirect labor is directly assigned to product cells; thus, less factory overhead is allocated to products.

Fewer Transactions

The traditional process cost accounting system accumulates product costs by department. These costs are transferred from department to department as the product is manufactured. Thus, materials are recorded into and out of work in process inventories as the product moves through the factory.

The recording of product costs by departments facilitates the control of costs. However, this requires that many transactions and costs be recorded and reported. This adds cost and complexity to the cost accounting system.

In lean manufacturing, there is less need for cost control. This is because lower inventory levels make problems more visible. That is, managers don't need accounting reports to indicate problems because any problems become immediately known.

The lean accounting system uses **backflush accounting**. Backflush accounting simplifies the accounting system by eliminating the accumulation and transfer of product costs by departments, but instead pulls material and conversion costs directly to finished goods. Thus, efficiency is gained by not transferring costs through intermediate departmental work in process accounts.

Combined Accounts

Materials are received directly by the product cells and enter immediately into production. Thus, there is no central materials inventory location (warehouse) or a materials account. Instead, lean accounting debits all materials and conversion costs to an account titled *Raw and In Process Inventory*. Doing so combines materials and work in process costs into one account.

Lean manufacturing often does not use a separate direct labor cost classification. This is because the employees in product cells perform many tasks. Some of these tasks could be classified as direct, such as performing operations, and some as indirect, such as performing repairs. Thus, labor cost (direct and indirect) is combined with other product cell overhead costs and recorded in an account titled *Conversion Costs*.

To illustrate, assume the following data for Anderson Metal Fabricators, a manufacturer of metal covers for electronic test equipment:

Budgeted conversion cost	$2,400,000
Planned hours of production	1,920 hours

The cell conversion cost rate is determined as follows:

$$\text{Cell Conversion Cost Rate} = \frac{\text{Budgeted Conversion Cost}}{\text{Planned Hours of Production}}$$

$$= \frac{\$2{,}400{,}000}{1{,}920 \text{ hours}} = \$1{,}250 \text{ per hour}$$

The cell conversion rate is similar to a predetermined factory overhead rate, except that it includes all conversion costs in the numerator.

Assume that Anderson Metal's cover product cell is expected to require 0.02 hour of manufacturing time per unit. Thus, the conversion cost for the cover is $25 per unit, computed as follows:

$$\text{Conversion Cost for Cover} = \text{Manufacturing Time} \times \text{Cell Conversion Cost Rate}$$
$$= 0.02 \text{ hour} \times \$1{,}250 = \$25 \text{ per unit}$$

The recording of selected lean accounting transactions for Anderson Metal Fabricators for April is illustrated in Exhibit 7.

Exhibit 7 Transactions Using Lean Accounting—Anderson Metal Fabricators

Transaction	Journal Entry			Comment
	Raw and In Process Inventory	120,000		Note that the materials purchased are debited to the combined account, Raw and In Process Inventory. A separate materials account is not used, because materials are received directly in the product cells, rather than in an inventory location.
	Accounts Payable		120,000	
	To record materials purchases.			
Conversion costs are applied to 8,000 covers at a rate of $25 per cover.	Raw and In Process Inventory	200,000		The raw and in process inventory account is used to accumulate the applied cell conversion costs during the period. The credit to Conversion Costs is similar to the treatment of applied factory overhead.
	Conversion Costs		200,000	
	To record applied conversion costs of the medium-cover line.			
All 8,000 covers were completed in the cell. The raw and in process inventory account is reduced by the $15 per unit materials cost and the $25 per unit conversion cost.	Finished Goods Inventory	320,000		Materials ($15 × 8,000 units) $120,000 Conversion ($25 × 8,000 units) 200,000 Total $320,000 After the cost of the completed units is transferred from the raw and in process inventory account, the account's balance is zero. There are no units left in process within the cell.[2] This is a backflush transaction.
	Raw and In Process Inventory		320,000	
	To transfer the cost of completed units to finished goods.			
Of the 8,000 units completed, 7,800 were sold and shipped to customers at $70 per unit, leaving 200 finished units in stock. Thus, the finished goods inventory account has a balance of $8,000 (200 × $40).	Accounts Receivable	546,000		Units sold 7,800 Conversion and materials cost per unit × $40 Transferred to Cost of Goods Sold $312,000
	Sales		546,000	
	To record sales.			
	Cost of Goods Sold	312,000		
	Finished Goods Inventory		312,000	
	To record cost of goods sold.			

[2] The actual conversion cost per unit may be different from the budgeted conversion cost per unit due to cell inefficiency, improvements in processing methods, or excess scrap. These deviations from the budgeted cost can be accounted for as cost variances, as illustrated in more advanced texts.

Check Up Corner 13-2 Lean Accounting

The budgeted conversion costs for a lean cell are $142,500 for 1,900 production hours. Each unit produced by the cell requires 10 minutes of cell process time. During the month, 1,050 units are manufactured in the cell. The estimated materials cost is $46 per unit. Journalize entries for the following:

a. Materials are purchased to produce 1,100 units.
b. Conversion costs are applied to 1,050 units of production.
c. The cell completes 1,030 units, which are placed into finished goods.

Solution:

a.

Raw and In Process Inventory	50,600	
Accounts Payable		50,600

1,100 Units to be produced
× $46 Materials cost per unit
$50,600 Materials costs

b.

Raw and In Process Inventory	13,125	
Conversion Costs		13,125

$142,500 Budgeted conversion costs
÷ 1,900 Planned hours of production
$ 75 Cell conversion cost rate per hour
× 0.1667 (10 min./60 min.) Manufacturing time per unit per hour
$ 12.50 Conversion cost for cover (per unit)
× 1,050 Units produced
$ 13,125 Conversion cost

c.

Finished Goods Inventory	60,255	
Raw and In Process Inventory		60,255

$ 46.00 Materials cost per unit
+ 12.50 Conversion cost per unit
$ 58.50 Conversion and materials costs per unit
× 1,030 Units completed
$ 60,255 Cost of completed units

Check Up Corner

Nonfinancial Performance Measures

Lean manufacturing normally uses nonfinancial measures to help guide short-term operating performance. A **nonfinancial measure** is operating information not stated in dollar terms. Examples of nonfinancial measures of performance include:

- Lead time
- Value-added ratio
- Setup time
- Number of production line stops
- Number of units scrapped
- Deviations from scheduled production
- Number of failed inspections

Most companies use a combination of financial and nonfinancial operating measures, which are often referred to as *key performance indicators* (or *KPIs*). Nonfinancial measures are often available more quickly than financial measures. Thus, nonfinancial measures are often used for day-to-day operating decisions that require quick feedback. In contrast, traditional financial accounting measures are often used for longer-term operating decisions.

Direct Tracing of Overhead

In lean manufacturing, many indirect tasks are assigned to a product cell. For example, maintenance department personnel may be assigned to a product cell and cross-trained to perform other operations. Thus, the salary of maintenance personnel can be traced directly to the product cell and, thus, to the product.

In traditional manufacturing, maintenance personnel are part of the maintenance department. The cost of the maintenance department is then allocated to products based on predetermined factory overhead rates. Such allocations are not necessary when maintenance personnel are assigned directly to a product cell.

Objective 3
Describe and illustrate activity analysis for improving operations.

Activity Analysis

In Chapter 4, we discussed activity-based costing for product costing. Activities can also be used to support operational improvement in the lean enterprise using activity analysis. **Activity analysis** determines the cost of activities for the purpose of determining the cost of the following:

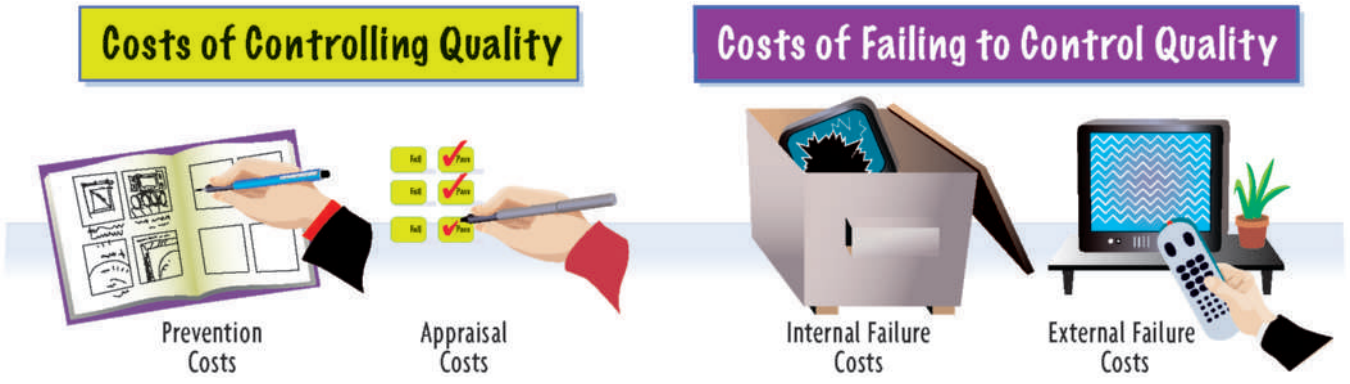
- Quality
- Value-added activities
- Processes

Costs of Quality

Competition encourages businesses to emphasize high-quality products, services, and processes. In doing so, businesses incur **costs of quality**, as illustrated in Exhibit 8. These costs of quality can be classified as follows:

- **Prevention costs**, which are costs of preventing defects before or during the manufacture of the product or delivery of services
  Examples: Costs of engineering good product design, controlling vendor quality, training equipment operators, maintaining equipment
- **Appraisal costs**, which are costs of activities that detect, measure, evaluate, and inspect products and processes to ensure that they meet customer needs
  Examples: Costs of inspecting and testing products
- **Internal failure costs**, which are costs associated with defects discovered before the product is delivered to the consumer
  Examples: Cost of scrap and rework
- **External failure costs**, which are costs incurred after defective products have been delivered to consumers
  Examples: Cost of recalls and warranty work

Exhibit 8 Costs of Quality



Prevention and appraisal costs can be thought of as costs of controlling quality *before* any products are known to be defective. Internal and external failure costs can be thought of as the cost of controlling quality *after* products have become defective. Internal and external failure costs also can be thought of as the costs of "failing to control quality" through prevention and appraisal efforts.

Prevention and appraisal costs are incurred *before* the product is manufactured or delivered to the customer. Prevention costs are incurred in an attempt to permanently improve product quality. In contrast, appraisal costs are incurred in an attempt to limit the amount of defective products that "slip out the door."

Internal and external failure costs are incurred *after* the defective products have been discovered. In addition to costs of scrap and rework, internal failure costs may be incurred for lost equipment

time because of rework and the costs of carrying additional inventory used for reworking. In addition to costs of recall and warranty work, external failure costs include the loss of customer goodwill. Although the loss of customer goodwill is difficult to measure, it may be the largest and most important quality control cost.

Precor provides training and workout videos on how to use its equipment. Link to Precor

The relationship between the costs of quality is shown in Exhibit 9. The graph in Exhibit 9 indicates that as prevention and appraisal costs (blue line) increase, the percent of good units increases. In contrast, as internal and external failure costs (green line) decrease, the percent of good units increases. Total quality costs (red line) is the sum of the prevention/appraisal costs and internal/external failure costs.

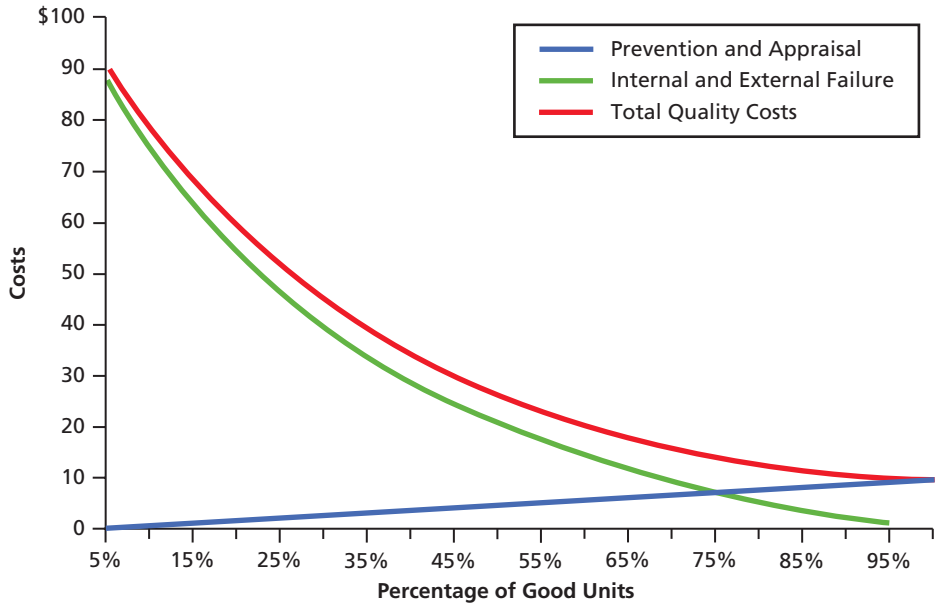


Exhibit 9
The Relationship between the Costs of Quality

The optimal level of quality (percent of good units) is the one that minimizes the total quality costs. At this point, prevention and appraisal costs are balanced against internal and external failure costs. Exhibit 9 indicates that the optimal level of quality occurs at (or near) 100% quality. This is because prevention and appraisal costs grow moderately as quality increases. However, the costs of internal and external failure drop dramatically as quality increases.

Quality Activity Analysis

An activity analysis of quality quantifies the costs of quality in dollar terms. To illustrate, the quality control activities, activity costs, and quality cost classifications for Gifford Company, a consumer electronics company, are shown in Exhibit 10.

Why It Matters

External Failure Costs: Lululemon Stretched Thin

Lululemon Athletica Inc. (LULU) experienced a significant product recall in 2013 because its women's black luon pants produced a visible level of "sheerness," which was deemed unacceptable to its customers. It was discovered that the material purchased for the product failed to meet its technical specifications. As a result, 17% of the pants were recalled and returned to the manufacturer, resulting in rework, allowances, and nearly $60 million in lost revenues.

Source: E. Tovar, "Cost of Quality: Case Study of Lululemon Recall 2013," *Prezi.com*, February 14, 2014.

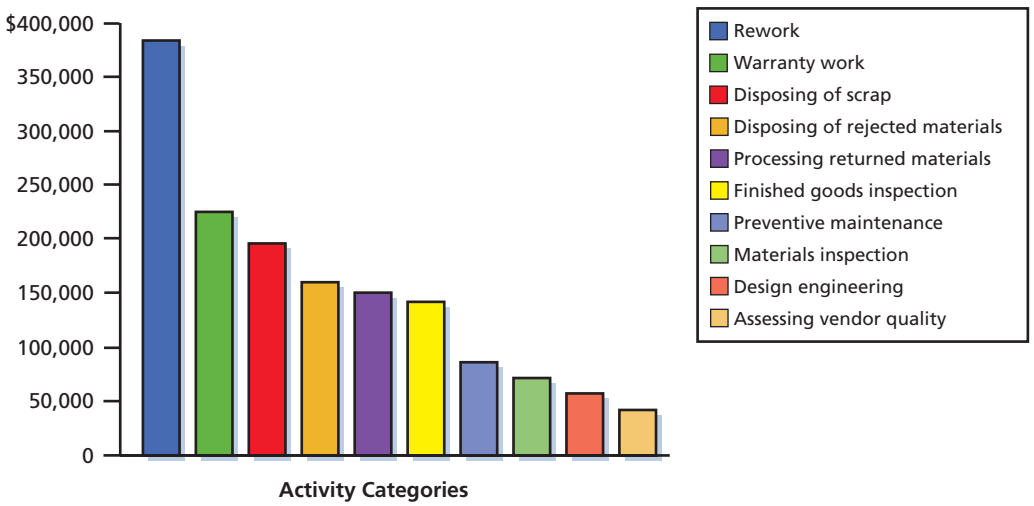
Exhibit 10
Quality Control Activity Analysis—Gifford Company

Quality Control Activities	Activity Cost	Quality Cost Classification
Design engineering	$ 55,000	Prevention
Disposing of rejected materials	160,000	Internal Failure
Finished goods inspection	140,000	Appraisal
Materials inspection	70,000	Appraisal
Preventive maintenance	80,000	Prevention
Processing returned materials	150,000	External Failure
Disposing of scrap	195,000	Internal Failure
Assessing vendor quality	45,000	Prevention
Rework	380,000	Internal Failure
Warranty work	225,000	External Failure
Total activity cost	$1,500,000	

Pareto Chart of Quality Costs One method of reporting quality cost information is using a Pareto chart. A **Pareto chart** is a bar chart that shows the totals of an attribute for a number of categories. The categories are ranked and shown left to right, so that the largest total attribute is on the left and the smallest total is on the right.

To illustrate, Exhibit 11 is a Pareto chart for the quality control activities in Exhibit 10. In Exhibit 11, the vertical axis is dollars, which represents quality control costs. The horizontal axis represents activity categories, which are the 10 quality control cost activities. The 10 quality control cost categories are ranked from the one with the largest total on the left to the one with the smallest total on the right. Thus, the largest bar on the left is rework costs ($380,000), the second bar is warranty work ($225,000), and so on.

Exhibit 11
Pareto Chart of Quality Costs



The Pareto chart gives managers a quick visual tool for identifying the most important quality control cost categories. Exhibit 11 indicates that Gifford Company should focus efforts on reducing rework and warranty costs.

Cost of Quality Report The costs of quality also can be summarized in a cost of quality report. A **cost of quality report** normally reports the following:

- Total activity cost for each quality cost classification
- Percent of total quality costs associated with each classification
- Percent of each quality cost classification to sales

Exhibit 12 is a cost of quality report for Gifford Company, based on assumed sales of $5,000,000. Exhibit 12 indicates that only 12% of the total quality cost is the cost of preventing quality problems, while 14% is the cost of appraisal activities. Thus, prevention and appraisal costs make up

Exhibit 12
Cost of Quality Report—Gifford Company

Gifford Company
Cost of Quality Report

Quality Cost Classification	Quality Cost	Percent of Total Quality Cost	Percent of Total Sales
Prevention	$ 180,000	12%	3.6%
Appraisal	210,000	14	4.2
Internal failure	735,000	49	14.7
External failure	375,000	25	7.5
Totals	$1,500,000	100%	30.0%

only 26% of the total quality control costs. In contrast, 74% (49% + 25%) of the quality control costs are incurred for internal (49%) and external failure (25%) costs. In addition, internal and external failure costs are 22.2% (14.7% + 7.5%) of sales.

Exhibit 12 implies that Gifford Company is not spending enough on prevention and appraisal activities. By spending more on prevention and appraisal, internal and external failure costs will decrease, as was shown in Exhibit 9.

Check Up Corner 13-3 Cost of Quality Report

A quality control activity analysis indicated the following four activity costs of an administrative department:

Verifying the accuracy of a form	$ 50,000
Responding to customer complaints	100,000
Correcting errors in forms	75,000
Redesigning forms to reduce errors	25,000
Total	$250,000

Sales are $2,000,000. Prepare a cost of quality report.

Solution:

Cost of Quality Report

Quality Cost Classification	Quality Cost	Percent of Total Quality Cost	Percent of Total Sales
Prevention	$ 25,000	10%	1.25%
Appraisal	50,000	20	2.50
Internal failure	75,000	30	3.75
External failure	100,000	40	5.00
Totals	$250,000	100%	12.50%

Associated activity cost ÷ $250,000

Associated activity cost ÷ $2,000,000

(Redesigning forms) Costs of preventing defects before or during the manufacture of the product

(Verifying accuracy) Costs of activities that detect, measure, evaluate, and inspect products and processes to ensure that they meet customer needs

(Correcting errors) Costs associated with defects discovered before the product is delivered to the consumer

(Responding to complaints) Costs incurred after defective products have been delivered to consumers

Check Up Corner

Value-Added Activity Analysis

In the preceding section, the quality control activities of Gifford Company were classified as prevention, appraisal, internal failure, and external failure activities. Activities also may be classified as follows:

- Value-added
- Non-value-added

A **value-added activity** is one that is necessary to meet customer requirements. A **non-value-added activity** is *not* required by the customer but occurs because of mistakes, errors, omissions, and process failures.

To illustrate, Exhibit 13 shows the value-added and non-value-added classification for the quality control activities for Gifford Company.[3] This exhibit also reveals that internal and external failure costs are classified as non-value-added. In contrast, prevention and appraisal costs are classified as value-added.[4]

Exhibit 13
Value-Added/ Non-Value-Added Quality Control Activities

Quality Control Activities	Activity Cost	Classification
Design engineering	$ 55,000	Value-added
Disposing of rejected materials	160,000	Non-value-added
Finished goods inspection	140,000	Value-added
Materials inspection	70,000	Value-added
Preventive maintenance	80,000	Value-added
Processing returned materials	150,000	Non-value-added
Disposing of scrap	195,000	Non-value-added
Assessing vendor quality	45,000	Value-added
Rework	380,000	Non-value-added
Warranty work	225,000	Non-value-added
Total activity cost	$1,500,000	

A summary of the value-added and non-value-added activities follows. The summary expresses value-added and non-value-added costs as a percent of total costs.

Classification	Amount	Percent
Value-added	$ 390,000	26%
Non-value-added	1,110,000	74
Total	$1,500,000	100%

The preceding summary indicates that 74% of Gifford Company's quality control activities are non-value-added. This should motivate Gifford Company to make improvements to reduce non-value-added activities.

Link to Precor Innovation and product improvement are value-added activities. **Precor** holds numerous patents for treadmills, bikes, and elliptical products.

Process Activity Analysis

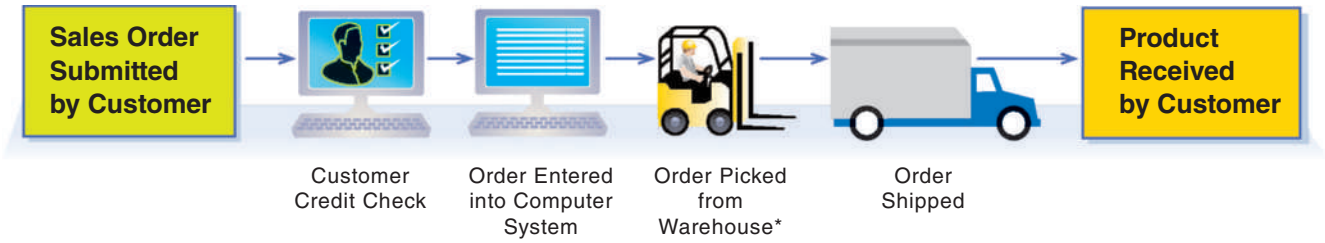
Activity analysis can be used to evaluate business processes. A **process** is a series of activities that converts an input into an output. In other words, a process is a set of activities linked together by inputs and outputs. Common business processes include the following:

- Procurement
- Product development
- Manufacturing
- Distribution
- Sales order fulfillment

Exhibit 14 shows a sales order fulfillment process for Masters Company. This process converts a customer order (the input) into a product received by the customer (the output).

[3] We use the quality control activities for illustrating the value-added and non-value-added activities in this section. However, a value-added/non-value-added activity analysis can be done for any activity in a business, not just quality control activities.
[4] Some believe that appraisal costs are non-value-added. They argue that if the product had been made correctly, then no inspection would be required. We take a less strict view and assume that appraisal costs are value-added.

Exhibit 14 Sales Order Fulfillment Process



*Operators driving forklifts receive a list of orders, drive to stacking locations within the warehouse, pick the orders, and then transport them back to an area to prepare for shipment.

Exhibit 14 indicates that Masters Company's sales order fulfillment process has the following four activities:

- Customer credit check
- Order entered into computer system
- Order picked from warehouse
- Order shipped

A process activity analysis can be used to determine the cost of the preceding activities. To illustrate, assume that a process activity analysis determines that the cost of the four activities is as follows:

Sales Order Fulfillment Activities	Activity Cost	Percent of Total Process Cost
Customer credit check	$14,400	18%
Order entered into computer system	9,600	12
Order picked from warehouse	36,000	45
Order shipped	20,000	25
Total sales order fulfillment process cost	$80,000	100%

If 10,000 sales orders are filled during the current period, the per-unit process cost is $8 per order ($80,000 ÷ 10,000 orders).

Management can use process activity analysis to improve a process. To illustrate, assume that Masters Company sets a cost improvement target of $6 per order. A $2 reduction per order ($8 – $6) requires improving efficiency or eliminating unnecessary activities.

Masters Company determines that only *new* customers need to have a credit check. If this change is made, it is estimated that only 25% of sales orders would require credit checks. In addition, by revising the warehouse product layout, it is estimated that the cost of picking orders can be reduced by 35%.

Assuming that 10,000 orders will be filled, the cost savings from these two improvements are as follows:

Sales Order Fulfillment Activities	Activity Cost Prior to Improvement	Activity Cost After Improvement	Activity Cost Savings
Customer credit check	$14,400	$ 3,600*	$10,800
Order entered into computer system	9,600	9,600	0
Order picked from warehouse	36,000	23,400**	12,600
Order shipped	20,000	20,000	0
Totals	$80,000	$56,600	$23,400
Cost per order (total cost divided by 10,000 orders)	$8.00	$5.66	

*$14,400 × 25%

**$36,000 – ($36,000 × 35%)

As illustrated, the activity changes generate a savings of $23,400.[5] In addition, the cost per order is reduced to $5.66, which is less than the $6.00 per order targeted cost.[6]

[5] This analysis assumes that the activity costs are variable to the inputs and outputs of the process. While this is likely true for processes primarily using labor, such as a sales order fulfillment process, other types of processes may have significant fixed costs that would not change with changes of inputs and outputs.

[6] Process activity analysis also can be integrated into a company's budgeting system using flexible budgets. Process activity analysis used in this way is discussed in advanced texts.

Analysis for Decision Making

Objective 4

Describe and illustrate the use of lean principles and activity analysis in a service or administrative setting.

Lean Performance for Nonmanufacturing

All of the lean principles and activity analyses discussed for a manufacturer can be adapted to service businesses or administrative processes. Examples of service businesses that use lean principles include hospitals, banks, insurance companies, and hotels. For service businesses, the "product" can be the service being offered, or even the customer being served. Thus, for example, a hospital would measure the length of time to admit a patient in evaluating its admissions process.

Examples of administrative processes that use lean principles include processing insurance applications, product designs, and sales orders. For administrative processes, the "product" is often information. Thus, for example, a product design department would measure how long it takes to process a product design modification.

To illustrate, the customer service department of Municipal Water Services, Inc., resolves residential water problems. To determine how to improve its customer service, the department would measure its resolution response time. Resolution response time data are as follows:

	Average Response Time
First contact	0.5 hour
Service scheduling	0.5 hour
Wait for service	17.0 hours
Service	2.0 hours
Total resolution time	20.0 hours

The total lead time from the customer's first contact to final resolution is 20 hours. Of this time, 17 hours represent the customer waiting for the service. This represents 85% (17 hrs. ÷ 20 hrs.) non-value-added lead time in this process, or a 15% value-added ratio. Process improvement should focus on reducing the amount of time a customer waits for service. Improving scheduling or adding resources to the process could reduce wait time.

Make a Decision Lean Performance for Nonmanufacturing

Analyze Northern Highlands Hospital (MAD 13-1)

Analyze Shield Insurance Company (MAD 13-2)

Analyze a hospital operating room (MAD 13-3)

Analyze a doctor's office (MAD 13-4)

Make a Decision

Let's Review

Chapter Summary

1. Lean manufacturing emphasizes reduced lead time, a product-oriented production layout, a team-oriented work environment, setup time reduction, pull manufacturing, high quality, and supplier and customer partnering in order to improve the supply chain.
2. Under lean manufacturing, the lean accounting system will have fewer transactions, will combine the materials and work in process accounts, and will account for direct labor as a part of cell conversion cost. Lean accounting will use nonfinancial reporting measures and result in more direct tracing of factory overhead to product cells.
3. Companies use activity analysis to identify the costs of quality, which include prevention, appraisal, internal failure, and external failure costs. The quality cost activities may be reported on a Pareto chart or quality cost report. An alternative method for categorizing activities is by value-added and non-value-added classifications. An activity analysis also can be used to improve the cost of processes.
4. Lean principles and activity analysis can be adapted to service businesses and to administrative processes. For service businesses, the product can be the service being sold, or even the customer being served. For administrative processes, the product is often simply information.

Key Terms

activity analysis (626)
appraisal costs (626)
backflush accounting (623)
batch size (617)
Conversion Costs (623)
cost of quality report (628)
costs of quality (626)
electronic data interchange (EDI) (621)
employee involvement (620)
enterprise resource planning (ERP) (621)
external failure costs (626)
internal failure costs (626)
lead time (615)
lean accounting (623)
lean enterprise (614)
lean manufacturing (614)
lean principles (614)
nonfinancial measure (625)
non-value-added activity (630)
non-value-added lead time (616)
Pareto chart (628)
prevention costs (626)
process (630)
process-oriented layout (620)
product-oriented layout (620)
pull manufacturing (620)
push manufacturing (621)
radio frequency identification devices (RFID) (621)
Raw and In Process (RIP) Inventory (623)
Six Sigma (621)
supply chain management (621)
value-added activity (630)
value-added lead time (616)
value-added ratio (616)

Practice

Multiple-Choice Questions

1. Which of the following is ***not*** a characteristic of the lean manufacturing philosophy?
   a. Product-oriented layout
   b. Push manufacturing (make to stock)
   c. Short lead times
   d. Reducing setup time as a critical improvement priority

2. Accounting for lean manufacturing is best described as:
   a. more complex.
   b. focused on direct labor.
   c. providing detailed variance reports.
   d. providing less transaction control.

3. A product cell for Dynah Company has budgeted conversion costs of $420,000 for the year. The cell is planned to be available 2,100 hours for production. Each unit requires $12.50 of materials cost. The cell started and completed 700 units. The cell process time for the product is 15 minutes per unit. What is the cost to be debited to Finished Goods for the period?
   a. $8,750
   b. $35,000
   c. $43,750
   d. $140,000

4. In-process inspection activities are an example of what type of quality cost?
   a. Prevention
   b. Appraisal
   c. Internal failure
   d. External failure

5. A Pareto chart is used to display:
   a. a ranking of attribute totals, by category, in the form of a bar chart.
   b. important trends in the form of a line chart.
   c. percentage information in the form of a pie chart.
   d. a listing of attribute totals, by category, in a table.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Lead time — Obj. 1

The Swift Mountain Ski Company manufactures skis in the finishing and assembly process. Skis are manufactured in 30-ski batch sizes. The finishing time is 14 minutes per ski. The assembly time is 10 minutes per ski. It takes 8 minutes to move a batch of skis from finishing to assembly.

a. Compute the value-added, non-value-added, and total lead time of this process.
b. Compute the value-added ratio. Round to one decimal place.

2. Lean features — Obj. 1

Which of the following are features of a lean manufacturing system?

a. Production pace matches demand
b. Centralized work in process inventory locations
c. Push scheduling
d. Receive raw materials directly to manufacturing cells

3. Lean accounting — Obj. 2

The annual budgeted conversion costs for a lean cell are $663,000 for 1,950 production hours. Each unit produced by the cell requires 15 minutes of cell process time. During the month, 665 units are manufactured in the cell. The estimated materials costs are $160 per unit. Journalize entries for the following:

a. Materials are purchased to produce 700 units.
b. Conversion costs are applied to 665 units of production.
c. The cell completes 650 units, which are placed into finished goods.

4. Cost of quality report — Obj. 3

A quality control activity analysis indicated the following four activity costs of a manufacturing department:

Rework	$ 39,000
Inspecting incoming raw materials	51,000
Warranty work	27,000
Process improvement effort	183,000
Total	$300,000

Sales are $1,000,000. Prepare a cost of quality report. Round percentages to one decimal place.

5. Process activity analysis **Obj. 3**

Lexter Company incurred an activity cost of $180,000 for inspecting 25,000 units of production. Management determined that the inspecting objectives could be met without inspecting every unit. Therefore, rather than inspecting 25,000 units of production, the inspection activity was limited to 40% of the production. Determine the inspection activity cost per unit on 25,000 units of total production both before and after the improvement.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Krisco Company operates under the lean philosophy. As such, it has a production cell for its microwave ovens. The conversion cost for 2,400 hours of production is budgeted for the year at $4,800,000.

During January, 2,000 microwave ovens were started and completed. Each oven requires 6 minutes of cell processing time. The materials cost for each oven is $100.

Instructions

Use lean accounting to:

1. Determine the budgeted cell conversion cost per hour.
2. Determine the manufacturing cost per unit.
3. Journalize the entries to record the costs charged to the production cell in January.
4. Journalize the entry to record the costs transferred to finished goods.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **b** The lean manufacturing philosophy embraces a product-oriented layout (answer a), making lead times short (answer c), and reducing setup times (answer d). Pull manufacturing, the opposite of push manufacturing (answer b), is also a lean manufacturing principle.

2. **d** Accounting in a lean manufacturing environment should not be complex (answer a), should not focus on direct labor (answer b) because it is combined with other conversion costs, and should not provide detailed variance reporting (answer c) because of higher reliance on nonfinancial performance measures. However, the lean manufacturing environment will have fewer transaction control features than the traditional system (answer d).

3. **c** $420,000 ÷ 2,100 hours = $200 per hour
   $200 per hour × 0.25 per hour = $50 per unit
   700 units × ($50 + $12.50) = $43,750

4. **b** Appraisal costs (answer b) are the cost of inspecting and testing activities, which include detecting, measuring, evaluating, and auditing products and processes. Prevention (answer a) activities are incurred to prevent defects from occurring during the design and delivery of products or services. Internal failure costs (answer c) are associated with defects that are discovered by the organization before the product or service is delivered to the customer. External failure costs (answer d) are costs incurred after defective units or services have been delivered to customers.

5. **a** A Pareto chart is a bar chart that ranks attribute totals by category (answer a). A line chart (answer b), a pie chart (answer c), and a table listing (answer d) are other ways of displaying information, but they are not Pareto charts.

Exercises

1. a. Value-added lead time ..... 24 min. (14 min. + 10 min.)
   Non-value-added lead time:
   Total within-batch wait time ..... 696 (14 min. + 10 min.) × (30 – 1)
   Move time 8
   Total lead time ..... 728 min.

   b. Value-added ratio: $\frac{24 \text{ min.}}{728 \text{ min.}} = 3.3\%$

2. a. Production pace matches demand
   d. Receive raw materials directly to manufacturing cells

3. a.

Raw and In Process Inventory	112,000	
Accounts Payable		112,000
To record materials purchases ($160 per unit × 700 units).		

   b.

Raw and In Process Inventory	56,525	
Conversion Costs		56,525
To record applied conversion costs {[($663,000 ÷ 1,950 hours) × (15 min. ÷ 60 min.)] × 665 units}.		

   c.

Finished Goods Inventory	159,250	
Raw and In Process Inventory		159,250
To transfer the cost of completed units to finished goods [($160 + $85) × 650 units].		

4. **Cost of Quality Report**

Quality Cost Classification	Quality Cost	Percent of Total Quality Cost	Percent of Total Sales
Prevention	$183,000	61%	18.3%
Appraisal	51,000	17	5.1
Internal failure	39,000	13	3.9
External failure	27,000	9	2.7
Totals	$300,000	100%	30.0%

5. Inspection activity before improvement ..... $180,000 ÷ 25,000 units = $7.20 per unit
   Inspection activity after improvement:
   Revised inspection cost ..... (40% × 25,000 units) × $7.20 per unit = $72,000
   Revised inspection cost per unit ..... $72,000 ÷ 25,000 units = $2.88 per unit

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1. Budgeted Cell Conversion Cost Rate = $\frac{\$4,800,000}{2,400 \text{ hours}} = \$2,000$ per cell hour

2.

Materials	$100 per unit
Conversion cost [($2,000 per hour ÷ 60 min.) × 6 min.]	200
Total	$300 per unit

3.

Raw and In Process Inventory	200,000	
Accounts Payable		200,000
To record materials purchases (2,000 units × $100 per unit).		

Raw and In Process Inventory	400,000	
Conversion Costs		400,000
To record applied conversion costs (2,000 units × $200 per unit).		

4.

Finished Goods Inventory	600,000	
Raw and In Process Inventory		600,000
To transfer the cost of completed units to finished goods (2,000 units × $300 per unit).		

Discussion Questions

1. What is the benefit of the lean philosophy?
2. What are some examples of non-value-added lead time?
3. Why is a product-oriented layout preferred by lean manufacturers over a process-oriented layout?
4. How is setup time related to lead time?
5. Why do lean manufacturers favor pull or "make to order" manufacturing?
6. Why would a lean manufacturer strive to produce zero defects?
7. How is supply chain management different from traditional supplier and customer relationships?
8. Why does lean accounting result in fewer transactions?
9. Why do lean manufacturers use a "raw and in process inventory" account, rather than separately reporting materials and work in process?
10. Why is the direct labor cost category eliminated in many lean manufacturing environments?
11. How does a Pareto chart assist management?
12. What is the benefit of identifying non-value-added activities?
13. In what ways can the cost of a process be improved?

Basic Exercises



BE 13-1 Lead time **Obj. 1**

Blues Inc. manufactures jeans in the cutting and sewing process. Jeans are manufactured in 40-jean batch sizes. The cutting time is 5 minutes per jean. The sewing time is 20 minutes per jean. It takes 2 minutes to move a batch of jeans from cutting to sewing.

a. Compute the value-added, non-value-added, and total lead time of this process.

b. Compute the value-added ratio. Round to one decimal place.

BE 13-2 Lean features **Obj. 1**

Which of the following are features of a lean manufacturing system?

a. Smaller batch sizes

b. Centralized maintenance areas

c. Employee involvement

d. Less wasted movement of material and people



BE 13-3 Lean accounting **Obj. 2**

The annual budgeted conversion costs for a lean cell are $180,000 for 1,000 production hours. Each unit produced by the cell requires 20 minutes of cell process time. During the month, 600 units are manufactured in the cell. The estimated materials costs are $30 per unit. Journalize the following entries for the month:

a. Materials are purchased to produce 500 units.

b. Conversion costs are applied to 600 units of production.

c. The cell completes 450 units, which are placed into finished goods.



BE 13-4 Cost of quality report **Obj. 3**

A quality control activity analysis indicated the following four activity costs of a hotel:

Inspecting cleanliness of rooms	$175,000
Processing lost customer reservations	40,000
Rework incorrectly prepared room service meal	20,000
Employee training	265,000
Total	$500,000

Sales are $4,000,000. Prepare a cost of quality report. Round percentages to one decimal place.



BE 13-5 Process activity analysis **Obj. 3**

Roen Company incurred an activity cost of $105,600 for inspecting 40,000 units of production. Management determined that the inspecting objectives could be met without inspecting every unit. Therefore, rather than inspecting 40,000 units of production, the inspection activity was limited to a random selection of 5,000 units out of the 40,000 units of production. Determine the inspection activity cost per unit on 40,000 units of total production both before and after the improvement.

Exercises

EX 13-1 Lean principles **Obj. 1**

The chief executive officer (CEO) of Cobalt Inc. just read an article written by a business professor at Harvard University describing the benefits of the lean philosophy. The CEO issued the following statement after reading the article:

This company will become a lean manufacturing company. Presently, we have too much inventory. To become lean, we need to eliminate the excess inventory. Therefore, I want all employees to begin reducing inventories until we make products "just in time." Thank you for your cooperation.

How would you respond to the CEO's statement?

EX 13-2 Lean as a strategy **Obj. 1**

The American textile industry has moved much of its operations offshore in the pursuit of lower labor costs. Textile imports have risen from under 5% of all textile production in the early 1960s to over 95% today. Offshore manufacturers make long runs of standard mass-market apparel items. These are then brought to the United States in container ships, requiring significant time between original order and delivery. As a result, retail customers must accurately forecast market demands for imported apparel items.

Assuming that you work for a U.S.-based textile company, how would you recommend responding to the low-cost imports?

EX 13-3 Lean principles

Obj. 1

Rag Swag Inc. manufactures various styles of men's casual wear. Shirts are cut and assembled by a workforce that is paid by piece rate. This means that they are paid according to the amount of work completed during a period of time. To illustrate, if the piece rate is $0.10 per sleeve assembled, and the worker assembles 800 sleeves during the day, then the worker would be paid $80 (800 × $0.10) for the day's work.

The company is considering adopting a lean manufacturing philosophy by organizing work cells around various types of products and employing pull manufacturing. However, no change is expected in the compensation policy. On this point, the manufacturing manager stated the following:

"Piecework compensation provides an incentive to work fast. Without it, the workers will just goof off and expect a full day's pay. We can't pay straight hourly wages—at least not in this industry."

How would you respond to the manufacturing manager's comments?

EX 13-4 Lead time analysis

Obj. 1

Furry Friends Inc. manufactures toy stuffed animals. The direct labor time required to cut, sew, and stuff a toy is 10 minutes per unit. The company makes two types of stuffed toys—a lion and a bear. The lion is assembled in lot sizes of 50 units per batch, while the bear is assembled in lot sizes of 8 units per batch. Since each product has direct labor time of 10 minutes per unit, management has determined that the lead time for each product is 10 minutes.

Is management correct? What are the lead times for each product?

EX 13-5 Reduce setup time

Obj. 1

Vernon Inc. has analyzed the setup time on its computer-controlled lathe. The setup requires changing the type of fixture that holds a part. The average setup time has been 140 minutes, consisting of the following steps:

Turn off machine and remove fixture from lathe	15 minutes
Go to tool room with fixture	15
Record replacement of fixture to tool room	18
Return to lathe	20
Clean lathe	20
Return to tool room	20
Record withdrawal of new fixture from tool room	12
Return to lathe	15
Install new fixture and turn on machine	5
Total setup time	140 minutes

a. Why should management be concerned about improving setup time?

b. What do you recommend to Vernon Inc. for improving setup time?

c. How much time would be required for a setup, using your suggestion in (b)?

EX 13-6 Compute lead time

Obj. 1

Value-added, 14 minutes



EXCEL TEMPLATE

Jackson Fabricators Inc. machines metal parts for the automotive industry. Under the traditional manufacturing approach, the parts are machined through two processes: milling and finishing. Parts are produced in batch sizes of 40 parts. A part requires 6 minutes in milling and 8 minutes in finishing. The move time between the two operations for a complete batch is 5 minutes.

Under the lean philosophy, the part is produced in a cell that includes both the milling and finishing operations. The operating time is unchanged; however, the batch size is reduced to 5 parts and the move time is eliminated.

Determine the value-added, non-value-added, and total lead times, and the value-added ratio under the traditional and lean manufacturing methods. Round percentages to one decimal place.

EX 13-7 Compute lead time

Obj. 1

✔ b. Non-value-added, 50 minutes



EXCEL TEMPLATE

Williams Optical Inc. is considering a new lean product cell. The present manufacturing approach produces a product in four separate steps. The production batch sizes are 45 units. The process time for each step is as follows:

Process Step 1	5 minutes
Process Step 2	8 minutes
Process Step 3	4 minutes
Process Step 4	3 minutes

The time required to move each batch between steps is 5 minutes. In addition, the time to move raw materials to Process Step 1 is also 5 minutes, and the time to move completed units from Process Step 4 to finished goods inventory is 5 minutes.

The new lean layout will allow the company to reduce the batch sizes from 45 units to 3 units. The time required to move each batch between steps and the inventory locations will be reduced to 2 minutes. The processing time in each step will stay the same.

Determine the value-added, non-value-added, and total lead times, and the value-added ratio under the (a) present and (b) proposed production approaches. Round percentages to one decimal place.

EX 13-8 Suppy chain management

Obj. 1



REAL WORLD

The following is an excerpt from an article discussing supplier relationships with the Big Three North American automakers.

"The Big Three select suppliers on the basis of lowest price and annual price reductions," said Neil De Koker, president of the Original Equipment Suppliers Association. "They look globally for the lowest parts prices from the lowest cost countries," De Koker said. "There is little trust and respect. Collaboration is missing." Japanese automakers want long-term supplier relationships. They select suppliers as a person would a mate. The Big Three are quick to beat down prices with methods such as electronic auctions or rebidding work to a competitor. The Japanese are equally tough on price but are committed to maintaining supplier continuity. "They work with you to arrive at a competitive price, and they are willing to pay because they want long-term partnering," said Carl Code, a vice president at **Ernie Green Industries**. "They [**Honda (HMC)** and **Toyota (TM)**] want suppliers to make enough money to stay in business, grow, and bring them innovation." The Big Three's supply chain model is not much different from the one set by Henry Ford. In 1913, he set up the system of independent supplier firms operating at arm's length on short-term contracts. One consequence of the Big Three's low-price-at-all-costs mentality is that suppliers are reluctant to offer them their cutting-edge technology out of fear the contract will be resourced before the research and development costs are recouped.

Source: Robert Sherefkin and Amy Wilson, "Suppliers Prefer Japanese Business Model," *Rubber & Plastics News*, March 17, 2003, Vol. 24, No. 11.

a. Contrast the Japanese supply chain model with that of the Big Three.

b. Why might a supplier prefer the Japanese model?

c. What benefits might accrue to the Big Three by adopting the Japanese supply chain practices?

EX 13-9 Employee involvement

Obj. 1



REAL WORLD

Quickie Designs Inc. uses teams in the manufacture of lightweight wheelchairs. Two features of its team approach are team hiring and peer reviews. Under team hiring, the team recruits, interviews, and hires new team members from within the organization. Using peer reviews, the team evaluates each member of the team with regard to quality, knowledge, teamwork, goal performance, attendance, and safety. These reviews provide feedback to the team member for improvement.

How do these two team approaches differ from using managers to hire and evaluate employees?

EX 13-10 Lean principles for a restaurant

Obj. 1

The management of Daddy-O's fast-food franchise wants to provide hamburgers quickly to customers. It has been using a process by which precooked hamburgers are prepared and placed under hot lamps. These hamburgers are then sold to customers. In this process, every customer

receives the same type of hamburger and dressing (ketchup, onions, mustard). If a customer wants something different, then a "special order" must be cooked to the customer's requirements. This requires the customer to wait several minutes, which often slows down the service line. Daddy-O's has been receiving more and more special orders from customers, which has been slowing service down considerably.

a. Is the Daddy-O's service delivery system best described as a push or pull system? Explain.

b. How might you use lean principles to provide customers quick service, yet still allow them to custom order their burgers?

EX 13-11 Accounting issues in a lean environment

Obj. 2

Eon Technologies has recently implemented a lean manufacturing approach. A production manager has approached the controller with the following comments:

I am very upset with our accounting system now that we have implemented our new lean manufacturing methods. It seems as if all I'm doing is paperwork. Our product is moving so fast through the manufacturing process that the paperwork can hardly keep up. For example, it just doesn't make sense to me to fill out daily labor reports. The employees are assigned to complete cells, performing many different tasks. I can't keep up with direct labor reports on each individual task. I thought we were trying to eliminate waste. Yet the information requirements of the accounting system are slowing us down and adding to overall lead time. Moreover, I'm still getting my monthly variance reports. I don't think that these are necessary. I have nonfinancial performance measures that are more timely than these reports. Besides, the employees don't really understand accounting variances. How about giving some information that I can really use?

What accounting system changes would you suggest in light of the production department manager's criticisms?

EX 13-12 Lean accounting

Obj. 2

✔ b. $105



SHOW ME HOW

Westgate Inc. uses a lean manufacturing strategy to manufacture DVR (digital video recorder) players. The company manufactures DVR players through a single product cell. The budgeted conversion cost for the year is $600,000 for 2,000 production hours. Each unit requires 21 minutes of cell process time. During March, 500 DVR players were manufactured in the cell. The materials cost per unit is $60. The following summary transactions took place during March:

1. Materials were purchased for March production.
2. Conversion costs were applied to production.
3. 500 DVR players were assembled and placed in finished goods.
4. 480 DVR players were sold for $240 per unit.

a. Determine the budgeted cell conversion cost per hour.

b. Determine the budgeted cell conversion cost per unit.

c. Journalize the summary transactions (1)–(4) for March.

EX 13-13 Lean accounting

Obj. 2

✔ a. $140



SHOW ME HOW

Modern Lighting Inc. manufactures lighting fixtures, using lean manufacturing methods. Style Omega has a materials cost per unit of $16. The budgeted conversion cost for the year is $308,000 for 2,200 production hours. A unit of Style Omega requires 18 minutes of cell production time. The following transactions took place during June:

1. Materials were acquired to assemble 620 Style Omega units for June.
2. Conversion costs were applied to 620 Style Omega units of production.
3. 600 units of Style Omega were completed in June.
4. 580 units of Style Omega were sold in June for $100 per unit.

a. Determine the budgeted cell conversion cost per hour.

b. Determine the budgeted cell conversion cost per unit.

c. Journalize the summary transactions (1)–(4) for June.

EX 13-14 Lean accounting

Obj. 2

✔ b. Finished goods, $7,300



Vintage Audio Inc. manufactures audio speakers. Each speaker requires $48 per unit of direct materials. The speaker manufacturing assembly cell includes the following estimated costs for the period:

Speaker assembly cell, estimated costs:	
Labor	$30,000
Depreciation	12,000
Supplies	6,000
Power	2,000
Total cell costs for the period	$50,000

The operating plan calls for 800 operating hours for the period. Each speaker requires 24 minutes of cell process time. The unit selling price for each speaker is $90. During the period, the following transactions occurred:

1. Purchased materials to produce 2,000 speaker units.
2. Applied conversion costs to production of 1,800 speaker units.
3. Completed and transferred 1,700 speaker units to finished goods.
4. Sold 1,600 speaker units.

There were no inventories at the beginning of the period.

a. Journalize the summary transactions (1)–(4) for the period.

b. Determine the ending balance of Raw and In Process Inventory and Finished Goods Inventory.

EX 13-15 Pareto chart

Obj. 3

Meagher Solutions Inc. manufactures memory chips for personal computers. An activity analysis was conducted, and the following activity costs were identified with the manufacture and sale of memory chips:

Activities	Activity Cost
Correct shipment errors	$ 150,000
Disposing of scrap	95,000
Emergency equipment maintenance	125,000
Employee training	50,000
Final inspection	80,000
Inspecting incoming materials	60,000
Preventive equipment maintenance	40,000
Processing customer returns	90,000
Scrap reporting	45,000
Supplier development	15,000
Warranty claims	250,000
Total	$1,000,000

Prepare a Pareto chart of these activities.

EX 13-16 Cost of quality report

Obj. 3

✔ b. Appraisal, 14.0% of total quality cost



a. Using the information in Exercise 15, identify the cost of quality classification for each activity.

b. Prepare a cost of quality report. Assume sales for the period were $4,000,000. Round percentages to one decimal place.

c. Interpret the cost of quality report.

EX 13-17 Pareto chart for a service company

Obj. 1, 3

Three Rivers Inc. provides cable TV and Internet service to the local community. The activities and activity costs of Three Rivers are identified as follows:

Activities	Activity Cost
Billing error correction	$ 60,000
Cable signal testing	140,000
Reinstalling service (installed incorrectly the first time)	40,000
Repairing satellite equipment	50,000
Repairing underground cable connections to the customer	25,000
Replacing old technology cable with higher quality cable	175,000
Replacing old technology signal switches with higher quality switches	150,000
Responding to customer home repair requests	30,000
Training employees	80,000
Total	$750,000

Prepare a Pareto chart of these activities.

EX 13-18 Cost of quality and value-added/non-value-added reports for a service company

Obj. 1, 3

✔ b. External failure, 20.7% of total cost


SHOW ME HOW


EXCEL TEMPLATE

a. Using the information in Exercise 17, identify the cost of quality classification for each activity and whether the activity is value-added or non-value-added.

b. Prepare a cost of quality report. Assume that sales are $3,000,000. Round percentages to one decimal place.

c. Prepare a value-added/non-value-added analysis.

d. Interpret the information in (b) and (c).

EX 13-19 Process activity analysis

Obj. 3

✔ a. $0.08 per can

The Brite Beverage Company bottles soft drinks into aluminum cans. The manufacturing process consists of three activities:

1. **Mixing:** water, sugar, and beverage concentrate are mixed.
2. **Filling:** mixed beverage is filled into 12-oz. cans.
3. **Packaging:** properly filled cans are boxed into cardboard "fridge packs."

The activity costs associated with these activities for the period are as follows:

Mixing	$216,000
Filling	168,000
Packaging	96,000
Total	$480,000

The activity costs do not include materials costs, which are ignored for this analysis. Each can is expected to contain 12 ounces of beverage. Thus, after being filled, each can is automatically weighed. If a can is too light, it is rejected, or "kicked," from the filling line prior to being packaged. The primary cause of kicks is heat expansion. With heat expansion, the beverage overflows during filling, resulting in underweight cans.

This process begins by mixing and filling 6,300,000 cans during the period, of which only 6,000,000 cans are actually packaged. Three hundred thousand cans are rejected due to underweight kicks.

A process improvement team has determined that cooling the cans prior to filling them will reduce the amount of overflows due to expansion. After this improvement, the number of kicks is expected to decline from 300,000 cans to 63,000 cans, thus increasing the number of filled cans to 6,237,000 [6,000,000 + (300,000 − 63,000)].

a. Determine the total activity cost per packaged can under present operations.

b. Determine the amount of increased packaging activity costs from the expected improvements.

c. Determine the expected total activity cost per packaged can after improvements. Round to three decimal places.

EX 13-20 Process activity analysis for a service company

Obj. 1, 3

✔ b. $250 per paid claim

SHOW ME HOW EXCEL TEMPLATE

Statewide Insurance Company has a process for making payments on insurance claims as follows:



An activity analysis revealed that the cost of these activities was as follows:

Receiving claim	$120,000
Adjusting claim	260,000
Paying claim	120,000
Total	$500,000

This process includes only the cost of processing the claim payments, not the actual amount of the claim payments. The adjusting activity involves verifying and estimating the amount of the claim and is variable to the number of claims adjusted.

The process received, adjusted, and paid 2,000 claims during the period. All claims were treated identically in this process.

To improve the cost of this process, management has determined that claims should be segregated into two categories. Claims under $1,000 and claims greater than $1,000: claims under $1,000 would not be adjusted but would be accepted upon the insured's evidence of claim. Claims above $1,000 would be adjusted. It is estimated that 80% of the claims are under $1,000 and would thus be paid without adjustment. It is also estimated that the additional effort to segregate claims would add 10% to the "receiving claim" activity cost.

a. Develop a table showing the percent of individual activity cost to the total process cost.

b. Determine the average total process cost per claim payment, assuming 2,000 total claims.

c. Prepare a table showing the changes in the activity costs as a result of the changes proposed by management. Show columns of activity cost prior to improvement, after improvement, and savings.

d. Estimate the average cost per claim payment, assuming that the changes proposed by management are enacted for 2,000 total claims.

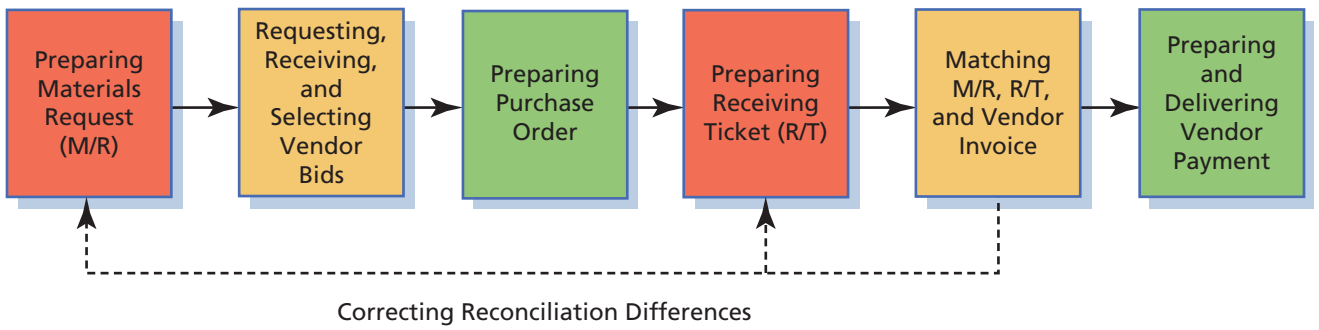
EX 13-21 Process activity analysis

Obj. 1, 3

✔ b. $40 per payment

EXCEL TEMPLATE

The procurement process for Jarom Wholesale Company includes a series of activities that transforms a materials requisition into a vendor payment. The process begins with a request for materials. The requesting department prepares and sends a materials request form to the Purchasing Department. The Purchasing Department then places a request for a quote to vendors. Vendors prepare bids in response to the request for a quote. A vendor is selected based on the lowest bid. A purchase order to the low-bid vendor is prepared. The vendor delivers the materials to the company, whereupon a receiving ticket is prepared. Payment to the vendor is authorized if the materials request form, receiving ticket, and vendor invoice are in agreement. These three documents fail to agree 40% of the time, initiating effort to reconcile the differences. Once the three documents agree, a payment is made. The process can be diagrammed as follows:



An activity analysis indicated the following activity costs with this process:

Preparing materials request	$ 32,000
Requesting, receiving, and selecting vendor bids	92,000
Preparing purchase order	20,000
Preparing receiving ticket	24,000
Matching M/R, R/T, and invoice	52,000
Correcting reconciliation differences	148,000
Preparing and delivering vendor payment	32,000
Total process activity cost	$400,000

On average, the process handles 10,000 individual requests for materials that result in 10,000 individual payments to vendors.

Management proposes to improve this process in two ways. First, the Purchasing Department will develop a preapproved vendor list for which orders can be placed without a request for quote. It is expected that this will reduce the cost of requesting and receiving vendor bids by 75%. Second, additional training and standardization will be provided to reduce errors introduced into the materials requisition form and receiving tickets. It is expected that this will reduce the number of reconciliation differences from 40% to 10%, over an average of 10,000 payments.

a. Develop a table showing the percent of individual activity cost to the total process cost.

b. Determine the average total process cost per vendor payment, assuming 10,000 payments.

c. Prepare a table showing the improvements in the activity costs as a result of the changes proposed by management. Show columns of activity cost prior to improvement, after improvement, and savings.

d. Estimate the average cost per vendor payment, assuming that the changes proposed by management are enacted for 10,000 total payments.

Problems: Series A

PR 13-1A Lean principles — Obj. 1

3. Average inventory for quarter, 18,000 lbs.

Bright Night, Inc., manufactures light bulbs. Its purchasing policy requires that the purchasing agents place each quarter's purchasing requirements out for bid. This is because the Purchasing Department is evaluated solely by its ability to get the lowest purchase prices. The lowest bidder receives the order for the next quarter (90 working days).

To make its bulb products, Bright Night requires 36,000 pounds of glass per quarter. Bright Night received two glass bids for the third quarter, as follows:

- *Central Glass Company*: $30.00 per pound of glass. Delivery schedule: 36,000 (400 lbs. × 90 days) pounds at the beginning of July to last for 3 months.
- *Ithaca Glass Company*: $30.20 per pound of glass. Delivery schedule: 400 pounds per working day (90 days in the quarter).

Bright Night accepted Central Glass Company's bid because it was the low-cost bid.

Instructions

1. Comment on Bright Night's purchasing policy.
2. What are the additional (hidden) costs, beyond price, of Central Glass Company's bid? Why weren't these costs considered?
3. Considering only inventory financing costs, what is the additional cost per pound of Central Glass Company's bid if the annual cost of money is 8%? (*Hint:* Determine the average value of glass inventory held for the quarter and multiply by the quarterly interest charge, then divide by the number of pounds.)

PR 13-2A Lead time

Obj. 1

✔ 1. Total wait time, 1,741 minutes

EXCEL TEMPLATE

Sound Tek Inc. manufactures electronic stereo equipment. The manufacturing process includes printed circuit (PC) board assembly, final assembly, testing, and shipping. In the PC board assembly operation, a number of individuals are responsible for assembling electronic components into printed circuit boards. Each operator is responsible for soldering components according to a given set of instructions. Operators work on batches of 45 printed circuit boards. Each board requires 5 minutes of board assembly time. After each batch is completed, the operator moves the assembled boards to the final assembly area. This move takes 10 minutes to complete.

The final assembly for each stereo unit requires 15 minutes and is also done in batches of 45 units. A batch of 45 stereos is moved into the test building, which is across the street. The move takes 20 minutes. Before conducting the test, the test equipment must be set up for the particular stereo model. The test setup requires 25 minutes. The units wait while the setup is performed. In the final test, the 45-unit batch is tested one at a time. Each test requires 9 minutes. The completed batch, after all testing, is sent to shipping for packaging and final shipment to customers. A complete batch of 45 units is sent from testing to shipping. The Shipping Department is located next to testing. Thus, there is no move time between these two operations. Packaging and labeling requires 10 minutes per unit.

Instructions

1. Determine the amount of value-added and non-value-added lead time and the value-added ratio in this process for an average stereo unit in a batch of 45 units. Round percentages to one decimal place. Categorize the non-value-added time into wait and move time.
2. How could this process be improved so as to reduce the amount of waste?

PR 13-3A Lean accounting

Obj. 2

✔ 4. Raw and In Process Inventory, $22,400

SHOW ME HOW EXCEL TEMPLATE

Dashboard Inc. manufactures and assembles automobile instrument panels for both eCar Motors and Greenville Motors. The process consists of a lean product cell for each customer's instrument assembly. The data that follow concern only the eCar lean cell.

For the year, Dashboard Inc. budgeted the following costs for the eCar production cell:

Conversion Cost Categories	Budget
Labor	$ 800,000
Supplies	275,000
Utilities	325,000
Total	$1,400,000

Dashboard Inc. plans 2,000 hours of production for the eCar cell for the year. The materials cost is $240 per instrument assembly. Each assembly requires 24 minutes of cell assembly time. There was no April 1 inventory for either Raw and In Process Inventory or Finished Goods Inventory.

The following summary events took place in the eCar cell during April:

a. Electronic parts and wiring were purchased to produce 450 instrument assemblies in April.

b. Conversion costs were applied for the production of 400 units in April.

c. 380 units were started, completed, and transferred to finished goods in April.

d. 350 units were shipped to customers at a price of $800 per unit.

Instructions

1. Determine the budgeted cell conversion cost per hour.
2. Determine the budgeted cell conversion cost per unit.
3. Journalize the summary transactions (a) through (d).
4. Determine the ending balance in Raw and In Process Inventory and Finished Goods Inventory.
5. How does the accounting in a lean environment differ from traditional accounting?

PR 13-4A Pareto chart and cost of quality report for a service company

Obj. 3, 4

✔ 4. Non-value-added, 61%

EXCEL TEMPLATE

The administrator of Liberty Hospital has been asked to perform an activity analysis of the emergency room (ER). The ER activities include cost of quality and other patient care activities. The lab tests and transportation are hospital services external to the ER for determining external failure costs. The result of the activity analysis is summarized as follows:

Activities	Activity Cost
Patient registration	$ 6,500
Verifying patient information	9,700
Assigning patients	13,000
Searching/waiting for doctor	9,200
Doctor exam	4,900
Waiting for transport	17,500
Transporting patients	16,200
Verifying lab orders	14,500
Searching for equipment	8,200
Incorrect labs	11,300
Lab tests	17,000
Counting supplies	19,000
Looking for supplies	8,200
Staff training	4,800
Total	$160,000

Instructions

1. Prepare a Pareto chart of the ER activities.
2. Classify the activities into prevention, appraisal, internal failure, external failure, and other patient care activities. Classify the activities into value-added and non-value-added activities.
3. Use the activity cost information to determine the percentages of total ER costs that are prevention, appraisal, internal failure, external failure, and other patient care activities.
4. Determine the percentages of the total ER costs that are value-added and non-value-added.
5. Interpret the information.

Problems: Series B

PR 13-1B Lean principles — Obj. 1

3. Average inventory for quarter, 1,800 frames

J. Burns Motorcycle Company manufactures a variety of motorcycles. J. Burns's purchasing policy requires that the purchasing agents place each quarter's purchasing requirements out for bid. This is because the Purchasing Department is evaluated solely by its ability to get the lowest purchase prices. The lowest cost bidder receives the order for the next quarter (90 days). To make its motorcycles, J. Burns requires 3,600 frames per quarter. J. Burns received two frame bids for the third quarter, as follows:

- *Midnight Frames, Inc.*: $401 per frame. Delivery schedule: 40 frames per working day (90 days in the quarter).
- *Iron Fist Frames Inc.*: $400 per frame. Delivery schedule: 3,600 (40 frames × 90 days) frames at the beginning of July to last for three months.

J. Burns accepted Iron Fist Frames Inc.'s bid because it was the low-cost bid.

Instructions

1. Comment on J. Burns's purchasing policy.
2. What are the additional (hidden) costs, beyond price, of Iron Fist Frames Inc.'s bid? Why weren't these costs considered?
3. Considering only inventory financing costs, what is the additional cost per frame of Iron Fist Frames Inc.'s bid if the annual cost of money is 8%? (*Hint:* Determine the average value of frame inventory held for the quarter and multiply by the quarterly interest charge, then divide by the number of frames.)

PR 13-2B Lead time — Obj. 1

✔ 1. Total wait time, 2,010 minutes

EXCEL TEMPLATE

Master Chef Appliance Company manufactures home kitchen appliances. The manufacturing process includes stamping, final assembly, testing, and shipping. In the stamping operation, a number of individuals are responsible for stamping the steel outer surface of the appliance.

(Continued)

The stamping operation is set up prior to each run. A run of 40 stampings is completed after each setup. A setup requires 60 minutes. The parts wait for the setup to be completed before stamping begins. Each stamping requires 5 minutes of operating time. After each batch is completed, the operator moves the stamped covers to the final assembly area. This move takes 10 minutes to complete.

The final assembly for each appliance unit requires 22 minutes and is also done in batches of 40 appliance units. The batch of 40 appliance units is moved into the test building, which is across the street. The move takes 25 minutes. In the final test, the 40-unit batch is tested one at a time. Each test requires 8 minutes. The completed units are sent to shipping for packaging and final shipment to customers. A complete batch of 40 units is sent from testing to shipping. The Shipping Department is located next to testing. Thus, there is no move time between these two operations. Packaging and shipment labeling requires 15 minutes per unit.

Instructions

1. Determine the amount of value-added and non-value-added lead time and the value-added ratio in this process for an average kitchen appliance in a batch of 40 units. Round percentages to one decimal place. Categorize the non-value-added time into wait and move time.
2. How could this process be improved so as to reduce the amount of waste?

PR 13-3B Lean accounting — Obj. 2

✔ 4. Raw and In Process Inventory, $9,700

SHOW ME HOW EXCEL TEMPLATE

Com-Tel Inc. manufactures and assembles two models of smartphones—the Tiger Model and the Lion Model. The process consists of a lean cell for each product. The data that follow concern only the Lion Model lean cell.

For the year, Com-Tel Inc. budgeted these costs for the Lion Model production cell:

Conversion Cost Categories	Budget
Labor	$122,000
Supplies	49,000
Utilities	18,000
Total	$189,000

Com-Tel plans 2,100 hours of production for the Lion Model cell for the year. The materials cost is $185 per unit. Each assembly requires 12 minutes of cell assembly time. There was no May 1 inventory for either Raw and In Process Inventory or Finished Goods Inventory.

The following summary events took place in the Lion Model cell during May:

a. Electronic parts were purchased to produce 900 Lion Model assemblies in May.

b. Conversion costs were applied for 875 units of production in May.

c. 850 units were completed and transferred to finished goods in May.

d. 800 units were shipped to customers at a price of $500 per unit.

Instructions

1. Determine the budgeted cell conversion cost per hour.
2. Determine the budgeted cell conversion cost per unit.
3. Journalize the summary transactions (a) through (d).
4. Determine the ending balance in Raw and In Process Inventory and Finished Goods Inventory.
5. How does the accounting in a lean environment differ from traditional accounting?

PR 13-4B Pareto chart and cost of quality report for a manufacturing company — Obj. 1, 3

✔ 4. Non-value-added, 35%

The president of Mission Inc. has been concerned about the growth in costs over the last several years. The president asked the controller to perform an activity analysis to gain a better insight into these costs. The activity analysis revealed the following:

Activities	Activity Cost
Correcting invoice errors	$ 7,500
Disposing of incoming materials with poor quality	15,000
Disposing of scrap	27,500
Expediting late production	22,500
Final inspection	20,000
Inspecting incoming materials	5,000
Inspecting work in process	25,000
Preventive machine maintenance	15,000
Producing product	97,500
Responding to customer quality complaints	15,000
Total	$250,000

The production process is complicated by quality problems, requiring the production manager to expedite production and dispose of scrap.

Instructions

1. Prepare a Pareto chart of the company activities.
2. Classify the activities into prevention, appraisal, internal failure, external failure, and not costs of quality (producing product). Classify the activities into value-added and non-value-added activities.
3. Use the activity cost information to determine the percentages of total costs that are prevention, appraisal, internal failure, external failure, and not costs of quality.
4. Determine the percentages of total costs that are value-added and non-value-added.
5. Interpret the information.

Make a Decision
Lean Performance for Nonmanufacturing

MAD 13-1 Analyze Northern Highlands Hospital

Obj. 4

Northern Highlands Hospital is evaluating its admissions process by measuring the time elapsed between patient check-in and arrival in the clinical area. The present process involves a patient checking in at a centralized area and providing information to an admissions specialist. After being admitted, the patient is escorted from the admissions area to the appropriate clinical area in the hospital. Average lead time information is as follows:

	Average Lead Time
Wait in line at check-in window	15 min.
Check in (one check-in service line)	5
Wait in check-in area for admissions desk	30
Give information at admissions desk (one desk)	10
Wait for escort in check-in area	15
Go with escort to clinical area	5
Total lead time to arrive at clinical area	80 min.

The hospital staffs one person at check-in and one person at the admissions desk. There is one dedicated escort.

a. Determine the non-value-added lead time in this process.

b. Determine the value-added ratio of this process.

c. Identify some areas where the hospital could make improvements to increase the value-added ratio of this process.

MAD 13-2 Analyze Shield Insurance Company — Obj. 4

Shield Insurance Company takes 10 days to make payments on insurance claims. Claims are processed through three departments: Data Input, Claims Audit, and Claims Adjustment. The three departments are located in different buildings, approximately one hour apart from each other. Claims are processed in batches of 100. Each batch of 100 claims moves through the three departments on a wheeled cart. Management is concerned about customer dissatisfaction caused by the long lead time for claim payments.

How might this process be changed so that the lead time is reduced significantly?

MAD 13-3 Analyze a hospital operating room — Obj. 4

Turn around time (TAT) is a measure of the length of time from the end of one surgery in an operating room to the beginning of the next surgery. Improving TAT improves the operating room efficiency by allowing more surgeries to be performed per day. TAT involves:

- sterilizing the operating room.
- setting up equipment and supplies for the next patient.
- preparing the next patient for surgery.

The average times associated with TAT activities were determined as follows:

Sterilization	15 min.
Equipment and supply setup	10
Patient preparation	15
Total TAT	40 min.

Each activity is performed in the operating room sequentially so that the total TAT averages 40 minutes. A process improvement team determined that the TAT could be improved by moving some of this activity outside of the operating room, thus allowing these activities to be done simultaneously. Sterilization must be done in the operating room, so this activity was not changed. However, equipment and supplies were prepared in a room outside of the operating room while sterilization was proceeding. The equipment and supplies were placed on a rolling cart, and then rolled into the operating room and staged for the next surgery. In addition, the improvement team determined the patient could be prepared outside of the operating room by using a small room for patient preparation. When the operating room was ready, the patient could be rolled in on a rolling bed and staged for the procedure. As a result of these changes, the total equipment and supply setup only consumed 2 minutes in the operating room, while the total patient preparation only consumed 3 minutes in the operating room.

a. Determine the revised TAT of the new process.

b. What is the ratio of TAT improvement between the old and new processes?

c. If the average surgical time took 40 minutes, how many additional surgeries could be performed in an eight-hour day as a result of the new process?

MAD 13-4 Analyze a doctor's office — Obj. 4

Marcus Simmons caught the flu and needed to see the doctor. Simmons called to set up an appointment and was told to come in at 1:00 P.M. Simmons arrived at the doctor's office promptly at 1:00 P.M. The waiting room had five other people in it. Patients were admitted from the waiting room in FIFO (first-in, first-out) order at a rate of 5 minutes per patient. After waiting until his turn, a nurse finally invited Simmons to an examining room. Once in the examining room, Simmons waited another 5 minutes before a nurse arrived to take some basic readings (temperature, blood pressure). The nurse needed 10 minutes to collect this clinical information. After the nurse left, Simmons waited 30 additional minutes before the doctor arrived. The doctor diagnosed the flu and provided a prescription for antibiotics, which took 5 minutes. Before leaving the doctor's office, Simmons waited 10 minutes at the business office to pay for the office visit.

Simmons spent 5 minutes walking next door to fill the prescription at the pharmacy. There were four people in front of Simmons, each person requiring 5 minutes to fill and purchase a prescription. Simmons arrived home 15 minutes after paying for his prescription.

a. What time does Simmons arrive home?

b. How much of the total elapsed time from 1:00 P.M. until when Simmons arrived home was non-value-added time?

c. What is the value-added ratio? Round percentage to one decimal place.

d. Why does the doctor require patients to wait so long for service?

Take It Further

ETHICS

TIF 13-1 Lead time and performance evaluation

In August, Lannister Company introduced a new performance measurement system in manufacturing operations. One of the new performance measures is lead time, which is determined by tagging a random sample of items with a log sheet throughout the month. The log sheets recorded the time that the sample items started production and the time that they ended production, as well as all steps in between. At the end of the month, the controller collected the log sheets and computed the average lead time of the tagged products. This number was reported to central management and was used to evaluate the performance of the plant manager. Because of the poor lead time results reported for August, the plant was under extreme pressure to reduce lead time in September.

The following memo was intercepted by the controller.

Date: September 3
To: Hourly Employees
From: Plant Manager

During last month, you may have noticed that some of the products were tagged with a log sheet. This sheet records the time that a product enters production and the time that it leaves production. The difference between these two times is termed the "lead time." Our plant is evaluated on improving lead time. From now on, I ask all of you to keep an eye out for the tagged items. When you see a tagged item, it is to receive special attention. Work on that item first, and then immediately move it to the next operation. Under no circumstances should tagged items wait on any other work that you have. Naturally, report accurate information. I insist that you record the correct times on the log sheet as the product goes through your operations.

How should the controller respond to this discovery?

TEAM ACTIVITY REAL WORLD

TIF 13-2 Activity analysis in a restaurant

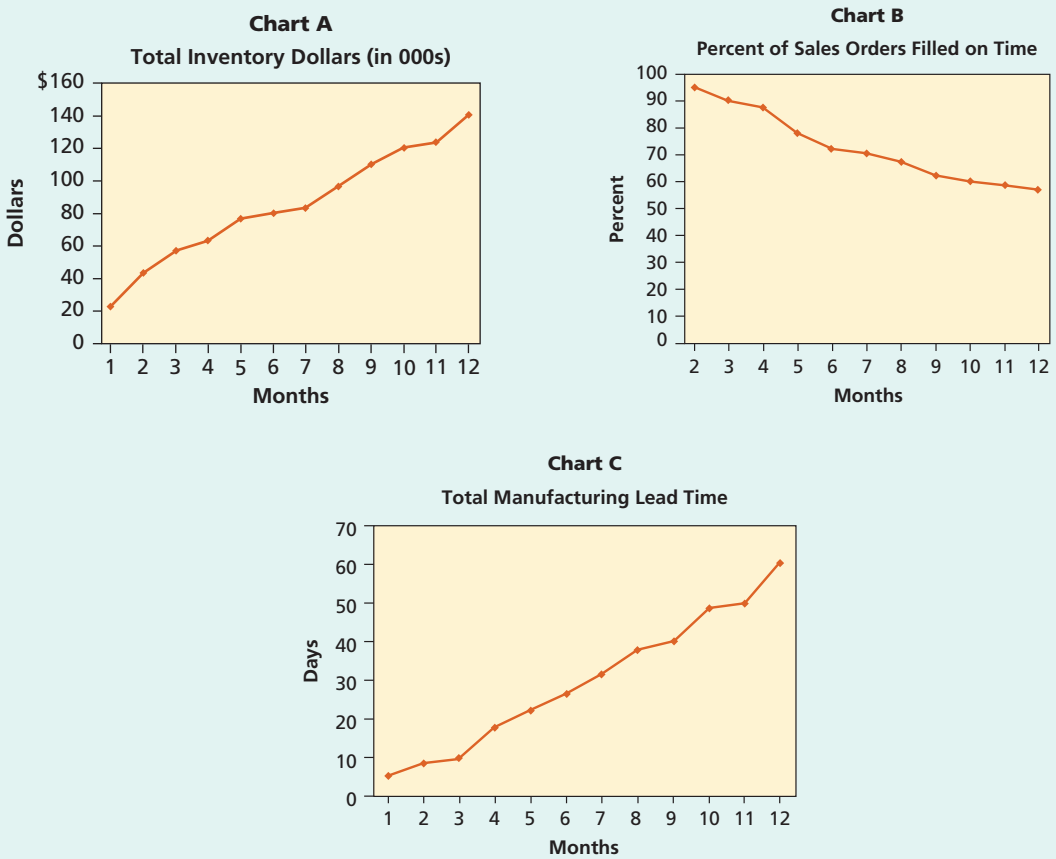
In groups of two to four people, visit a sit-down restaurant and do a lead time study. If more than one group chooses to visit the same restaurant, choose different times for your visits. Note the time when you walk in the door of the restaurant and the time when you walk out the door after you have eaten. The difference between these two times is the total lead time of your restaurant experience. While in the restaurant, determine the time spent on non-value-added time, such as wait time, and the time spent on value-added eating time. Note the various activities and the time required to perform each activity during your visit to the restaurant.

Compare your analyses, identifying possible reasons for differences in the times recorded by teams that visited the same restaurant.

COMMUNICATION

TIF 13-3 Lean principles and operating performance

Ethan Fromme, the chief financial officer of Maximal Inc., has asked for your help in interpreting the company's operating performance. He has provided you with the following three performance graphs for the most recent fiscal year.



Based on the information in these graphs, write a brief memo to Mr. Fromme, evaluating the company's ability to produce high-quality products at a low cost with a fast response time and immediate availability.

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Leese Inc. has the following quality financial data for its most recent fiscal year.

Rework costs	$110,000
Warranty repair costs	280,000
Product line inspection	95,000
Design engineering	300,000
Supplier evaluation	240,000
Labor training	150,000
Product testing	65,000
Breakdown maintenance	70,000
Product scrap	195,000
Cost of returned goods	180,000
Customer support	35,000
Product liability claims	80,000

The total amount of prevention costs that should be reported in a cost of quality report for the year is:

a. $390,000.
b. $450,000.
c. $690,000.
d. $755,000.

2. When measuring the cost of quality, the cost of inspecting incoming raw materials is a(n):
   a. prevention cost.
   b. appraisal cost.
   c. internal failure cost.
   d. external failure cost.

3. In measuring the cost of quality, which one of the following is considered an appraisal cost?
   a. Rework cost
   b. Product testing cost
   c. Warranty claims cost
   d. Equipment maintenance cost

4. External failure costs include all of the following costs ***except*** those related to:
   a. lost sales and lost customers.
   b. warranty obligations.
   c. product liability suits.
   d. product field testing.

Pathways Challenge



This is Accounting!

Information/Consequences

Doughnut production at **Krispy Kreme (KKD)** is an exact process based upon measurement and testing. The standardized process provides the exact time necessary, no more, no less, for doughnuts to rise, cook, and cool. Mixing, shaping, and cooking is done by machines that have been optimized to maximize quality and minimize waste (time and materials). Thus, lead times are minimized by ensuring that no time is wasted in the production process; every second is accounted for. Material usage is also optimized in the production process, limiting the waste of cooking oil by reusing unabsorbed oil, and minimizing dough waste by using machines to ensure exact ingredient measurement.

Move time is typically non-value-added. This is because the customer typically doesn't value the fact that, during production, the product was moved from one department to another. However, at Krispy Kreme, move time is part of the cooking process, and is thus a value-added activity. For example, as a doughnut is moved along a conveyor belt from the oil it was cooked in to the glazing process, it cools just enough for the glaze to be applied appropriately. After the doughnut has been glazed, it is still too hot to eat. The final move of the doughnut along a conveyor belt from the glazing process to the customer provides the necessary time for the doughnut to cool sufficiently for safe consumption, while still living up to the promise of "Hot Doughnuts Now."

Suggested Answer

Chapter

14 The Balanced Scorecard and Corporate Social Responsibility

Principles

Chapter 1 *Introduction to Managerial Accounting*

Developing Information

COST SYSTEMS

Chapter 2 *Job Order Costing*
Chapter 3 *Process Costing*
Chapter 4 *Activity-Based Costing*

COST ALLOCATIONS

Chapter 5 *Support Departments*
Chapter 5 *Joint Costs*

Decision Making

PLANNING AND EVALUATING TOOLS

Chapter 6 *Cost-Volume-Profit Analysis*
Chapter 7 *Variable Costing*
Chapter 8 *Budgeting Systems*
Chapter 9 *Standard Costing and Variances*
Chapter 10 *Decentralized Operations*
Chapter 11 *Differential Analysis*

STRATEGIC TOOLS

Chapter 12 *Capital Investment Analysis*
Chapter 13 *Lean Manufacturing*
Chapter 13 *Activity Analysis*
Chapter 14 ***The Balanced Scorecard***
Chapter 14 ***Corporate Social Responsibility***

Intermountain Healthcare

Most large companies are complex organizations that must continuously adapt to changing business environments. Leaders in these organizations must constantly update their goals, develop ways to accomplish those goals, measure performance to see how successful their efforts have been, and make adjustments as needed. Many organizations, even some for-profit companies, also strive to make the world a better place as they work toward improving their own bottom line. How can managers simplify the complex nature of their strategic endeavors so that they can successfully navigate the business environments in which they work?

Intermountain Healthcare is the eleventh largest nonprofit healthcare system in the United States. The healthcare industry makes up almost 20% of the U.S. gross domestic product (GDP). Almost every aspect of the healthcare industry is immensely complex, from the legal regulations surrounding billing for services to the ever-changing best practices in healthcare delivery. Further, healthcare touches the lives of everyone—and every individual is different. You might argue that every single end "product" of the healthcare industry—the patient—is unique. Because Intermountain is a large healthcare system, it touches almost every aspect of this complex industry. It has an insurance entity (SelectHealth), it employs physicians (Intermountain Medical Group), it distributes medical technology to its wholly owned hospitals, and it even plans to begin manufacturing generic drugs (Project Rx). Further, Intermountain's overall mission is not about profits, it is about "helping people live the healthiest lives possible." How can such a complex organization in such a complex industry focus on the goals that matter most for the company to succeed? How can it measure performance in a way that relates to the strategy of the company? Traditional measures like profits and market share are important, but if Intermountain truly wants to help people live healthy lives, how else should it be measuring performance?

Intermountain is one of the many companies that uses the balanced scorecard, a common managerial accounting tool discussed in this chapter, to measure performance and reach its goals. This chapter also discusses how many companies take responsibility for the impact their operations have on society and actively try to improve social well-being within and outside of the firm. Finally, the chapter considers how management accounting tools can help in these socially responsible endeavors.

Sources: "20 Largest Nonprofit Hospital Systems | 2015," *Becker's Hospital Review*, December 21, 2015 (www.beckershospitalreview.com/lists/20-largest-nonprofit-hospital-systems-2015.html); https://intermountainhealthcare.org/about.



PHILIP RAMEY PHOTOGRAPHY, LLC/GETTY IMAGES

Link to Intermountain Healthcare . . . . . Pages 657, 659, 660, 667, 673

What's Covered

The Balanced Scorecard and Corporate Social Responsibility

Performance Measurement Systems
- Performance Measurement Systems (Obj. 1)
- Strategic Performance Measurement Systems (Obj. 1)

The Balanced Scorecard (BSC)
- Performance Perspectives (Obj. 2)
- Strategic Objectives (Obj. 2)
- Performance Metrics (Obj. 2)
- Strategic Initiatives (Obj. 2)
- Performance Targets (Obj. 2)

Using the Balanced Scorecard (BSC)
- Strategy Maps (Obj. 3)
- Measure Maps (Obj. 3)
- Strategic Learning (Obj. 3)
- Scorecard Cascading (Obj. 3)
- Cognitive Biases (Obj. 3)

Corporate Social Responsibility (CSR)
- CSR Balanced Scorecard (Obj. 4)
- Encouraging CSR (Obj. 4)

Learning Objectives

Obj. 1 Describe the concept of a performance measurement system.

Obj. 2 Describe and illustrate the basic elements of a balanced scorecard.

Obj. 3 Describe and illustrate the balanced scorecard, including the use and impact of strategy maps, measure maps, strategic learning, scorecard cascading, and cognitive biases.

Obj. 4 Describe corporate social responsibility (CSR), including methods of measuring and encouraging social responsibility using the balanced scorecard.

Analysis for Decision Making

Obj. 5 Use capital investment analysis to evaluate CSR projects.

Objective 1
Describe the concept of a performance measurement system.

Performance Measurement Systems

Managerial accounting primarily focuses on measuring and reporting information for internal decision making. For example, managerial accounting information is used for evaluating performance and strategic decision making.

Performance measurement systems are used by management to assess how well employees or units within a company meet the company's goals and objectives. A performance measurement system does this by using metrics (or measures) of current conditions or performance. A metric or measure is a representation of something a person or company cares about. For example, your resting heart rate is a metric of your health. Your resting heart rate is not a perfect measure of health, but it is one of many metrics available to health professionals.

Metrics like operating income and cash flows are often used by companies to measure their financial condition and performance. Accounting metrics, however, are not of interest in and of themselves. Instead, they simplify the complexities of business for decision-making purposes. For example,

Why It Matters

The Evolution of Performance Measurement Systems

Early performance measurement systems were developed in France in the 1950s. Some French manufacturing firms used what was known as the *tableau de bord*, or *dashboard*, to monitor performance. This tool was a collection of important financial metrics for the company. It became especially important as companies grew in size and geographic diversity, which made it hard for top management to have direct contact with the various parts of the organization. The dashboard collected and summarized key performance metrics, enabling managers to oversee increasingly complex operations.

Source: Anne Pezet, "The History of the French Tableau De Bord (1885–1975): Evidence from the Archives," *Accounting Business and Financial History*, Taylor & Francis, 2009, 19(2), pp. 103–125.

material price variances (Chapter 9) are often used as metrics for measuring a purchasing department's performance. Likewise, return on investment and residual income (Chapter 10) are often used as metrics for measuring the performance of decentralized units (segments) within a company.

Strategic performance measurement systems define and link strategic objectives to the performance metrics of a company.[1] Seventy-five percent of large companies worldwide, including **ExxonMobil Corporation (XOM)**, **Hewlett-Packard, Inc. (HPQ)**, and **Citigroup Inc. (C)**, use strategic performance measurement systems.[2] One such strategic performance measurement system is the balanced scorecard, which we discuss next.

Intermountain Healthcare was founded in 1975 when The Church of Jesus Christ of Latter-day Saints donated 15 hospitals to the nonprofit organization. Intermountain uses performance measurement systems extensively.

Link to Intermountain Healthcare

The Balanced Scorecard

Objective 2
Describe and illustrate the basic elements of a balanced scorecard.

The **balanced scorecard (BSC)** is the best-known strategic performance measurement system. The balanced scorecard emphasizes a balanced view of performance, thus its name, from multiple perspectives—not just financial. For example, nonfinancial performance metrics such as customer satisfaction and employee training are included within the balanced scorecard. Such metrics are often **leading indicators** of future financial performance. For example, if customer satisfaction for a movie theatre declines, sales for future months may also decline. In contrast, actual sales is normally considered a **lagging indicator**.

The balanced scorecard is made up of the following elements:

- Performance perspectives
- Strategic objectives
- Performance metrics
- Strategic initiatives
- Performance targets
- Strategy maps
- Measure maps

The term *balanced scorecard* may be used as a generic term for a strategic performance measurement system. That is, some companies call their strategic performance measurement systems *balanced scorecards* even if they don't include all of the elements of a traditional balanced scorecard.

Intermountain Healthcare calls its version of the balanced scorecard a *huddle board*, emphasizing the importance of employee teams gathering to discuss the scorecard.

Link to Intermountain Healthcare

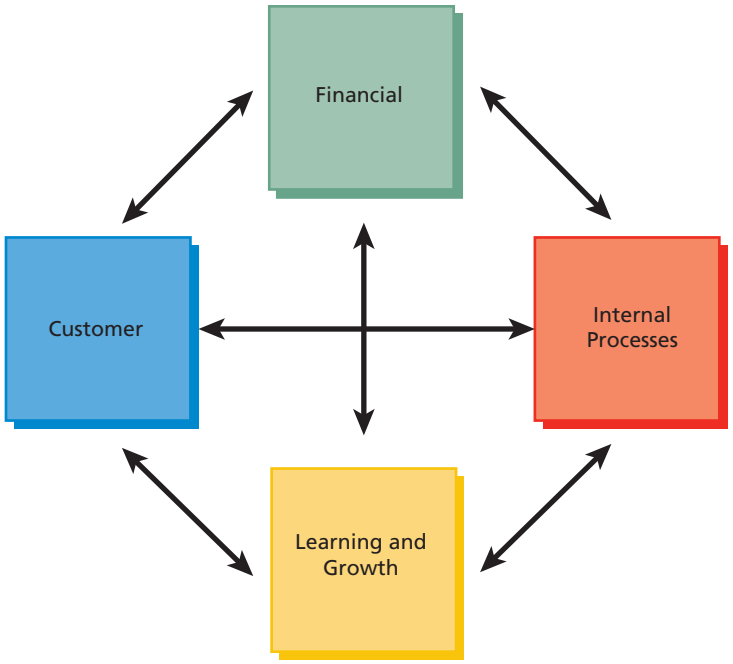
Performance Perspectives

A balanced scorecard has the following four **performance perspectives** shown in Exhibit 1:

- Financial
- Internal processes
- Learning and growth
- Customer

[1] Our discussion focuses on companies (corporations), but the concepts discussed can be applied to any entity.
[2] D. Rigby and B. Bilodeau, *Management Tools and Trends 2015, An Executives Guide: Bain & Company*, 2007 (http://www.bain.com/publications/articles/management-tools-and-trends-2015.aspx).

Exhibit 1
Balance among Perspectives in the Balanced Scorecard



The objectives of the performance perspectives are as follows:

- Focus management on looking beyond typical financial measures of performance, such as sales and profits, and thus, encourage a more balanced view of performance.
- Organize the scorecard into types of performance.

Performance in the financial perspective focuses on traditional accounting measures, such as revenues, profits, return on investment, and cash flows. Performance in the customer perspective focuses on satisfying customers. Performance in this perspective often includes the ability to obtain and retain customers. Performance in the internal processes perspective focuses on operational efficiencies. As examples, performance in this perspective may include the time it takes to manufacture a product, the waste generated in the manufacturing process, or the number of defective units produced. Performance in the learning and growth perspective involves research and development efforts. Performance in this perspective also includes employee training, retention, and satisfaction.

Why It Matters

Turning Around Charles Schwab

Customer service is a key component to any balanced scorecard, and it is a particularly critical component in service industries. Since 2003, **Bain & Company**, a consulting firm, has helped companies improve customer service by focusing on a customer loyalty metric called the Net Promoter Score. This metric, when used as part of a balanced scorecard, evaluates customer service by assessing how likely a customer is to recommend the company to others.

Charles Schwab Corporation (SCHW) is a full-service financial advisory firm that was founded in 1973. In 2004, the company was struggling. Although Schwab had been built on delivering exceptional customer service, the company lost its way. When customers were surveyed, they gave Schwab a –35% Net Promoter Score, indicating that more customers wanted to see the company fail than would be willing to promote the company to others.

In response, Schwab hired Bain to help improve its customer experience and customer loyalty. Bain helped Schwab develop and implement a Client Promoter System that focused on embedding the Client Promoter Score deep within the company's values and core strategy. As Schwab CEO Walt Bettinger describes, "If you serve clients in the way that you would like to be served, they are going to want to do more business with you." The results were significant. By 2008, the company's stock price had more than doubled, and in 2010, Schwab received a Net Promoter Score of 46%, the highest in its sector.

Sources: "Schwab Earns Highest Customer Loyalty Ranking Among Brokerage & Investment Firms in Satmetrix Net Promoter's 2010 Industry Report," *BusinessWire*, March 25, 2010; "Seeing the World Through the Client's Eyes," Bain & Company (www.netpromotersystem.com/videos/trailblazer-video/charles-schwab.aspx).

Some companies include additional performance perspectives to those shown in Exhibit 1. For example, **ExxonMobil Corporation**'s **(XOM)** scorecard includes a safety perspective that reflects management's objective that no one is injured in the production and delivery of its products.

Instead of the traditional four performance perspectives, **Intermountain Healthcare** has seven "dimensions of care," including safety, quality, patient experience, access, stewardship, caregiver engagement, and growth.

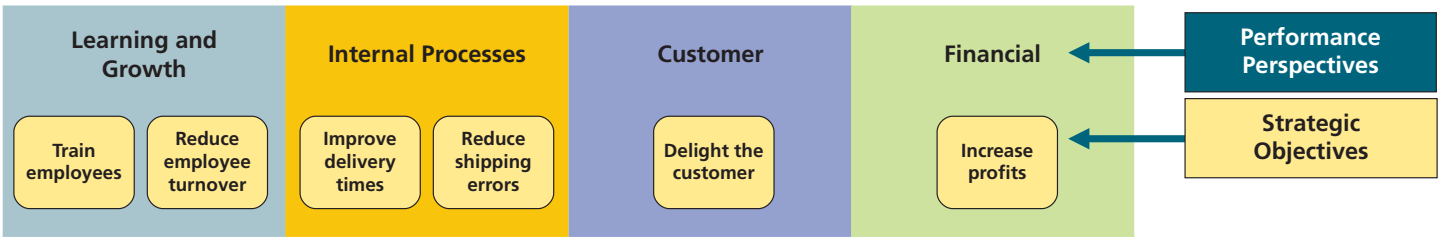
Link to Intermountain Healthcare

Strategic Objectives

Each of the four performance perspectives in Exhibit 1 should be linked to one or more strategic objectives. A **strategic objective** defines the purpose of an action taken within a company. A strategic objective is not the same as the overall mission statement or strategy of the company. Instead, each strategic objective is a subcomponent of the overall entity's mission statement or strategy.

To illustrate, assume that **Cordier Toys, Inc.**, an online toy retailer, uses a balanced scorecard and has developed strategic objectives for each of the four performance perspectives as shown in Exhibit 2. The strategic objectives in the learning and growth perspective are to train employees and reduce employee turnover. The strategic objectives in the internal processes perspective are to improve delivery times and reduce shipping errors. The strategic objective in the customer perspective is to delight the customer. Finally, the strategic objective in the financial perspective is to increase profits. These strategic objectives provide guidance to Cordier's management as to the actions that should be taken related to the four performance perspectives.

Exhibit 2 Cordier Toys' Strategic Objectives

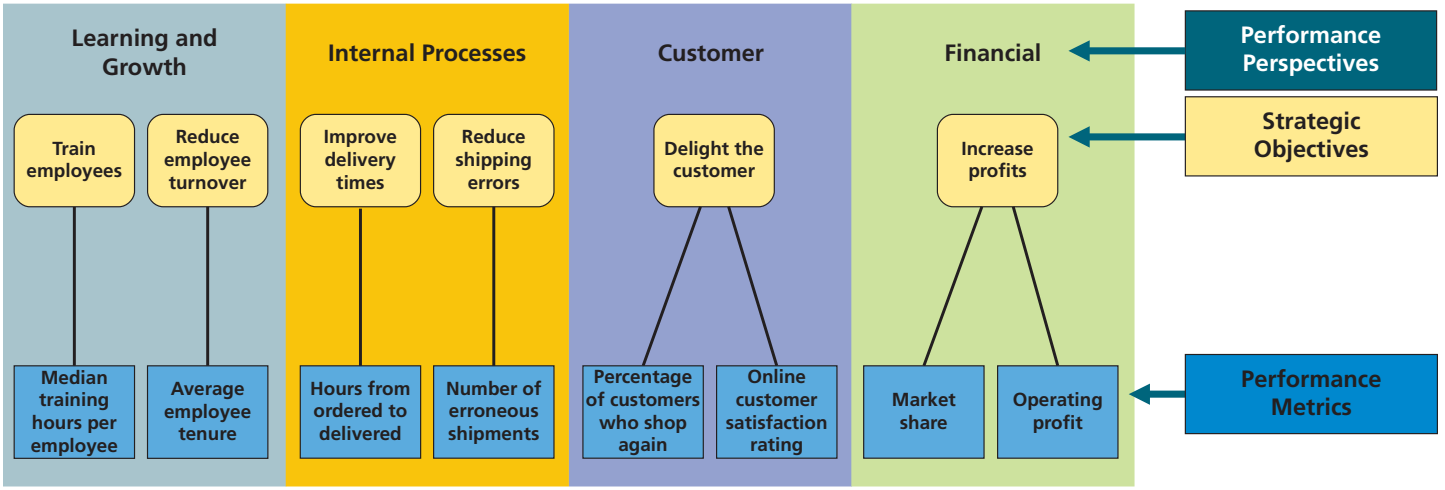


Performance Metrics

Although strategic objectives are useful for guiding management's actions, they do not measure whether the company is achieving its objectives. Rather, **performance metrics** are used to assess performance in achieving the strategic objectives. At least one metric is used for each strategic objective.

To illustrate, **Cordier Toys, Inc.**, has developed the performance metrics shown in Exhibit 3. For the strategic objective to train employees, management measures (tracks) the median training hours for employees. For the strategic objective to reduce employee turnover, management measures (tracks) the average tenure of employees. For the strategic objective to improve delivery times, management measures (tracks) the hours from the time an order is placed to the time it is delivered. For the strategic objective to reduce shipping errors, management measures (tracks) the number of erroneous shipments. For the strategic objective to delight the customer, management measures (tracks) the percentage of customers who shop again and the online customer satisfaction rating. For the strategic objective to increase profits, management measures (tracks) market share and operating profit. Cordier Toys uses these performance metrics for assessing its success in achieving its strategic objectives.

Exhibit 3 Cordier Toys' Performance Metrics



Link to Intermountain Healthcare

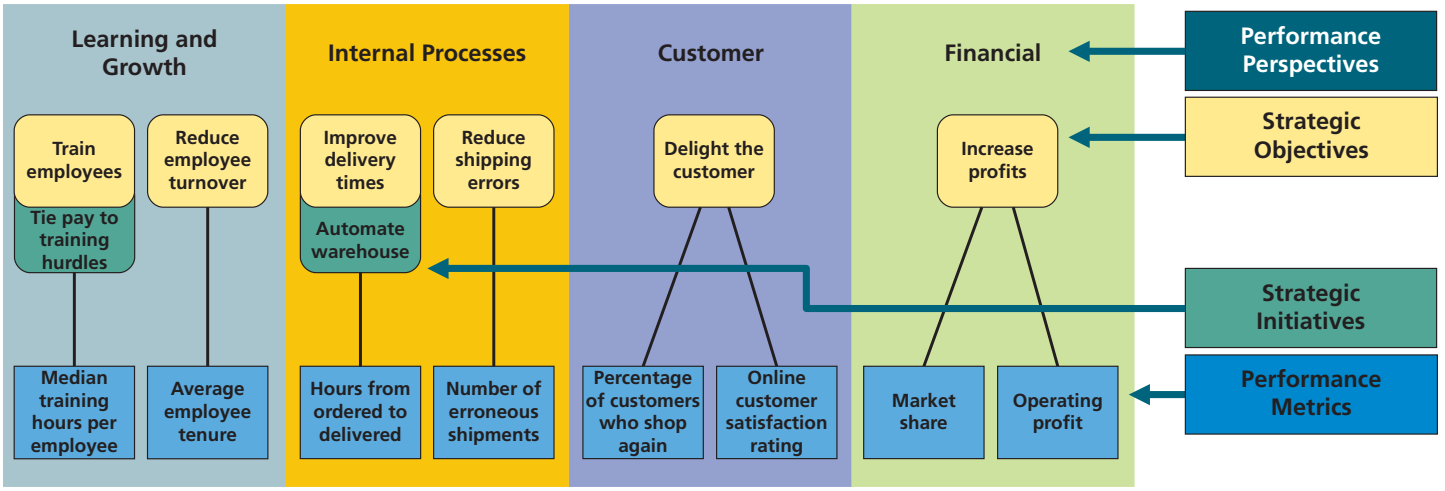
The executive leadership team of **Intermountain Healthcare** regularly reviews the most important performance metrics, which it refers to as key performance indicators (KPIs) of the organization.

Strategic Initiatives

Although strategic objectives and performance metrics are useful elements of the balanced scorecard, they do not specify the actions necessary to achieve the objectives. **Strategic initiatives** are action plans that management implements to achieve the strategic objectives.

To illustrate, **Cordier Toys, Inc.**, plans to use two strategic initiatives to achieve the strategic objectives of improving delivery times and training employees. To reduce delivery times, management plans to automate its picking and packaging process. To motivate employees to participate in training programs, management plans to provide pay increases to employees who achieve training goals. Exhibit 4 shows how these two strategic initiatives are directed at achieving the strategic objectives of train employees and improve delivery times.

Exhibit 4 Cordier Toys' Strategic Initiatives



Performance Targets

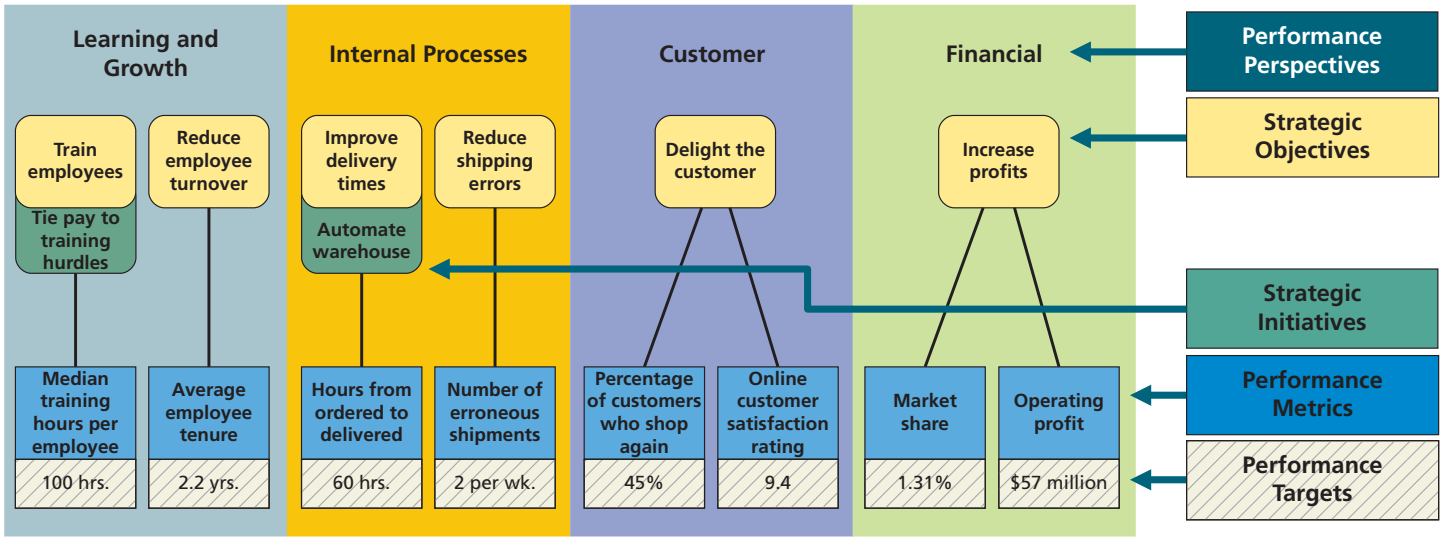
Performance targets are levels or rates of improvement that management wants to achieve for performance metrics. Performance targets provide goals for employees and are often linked to incentive compensation, such as employee quarterly bonuses.

To illustrate, **Cordier Toys, Inc.**, developed the following performance targets to serve as employee goals:

- Achieve 100 hours of median training time per employee.
- Maintain an average employee tenure of at least 2.2 years.
- Reduce the delivery time from the moment a product is ordered to the time it is delivered to 60 hours or less.
- Reduce erroneous shipments to 2 per week.
- Increase the percentage of customers who return to the website to make additional purchases to 45% or higher.
- Increase the online customer satisfaction rating to 9.4 (out of 10) or higher.
- Increase market share to 1.31% or higher.
- Increase operating profits to $57 million or higher.

These performance targets have been added to Cordier Toys' balanced scorecard as shown in Exhibit 5.

Exhibit 5 Cordier Toys' Performance Targets



Using the Balanced Scorecard

Objective 3
Describe and illustrate the balanced scorecard, including the use and impact of strategy maps, measure maps, strategic learning, scorecard cascading, and cognitive biases.

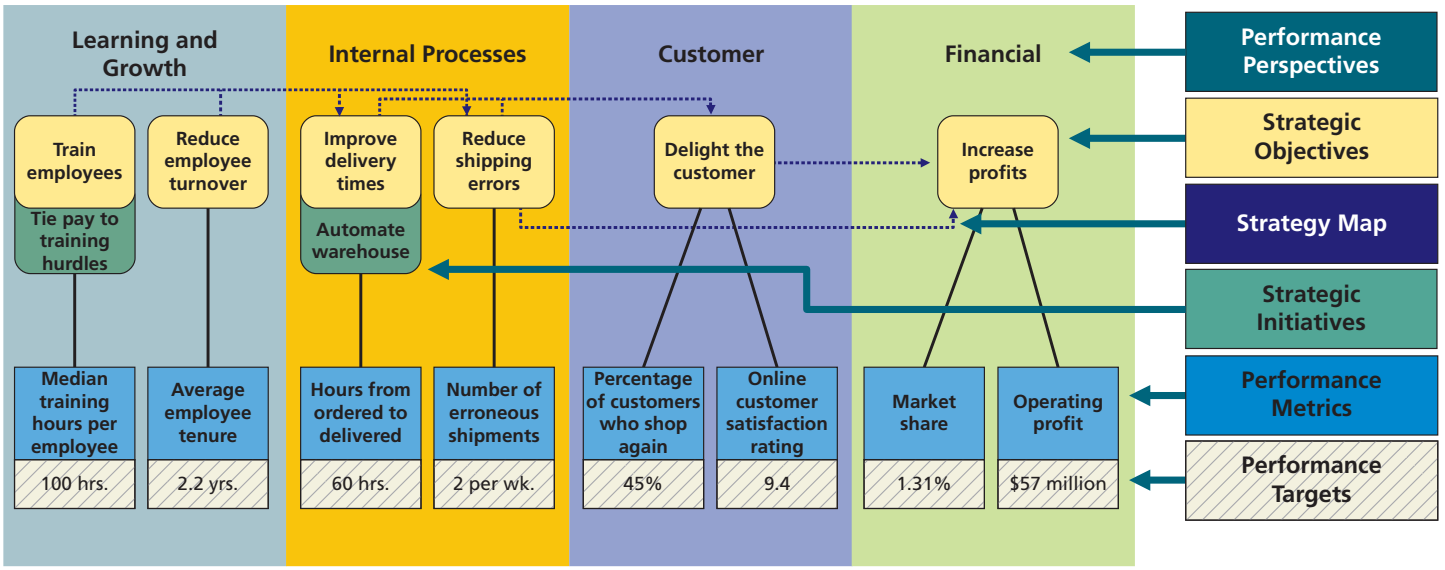
The elements of the balanced scorecard discussed thus far provide an overview of what the company plans to do (*strategic objectives*), how management assesses company performance (*performance metrics*), actions the company plans to take (*strategic initiatives*), and performance goals (*performance targets*). These balanced scorecard elements are linked together to form a cohesive strategy for the company using strategy maps.

Strategy Maps

A **strategy map** shows the expected cause-and-effect relationships among strategic objectives. In doing so, a strategy map shows how each strategic objective contributes to the overall mission or strategy of the company. Sometimes a strategy map is referred to as a *value chain*.

To illustrate, dotted blue arrows have been added to **Cordier Toys**' balanced scorecard shown in Exhibit 6. These arrows create a strategy map that links the strategic objectives to each other and ultimately to the overall objective of increasing profits.

Exhibit 6 Cordier Toys' Strategy Map



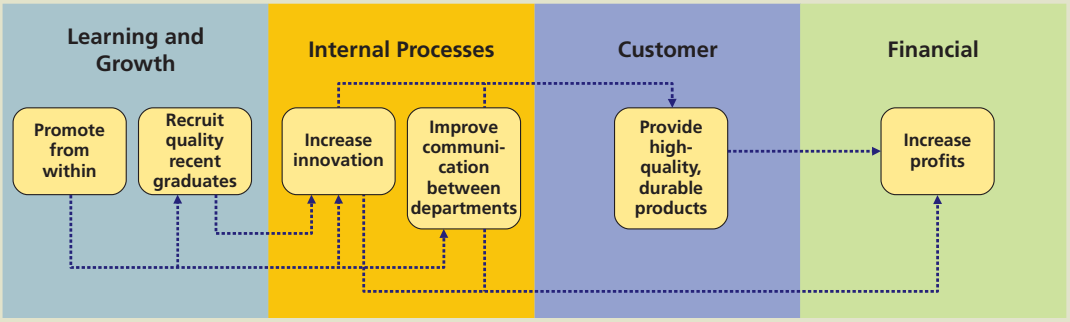
Cordier Toys' strategy map shows that training employees and reducing employee turnover are expected to improve delivery times and reduce shipping errors. In turn, improving delivery times and reducing shipping errors are expected to increase customer delight, which in turn is expected to increase profits. Finally, reducing shipping errors will also increase profits by reducing the costs associated with processing returns.

Check Up Corner 14-1 Understanding a Strategy Map

Cameron Tools Inc. has developed a balanced scorecard with six objectives under the four standard performance perspectives. In the learning and growth perspective, the company has strategic objectives to (1) promote employees from within the company and (2) recruit quality recent graduates. In the internal processes perspective, the company has strategic objectives to (1) increase innovation and (2) improve communication between departments. In the customer perspective, the company has a strategic objective to provide higher-quality products that last longer. Finally, in the financial perspective, the company has the strategic objective to increase profits. Given these strategic objectives, draw a strategy map that shows how these objectives influence each other and ultimately lead to the company's objective of increasing profits.

Solution:

A possible version of the strategy map with an explanation of the links between strategic objectives follows:



Promoting employees from within can be expected to increase the ability to recruit quality recent graduates, because these new hires can look forward to job growth within the company. Promoting employees from within can also be expected to increase innovation and improve communication between departments, because employees will be more willing to innovate if they know it may lead to a promotion, and employees who have spent a long time at the company will better understand proper communication between departments. Recruiting quality recent graduates can be expected to increase innovation, because quality new hires are likely to bring a fresh perspective and new ideas to the company. Both increased innovation and improved interdepartment communications can be expected to lead to more efficient production of higher-quality, more durable products. Increased innovation and improved interdepartment communications may also directly increase profits as more efficient, cost-reducing production processes are developed and costly errors are avoided. Finally, the production of better products can also be expected to increase profits.

While the links provided in this solution represent a possible mapping of strategic objectives on the balanced scorecard for Cameron Tools Inc., this mapping is not the only possible solution. Linking strategic objectives together on a balanced scorecard always involves some degree of subjectivity.

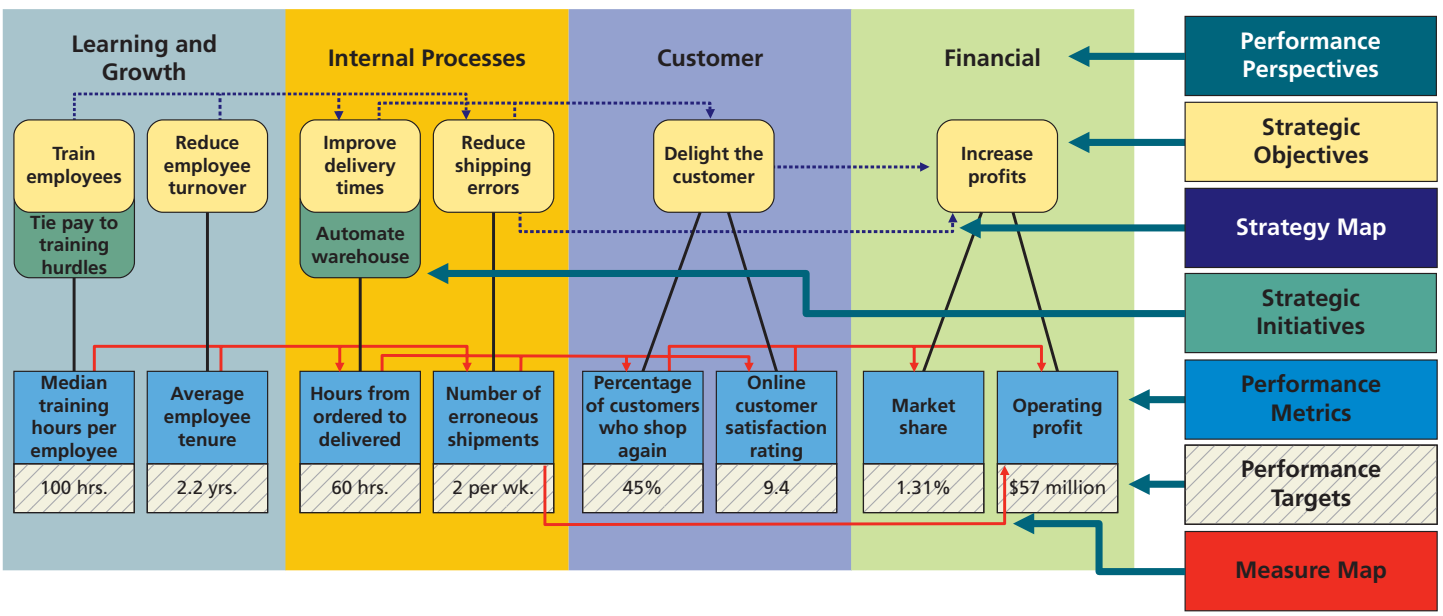
Check Up Corner

Measure Maps

A **measure map** shows the expected relationships among performance metrics. These expected relationships are based on the strategy map, which links the strategic objectives. The measure map also shows which metrics are leading indicators and which measures are lagging indicators of performance. Metrics that are early in the value chain are normally considered leading indicators, while metrics later in the value chain are normally lagging indicators. However, a leading indicator can be *any* metric where performance is predictive of performance in another metric. Similarly, a lagging indicator can be any metric where performance is predicted by performance in another metric. For example, if customer satisfaction ratings are predictive of sales, then customer satisfaction ratings are a leading indicator and sales are a lagging indicator.

Cordier Toys' measure map is shown in Exhibit 7. The thin red arrows indicate the relationships among performance metrics.

Exhibit 7 Cordier Toys' Measure Map



The relationships shown in the measure map of Exhibit 7 are the same as the strategy map, with two exceptions. First, the delight the customer objective is related to the two performance metrics of percentage of customers who shop again and online customer satisfaction rating. Both of these metrics are leading indicators for the two performance metrics of market share and operating profit. Second, the reduce shipping errors objective is related to the number of erroneous shipments. While this metric is not expected to significantly affect market share, it is a leading indicator for operating profit. That is, the costs of processing returns will decrease operating profit.

Check Up Corner 14-2 Understanding a Measure Map

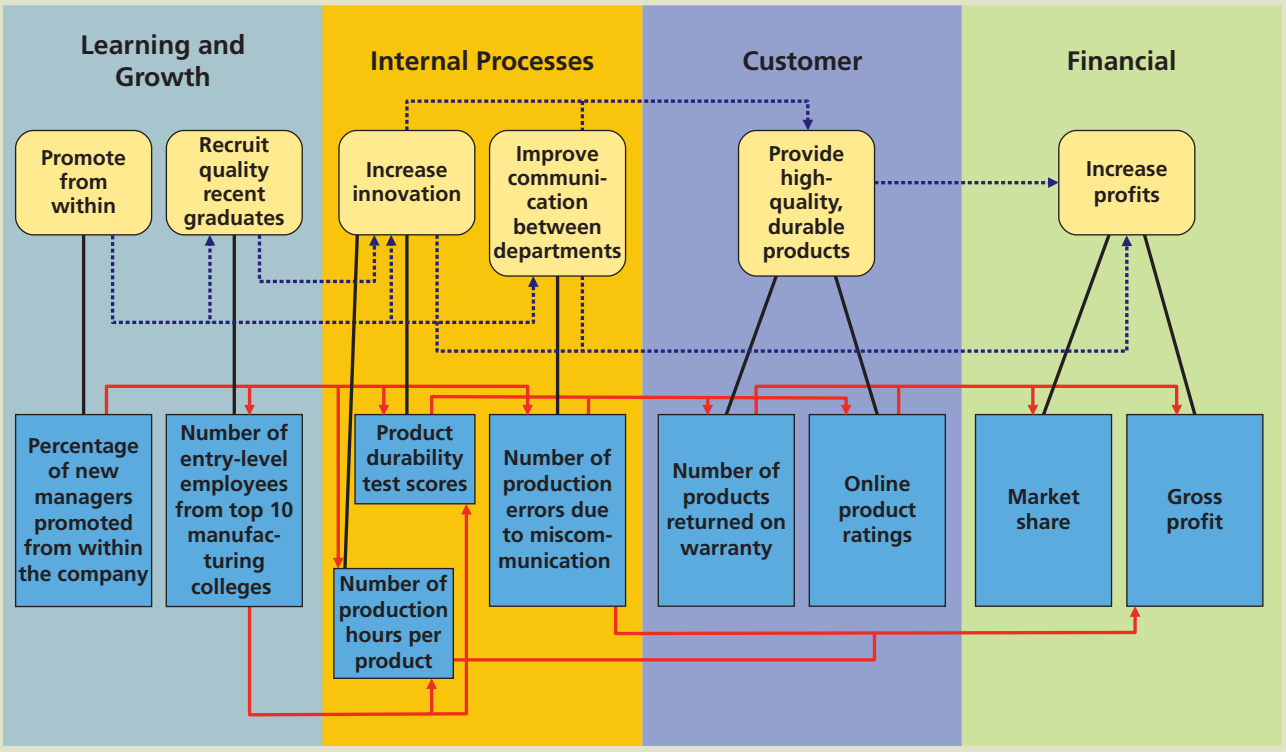
Building on the Cameron Tools Inc. balanced scorecard example from Check Up Corner 14-1, assume that the company has the following performance metrics for each strategic objective:

- *Promote from within:* Percentage of new managers promoted from within the company
- *Recruit quality recent graduates:* Number of entry-level employees from top 10 manufacturing colleges
- *Increase innovation:* Product durability test scores and number of production hours per product
- *Improve communication between departments:* Number of production errors due to miscommunication
- *Provide high-quality, durable products:* Number of products returned on warranty and online product ratings
- *Increase profits:* Market share and gross profit

Given these performance metrics and their related strategic objectives, draw a measure map showing the expected relationships among performance metrics.

Solution:

The following is a possible version of the measure map with an explanation of the links between strategic objectives:



The links in the measure map are, for the most part, a reflection of the links in the strategy map. For example, consider the percentage of new managers promoted from within the company, which is a performance metric of the promote from within objective. Because the promote from within objective is expected to influence the recruit quality recent graduates, increase innovation, and improve communication between departments objectives, the performance metrics of these objectives will be related in a similar fashion. Specifically, the percentage of new managers promoted from within the company should influence the number of entry-level employees from top 10 manufacturing colleges (a performance metric of recruit quality recent graduates), product durability test scores and number of production hours per product (both performance metrics of increase innovation), and number of production errors due to miscommunication (a performance metric of improve communication between departments).

All other performance metric linkages in the measure map follow this pattern, with two exceptions. First, note that there are two performance metrics of the increase innovation objective. Each of these performance metrics represents a different aspect of the increase innovation objective. Product durability test scores represents innovation related to product design, while number of production hours per product represents innovation related to the production process. Further, only one of these performance metrics is expected to have a direct effect on the increase profits objective. Because number of production hours per product has clear implications for the cost of goods manufactured and sold, this performance metric will likely impact gross profit (a performance metric of the increase profits objective). Second, although there are two performance metrics related to increasing profits, both performance metrics represent a different aspect of this objective. Market share represents an increase in revenues, which will increase profits. Gross profit represents both revenues and costs. Thus, performance metrics that are likely to affect costs should directly link to the gross profit performance metric in the measure map, while performance metrics that are likely to affect revenues should directly link to both market share and gross profit. Accordingly, because number of production hours per product and number of production errors due to miscommunication both directly affect costs, they are both linked to gross profit. However, because number of products returned on warranty and online product ratings affect revenues, both performance metrics are linked to both market share and gross profit.

Number of production hours per product and number of production errors due to miscommunication can both be expected to directly influence gross profit. Product durability test scores and number of production errors due to miscommunication can both be expected to influence number of products returned on warranty and online product ratings. These will both, in turn, affect market share and gross profit.

While the links provided in this solution represent a possible mapping of performance metrics on the balanced scorecard for Cameron Tools Inc., this mapping is not the only possible solution. Linking performance metrics together on a balanced scorecard always involves some degree of subjectivity.

Check Up Corner

Strategic Learning

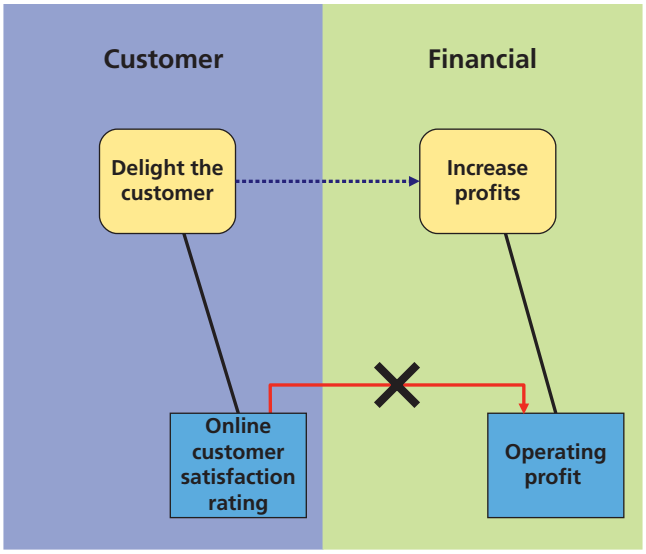
The relationships shown in a balanced scorecard strategy map represent expectations of how the strategic objectives affect one another. The measure map provides a means for verifying these expectations, because the measure map shows relationships between performance metrics (quantitative variables), which can be statistically tested.

If the expected relationships are not supported by statistical analyses, management may need to adjust its strategic objectives. This process of using performance metrics to verify strategic objective expectations and, if necessary, adjusting them is called **strategic learning**.

The lack of statistical support for a relationship among performance metrics does not necessarily mean that the strategic objective is flawed. For example, the lack of statistical support may occur because the performance metric does not accurately measure the strategic objective. In other cases, there may be a time lag in how the performance metric measures the strategic objective.

To illustrate, assume that **Cordier Toys, Inc.**, uses statistical analyses to verify expected relationships between its performance metrics and strategic objectives. Assume that the analyses support most of the relationships. However, an increase in the online customer satisfaction rating did not generate an increase in the operating profit, as shown in Exhibit 8.

Exhibit 8
Analyzing Performance at Cordier Toys

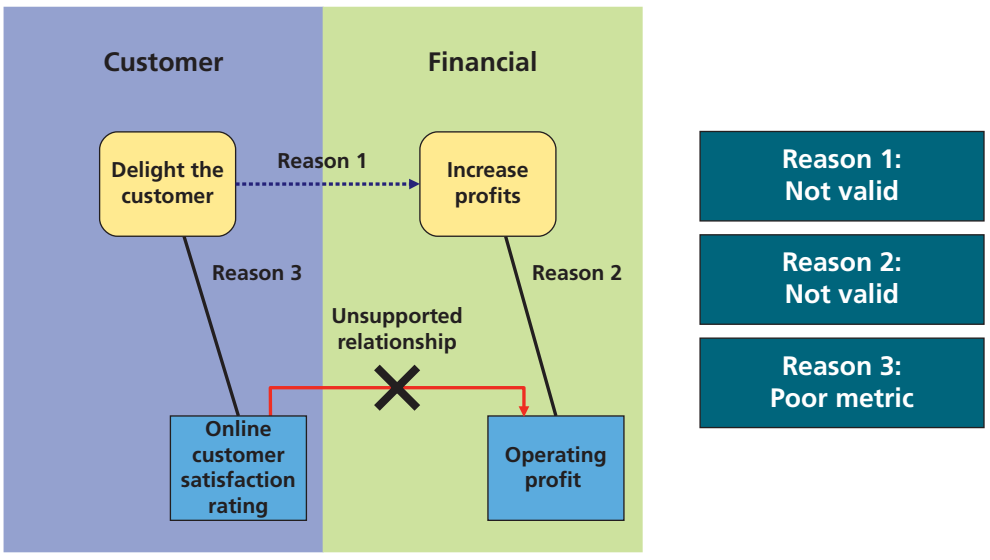


Possible reasons for this result are as follows:

Reason 1: Delighting the customer has no effect on increasing profits.
Reason 2: Operating profit is a poor performance metric for increasing profits.
Reason 3: The online customer satisfaction rating is a poor performance metric for delighting the customer.

Of the possible reasons for the unsupported relationship, Reason 1 and Reason 2 do not seem logical. That is, customer satisfaction should lead to an increase in customers, sales, and profits (Reason 1). Likewise, operating profit is a direct measure of increasing profits (Reason 2). This leaves as an explanation that the online customer satisfaction rating is a poor metric for increasing profits (Reason 3), as summarized in Exhibit 9.

Exhibit 9
Strategic Learning at Cordier Toys



Assume that upon further investigation, Cordier Toys learned that to avoid low online customer satisfaction ratings, its sales team had been contacting unsatisfied customers. Specifically, the sales team offered to let the customers keep the merchandise with a full refund,

provided the customers adjust their customer satisfaction feedback to a positive rating. While this practice increased Cordier Toys' online customer satisfaction ratings, it decreased operating profits. That is, sales decreased (refunds), but cost of goods sold did not. In addition, some of these customers were not more "delighted" by the follow-up. In fact, most of these customers felt the same as they did before, even though they changed their rating. Some customers even felt worse about the company, because they felt the firm was manipulating its customer satisfaction ratings.

Upon learning that follow-up sales calls were causing the unsupported relationship, Cordier Toys began discussing other strategic initiatives that might better address unhappy customers. These strategic initiatives included the possibility of providing discount coupons to unsatisfied customers and providing free shipping on returned products.

Scorecard Cascading

For a balanced scorecard to be effective, it should be relevant for each level of management. For example, large corporations may use a corporate-level scorecard for top executives and various other scorecards for other levels of management and operations. Decentralized corporations often have balanced scorecards for each division. Within divisions, additional scorecards may be used, such as employee-specific scorecards or **personal scorecards**. These scorecards are used to show how an employee's job relates to the division- and corporate-level scorecards.

The use of multiple scorecards, with scorecards being divided up into smaller, division- and job-specific scorecards, is called **scorecard cascading**. Scorecard cascading is an effective way of ensuring that all individuals throughout the company support the overriding strategy of the company.

Intermountain Healthcare's system-wide scorecard cascades down throughout every part of the organization. Individual scorecards are labeled Tier 1 through Tier 7, depending on which level of the organization the scorecard represents.

Link to Intermountain Healthcare

Cognitive Biases

Decision making with the balanced scorecard may be subject to cognitive or psychological biases. A **cognitive bias** results in decisions that are not economically accurate or rational. Some of the cognitive biases that may affect the use of balanced scorecards are as follows:

- Motivated reasoning
- Surrogation
- Common measures bias

Motivated Reasoning **Motivated reasoning** is the tendency for a person to see what they want to see in data. The reason people are susceptible to motivated reasoning is that they want to feel good about themselves. As a result, they convince themselves that data they are looking at tells them what they want to hear. People subject to motivated reasoning tend to do the following:

- Ignore bad news
- Rely too heavily on good news
- Stop gathering information when results look good
- Continue searching for good news when things look bad
- Interpret ambiguous news as good news

To illustrate, assume that **Cordier Toys, Inc.**, is evaluating the strategic initiative of automating picking and packaging systems in its 10 warehouses. Before fully implementing the initiative,

Cordier Toys decided to try it out at Warehouses 1–5. After one month, the following data have been gathered:

	Automation Implemented (Pilot Program) Warehouses 1–5					Automation NOT Implemented Warehouses 6–10				
Warehouse number	1	2	3	4	5	6	7	8	9	10
Hours from ordered to delivered	48	52	53	47	52	73	71	69	65	72
Number of erroneous shipments	28	31	15	23	37	12	8	15	13	11

The performance metric of hours from ordered to delivered averaged 50.4 hours [(48 + 52 + 53 + 47 + 52) ÷ 5] at Warehouses 1–5 where the initiative was implemented. At Warehouses 6–10 where the initiative was not implemented, the average hours from ordered to delivered was 70.0 hours [(73 + 71 + 69 + 65 + 72) ÷ 5]. As a result, the automation initiative was evaluated by the manager in charge of the test as validated (successful).

Assume, however, that the manager who developed the initiative was also in charge of evaluating its success. Because the manager evaluating the initiative also developed it, the manager may be biased by motivated reasoning to find support for the initiative. For example, the performance metric of number of erroneous shipments was an average of 26.8 errors [(28 + 31 + 15 + 23 + 37) ÷ 5] at Warehouses 1–5 (with automation). In contrast, Warehouses 1–6 (without automation) had an average of 11.8 errors [(12 + 8 + 15 + 13 + 11) ÷ 5].

Although the hours from ordered to delivered were lower in the automated warehouses, the number of erroneous shipments increased. Thus, the pilot program showed mixed results for automating the warehouses.



Ethics: Do It!

Motivated reasoning is likely a primary culprit behind many corporate ethics scandals. Even when people are trying to be ethical, the tendency for people to see what they want to see in data can lead them to make unethical choices. For example, motivated reasoning can make it easier to rationalize unethical choices, such as creating journal entries that are misleading based on subjective assessments.

Surrogation **Surrogation** is the tendency to behave like the performance metrics *are* the strategic objectives. In other words, rather than using performance metrics to evaluate strategic objectives, surrogation leads people to act as if the metric *is* the objective.

To illustrate, **Cordier Toys, Inc.**, uses the online customer satisfaction rating as a performance metric for the strategic objective to delight the customer. To maximize this metric, Cordier Toys' employees sent customers follow-up emails asking for positive ratings. While this may increase customer satisfaction ratings, it may not actually increase customer satisfaction. It may, in fact, decrease customer satisfaction when customers receive unsolicited emails.

In this case, Cordier Toys' employees are subject to surrogation by treating the customer satisfaction rating as though it is the strategic objective, forgetting that customer delight is the true aim. This surrogation effect may be compounded if Cordier Toys uses the customer satisfaction rating for determining employee pay raises.

Why It Matters

Avoiding Surrogation in Healthcare

Companies may avoid surrogation using their performance measurement systems. For example, **Intermountain Healthcare**, a large, integrated healthcare system in the western United States, encourages healthcare providers to think holistically about the health of their patients and reduce costs while delivering high-quality care. One area of concern is the high frequency of lower back imaging (typically an MRI or an X-ray) when patients visit the doctor with complaints of lower back pain. Since most lower back pain resolves itself within three to six weeks, the best practice in these cases is to wait three to six weeks before ordering imaging. Failing to wait three to six weeks for imaging not only increases costs, but it can also lead to unnecessary interventions and radiation exposure. To reduce inappropriate lower back imaging, Intermountain reports to physicians the percentage of lower back imaging that is done after waiting three weeks from the initial patient visit.

While this reporting reduces lower back imaging, surrogation may occur. Specifically, physicians may begin minimizing this measure as a strategy. However, in some instances (such as when patients have immobilizing pain or when patients have experienced consistent pain long before meeting with a physician), early imaging may be advisable. To reduce this possibility of surrogation, Intermountain sets a goal of 80% for this measure (i.e., 80% of patients presenting with uncomplicated lower back pain wait at least three weeks before lower back imaging). This measure and performance target helps to reduce surrogation by encouraging physicians to reduce unnecessary imaging while signaling that the intent is not to do away with all early imaging (i.e., the goal is not 100%).

Pathways Challenge



This is Accounting!

Economic Activity

Surrogation can occur anywhere measures are used to evaluate performance. Even if surrogation occurs, it may not affect firm value. For example, an employee may lose sight of the strategy objective to make top quality products and instead focus on measures linked to quality standards. In this case, surrogation is not likely to cause a problem. However, in other cases, surrogation can have a dramatic impact on the firm.

In 2016, **Wells Fargo & Company (WFC)**, one of the largest financial institutions in the world, disclosed that its employees had created 2.1 million deposit and credit card accounts without customer consent. Later, Wells Fargo was widely criticized for its cross-sell strategy, where employees were encouraged to sell multiple financial products to customers. Around that time, Wells Fargo indicated in its quarterly report that it was undergoing an effort to "align our cross-sell metric with our strategic focus of long-term retail banking relationships." In other words, Wells Fargo never had a cross-sell *strategy*; it had a cross-sell *measure*. Allowing the measure to become the strategy was part of what led to the behaviors that cost Wells Fargo hundreds of millions in fines, lawsuits, and reimbursed fees, not to mention the tremendous damage to the Wells Fargo brand.

Critical Thinking/Judgment

What are the advantages and disadvantages of using performance measures instead of just focusing on strategy?

Wells Fargo employees were compensated, in part, for their ability to cross-sell products. Was Wells Fargo wrong to add incentives to its cross-sell measure?

How might Wells Fargo address the issue of surrogation?

Suggested answer at end of chapter.

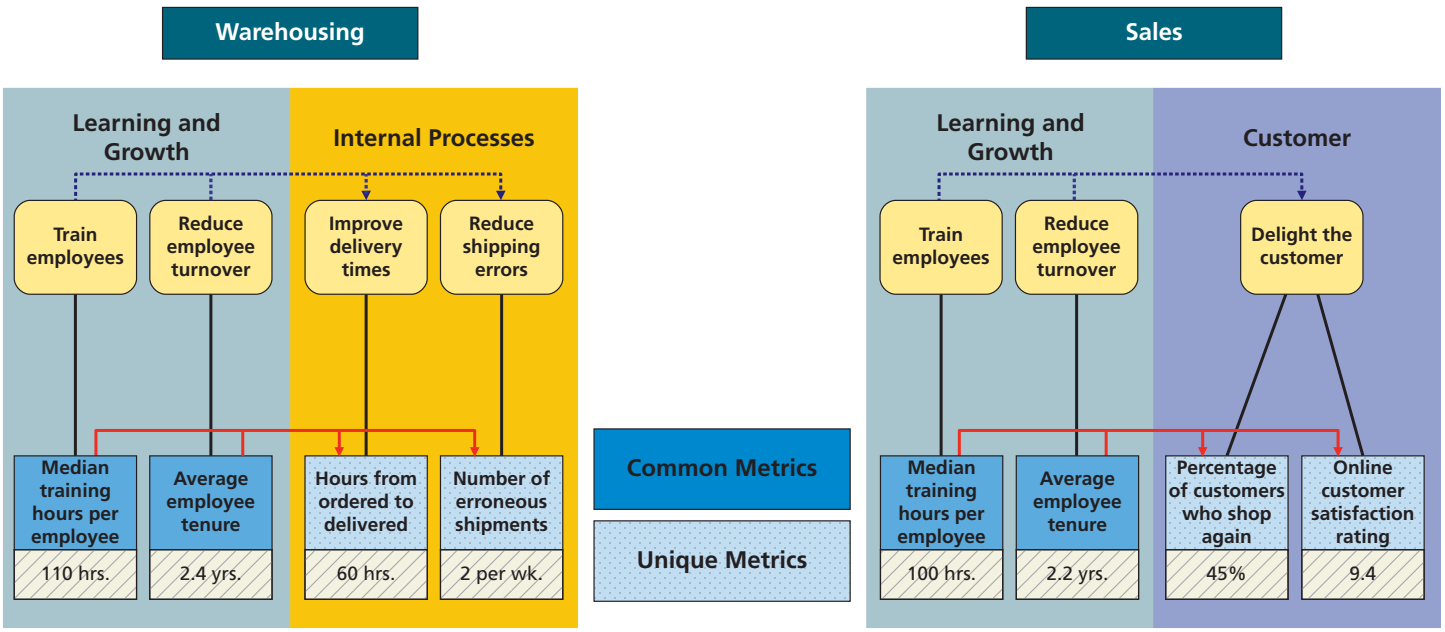
Sources: Aaron Back, "Wells Fargo's Questionable Cross-Selling Strategy," *The Wall Street Journal*, September 9, 2016; "Administrative Proceeding in the Matter of Wells Fargo Bank, N.A.," United States of America Consumer Financial Protection Bureau, August 22, 2016; "Wells Fargo Reports $5.3 Billion in Quarterly Net Income," *Wells Fargo News Release*, January 13, 2017.

Common Measures Bias Companies may use balanced scorecards for evaluating the performance of their divisions. In such cases, the scorecards for different divisions are often similar, but not identical.

When managers compare the performance of divisions within a company, they may ignore performance metrics that are *unique* to individual divisions. Instead, managers may focus on common performance metrics for all divisions. This bias is called the **common measures bias**. A result of the common measures bias is that it ignores the unique features of divisional scorecards. This, in turn, can lead to inaccurate assessments of divisional performance.

To illustrate, assume that **Cordier Toys, Inc.**, has two divisions: Warehousing and Sales. Each division has a unique scorecard, as shown in Exhibit 10.

Exhibit 10 Divisional Scorecards at Cordier Toys



The Warehousing Division's scorecard focuses on the learning and growth and internal processes perspectives. The Sales Division's scorecard focuses on the learning and growth and customer perspectives. Both scorecards have the learning and growth performance metrics of median training hours per employee and average employee tenure. These are common metrics. The Warehousing scorecard has the unique metrics of hours from ordered to delivered and number of erroneous shipments. The Sales scorecard has the unique metrics of percentage of customers who shop again and online customer satisfaction rating.

Assume that in evaluating both divisions, Cordier Toys' management focuses on median training hours per employee and average employee tenure. Because the Warehousing Division employees received more training and stay longer with the company, Cordier Toys awards the Warehousing Division manager a larger bonus. The fact that Cordier Toys ignored the unique metrics for each division is an example of the common measures bias.

Objective 4
Describe corporate social responsibility (CSR), including methods of measuring and encouraging social responsibility using the balanced scorecard.

Corporate Social Responsibility

Corporate social responsibility (CSR) describes the efforts of companies to take responsibility for the impact their operations have on society and to improve social well-being within and outside of the firm. Companies are taking a more active role in focusing and reporting on CSR. In 2011, only 20% of Fortune 500 companies issued public reports on their CSR activities.

In 2012, that number increased to 53%. By 2015, over 80% of Fortune 500 companies reported on their CSR activities.[3]

CSR activities can include far-reaching issues such as reducing global poverty and protecting the environment. They can also include more local issues, such as improving employee working conditions and sponsoring community health programs. Examples of CSR activities are provided in Exhibit 11.

Exhibit 11
CSR Activities

Category	Description	Examples
Agriculture	Farming and ranching techniques that do not damage or disrupt the environment	Mixed farming, crop rotation, multiple cropping
Energy	Generating energy with little or no pollution	Wind turbines, solar power
Engineering and construction	Designing and constructing buildings that are highly efficient in using natural resources while minimizing pollution	Recycled building materials, high-efficiency heating and cooling systems, renewable energy generation
Transportation	Using transportation methods that result in little pollution and have a minimal impact on the environment	Expanded public transportation systems, green vehicles, biofuel-powered vehicles
Waste minimization	Recycling and reuse practices that reduce the amount of waste disposed in landfills	Curbside recycling collection, composting, reusable products (e.g., water bottles)

When CSR activities involve ensuring the ability to meet current needs without compromising the ability of future generations to meet their needs (such as with efforts that protect the environment), the CSR activities are referred to as **sustainability** efforts.[4] However, sometimes the terms CSR and sustainability are used interchangeably.[5] For example, the Dow Jones Sustainability Index defines sustainability very much like CSR, describing it as "a business approach that creates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments."[6]

CSR Reporting

CSR activities have not always been thought of as a concern of companies or their management. For example, in 1970 Milton Friedman (a Nobel Prize winner in Economics) suggested that management efforts not directly related to increasing profits are stealing from shareholders. However, in recent years, the popularity of CSR efforts has grown. In fact, many investors and consumers expect management to engage in CSR efforts that have a positive impact on society. A survey by KPMG, a large global accounting firm, found that 75% of the firms surveyed engage in CSR activities.[7]

CSR and sustainability information can provide important feedback to guide a company's strategic and operational decision making. Managers can use this feedback to increase revenue, control costs, and allocate resources efficiently. For example, **eco-efficiency measures** are a form of CSR information that helps managers evaluate the savings generated by using fewer natural resources in a company's operations. Examples of eco-efficiency measures are provided in Exhibit 12.

[3] "CSR's Mainstream Shift: 81% of Leading Companies Published Corporate Sustainability Reports in 2015," *Bulldog Reporter*, March 16, 2016 (www.bulldogreporter.com/csrs-mainstream-shift-81-of-leading-companies-published-corporate-sustainability-reports-in-2015/).

[4] G. H. Brundtland, *Report of the World Commission on Environment and Development: Our Common Future*, United Nations, May 21, 1987 (www.un-documents.net/our-common-future.pdf).

[5] K. M. Soderstrom, N. S. Soderstrom, and C. R. Stewart, "Sustainability/CSR Research in Management Accounting: A Review of the Literature," *Advances in Management Accounting*, Volume 28, Emerald Publishing Limited, 2017, pp. 59–86.

[6] www.sustainability-indices.com/sustainability-assessment/corporate-sustainability.jsp.

[7] Prof. Dr. Ans Kolk, Mark van der Veen, Jonatan Pinkse, and Fabienne Fortanier, *KPMG International Survey of Corporate Responsibility Reporting 2005*, June 2005 (https://commdev.org/userfiles/files/1274_file_D2.pdf).

Exhibit 12
Eco-Efficiency Measures

Energy efficiency	Energy cost savings from replacing lighting fixtures in a production facility with energy-efficient lighting
Material use efficiency	Materials cost savings from reducing the amount of product packaging materials
Fuel efficiency	Fuel cost savings from replacing gas-powered vehicles with hybrid or alternative energy vehicles
Waste efficiency	Waste removal cost savings from recycling and reusing waste and by-product materials

Although not required by generally accepted accounting principles, many firms choose to report their CSR and sustainability efforts. The **Global Reporting Initiative** is an international organization that develops and encourages the use of sustainability reporting standards.[8] The Global Reporting Initiative claims that "increase[ing] transparency around the impact of … business on issues such as climate change, human rights and corruption, … enable[s] organization[s] to make better decisions that create social, environmental and economic benefits for all … stakeholders." Many corporations use a **triple bottom line** approach to their sustainability by reporting on the following:

- Financial performance
- Social performance
- Environmental performance

Corporate Social Responsibility and the Balanced Scorecard

A balanced scorecard, which links all of the company's strategic objectives together, is helpful in integrating CSR activities into the core strategy of the company. In doing so, companies may include CSR activities in a separate corporate social responsibility performance perspective. Other companies integrate CSR strategic objectives into the four perspectives (learning and growth, internal processes, customer, and financial) of the balanced scorecard. This creates what is sometimes referred to as a **sustainability balanced scorecard (SBSC)**.[9]

Why It Matters CONCEPT CLIP

Sustainable Papermaking

Processing companies involved with papermaking, refining, and chemical processing focus on sustainability because of their impacts on the environment. For example, papermaking requires the use of large amounts of wood fiber (cellulous), energy, and water. Thus, papermakers are actively involved in sustainability efforts to reduce the negative environmental impacts from the use of these resources.

To illustrate, **International Paper Company** provides an annual report to external stakeholders identifying its progress toward its corporate social responsibility objectives. A recent report identified the following sustainability areas:

- *Safety*: Improve worker health and safety, resulting in a 68% reduction in life-impacting injuries.
- *Water use*: Identify and implement water conservation opportunities at each paper mill.
- *Greenhouse gas emissions*: Reduce greenhouse gases by using renewable carbon-neutral biomass to meet over 70% of energy needs.
- *Forest stewardship*: Implement sustainable forest management practices that provide a low-cost fiber supply while simultaneously conserving primary forests.
- *Ethics and compliance*: Train suppliers in the company's Supplier Code of Conduct.
- *Stakeholder engagement*: Engage with communities, customers, and governments by participating in conferences, providing donations, and volunteering.

Source: *In Our Nature: Sustainability Year in Review 2014*, International Paper Company (www.internationalpaper.com/docs/default-source/english/sustainability/2014_sust_full-report.pdf?sfvrsn=58).

[8] www.globalreporting.org.
[9] E. G. Hansen and S. Schaltegger, "The Sustainability Balanced Scorecard: A Systematic Review of Architectures," *Journal of Business Ethics*, January 2016.

Intermountain Healthcare includes many CSR strategic objectives on its scorecard, including objectives to help the homeless, fight opioid addiction, and prevent suicide.

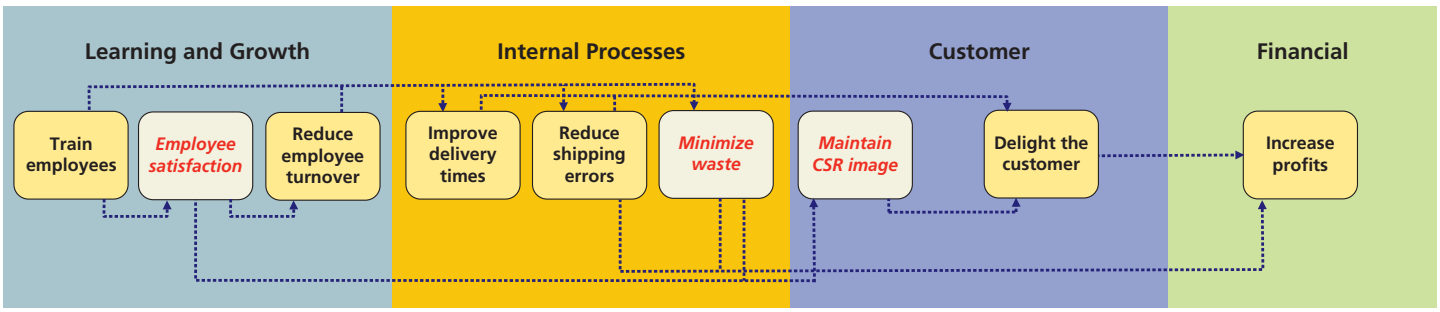
Link to Intermountain Healthcare

To illustrate, assume that **Cordier Toys, Inc.**, has decided to integrate CSR strategic objectives into a SBSC balanced scorecard. Specifically, Cordier Toys has developed the following CSR strategic objectives:

- Ensure that employees are satisfied with their work environments (employee satisfaction)
- Minimize waste of environmental resources, including energy and water (minimize waste)
- Maintain a socially responsible image for customers (maintain CSR image)

In developing its SBSC scorecard, Cordier Toys must first decide where the CSR strategic objectives fit within its strategy map. The SBSC strategy map Cordier Toys developed, with the new CSR-related objectives in red italics, is shown in Exhibit 13.

Exhibit 13 Sustainability Balanced Scorecard (SBSC)



Cordier Toys selected the following performance metrics to match with its new CSR strategic objectives:

- Employee satisfaction rating (for the employee satisfaction objective)
- Utility cost variance (for the minimize waste objective)
- Customer survey rating on CSR (for the maintain CSR image objective)

For each of the new performance metrics, Cordier Toys also set the following performance targets:

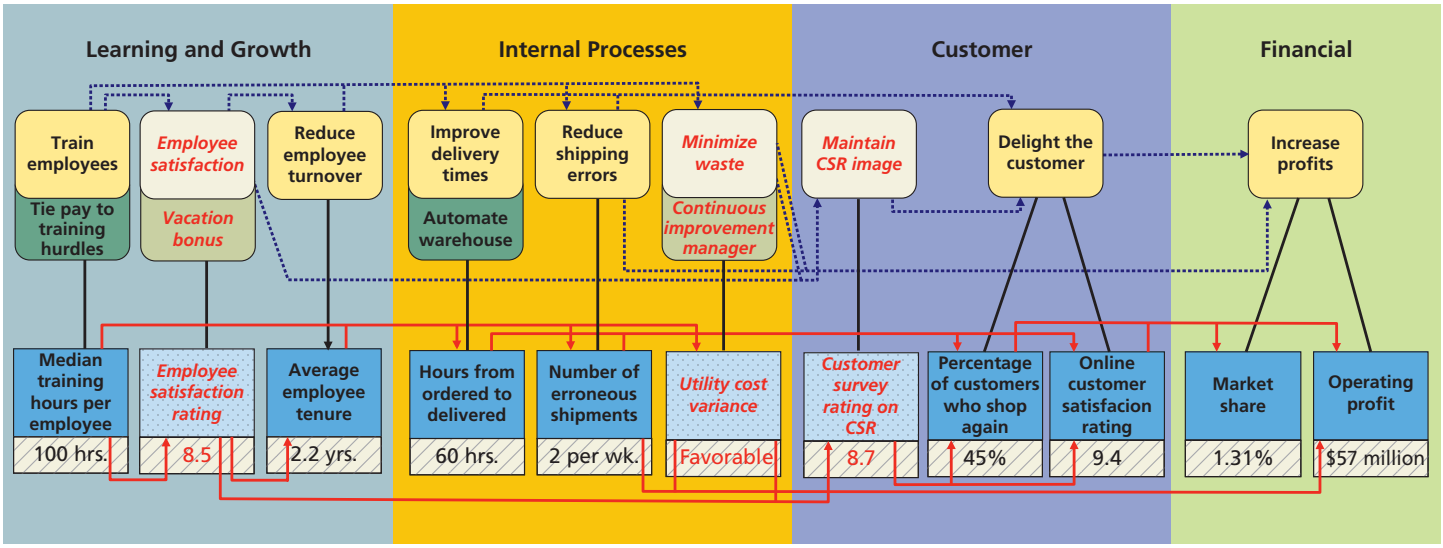
- Achieve employee satisfaction ratings of 8.5 or higher
- Maintain a favorable utility cost variance
- Achieve customer survey rating on CSR of 8.7 or higher

Finally, Cordier Toys has implemented two new strategic initiatives. To minimize waste, management has hired a continuous improvement manager who is to oversee waste reduction. To improve employee satisfaction, management has added a vacation bonus for all employees.

The new performance metrics, performance targets, and strategic initiatives are shown in red italics type in Exhibit 14. Thin red arrows link the metrics together, creating a measure map.

As illustrated with Cordier Toys, CSR activities may be incorporated into a balanced scorecard. Some companies, however, treat CSR activities as "add-on" efforts rather than integrating them directly into their balanced scorecards.

Exhibit 14 Measures of CSR Strategic Objectives



Encouraging Corporate Social Responsibility

To be successful, a balanced scorecard must encourage managers and employees to achieve strategic objectives. Tying manager and employee compensation directly to performance metrics and targets encourages and motivates managers and employees to achieve strategic objectives. However, social psychologists have found that linking compensation to performance measures may "crowd out" other intrinsic motivations. For example, individuals sometimes accept work for lower pay because they are attracted by the CSR activities of the organization where they accepted employment. In fact, CSR activities are often used by recruiters to hire top talent interested in making a difference beyond the traditional financial results. Thus, management must carefully consider the trade-off between intrinsic motivation and incentive compensation, especially when attempting to motivate CSR-related performance.

Analysis for Decision Making

Objective 5
Use capital investment analysis to evaluate CSR projects.

Capital Investment in CSR

To implement CSR practices, significant capital investments are often required. Some examples of CSR-related capital investments are provided in Exhibit 15.

Exhibit 15
Examples of CSR Capital Investments

CSR Objective	Capital Investment Example
Minimize resource waste and environmental degradation	A mining company invests in land, soil, and water reclamation projects.
Develop new sustainable markets	A consumer products company invests in equipment to produce environmentally friendly cleaning products.
Reduce litigation risks	A paper mill invests in wastewater recycling to avoid the potential legal liability for river contamination.
Maintain an attractive and safe working environment	A software company invests in an employee wellness and fitness center to attract and retain high-performance employees.

Often, CSR investment proposals can be analyzed using managerial accounting methods described throughout this textbook. For example, the investment in manufacturing equipment for a new environmentally safe cleaning product would require capital investment analysis as described in an earlier chapter.

In contrast, the benefits of some CSR investments may be difficult to measure and, thus, must be evaluated qualitatively. For example, the benefits of a wellness and fitness center for employees would be difficult to evaluate quantitatively. In addition, CSR investments may be legally mandated and, thus, are justified more by the requirements of the law than by their immediate economic benefits. Examples might be the land, soil, and water reclamation projects and the wastewater recycling project listed in Exhibit 15.

To illustrate a capital investment analysis, Carpenter Company proposes to install solar panels to satisfy a portion of its power requirements for its manufacturing plant. The solar panels' investment cost is $150,000. The solar panels' operating and maintenance cost is expected to be $20,000 per year. The plant uses an average of 3,000 kilowatt-hours (kwh) per day for 250 sunny days per year. A kilowatt-hour is the use of 1,000 watts per hour and is a standard measure of electricity consumption. The solar panels replace metered electricity from the power company that costs Carpenter $0.12 per kwh. The solar panels are expected to last 10 years and have no salvage value.

Annual cost savings:	
Kilowatt-hours per day	3,000 kwh
Number of sunny operating days	× 250 days
Kilowatt-hours per year	750,000 kwh
Metered electricity cost per kwh	× $0.12 per kwh
Total metered cost savings	$ 90,000
Annual solar panel operating cost	(20,000)
Net annual savings	$ 70,000

The net present value of the project, assuming a minimum rate of return of 10%, is computed as follows:

Annual net cash flow savings from installing solar panels	$ 70,000
Present value factor for an annuity of $1 at 10% for 10 periods (Appendix A)	× 6.14457
Present value of annual savings (rounded)	$ 430,120
Amount to be invested	(150,000)
Net present value	$ 280,120

The net present value is positive; thus, the proposal is supported by the analysis.

Make a Decision — Capital Investment in CSR

Analyze a CSR capital investment proposal for Den-Tex Company (MAD 14-1)

Analyze CSR initiatives at Boxwood Company (MAD 14-2)

Analyze CSR initiatives at Green Manufacturing (MAD 14-3)

Make a Decision

Let's Review

Chapter Summary

1. Performance measurement systems were developed as a means of measuring companies' financial condition and performance. They use metrics, or representative measures, to gauge company performance in various areas. Strategic performance measurement systems define and link companies' strategic objectives to the performance metrics of a company.
2. The balanced scorecard (BSC) is the best-known strategic performance measurement system. It emphasizes a balanced view of performance using both financial and nonfinancial performance metrics. The balanced scorecard is divided into four performance perspectives: financial, customer, internal processes, and learning and growth. These performance perspectives each have strategic objectives and related strategic initiatives that aggregately embody and put into action the company's overall mission and goals. Performance metrics are used to assess the company's performance in achieving each of its strategic objectives. Performance targets are levels of improvement that management wants to achieve for performance metrics.
3. Strategy maps are used within a balanced scorecard to show how different strategic objectives are expected to affect each other and thereby contribute to the overall mission or strategy of the company. Measure maps are used to verify these expectations by showing how different performance metrics relate to each other. Measure maps also indicate which metrics are leading and which are lagging indicators of performance. This process of using performance metrics to verify the expected causal relationships among strategic objectives, and adjust them if necessary, is called strategic learning. To ensure that balanced scorecards are relevant for each level of management, some companies use multiple scorecards. Sometimes scorecards are divided up into smaller, division- and job-specific scorecards in a method called scorecard cascading. People making decisions with balanced scorecards should take care to guard against biases such as motivated reasoning, surrogation, and common measures bias.
4. Corporate social responsibility (CSR) describes the efforts of companies to take responsibility for the impacts their operations have on society and to improve social well-being within and outside of the firm. Reporting CSR activities is not typically required, but more and more companies are reporting their CSR activities in response to investors and consumers who value CSR efforts. Some ways that companies measure their CSR activities are through eco-efficiency measures and the triple bottom line, which reports on financial, social, and environmental performance. Companies can also integrate their CSR objectives with their core strategy using the balanced scorecard. This integration results in what is called the sustainability balanced scorecard (SBSC).
5. To implement CSR practices, significant capital investments are often required. Many CSR investment proposals can be analyzed using managerial accounting methods, such as the net present value method. The benefits of some CSR investments may be difficult to measure and, thus, must be evaluated qualitatively. CSR investments that are legally mandated are justified by the requirements of the law more than their immediate economic benefits.

Key Terms

balanced scorecard (BSC) (657)
cognitive bias (667)
common measures bias (670)
corporate social responsibility (CSR) (670)
eco-efficiency measures (671)
Global Reporting Initiative (672)
lagging indicator (657)
leading indicators (657)
measure map (663)
motivated reasoning (667)
performance measurement systems (656)
performance metrics (659)
performance perspectives (657)
performance targets (661)
personal scorecards (667)
scorecard cascading (667)
strategic initiatives (660)
strategic learning (665)
strategic objective (659)
strategic performance measurement systems (657)
strategy map (661)
surrogation (668)
sustainability (671)
sustainability balanced scorecard (SBSC) (672)
triple bottom line (672)

Practice

Multiple-Choice Questions

1. Which of the following is ***not*** an example of a metric that companies are likely to use to measure some aspect of performance?
   a. Operating income
   b. CEO salary
   c. Cash flows
   d. Average employee tenure

2. Which of the following are elements of the balanced scorecard?
   i. Performance targets
   ii. Strategy maps
   iii. Performance forecasts
   iv. Strategic initiatives
   a. i only
   b. iii and iv
   c. i, ii, and iv
   d. i, ii, iii, and iv

3. Which of the following statements is true regarding the balanced scorecard?
   a. Strategic objectives are the same as the overall mission statement of a company.
   b. All effective performance metrics of a balanced scorecard are financial measures.
   c. Strategic initiatives are brainstormed ideas about what a company's strategic objectives should be.
   d. Performance targets are levels or rates of improvement that management wants to achieve for performance metrics.

4. Which of the following statements most accurately describes the difference between a strategy map and a measure map?
   a. Strategy maps show which performance metrics are leading or lagging indicators of performance, while measure maps show the expected relationships among performance metrics.
   b. Strategy maps show how strategic initiatives will fulfill strategic objectives, while measure maps show how strategic initiatives are effective measures of the strategic objectives.
   c. Strategy maps show the expected cause-and-effect relationships among strategic objectives, while measure maps show the expected relationships among performance metrics.
   d. Strategy maps show the cause-and-effect relationships among strategic initiatives, while measure maps measure the strength of those relationships.

5. Which of the following best describes one of the main reasons why most Fortune 500 companies now issue CSR reports?
   a. Investors and consumers are increasingly rewarding companies that are engaged in CSR activities.
   b. CSR reports are required of public companies by the SEC.
   c. The Global Reporting Initiative penalizes companies that fail to issue CSR reports.
   d. The managers of Fortune 500 companies are more ethical than they used to be.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Strategic performance measurement systems — Obj. 1

Bronco's Breakfasts is a local restaurant that is famous for its high-quality and filling breakfasts. The company has the following data for the last year:

Number of first-time clients	4,400
Estimated market share	1.4%
Total operating costs	$142,000
Number of return customers	1,980
Average customer satisfaction rating (out of 10)	9.2
Average training hours per employee	25
Total sales	$212,000

While the business does not have any explicit strategic objectives, Bronco has mentioned that serving clients satisfactorily is a high priority and appears to be a significant driver of future sales. He has noticed that when about half of his customers come back to the restaurant again, total sales are approximately the same as the industry average for local restaurants.

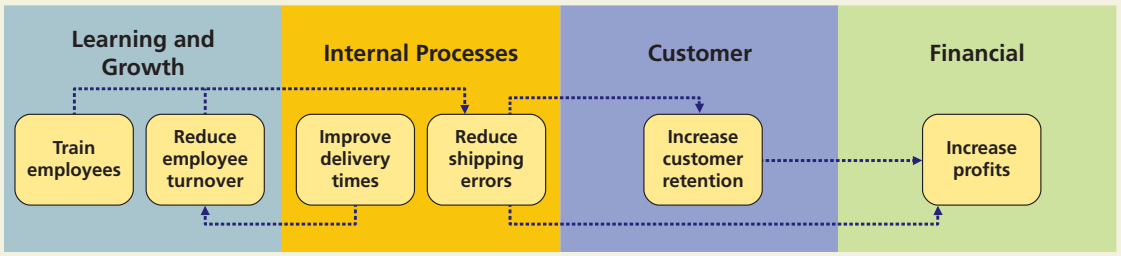
a. What performance metrics could Bronco use to measure his strategic objective to serve customers satisfactorily?
b. Is Bronco's Breakfasts currently performing at a statistically high, medium, or low level in each of the performance metrics you have chosen?

2. Strategic initiatives — Obj. 2

Springbok Strikers Inc. is a South African company that has developed a new strategic initiative aimed at increasing profits. Currently, the company's operating profit is 8% of sales, but the company wants it to be at least 12%. The new initiative is to open two new markets—the United States and Great Britain—where the company has not sold before. The company's current monthly volume of sales is $5 million. The initiative is expected to bring in an additional $2 million and $1.5 million of monthly sales from the United States and Great Britain, respectively, without any cannibalization of current revenues (i.e., the additional sales to the United States and Great Britain will not take away from the current monthly sales volume of $5 million). Determine what the combined total operating expenses of the two initiatives would need to be for the overall strategic initiative to achieve the company's target operating profit.

3. Strategy maps and performance metrics — Obj. 3

Mountain Lion Inc. has begun developing its balanced scorecard. It has drawn the following strategy map for its strategic objectives:



The company has also developed the following performance metrics: number of erroneous shipments, average employee tenure, market share, percentage of customers who shop again, average training hours per employee, earnings per share, and hours from ordered to delivered. Mountain Lion Inc. has hired you as a consultant on its balanced scorecard. Specifically, Mountain Lion's management would like you to: (a) redraw the strategy map so that it more logically ties the strategic objectives together and (b) add the performance metrics Mountain Lion currently uses to the balanced scorecard, tying each of them to the appropriate strategic objective.

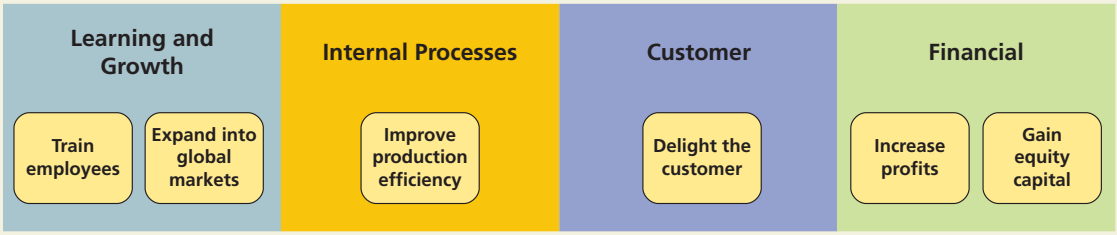
4. Cognitive biases **Obj. 3**

Happy Heroes Healthcare has a strategic objective to reduce costs and increase quality for its patients. One area of focus is to reduce the prescription of a costly, and potentially addictive, powerful painkiller. When patients visit a doctor with shoulder pain, the doctor normally prescribes this painkiller until the appropriate diagnosis is confirmed and the needed operation takes place. However, about 60% of the time, the degree of shoulder pain a patient comes in with does not necessitate a powerful painkiller and does not lead to a diagnosis for which an operation is required. Happy Heroes Healthcare wants to develop a goal to reduce the number of prescriptions while appropriately assisting patients who do come in with substantial shoulder pain.

a. Identify and define which cognitive bias Happy Heroes Healthcare is trying to avoid.
b. Suggest an appropriate performance target for the percentage of patients with shoulder pain for which the company should aim to prescribe the expensive painkiller. Explain your reasoning.

5. Corporate social responsibility and the balanced scorecard **Obj. 4**

Wilkinson World Inc. has developed a balanced scorecard with the following strategic objectives in the traditional four performance perspectives:



The company's CEO senses a disconnect between the company's social initiatives and business objectives. He wants to integrate the company's CSR activities into the company's overall mission and objectives using the balanced scorecard. The company's CSR strategic objectives are to minimize toxic emissions, improve public perceptions of the company's CSR, and ensure safe work environments. Determine how these CSR strategic objectives should fit into the balanced scorecard, and draw a strategy map showing how all the strategic objectives relate to each other.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Hunter Essentials Inc. specializes in producing four big game hunting gear products: rifles, ammunition, knives, and apparel. The company is in the process of developing its balanced scorecard.

The company has the following strategic objectives:

- Satisfy the customer
- Reduce employee turnover
- Improve shipping efficiency
- Increase profits
- Increase product selection diversity
- Reduce product defects

The company also has the following performance metrics:

- Number of unique products
- Average employee tenure
- Percentage of defective products (as compared to the total number of products produced)
- Online customer reviews
- Days from ordered to delivered
- Customer retention percentage
- Market share

(Continued)

Instructions

1. Determine which performance perspective each strategic objective should fall under.
2. Match each performance metric to a strategic objective and draw a measure map showing how the performance metrics affect each other.
3. Suggest at least one strategic initiative for each strategic objective.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

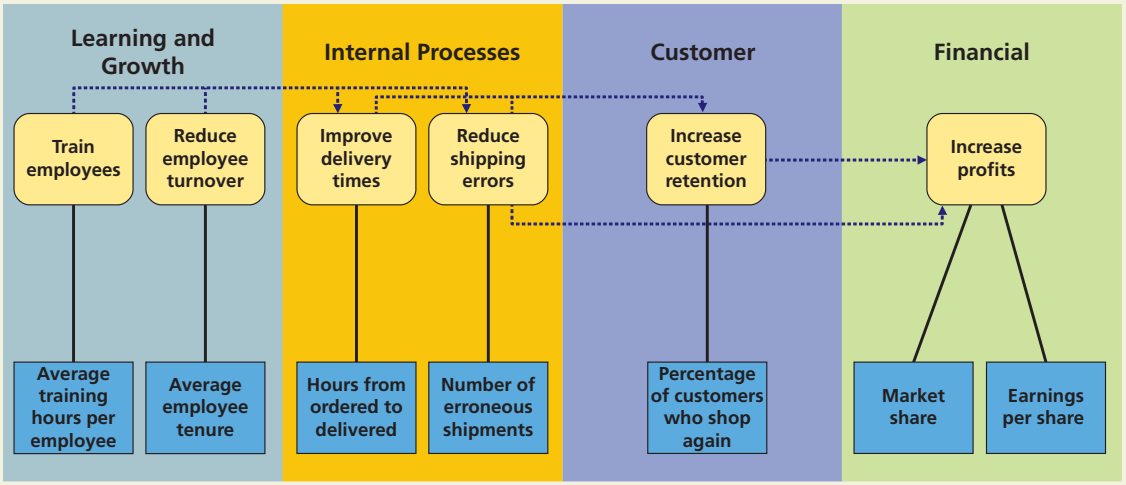
Answers

Multiple-Choice Questions

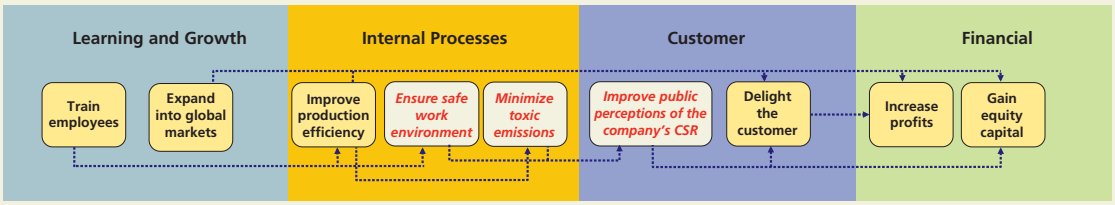
1. **b** CEO salary is not a measure that is likely to be used to assess performance for a company. Operating income, cash flows, and average employee tenure are all common company measures of performance.
2. **c** Performance forecasts are not an element of a balanced scorecard. Performance targets, strategy maps, and strategic initiatives are all elements of a balanced scorecard.
3. **d** Statement d accurately describes the definition of performance targets, an element of the balanced scorecard.
4. **c** A measure map is a reflection of the strategy map. The measure map shows the causal relationships between performance metrics based upon the linkages between strategic objectives shown in the strategy map.
5. **a** Increased CSR reporting has been driven by investors' and consumers' increasing demand for it. CSR reporting is not required by the SEC, and the Global Reporting Initiative is not allowed to penalize companies that do not issue CSR reports. The ethical standards of today's top management of Fortune 500 companies may or may not be higher than their predecessors, but this does not appear to be the driving factor of CSR reporting.

Exercises

1. a. From the data provided, the most logical performance metrics Bronco could use are the average customer satisfaction rating and a computed percentage of customers who return. This metric can be computed by dividing the number of returning customers by the number of first-time customers.
   b. An average customer satisfaction rating of 9.2 out of 10 indicates high performance. The percentage of clients who return is 45% (1,980 ÷ 4,400). Based on Bronco's analysis discussed in the exercise, this indicates a medium level of performance on this metric.
2. $2,880,000. Current operating profit is $400,000 (8% × $5,000,000). This means that current operating expenses are $4,600,000 ($5,000,000 − $400,000). The new initiative would result in total sales of $8,500,000 ($5,000,000 + $2,000,000 + $1,500,000). Achieving the company's target operating profit would result in operating profit of $1,020,000 (12% × $8,500,000) and total operating expenses of $7,480,000 ($8,500,000 − $1,020,000). This means the new initiative could only incur $2,880,000 of additional operating expenses ($7,480,000 − $4,600,000).
3. The revised balanced scorecard with redrawn strategy map that follows (a) more logically ties the strategic objectives together and (b) demonstrates how performance metrics represent the various scorecard objectives:



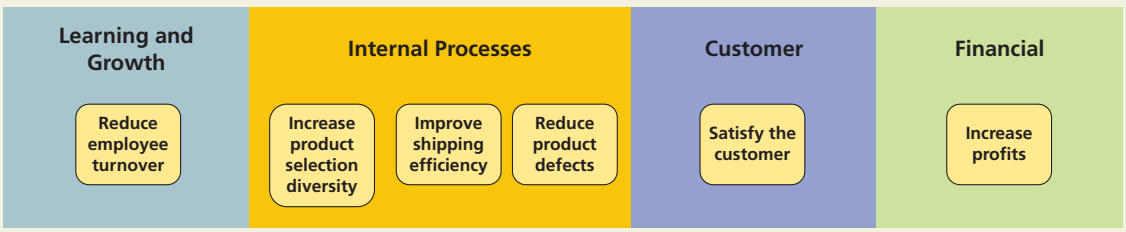
4. a. Happy Heroes Healthcare is trying to avoid surrogation. Surrogation is the tendency to behave like the performance metrics are the strategic objectives. In this case, Happy Heroes Healthcare's strategic objective is to reduce unnecessary costs and risks to its customers. Its goal to reduce the number of prescriptions of expensive and addictive painkillers is aimed at achieving this strategic objective, but if the company only focuses on this performance metric, it may deny the prescription of painkillers to patients for whom it is worth the cost and risk.
   b. Approximately 40% is likely the best performance target for this metric; however, any percentage between 20–50% is an acceptable response. A response of 0% would be inappropriate, as it would cause the surrogation bias discussed in part (a). Anything greater than 50% is probably too high of a target, because the company already estimates that at most only about 40% of patients who come in actually benefit from the powerful painkiller.
5. Following is a possible version of the scorecard that includes the CSR objectives and links together all of the scorecard objectives:



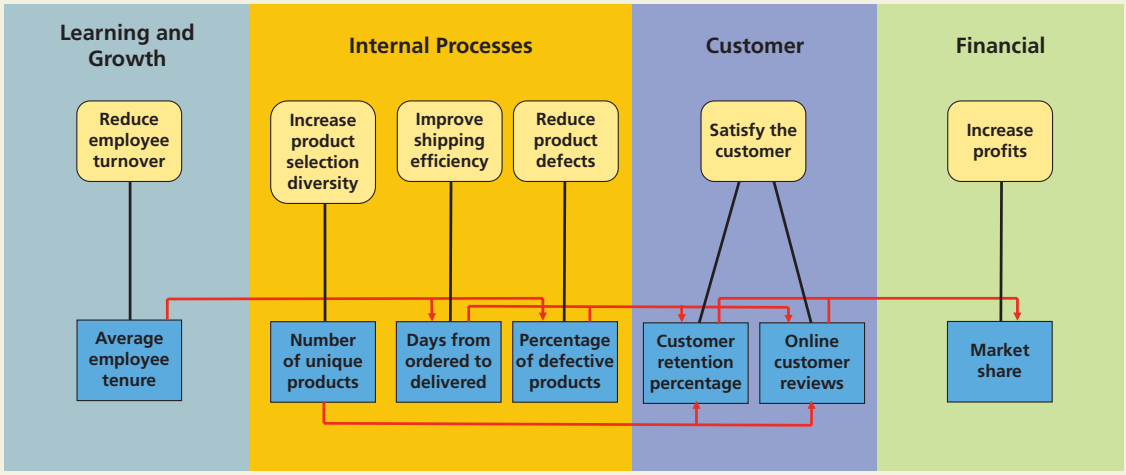
Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1. Following is a possible categorization of the strategic objectives into performance perspectives:



2. Following is a logical matching of the strategic objectives to the performance metrics, as well as a measure map showing how the metrics likely affect each other:



3. Following are several possible strategic initiatives for each strategic objective:

   Reduce employee turnover:
   - Increase annual salary raises by 2%
   - Implement a training program that will help employees inside the company qualify for promotions

   Increase product selection diversity:
   - Offer rewards to development employees for new product development milestones
   - Survey customers about products they would like to see the company offer

   Improve shipping efficiency:
   - Automate warehouse
   - Automate order processing

   Reduce product defects:
   - Increase quantity and robustness of product quality tests
   - Inspect a higher proportion of parts upon receipt

   Satisfy the customer:
   - Increase returns and exchange window by 30 days
   - Hire a Web development consultant to improve the online website interface and navigability

   Increase profits:
   - Negotiate better volume discounts with shipping company
   - Increase prices of goods in high demand

Discussion Questions

1. How does a strategic performance measurement system improve upon an ordinary performance measurement system?
2. What is the difference between a leading indicator and a lagging indicator?
3. What is the purpose of the performance perspectives of a balanced scorecard?
4. How are strategic objectives and strategic initiatives different? How are they related?
5. What do strategy maps show, and how do they add value to the balanced scorecard?
6. What is the purpose of scorecard cascading?
7. What are some of the dangerous tendencies of people who fall prey to the bias of motivated reasoning?
8. Why is the common measures bias especially prevalent in companies that use scorecard cascading?
9. How is *sustainability* distinguishable from *corporate social responsibility*?
10. How can the balanced scorecard be used to address CSR objectives?

Basic Exercises

SHOW ME HOW

BE 14-1 Leading and lagging indicators — Obj. 2

72 Inc. has developed a balanced scorecard with the following performance metrics:

- Total sales
- Employee turnover
- Market share
- Number of shipping errors
- Median training hours per employee
- Number of new customers

Relative to the metric "customer satisfaction ratings," which of these performance metrics are leading indicators and which are lagging indicators?

SHOW ME HOW

BE 14-2 Performance perspectives and metrics — Obj. 2

Bluetiful Inc. has the following strategic objectives on its balanced scorecard but is unsure how to measure them:

- Increase profits
- Obtain new customers
- Improve production efficiency
- Recruit top candidates

State which performance perspective each strategic objective should fall under, and suggest at least two possible performance metrics for each strategic objective listed.

SHOW ME HOW

BE 14-3 Measure maps — Obj. 3

Moses Moonrocks Inc. has developed a balanced scorecard with a measure map that suggests that the number of erroneous shipments has a direct effect on operating profit. The company estimates that every shipment error leads to a reduction of revenue by $3,000 and increased costs of about $2,000. If the company has the following budgeted sales and costs for next month (without accounting for any possible shipping errors), determine how many shipping errors the company can afford to have and still break even:

Sales	$230,000
Cost of goods sold	150,000
Depreciation expense	30,000
Other expenses	20,000

SHOW ME HOW

BE 14-4 Cognitive biases — Obj. 3

Gary's Gumbo is a locally owned restaurant in Houston, Texas, with eight locations. The owner recently developed a new recipe for the restaurant's signature gumbo dish. The owner decided to try out the dish in four of the company's locations. After one month, the owner had gathered the following data:

	Locations with New Gumbo Recipe				Locations with Old Gumbo Recipe			
Location #	1	2	3	4	5	6	7	8
Number of orders	1,253	1,386	1,495	1,377	1,112	1,025	1,224	997
Number of customer complaints (about the dish)	34	36	44	32	12	9	6	8

After looking over the data, the owner happily noted that the number of orders of the signature gumbo dish at the locations where the new recipe had been used (locations 1–4) had increased in comparison to the traditional number of orders of the dish (locations 5–8). The owner then decided to implement the new recipe at the rest of the company's locations.

a. Evaluate whether the owner made the correct decision.

b. Identify which cognitive bias was likely at play in this situation, and describe how it occurred.



BE 14-5 Corporate social responsibility and the balanced scorecard — Obj. 4

Lonnie's Shipping Co. is considering switching to an all-electric fleet to minimize emissions. Lonnie wants to gradually implement this change over the next 10 years. The company currently has a fleet of 100 trucks, half of which are electric-powered. Upon consulting with Lonnie, you have determined that an appropriate course of action is to include this CSR activity as a strategic objective in the company's current balanced scorecard.

a. Under which performance perspective should the CSR strategic objective be placed?

b. Suggest one possible performance metric for the CSR strategic objective.

c. Determine an appropriate yearly performance target for the performance metric you suggested in part (b).

Exercises

EX 14-1 Strategic performance measurement systems — Obj. 1

✔ b. Cost of ingredients per meal

Henry's Cafe is a local restaurant that is growing quickly. While the company does not yet have a balanced scorecard, Henry has mentioned that being efficient in producing meals is a high priority of his business and appears to be a significant driver of profits. Henry tells you he gathers the following data: sales, cost of labor, employee turnover, labor hours, cost of ingredients, overhead costs, average training hours per employee, number of erroneous meals prepared, the time when orders were made (e.g., at 12:43 PM), the time when orders were delivered, and number of customers per day.

a. Under which performance perspective on the balanced scorecard should Henry's strategic objective to efficiently produce meals be placed?

b. Based on the data collected, what are at least three performance metrics Henry could develop to measure his strategic objective to efficiently produce meals?

c. Identify whether the performance metrics you suggested in part (b) are leading or lagging indicators relative to a performance metric "total cost of production per meal."

EX 14-2 The balanced scorecard for a service company — Obj. 2

✔ Average card member spending: customer perspective



American Express Company is a major financial services company noted for its American Express® card. Some of the performance measures used by the company on its balanced scorecard follow:

- Average card member spending
- Number of Internet features
- Cards in force
- Number of merchant signings
- Earnings growth
- Number of new card launches
- Hours of credit consultant training
- Return on equity
- Investment in information technology
- Revenue growth
- Number of card choices

For each measure, identify whether the measure best fits the learning and growth, internal processes, customer, or financial performance perspective of the balanced scorecard.

EX 14-3 Building a balanced scorecard — Obj. 2

✔ Gross profit: financial perspective

Eat-n-Run Inc. owns and operates 10 food trucks (mobile kitchens) throughout metropolitan Los Angeles. Each food truck has a different food theme, such as Irish-Mexican fusion, traditional Mexican street food, Ethiopian cuisine, and Lebanese-Italian fusion. The company was founded three years ago by Juanita O'Brien when she opened a single food truck with a unique menu. As her business has grown, she has become concerned about her ability to manage and control the business. O'Brien describes how the company was built, its key success factors, and its recent growth:

I built the company from the ground up. In the beginning, it was just me. I drove the truck, set the menu, bought the ingredients, prepared the meals, served the meals, cleaned the kitchen, and maintained the equipment. I made unique meals from quality ingredients and didn't serve anything that wasn't perfect. I changed my location daily and notified customers of my location via Twitter.

As my customer base grew, I hired employees to help me in the truck. Then one day I realized that I had a formula that could be expanded to multiple trucks. Before I knew it, I had 10 trucks and was hiring people to do everything that I used to do by myself. Now, I work with my team to build the menu, set daily locations for the trucks, and manage the operations of the business.

My business model is based on providing the highest-quality street food and charging more for it than other trucks. You won't get the cheapest meal at one of my trucks, but you will get the best. The superior quality allows me to price my meals a little bit higher than the other trucks. My employees are critical to my success. I pay them a better wage than they could make on other food trucks, and I expect more from them. I rely on them to maintain the quality that I established when I opened my first truck.

Things are going great, but I'm feeling overwhelmed. So far, the growth in sales has led to a growth in profitability—but I'm getting nervous. If quality starts to fall off, my brand value erodes, and that could affect the prices that I charge for my meals and the success of my business.

Create balanced scorecard metrics for Eat-n-Run Inc. Identify whether these measures best fit the learning and growth, internal processes, customer, or financial performance perspective of the balanced scorecard.

EX 14-4 Performance metrics

Obj. 2

✔ a. Program B: 6.4 mistakes per chef



SHOW ME HOW

Buffalo BBQ Restaurant is trying to become more efficient in training its chefs. It is experimenting with two training programs aimed at this objective. Both programs have basic and advanced training modules. The restaurant has provided the following data regarding the two programs after two weeks of implementation:

	Training Program A					Training Program B				
New chef #	1	2	3	4	5	6	7	8	9	10
Hours of basic training	22	24	28	21	23	25	24	29	31	28
Hours of advanced training	8	7	8	10	11	4	3	0	1	2
Number of chef mistakes	12	13	15	14	14	7	6	8	5	6

a. Compute the following performance metrics for each program:
   (1) Average hours of employee training per chef, rounded to one decimal place
   (2) Average number of mistakes per chef, rounded to one decimal place

b. Which program should the restaurant implement moving forward?

EX 14-5 Performance metrics

Obj. 2

✔ a. Procedure A: 0.343 error per shipment



SHOW ME HOW

Apples & Oranges Inc. is trying to become more efficient in shipping goods. It is experimenting with two new shipping procedure initiatives aimed at achieving this strategic objective. The company has provided the following data regarding the two procedures after one month of implementation:

	Shipping Procedure A	Shipping Procedure B
Number of shipping errors	105	132
Hours from ordered to shipped	16.3	19.2
Shipping time (hours from shipped to delivered)	8.7	8.5
Pounds of goods shipped	860,000	797,000
Number of shipments	306	315

a. Compute the following performance metrics for each program:
   (1) Average number of shipping errors per shipment, rounded to three decimal places
   (2) Hours from ordered to delivered, rounded to one decimal place
   (3) Average pounds of goods per shipment, rounded to two decimal places

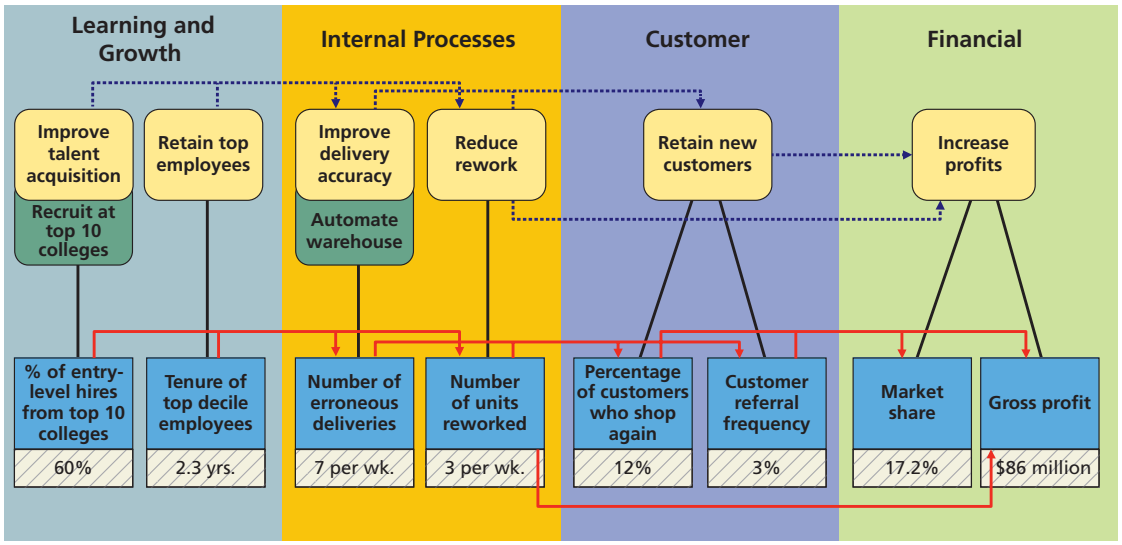
b. Which program should the company implement moving forward?

EX 14-6 Elements of the balanced scorecard

Obj. 2

✔"Market share" is a performance metric

The following is the balanced scorecard for Smith Company:



a. Label each element of the balanced scorecard.

b. Identify the company's *overall* strategic objective (i.e., the strategic objective that all the other strategic objectives contribute to, whether directly or indirectly).

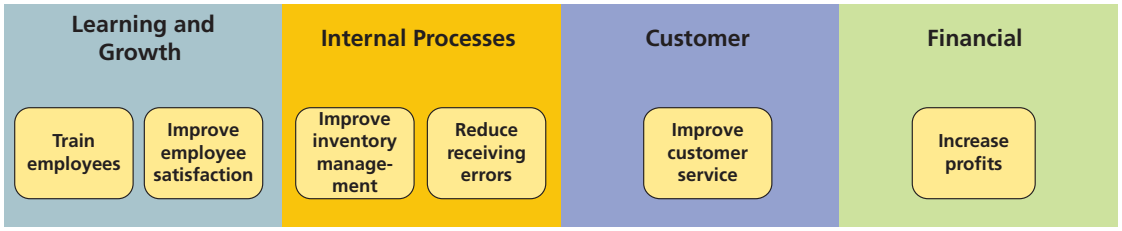
EX 14-7 Strategy maps

Obj. 3

✔b. Improving customer service leads to increased profits

SHOW ME HOW

Grand Grocery developed a balanced scorecard with six strategic objectives under the standard four performance perspectives, as follows:



a. Draw a strategy map that shows how these strategic objectives likely influence each other.

b. Describe, in words, the relationships illustrated by the strategy map.

EX 14-8 Unique balanced scorecards

Obj. 3

✔Median training hours per employee: common measure

SHOW ME HOW

Coulson and Company is a large retail business that has a firm-wide balanced scorecard. Recently, management has discussed the need for the balanced scorecard to be more relevant to each individual department of the company. Specifically, management wants to come up with unique scorecards for its Public Relations and Inventory Management departments. For both departments, management recognizes that properly and efficiently training employees is important. For these purposes, management gathers data on the median training hours per employee and new employee performance review ratings. For the Inventory Management Department, management is focused on reducing stockouts (running out of certain inventory items) and keeping accurate inventory counts. For these purposes, the company tracks the number of back orders and discrepancies between the physical and record counts of inventory, respectively. For the Public Relations Department, management is focused on improving the public's CSR image of the company

and attracting new customers. Management measures these objectives using Forbes CSR Rating of Coulson and Company and the number of new customers, respectively.

a. Identify the term for Coulson and Company's plan to create unique balanced scorecards for its individual departments.

b. Draw the unique balanced scorecards of each department. Identify the departments' common and unique measures, and include all the elements of the balanced scorecard that you can in your drawings, given the information provided.

EX 14-9 Measure maps

Obj. 3

✔ a. New customer retention rate: 55%

Rizzo Goal Inc. produces and sells hockey equipment, often custom made for online orders. The company has the following performance metrics on its balanced scorecard: days from ordered to delivered, number of shipping errors, customer retention rate, and market share. A measure map illustrates that the days from ordered to delivered and the number of shipping errors are both expected to directly affect the customer retention rate, which affects market share. Additional internal analysis finds that:

- Every shipping error over three shipping errors per month reduces the customer retention rate by 1.5%.
- On average, each day above three days from ordered to delivered yields a reduction in the customer retention rate of 1%.
- Each day before three days from order to delivery yields an increase in the customer retention rate of 1%, on average.
- Rizzo Goal Inc.'s current customer retention rate is 60%.
- The company estimates that for every 1% increase or decrease in the customer retention rate, market share changes 0.5% in the same direction.
- Rizzo Goal Inc.'s current market share is 21.4%.

Ignoring any other factors, if the company has six shipping errors this month and an average of 3.5 days from ordered to delivered, determine (a) the new customer retention rate and (b) the new market share that Rizzo Goal Inc. expects to have.

EX 14-10 Measure maps

Obj. 3

✔ Total decrease in future market share: 1.02%



SHOW ME HOW

Silver Lining Inc. has a balanced scorecard with a strategy map that shows that delivery time and the number of erroneous shipments are expected to affect the company's ability to satisfy the customer. Further, the strategy map for the balanced scorecard shows that the hours from ordered to delivered affects the percentage of customers who shop again, and the number of erroneous shipments affects the online customer satisfaction rating. The following information is also available:

- The company's target hours from ordered to delivered is 40.
- Every hour over the ordered-to-delivered target results in a 0.5% decrease in the percentage of customers who shop again.
- The company's target number of erroneous shipments per year is no more than 65.
- Every error over the erroneous shipments target results in a 0.5 point decrease in the online customer satisfaction rating and an added future financial loss of $500.
- The company estimates that for every 1% decrease in the percentage of customers who shop again, future profit decreases by $4,000 and market share decreases by 0.3%.
- The company also estimates that for every 1 point decrease in the overall online customer satisfaction rating (on a scale of 1 to 10), future profit decreases by $3,000 and market share decreases by 0.6%.

Using these estimates, determine how much future profit and future market share will change if:

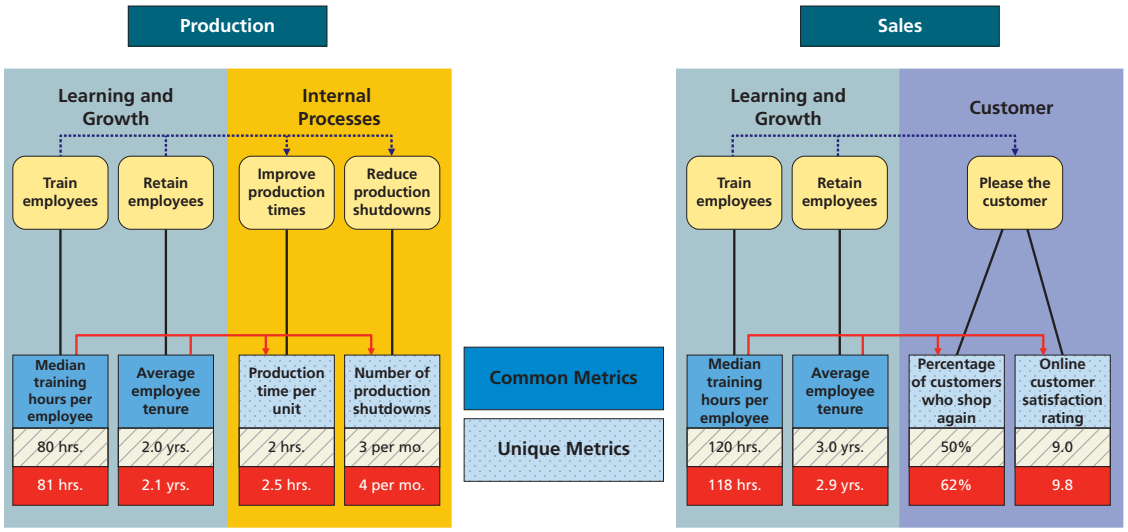
- Average hours from ordered to shipped is 27.5.
- Average shipping time (hours from shipped to delivered) is 16.3.
- Number of erroneous shipments is 80.

EX 14-11 Cognitive biases

Obj. 3

✔ a. Common measures bias

Two departments within Cougar Gear Inc. are Production and Sales. Each department has a unique scorecard, as follows:



The Production Department scorecard focuses on the learning and growth and internal processes perspectives. The Sales Department scorecard focuses on the learning and growth and customer perspectives. Both scorecards have the learning and growth performance metrics of median training hours per employee and average employee tenure. The Production scorecard has the unique metrics of production time per unit and number of production shutdowns. The Sales scorecard has the unique metrics of percentage of customers who shop again and online customer satisfaction rating. The performance targets for each metric are shown in the tan boxes just under the performance metrics. The actual achieved metrics are shown in the red boxes just below the tan boxes. When evaluating both departments, Cougar Gear's management looks at the median training hours per employee and average employee tenure metrics and subsequently decides to give the Sales Department a large bonus while giving the Production Department a minimal bonus.

a. Determine and define the type of cognitive bias Cougar Gear's management has exhibited in this instance.

b. Determine which department would have received the larger bonus had the company's management not been biased in the evaluation.

c. Discuss one advantage and one disadvantage of using unique balanced scorecards for different departments or divisions of a company.

EX 14-12 Corporate social responsibility and the balanced scorecard

Obj. 4

✔ a. Customer



SHOW ME HOW

Sunny Nights Inc. is completely powered by the city power grid, but management is considering switching fuel sources in an effort to improve the public's perception of the company's corporate social responsibility. Within the next five years, management wants the company to be completely solar powered and to market this change through company advertising. Upon consulting with Sunny Nights, you have determined that an appropriate course of action is to include this CSR activity as a strategic objective on the company's current balanced scorecard.

a. Determine the appropriate performance perspective for the CSR strategic objective.

b. Suggest one possible performance metric for the objective.

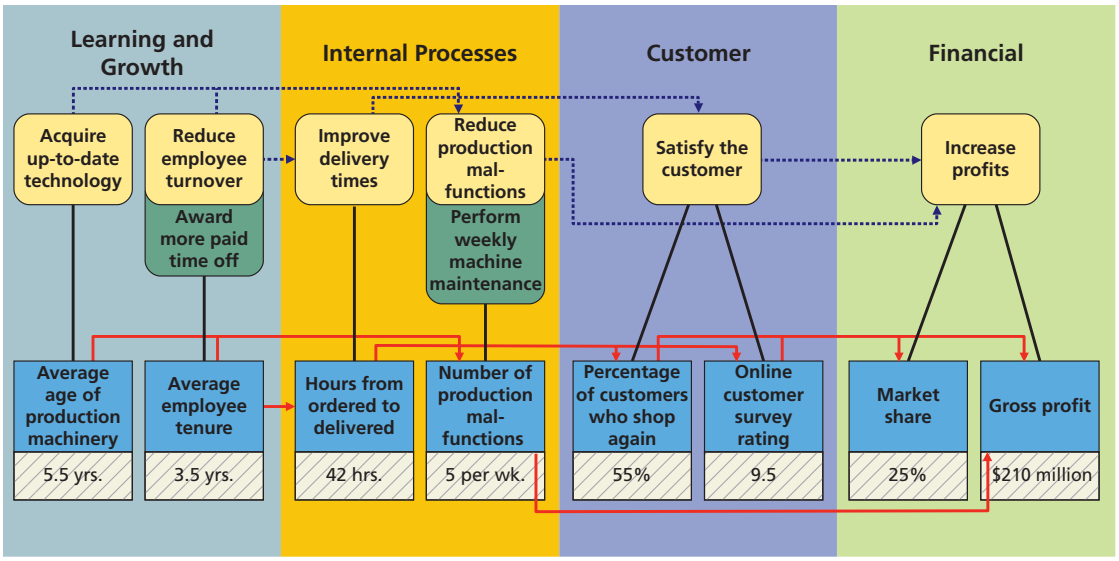
c. Determine an appropriate yearly performance target for the performance metric.

Problems: Series A

PR 14-1A Elements of the balanced scorecard

Obj. 2

✔ 1. "Award more paid time off" and "perform weekly machine maintenance" are strategic initiatives



Instructions

1. Label each element of the balanced scorecard.
2. Describe in words the relationships illustrated by the scorecard's strategy map.
3. Describe in words the relationships illustrated by the scorecard's measure map.

PR 14-2A Strategic initiatives and CSR

Obj. 2, 4

✔ 2. Total cost of Procedure 2: $310,000

SHOW ME HOW

Get Hitched Inc. is a production company that is in the process of testing a strategic initiative aimed at increasing gross profit. The company's current sales revenue is $1.5 million. Currently, the company's gross profit is 35% of sales, but the company's target gross profit percentage is 40%. The company's current monthly cost of production is $975,000. Of this cost, 60% is for labor, 30% is for materials, and 10% is for overhead.

The strategic initiative being tested at Get Hitched is a redesign of its production process that splits the process into two sequential procedures. The makeup of the costs of production for Procedure 1 is currently 50% direct labor, 45% direct materials, and 5% overhead. The makeup of the costs of production for Procedure 2 is currently 55% direct labor, 25% direct materials, and 20% overhead. Company management estimates that Procedure 1 costs twice as much as Procedure 2.

Instructions

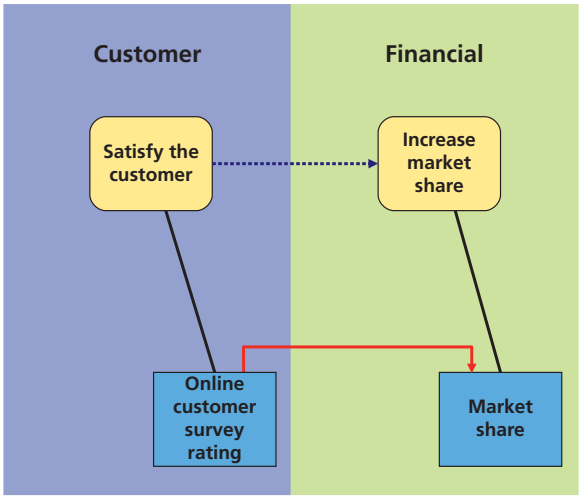
1. Determine what the cost of labor, materials, and overhead for both Procedures 1 and 2 would need to be for the company to meet its target gross profit at the current level of sales.
2. The company's actual direct materials cost is $279,000 for Procedure 1. Determine the actual cost of direct labor, direct materials, and overhead for each procedure, and the total cost of production for each procedure.
3. The company is planning a CSR initiative to reuse some of the indirect materials used in production during Procedure 2. These indirect materials normally make up 60% of the overhead cost for Procedure 2, but the CSR initiative would reduce the usage of indirect materials. Determine what the maximum new cost of these indirect materials could be for Procedure 2 if this CSR initiative is expected to enable the company to meet its target gross profit percentage (holding all other costs constant).

PR 14-3A Strategic learning

Obj. 3

✔ 2. Market share is a poor performance metric for increasing market share

Hyperflash Inc. has a balanced scorecard that includes the following relationships:



Actual results for this month and last month are as follows:

	This Month	Last Month
Online customer survey rating	9.2	8.5
Market share	10.5%	12.3%

Instructions

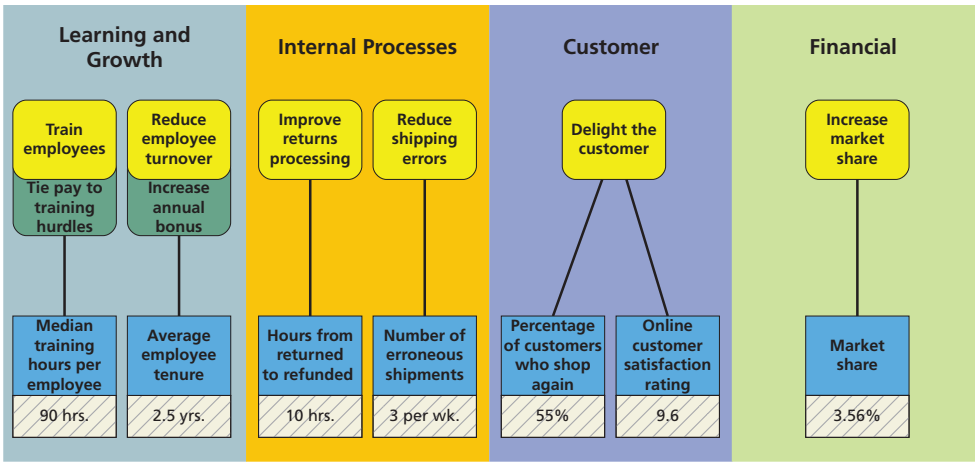
1. Analyze these data to verify whether they support the expected relationship between the strategic objectives and performance metrics.
2. Identify three possible reasons for any unsupported relationship you identified in part (1).
3. Which of the three possibilities you identified in part (2) is the most likely reason for the unsupported relationship you identified in part (1)?

Problems: Series B

PR 14-1B Elements of the balanced scorecard

Obj. 2

✔ "Delight the customer" is a strategic objective



Instructions

1. Based on the balanced scorecard and the following descriptions of the predicted relationships between strategic objectives, draw the scorecard's strategy map.
   a. Training employees effectively and reducing employee turnover can both be expected to improve returns processing and reduce shipping errors.

b. Both improving returns processing and reducing shipping errors can be expected to delight the customer.
c. Delighting the customer can be expected to increase market share.

2. Based on the balanced scorecard and the following descriptions of the predicted relationships between performance metrics, draw the scorecard's measure map.
   a. Median training hours per employee and average employee tenure will both influence hours from returned to refunded and number of erroneous shipments.
   b. Both hours from returned to refunded and number of erroneous shipments will affect percentage of customers who shop again and online customer satisfaction rating.
   c. Both percentage of customers who shop again and online customer satisfaction rating will influence the company's market share.
3. Label each element of the balanced scorecard.

PR 14-2B Strategic initiatives and CSR — Obj. 2, 4

✔ 2. Total cost of Procedure 1: $285,000

Blue Skies Inc. is a retail gardening company that is piloting a new strategic initiative aimed at increasing gross profit. Currently, the company's gross profit is 25% of sales, and its target gross profit percentage is 30%. The company's current monthly sales revenue is $600,000.

The new initiative being piloted is to produce goods in-house instead of buying them from wholesale suppliers. Its in-house production process has two procedures. The makeup of the costs of production for Procedure 1 is 40% direct labor, 45% direct materials, and 15% overhead. The makeup of the costs of production for Procedure 2 is 60% direct labor, 30% direct materials, and 10% overhead. Assume that Procedure 1 costs twice as much as Procedure 2.

Instructions

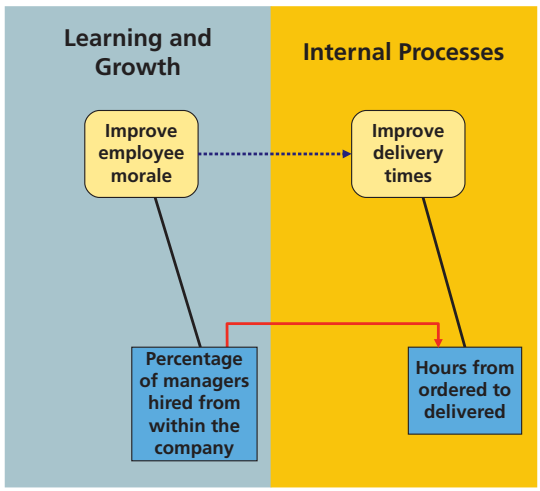
1. Determine what the cost of labor, materials, and overhead for both Procedures 1 and 2 would need to be for the company to meet its target gross profit.
2. The company's actual labor cost is $114,000 for Procedure 1. Determine the actual cost of direct labor, direct materials, and overhead for each procedure, and the total cost of production for each procedure.
3. The company is planning a CSR initiative to recycle the indirect materials used in production during Procedure 1. The company is paid for any of the indirect materials it recycles, and it applies the income from these payments as a direct offset to the cost of the direct materials. These indirect materials normally make up 70% of the overhead cost for Procedure 1. Determine what the maximum new cost (net of recycling revenues) of these indirect materials could be for Procedure 1 if this CSR initiative were to enable the company to meet its target gross profit percentage without changing any other costs.

PR 14-3B Strategic learning — Obj. 3

✔ 2. Improving employee morale has no effect on improving delivery times



Eye Swear Inc. has a balanced scorecard that includes the following relationships:



(Continued)

Actual results for this year and last year are as follows:

	This Year	Last Year
Percentage of managers hired from within	10%	7%
Hours from ordered to delivered	42.5	39.7

Instructions

1. Analyze these statistics to verify whether they support the expected relationships between the strategic objectives and performance metrics.
2. Identify three possible reasons for any unsupported relationship you identified in part (1).
3. Which of the three possibilities you identified in part (2) is the most likely reason for the unsupported relationship you identified in part (1)?

Make a Decision
Capital Investment in CSR

MAD 14-1 Analyze a CSR capital investment proposal for Den-Tex Company — Obj. 5

Den-Tex Company is evaluating a proposal to replace its HID (high intensity discharge) lighting with LED (light emitting diode) lighting throughout its warehouse. LED lighting consumes less power and lasts longer than HID lighting for similar performance. The following information was developed:

HID watt hour consumption per fixture	500 watts per hr.
LED watt hour consumption per fixture	300 watts per hr.
Number of fixtures	700
Lifetime investment cost (in present value terms) to replace each HID fixture with LED	$500
Operating hours per day	10
Operating days per year	300
Metered utility rate per kilowatt-hour (kwh)*	$0.11

*Note: A kilowatt-hour is equal to 1,000 watts per hour.

a. Determine the investment cost for replacing the 700 fixtures.

b. Determine the annual utility cost savings from employing the new energy solution.

c. Should the proposal be accepted? Evaluate the proposal using net present value, assuming a 15-year life and 8% minimum rate of return. (Present value factors are available in Appendix A.)

MAD 14-2 Analyze CSR initiatives at Boxwood Company — Obj. 5

Boxwood Company is a wholesale plant nursery that is considering implementing two CSR initiatives. Information about these initiatives is summarized as follows:

Replace old greenhouse fans with new energy-efficient fans:	
Old greenhouse fan electricity consumption per unit	800 watts per hr.
New energy-efficient greenhouse fan electricity consumption per unit	500 watts per hr.
Number of units	80
Cost of each new unit	$750
Cost of replacing each old unit with new unit	$100
Operating hours per day	8
Operating days per year	180
Metered utility rate per kilowatt-hour (kwh)*	$0.10

**Note:* A kilowatt-hour is equal to 1,000 watts per hour.

Replace gasoline-powered ATVs with electric-powered ATVs:	
Number of ATVs	15
Cost of new electric-powered ATV per unit	$24,000
Fuel, repair, other cost savings per ATV per hour of use	$1.70
Operating hours per day per ATV	5
Operating days per year per ATV	270

a. Determine which performance perspectives each CSR initiative would best fit under on the balanced scorecard.

b. Determine the initial investment cost of each initiative.

c. Determine the yearly cost savings of each initiative.

d. Determine how many years it will take for each initiative to pay off its initial investment cost.

e. Assuming that the new fans have an estimated useful life of 25 years and that the ATVs have an estimated useful life of 8 years, determine which initiatives should be adopted.

MAD 14-3 Analyze CSR initiatives at Green Manufacturing

Obj. 5

Green Manufacturing is a traditional manufacturing company located in the midwestern United States. The company's operations manager is developing a strategy to become more CSR-oriented. In an effort to evaluate possible areas where CSR initiatives can be implemented, the manager has gathered the following data regarding three potential CSR activities:

	Initial Added Cost	Variable Cost	Variable Savings
Recycle and reuse production materials	$ 5,000	$0.10 per lb. of recycled material	$0.15 per lb. of recycled material
Add solar panels as a source of power	700,000	$1,000 per year	$33,000 per year
Replace assembly room light fixtures with natural light	120,000	$180 per month	$220 per month

The recycling activity would carry on indefinitely. The solar panels would have a useful life of 30 years. The replacement of assembly room light fixtures with natural light is assumed to have an 80-year effect.

a. Identify which CSR activities Green Manufacturing should implement.

b. For each CSR activity you recommend, identify an appropriate related performance metric.

Take It Further

ETHICS

TIF 14-1 Motivated reasoning and surrogation

Biases like motivated reasoning and surrogation are very prevalent in the business world. Managers are often compensated and evaluated based on performance measures such as production costs and profit margin. Hence, when subjective decisions need to be made regarding joint cost allocation, support department cost allocation, and budgeting, managers are motivated to believe and overvalue evidence that supports their products receiving less cost allocations, more budgeting, and other favorable outcomes. At the same time, managers will discount any evidence or reasoning that does not produce a favorable outcome for them. This is all part of the bias known as motivated reasoning. It is important to note, as well, that people exhibit the motivated reasoning bias unconsciously. In other words, people commonly overvalue favorable information and discount unfavorable information without realizing it.

(Continued)

Surrogation is another bias that managers frequently unintentionally exhibit. A brief example of this bias is illustrated in the following story:

> The management of a restaurant chain seeking to improve customer satisfaction uses online customer reviews as a measure of this strategic objective. To encourage this objective, management offered a generous bonus to all employees at restaurant locations that increase their online customer review rating by one star. After a few months, management noticed the online customer review rating had dramatically increased at one particular location and paid out the increased bonus. Upon further investigation, management discovered that the manager of this location was offering 15% discounts on all purchases to anyone who gave the restaurant a 5-star review.

This story illustrates surrogation bias because, at that particular location, the performance measure was being treated like the strategic objective. While the performance rating improved, it was not reflective of the strategic objective it was meant to measure (customer satisfaction).

a. How can the cognitive biases of motivated reasoning and surrogation affect the usefulness of the balanced scorecard?

b. Develop some ideas of how you can protect yourself from falling prey to each of these biases.

TIF 14-2 Analyze performance metrics

TEAM ACTIVITY

Blake & McKenzie Tax Services is a company serving 72 clients (as of the beginning of last month) that is working on reorganizing its balanced scorecard. Currently, the company has the following performance metrics: online client satisfaction rating, client growth percentage (the number of total clients at the beginning of the current month compared to the number of total clients at the beginning of the prior month), market share, and profit margin. The company tracks these metrics from month to month. The company's target client growth percentage is 4% per month. Its target average online client satisfaction rating is 4.8 stars. Last month, the company noted the following data related to these metrics:

New clients	7
Lost clients	4
Market share	1.52%
Profit margin	65%

a. Working together in teams, create strategic objectives that each of the company's four performance metrics might represent.

b. Determine whether the company achieved its client growth percentage target last month.

c. Suppose that last month, the company received 55 five-star reviews, 10 four-star reviews, 3 three-star reviews, 1 two-star review, and 1 one-star review (some clients did not submit a review). Determine whether the company met its average online client satisfaction rating target.

d. Come up with at least one strategic initiative for the strategic objective of any performance metric target that you know the company did not meet last month.

TIF 14-3 Build a balanced scorecard

TEAM ACTIVITY

Young Manufacturing Company is a startup manufacturing firm looking to build and develop its balanced scorecard. Gunner Young, the company owner, has told you the following:

> Our company was built on the shoulders of our hard-working, diligent employees. I believe that the heart and soul of any company is its employees. If our company is going to succeed, we need to continue to hire and train hard-working, passionate, and ethical employees. I also believe in being efficient. I've noticed that the companies that always find ways to cut production costs and produce their goods faster are the ones that win in this industry.

Gunner has also told you that he is mainly focused on maintaining the customers he has rather than seeking out a lot of new ones. At the end of the day, he admits that his company's ultimate objective is increasing the bottom line.

a. Working together in a team, list one strategic objective for each performance perspective of the balanced scorecard based on the information Gunner provided.

b. For each strategic objective you came up with in part (a), list at least one performance metric.

c. Describe the relationships that would be illustrated by a strategy map of Young's balanced scorecard.

d. Describe the relationships that would be illustrated by a measure map of Young's balanced scorecard.

COMMUNICATION

TIF 14-4 Plato's cave

The fundamental concept behind strategic performance measurement systems is that an organization's strategy can be represented by a set of performance measures. This basic concept of representing a complex idea (like strategy) with something more tangible (like a measure) goes back hundreds, even thousands of years. Plato's *Allegory of the Cave* provides perhaps the first evidence of this concept. In the allegory, Plato describes a hypothetical scenario in which a group of prisoners is chained to a wall inside a cave, locked in a position facing away from the cave opening. Plato explains that the prisoners have been in this condition their entire lives so their knowledge of the outside world is limited to what they are able to perceive in their current state staring only at the cave wall. Plato then describes how sunlight from the outside casts shadows of anything that passes by the cave opening into the cave. These shadows appear on the wall that the prisoners are facing, and sounds from the outside echo off the shadowed wall. Plato explains that, to the prisoners, reality is not *outside* the cave but the shadows *are* reality. To them, sounds don't come from the outside but rather from the shadows on the wall before them. Plato then goes on to discuss the status of a prisoner freed from this bondage and his initial reaction to exposure to a different reality. Plato says, "Will he not fancy that the shadows which he formerly saw are truer than the objects which are now shown to him?"

This allegory illustrates that reality can really only be indirectly perceived via imperfect representations of reality. That is what accounting is all about. Accounting measures are imperfect representations of economic ideas that cannot be seen directly—just like Plato's shadows in the cave. Accounting measures are merely reflections of more interesting and important concepts.

Consider financial statements and answer the following: Why do people care about what is on a firm's balance sheet or income statement? Are they really interested in the financial statements in and of themselves, or do they use the financial statements to learn something about the issues they really care about? What are some of those issues?

Certified Management Accountant (CMA®) Examination Questions (Adapted)

1. Which of the following statements regarding the balanced scorecard is ***not*** correct?
   a. It seeks to address the problems associated with traditional financial measures used to assess performance.
   b. The notion of value chain analysis plays a major role in the drawing up of a balanced scorecard.
   c. It relies on the perception of the users with regard to service provided.
   d. It is directly derived from scientific management theories.

2. The balanced scorecard provides an action plan for achieving competitive success by focusing management attention on critical success factors. Which of the following is ***not*** one of the competitive success factors commonly found on the balanced scorecard?
   a. Competitor business strategies
   b. Financial performance measures
   c. Internal business processes
   d. Learning and growth

3. Which of the following statements best describes the performance elements found on most balanced scorecards?
    a. The balanced scorecard contains neither financial nor nonfinancial performance measures.
    b. The balance scorecard contains nonfinancial but not financial performance measures.
    c. The balanced scorecard contains financial but not nonfinancial performance measures.
    d. The balanced scorecards contains both financial and nonfinancial performance measures.
4. A sign of the successful implementation of a balanced scorecard is the presence of cause-and-effect relationships. An example of this success for a hotel is meeting the target of:
    a. decreasing a customer's check-in time, which causes an increase in the number of implemented employee suggestions.
    b. increasing employee training hours, which causes employee compensation to increase.
    c. increasing profit, which causes an increase in employee job satisfaction ratings.
    d. receiving more 5-star ratings from customers, which causes an increase in profit.

Pathways Challenge



This is Accounting!

Information/Consequences

Strategic objectives are usually somewhat vague and ambiguous. Performance measures provide more tangible concepts for employees and managers to work with. Saying "Delight the customer" might not make sense to an employee ("How exactly do you want me to do that?"), but measuring customer satisfaction survey scores provides a tangible measure that is easier for employees to work with. That said, measures are almost always imperfect representations of the strategy. The more a measure is misaligned with the strategy, the more surrogation is likely to occur.

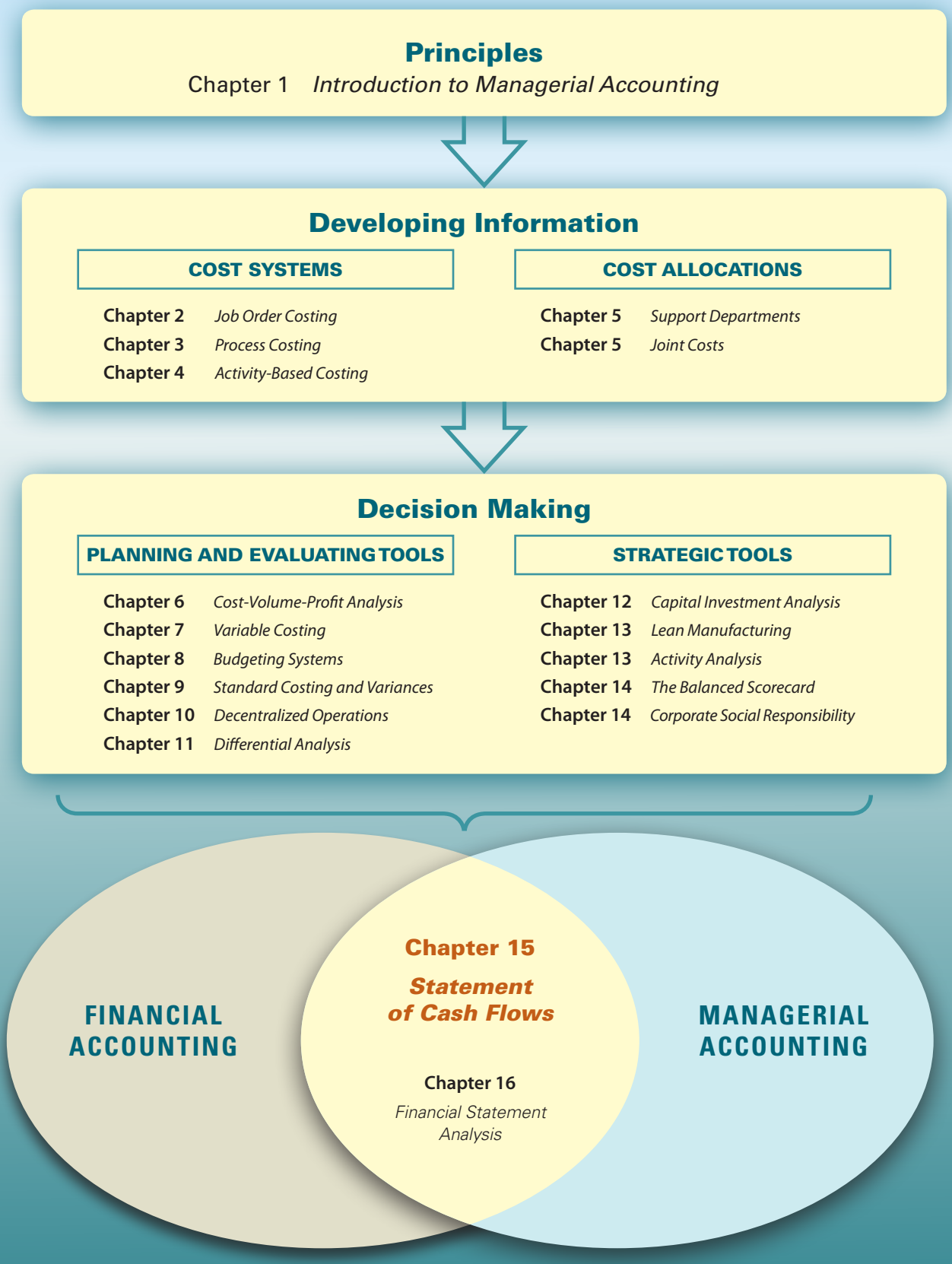
Many companies tie compensation to performance measures to ensure that employees are motivated to work hard at the tasks the company wants them to do. But **Wells Fargo (WFC)** has been criticized for not being more aware of the ways in which its employees could take advantage of the compensation structure and engage in unethical activities to maximize their individual performance on the cross-sell measure. Use of incentives requires careful consideration of all activities, good and bad, that are incentivized. Further, incentives tend to increase the focus on measures, potentially increasing surrogation.

Surrogation is most likely to happen when strategy is relatively inaccessible to employees and when any given measure becomes very salient. Involving employees in the development of strategy can help make strategy more understandable and more accessible. Tying compensation to more than one measure (or not to any measure at all) can decrease the salience of any one measure, potentially decreasing surrogation.

Suggested Answer

Chapter

15 Statement of Cash Flows



National Beverage Corp.

Suppose you were to receive $100 from an event. Would it make a difference what the event was? Yes, it would! If you received $100 for your birthday, then it's a gift. If you received $100 as a result of working part time for a week, then it's the result of your effort. If you received $100 as a loan, then it's money that you will have to pay back in the future. If you received the $100 as a result of selling your iPod, then it's the result of selling an asset. Thus, the $100 received can be associated with different types of events, and these events have different meanings to you and different implications for your future. You would much rather receive a $100 gift than take out a $100 loan. Likewise, company stakeholders view inflows and outflows of cash differently, depending on their source.

Companies are required to report information about the events causing a change in cash over a period of time. This information is reported on the statement of cash flows. One such company is **National Beverage Corp. (FIZZ)**, which is an alternative beverage company, known for its innovative soft drinks, enhanced juices and waters, and fortified powders and supplements. You have probably seen the company's Shasta and Faygo soft drinks, or LaCroix, Everfresh, and Crystal Bay drinks at your local grocery or convenience store. As with any company, cash is important to National Beverage. Without cash, National Beverage would be unable to expand its brands, distribute its products, support extreme sports, or provide a return for its owners. Thus, its managers are concerned about the sources and uses of cash.

In previous chapters, we have used the income statement, balance sheet, statement of stockholders' equity, and other information to analyze the effects of management decisions on a business's financial position and operating performance. In this chapter, we focus on the events causing a change in cash by presenting the preparation and use of the statement of cash flows.



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Link to National Beverage . . . . . Pages 702, 703, 708, 711, 713, 715

What's Covered

Statement of Cash Flows

Cash Flows
- Types of Cash Flows (Obj. 1)
- Direct Method (Obj. 1)
- Indirect Method (Obj. 1)
- Noncash Transactions (Obj. 1)

Operating Activities—Indirect Method
- Net Income (Obj. 2)
- Noncash Expenses (Obj. 2)
- Gains and Losses (Obj. 2)
- Current Assets and Liabilities (Obj. 2)

Investing Activities
- Land (Obj. 3)
- Buildings (Obj. 3)

Financing Activities
- Bonds Payable (Obj. 4)
- Common Stock (Obj. 4)
- Dividends and Dividends Payable (Obj. 4)

Reporting Cash Flows
- Preparing the Statement of Cash Flows (Obj. 5)

Learning Objectives

Obj. 1 Describe the cash flow activities reported on the statement of cash flows.

Obj. 2 Prepare the "Cash flows from operating activities" section of the statement of cash flows using the indirect method.

Obj. 3 Prepare the "Cash flows from investing activities" section of the statement of cash flows.

Obj. 4 Prepare the "Cash flows from financing activities" section of the statement of cash flows.

Obj. 5 Prepare a statement of cash flows.

Analysis for Decision Making

Obj. 6 Describe and illustrate the use of free cash flow in evaluating a company's cash flow.

Appendices 1 and 2

Obj. App 1 Use a spreadsheet to prepare the statement of cash flows under the indirect method.

Obj. App 2 Prepare a statement of cash flows under the direct method.

Objective 1
Describe the cash flow activities reported on the statement of cash flows.

Reporting Cash Flows

The **statement of cash flows** reports a company's cash inflows and outflows for a period.[1] The statement of cash flows provides useful information about a company's ability to do the following:

- Generate cash from operations
- Maintain and expand its operating capacity
- Meet its financial obligations
- Pay dividends

The statement of cash flows is used by managers in evaluating past operations and in planning future investing and financing activities. It is also used by external users such as investors and creditors to assess a company's profit potential and ability to pay its debt and pay dividends.

note:
The statement of cash flows reports cash flows from operating, investing, and financing activities.

The statement of cash flows reports three types of cash flow activities, as follows:

1. **Cash flows from operating activities** are the cash flows from transactions that affect the net income of the company.

   Example: Purchase and sale of merchandise by a retailer.

2. **Cash flows from investing activities** are the cash flows from transactions that affect investments in the noncurrent assets of the company.

   Example: Purchase and sale of fixed assets, such as equipment and buildings.

[1] As used in this chapter, *cash* refers to cash and cash equivalents. Examples of cash equivalents include short-term, highly liquid investments, such as money market accounts, bank certificates of deposit, and U.S. Treasury bills.

3. **Cash flows from financing activities** are the cash flows from transactions that affect the debt and equity of the company.

   Example: Issuing or retiring equity and debt securities.

The cash flows are reported on the statement of cash flows as follows:

Cash flows from operating activities	$XXX
Cash flows from investing activities	XXX
Cash flows from financing activities	XXX
Net increase (decrease) in cash	$XXX
Cash at the beginning of the period	XXX
Cash at the end of the period	$XXX

The ending cash on the statement of cash flows equals the cash reported on the company's balance sheet at the end of the year.

Exhibit 1 illustrates the sources (increases) and uses (decreases) of cash by each of the three cash flow activities. A *source* of cash causes the cash flow to increase and is called a *cash inflow*. A *use* of cash causes cash flow to decrease and is called a *cash outflow*.

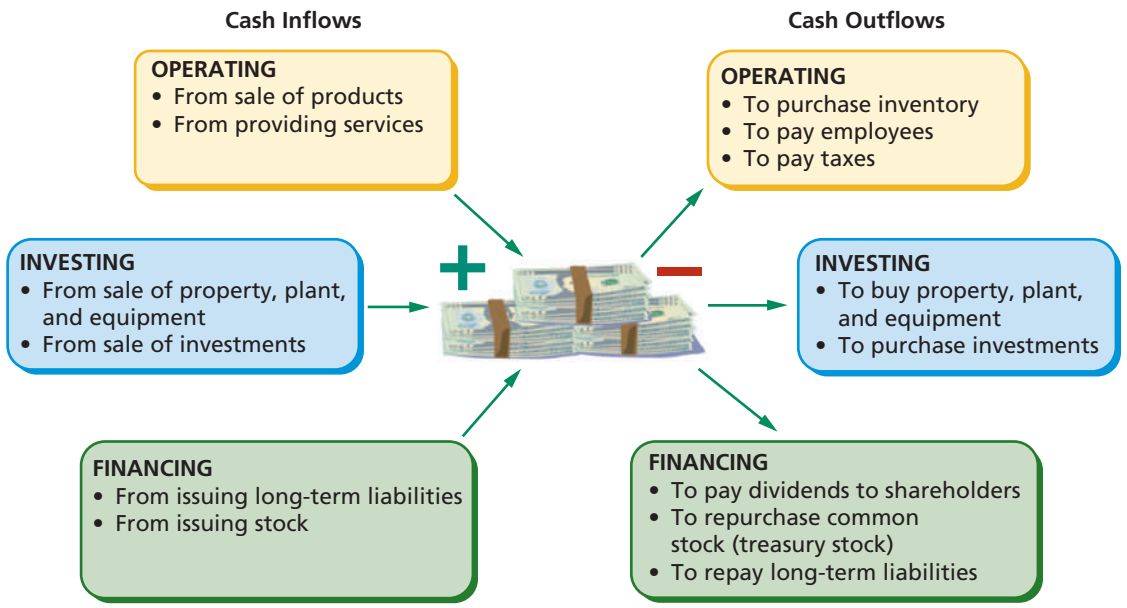


Exhibit 1
Sources and Uses of Cash

Cash Flows from Operating Activities

Cash flows from operating activities report the cash inflows and outflows from a company's day-to-day operations. Companies may select one of two alternative methods for reporting cash flows from operating activities on the statement of cash flows:

- The direct method
- The indirect method

Both methods result in the same amount of cash flows from operating activities. They differ in the way they report cash flows from operating activities.

The Direct Method The **direct method** reports operating cash inflows (receipts) and cash outflows (payments) as follows:

Cash flows from (used for) operating activities:		
Cash received from customers	$ XXX	
Cash payments for merchandise	(XXX)	
Cash payments for operating expenses	(XXX)	
Cash payments for interest	(XXX)	
Cash payments for income taxes	(XXX)	
Net cash flow from operating activities		$XXX

The primary operating cash inflow is cash received from customers. The primary operating cash outflows are cash payments for merchandise, operating expenses, interest, and income tax payments. The cash received from operating activities less the cash payments for operating activities is the net cash flow from operating activities.

The primary advantage of the direct method is that it *directly* reports cash receipts and cash payments on the statement of cash flows. Its primary disadvantage is that these data may not be readily available in the accounting records. Thus, the direct method is normally more costly to prepare and, as a result, is used infrequently in practice. For this reason, the direct method is described and illustrated in Appendix 2 following this chapter.

The Indirect Method The **indirect method** reports cash flows from operating activities by beginning with net income and adjusting it for revenues and expenses that do not involve the receipt or payment of cash, as follows:

Cash flows from (used for) operating activities:		
Net income	$XXX	
Adjustments to reconcile net income to net cash flow from operating activities	XXX	
Net cash flow from operating activities		$XXX

The adjustments to reconcile net income to net cash flow from operating activities include such items as depreciation and gains or losses on fixed assets. Changes in current operating assets and liabilities such as accounts receivable or accounts payable are also added or deducted, depending on their effect on cash flows. In effect, these additions and deductions adjust net income, which is reported on an accrual accounting basis, to cash flows from operating activities, which is a cash basis.

A primary advantage of the indirect method is that it reconciles the differences between net income and net cash flow from operations. In doing so, it shows how net income is related to the ending cash balance that is reported on the balance sheet.

Because the data are readily available, the indirect method is less costly to prepare than the direct method. As a result, the indirect method of reporting cash flows from operations is most commonly used in practice.

Link to National Beverage

National Beverage Corp. uses the indirect method of reporting the cash flows from operating activities in its statement of cash flows.

Comparing the Direct and Indirect Methods Exhibit 2 illustrates the "Cash flows from operating activities" section of the statement of cash flows for **NetSolutions**. It shows the direct and indirect methods. As Exhibit 2 illustrates, both methods report the same amount of net cash flow from operating activities of $2,900.

Exhibit 2 Cash Flows from Operations: Direct and Indirect Methods—NetSolutions

Direct Method

Cash flows from (used for) operating activities:	
Cash received from customers	$ 7,500
Cash payments for expenses and payments to creditors	(4,600)
Net cash flow from operating activities	$ 2,900

Indirect Method

Cash flows from (used for) operating activities:	
Net income	$3,050
Increase in accounts payable	400
Increase in supplies	(550)
Net cash flow from operating activities	$2,900

the same

Link to National Beverage

For a recent year, **National Beverage Corp.** reported net cash provided by operating activities of $78,955,000.

Why It Matters

CONCEPT CLIP

Cash Crunch!

The Wet Seal, Inc. (WTSL), a young women's clothing retailer, recently filed for bankruptcy protection. The cash flows from operating activities for the three years prior to bankruptcy (in thousands) follow:

	Year 3	Year 2	Year 1
Cash provided (used for) operating activities	$(17,589)	$(26,191)	$61,900

As can be seen, cash flows from operating activities trended into negative territory during the two years prior to the firm's bankruptcy. Thus, when cash flows from operating activities are negative, it can lead to financial distress.

Cash Flows from Investing Activities

Cash flows from investing activities show the cash inflows and outflows related to changes in a company's long-term assets. Cash flows from investing activities are reported on the statement of cash flows as follows:

Cash flows from (used for) investing activities:		
Cash inflows from investing activities	$ XXX	
Cash used for investing activities	(XXX)	
Net cash flow from investing activities		$XXX

Cash inflows from investing activities normally arise from selling fixed assets, investments, and intangible assets. Cash outflows normally include payments to purchase fixed assets, investments, and intangible assets.

For a recent year, **National Beverage Corp.** reported net cash used for investing activities of $12,024,000.

Link to National Beverage

Cash Flows from Financing Activities

Cash flows from financing activities show the cash inflows and outflows related to changes in a company's long-term liabilities and stockholders' equity. Cash flows from financing activities are reported on the statement of cash flows as follows:

Cash flows from (used for) financing activities:		
Cash inflows from financing activities	$ XXX	
Cash used for financing activities	(XXX)	
Net cash flow from financing activities		$XXX

Cash inflows from financing activities normally arise from issuing long-term debt or equity securities. For example, issuing bonds, notes payable, preferred stock, and common stock creates cash inflows from financing activities. Cash outflows from financing activities include paying cash dividends, repaying long-term debt, and acquiring treasury stock.

For a recent year, **National Beverage Corp.** reported net cash used for financing activities of $13,810,000.

Link to National Beverage

Why It Matters

Growing Pains

Twitter, Inc. (TWTR) is a global social media platform used for real-time self-expression and conversation within the limits of 140-character tweets. The cash flows from operating, investing, and financing activities for Twitter's first four years as a public company (in thousands) are as follows:

	Cash provided by (used for)			
	Operating activities	Investing activities	Financing activities	Net change for year
Year 1	$ 1,398	$(1,306,066)	$1,942,176	$ 637,508
Year 2	81,796	(1,097,272)	1,691,722	676,246
Year 3	383,066	(902,421)	(62,998)	(582,353)
Year 4	763,055	(598,008)	(83,975)	81,072

Twitter significantly improved its cash flows from operations from Year 1 to Year 4. Twitter made significant investments in order to expand. This is shown by the cash flows used in investing activities for Years 1 through 4. Since the cash flows from operations were insufficient to fund this growth, the company obtained cash from financing activities. For example, Twitter received cash from stockholders in Year 1 and from creditors in Year 2, which was used to expand and provide future flexibility.

Noncash Investing and Financing Activities

A company may enter into transactions involving investing and financing activities that do not *directly* affect cash. For example, a company may issue common stock to retire long-term debt. Although this transaction does not directly affect cash, it does eliminate future cash payments for interest and for paying the bonds when they mature. Because such transactions *indirectly* affect cash flows, they are reported in a separate section of the statement of cash flows. This section usually appears at the bottom of the statement of cash flows.

Format of the Statement of Cash Flows

The statement of cash flows presents the cash flows generated from, or used for, the three activities previously discussed: operating, investing, and financing. These three activities are always reported in the same order, as shown in Exhibit 3.

Exhibit 3
Order of Reporting Statement of Cash Flows

Rundell Inc.
Statement of Cash Flows
For the Year Ended 20Y8

Cash flows from (used for) operating activities:		
(List of items, as illustrated in Exhibit 1)	$XXX	
Net cash flow from operating activities		$XXX
Cash flows from (used for) investing activities:		
(List of items, as illustrated in Exhibit 1)	$XXX	
Net cash flow from (used for) investing activities		XXX
Cash flows from (used for) financing activities:		
(List of items, as illustrated in Exhibit 1)	$XXX	
Net cash flow from (used for) financing activities		XXX
Net increase (decrease) in cash		$XXX
Cash at the beginning of the period		XXX
Cash at the end of the period		$XXX
Noncash investing and financing activities		$XXX

No Cash Flow per Share

Cash flow per share is sometimes reported in the financial press. As reported, cash flow per share is normally computed as *cash flow from operations divided by the number of common shares outstanding*. However, such reporting may be misleading because of the following:

- Users may misinterpret cash flow per share as the per-share amount available for dividends. This would not be the case if the cash generated by operations is required for repaying loans or for reinvesting in the business.
- Users may misinterpret cash flow per share as equivalent to (or better than) earnings per share.

For these reasons, the financial statements, including the statement of cash flows, should not report cash flow per share.

Check Up Corner 15-1 Classifications of Cash Flows

During its first month of operations, Templeton Company had the following cash transactions:

a. Issued 30,000 shares of common stock.

b. Purchased a new piece of equipment.

c. Sold merchandise to customers.

d. Paid employees' wages.

e. Paid a dividend.

Identify whether each of these transactions would be reported as an operating, investing, or financing activity on the statement of cash flows.

Solution:

a.	Financing	Issued 30,000 shares of common stock.
b.	Investing	Purchased a new piece of equipment.
c.	Operating	Sold merchandise to customers.
d.	Operating	Paid employees' wages.
e.	Financing	Paid a dividend.

Operating activities show the cash inflows and outflows from a company's day-to-day operations.

Investing activities show the cash inflows and outflows related to changes in a company's long-term assets.

Financing activities show the cash inflows and outflows related to changes in a company's long-term liabilities and stockholders' equity.

Check Up Corner

Cash Flows from Operating Activities—The Indirect Method

Objective 2
Prepare the "Cash flows from operating activities" section of the statement of cash flows using the indirect method.

The indirect method of reporting cash flows from operating activities uses the logic that a change in any balance sheet account (including cash) can be analyzed in terms of changes in the other balance sheet accounts. Thus, by analyzing changes in noncash balance sheet accounts, any change in the cash account can be *indirectly* determined.

To illustrate, the accounting equation can be solved for cash as follows:

$$\text{Assets} = \text{Liabilities} + \text{Stockholders' Equity}$$
$$\text{Cash} + \text{Noncash Assets} = \text{Liabilities} + \text{Stockholders' Equity}$$
$$\text{Cash} = \text{Liabilities} + \text{Stockholders' Equity} - \text{Noncash Assets}$$

Therefore, any change in the cash account can be determined by analyzing changes in the liability, stockholders' equity, and noncash asset accounts as follows:

$$\textit{Change} \text{ in Cash} = \textit{Change} \text{ in Liabilities} + \textit{Change} \text{ in Stockholders' Equity} - \textit{Change} \text{ in Noncash Assets}$$

Under the indirect method, there is no order in which the balance sheet accounts must be analyzed. However, net income (or net loss) is the first amount reported on the statement of cash flows. Because net income (or net loss) is a component of any change in Retained Earnings, the first account normally analyzed is Retained Earnings.

To illustrate the indirect method, the income statement and comparative balance sheets for **Rundell Inc.**, shown in Exhibit 4, are used. Ledger accounts and other data supporting the income statement and balance sheet are presented as needed.[2]

Exhibit 4
Income Statement and Comparative Balance Sheet

Rundell Inc.
Income Statement
For the Year Ended December 31, 20Y8

Sales		$1,180,000
Cost of goods sold		(790,000)
Gross profit		$ 390,000
Operating expenses:		
Depreciation expense	$ 7,000	
Other operating expenses	196,000	
Total operating expenses		(203,000)
Operating income		$ 187,000
Other revenue and expense:		
Gain on sale of land	$ 12,000	
Interest expense	(8,000)	4,000
Income before income tax		$ 191,000
Income tax expense		(83,000)
Net income		$ 108,000

Rundell Inc.
Comparative Balance Sheet
December 31, 20Y8 and 20Y7

	20Y8	20Y7	Increase (Decrease)
Assets			
Cash	$ 97,500	$ 26,000	$ 71,500
Accounts receivable (net)	74,000	65,000	9,000
Inventories	172,000	180,000	(8,000)
Land	80,000	125,000	(45,000)
Building	260,000	200,000	60,000
Accumulated depreciation—building	(65,300)	(58,300)	(7,000)*
Total assets	$618,200	$537,700	$ 80,500
Liabilities			
Accounts payable (merchandise creditors)	$ 43,500	$ 46,700	$ (3,200)
Accrued expenses payable (operating expenses)	26,500	24,300	2,200
Income taxes payable	7,900	8,400	(500)
Dividends payable	14,000	10,000	4,000
Bonds payable	100,000	150,000	(50,000)
Total liabilities	$191,900	$239,400	$(47,500)
Stockholders' Equity			
Common stock, $2 par	$ 24,000	$ 16,000	$ 8,000
Paid-in capital in excess of par	120,000	80,000	40,000
Retained earnings	282,300	202,300	80,000
Total stockholders' equity	$426,300	$298,300	$128,000
Total liabilities and stockholders' equity	$618,200	$537,700	$ 80,500

*There is a $7,000 increase to Accumulated Depreciation—Building, which is a contra asset account. As a result, the $7,000 increase in this account must be subtracted in summing to the increase in total assets of $80,500.

[2] An appendix that discusses using a spreadsheet (work sheet) as an aid in assembling data for the statement of cash flows is presented at the end of this chapter. This appendix illustrates the use of this spreadsheet in reporting cash flows from operating activities using the indirect method.

Net Income

Rundell Inc.'s net income for 20Y8 is $108,000 as shown in the income statement in Exhibit 4. Since net income is closed to Retained Earnings, net income also helps explain the change in retained earnings during the year. The retained earnings account for Rundell is as follows:

Account *Retained Earnings* Account No.

Date	Item	Debit	Credit	Balance Debit	Balance Credit
20Y8					
Jan. 1	Balance				202,300
June 30	Dividends declared	14,000			188,300
Dec. 31	Net income		108,000		296,300
31	Dividends declared	14,000			282,300

The retained earnings account indicates that the $80,000 ($282,300 − $202,300) change resulted from net income of $108,000 and cash dividends of $28,000 ($14,000 + $14,000). The net income of $108,000 is the first amount reported in the "Cash flows from operating activities" section. The impact of the dividends of $28,000 on cash flows will be included as part of financing activities.

Adjustments to Net Income

The net income of $108,000 reported by **Rundell Inc.** does not equal the cash flows from operating activities for the period. This is because net income is determined using the accrual method of accounting.

Under the accrual method of accounting, revenues and expenses are recorded at different times from when cash is received or paid. For example, merchandise may be sold on account and the cash received at a later date. Likewise, insurance premiums may be paid in the current period but expensed in a following period.

Thus, under the indirect method, adjustments to net income must be made to determine cash flows from operating activities. The typical adjustments to net income are shown in Exhibit 5.[3]

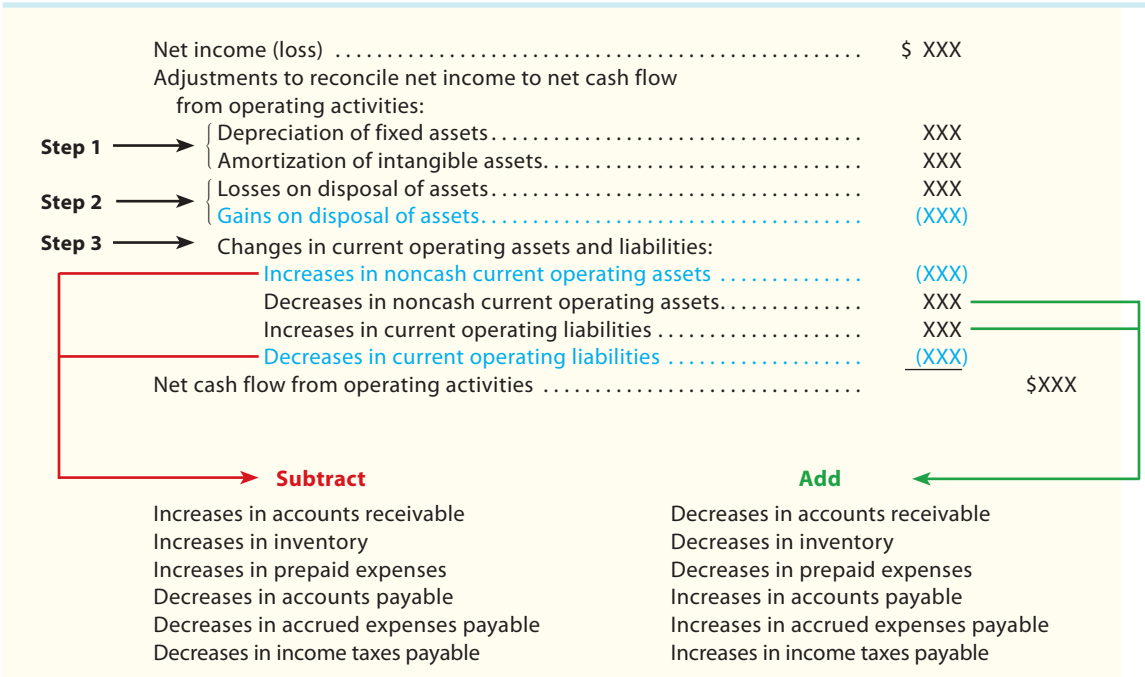


Exhibit 5
Adjustments to Net Income (Loss) Using the Indirect Method

[3] Other items that also require adjustments to net income to obtain cash flows from operating activities include amortization of bonds payable discounts (add), losses on debt retirement (add), amortization of bonds payable premiums (deduct), and gains on retirement of debt (deduct). These topics are covered in advanced accounting courses.

Net income is normally adjusted to cash flows from operating activities, using the following steps:

- Step 1. Expenses that do not affect cash are added. Such expenses decrease net income but do not involve cash payments.

  Example: Depreciation of fixed assets and amortization of intangible assets are added to net income.

- Step 2. Losses on the disposal of assets are added and gains on the disposal of assets are deducted. The disposal (sale) of assets is an investing activity rather than an operating activity. However, such losses and gains are reported as part of net income. As a result, any *losses* on disposal of assets are *added* back to net income. Likewise, any *gains* on disposal of assets are *deducted* from net income.

  Example: Land costing $100,000 is sold for $90,000. The loss of $10,000 is added back to net income.

- Step 3. Changes in current operating assets and liabilities are added or deducted as follows:

  - Increases in noncash current operating assets are deducted.
  - Decreases in noncash current operating assets are added.
  - Increases in current operating liabilities are added.
  - Decreases in current operating liabilities are deducted.

  Example: A sale of $10,000 on account increases sales, accounts receivable, and net income by $10,000. However, cash is not affected. Thus, the $10,000 increase in accounts receivable is deducted. Similar adjustments are required for the changes in the other current asset and liability accounts, such as inventory, prepaid expenses, accounts payable, accrued expenses payable, and income taxes payable, as shown in Exhibit 5.

Link to National Beverage

In a recent statement of cash flows, **National Beverage Corp.** reported changes in current asset and liability accounts for accounts receivable, inventories, accounts payable, and accrued liabilities.

The "Cash flow from operating activities" section of **Rundell Inc.**'s statement of cash flows is shown in Exhibit 6.

Exhibit 6
Net Cash Flow from Operating Activities—Indirect Method

	Cash flows from (used for) operating activities:		
	Net income	$108,000	
	Adjustments to reconcile net income to net cash flow from operating activities:		
Step 1 →	Depreciation	7,000	
Step 2 →	Gain on sale of land	(12,000)	
	Changes in current operating assets and liabilities:		
	Increase in accounts receivable	(9,000)	
	Decrease in inventories	8,000	
Step 3 →	Decrease in accounts payable	(3,200)	
	Increase in accrued expenses payable	2,200	
	Decrease in income taxes payable	(500)	
	Net cash flow from operating activities		$100,500

Rundell's net income of $108,000 is converted to cash flows from operating activities of $100,500 as follows:

- Step 1. Add depreciation of $7,000.
  Analysis: The comparative balance sheet in Exhibit 4 indicates that Accumulated Depreciation—Building increased by $7,000. The following account indicates that depreciation for the year was $7,000 for the building:

Account *Accumulated Depreciation—Building* Account No.

Date	Item	Debit	Credit	Balance Debit	Balance Credit
20Y8					
Jan. 1	Balance				58,300
Dec. 31	Depreciation for year		7,000		65,300

- Step 2. Deduct the gain on the sale of land of $12,000.
  Analysis: The income statement in Exhibit 4 reports a gain of $12,000 from the sale of land. The proceeds, which include the gain, are reported in the investing section of the statement of cash flows.[4] Thus, the gain of $12,000 is deducted from net income in determining cash flows from operating activities.
- Step 3. Add and deduct changes in current operating assets and liabilities excluding cash.
  Analysis: The increases and decreases in the current operating asset and current liability accounts excluding cash are as follows:

Accounts	December 31 20Y8	December 31 20Y7	Increase (Decrease)
Accounts Receivable (net)	$ 74,000	$ 65,000	$ 9,000
Inventories	172,000	180,000	(8,000)
Accounts Payable (merchandise creditors)	43,500	46,700	(3,200)
Accrued Expenses Payable (operating expenses)	26,500	24,300	2,200
Income Taxes Payable	7,900	8,400	(500)

Accounts receivable (net): The $9,000 increase is deducted from net income. This is because the $9,000 increase in accounts receivable indicates that sales on account were $9,000 more than the cash received from customers. Thus, sales (and net income) includes $9,000 that was not received in cash during the year.

Inventories: The $8,000 decrease is added to net income. This is because the $8,000 decrease in inventories indicates that the cost of goods *sold* exceeds the cost of the merchandise *purchased* during the year by $8,000. In other words, the cost of goods sold includes $8,000 of merchandise from inventory that was not purchased (used cash) during the year.

Accounts payable (merchandise creditors): The $3,200 decrease is deducted from net income. This is because a decrease in accounts payable indicates that the cash *payments* to merchandise creditors exceed the merchandise *purchased on account* by $3,200. Therefore, the cost of goods sold is $3,200 less than the cash paid to merchandise creditors during the year.

Accrued expenses payable (operating expenses): The $2,200 increase is added to net income. This is because an increase in accrued expenses payable indicates that operating expenses exceed the cash payments for operating expenses by $2,200. In other words, operating expenses reported on the income statement include $2,200 that did not require a cash outflow during the year.

Income taxes payable: The $500 decrease is deducted from net income. This is because a decrease in income taxes payable indicates that taxes paid exceed the amount of taxes incurred during the year by $500. In other words, the amount reported on the income statement for income tax expense is less than the amount paid by $500.

[4] The reporting of the proceeds (cash flows) from the sale of land as part of investing activities is discussed later in this chapter.

Check Up Corner 15-2 Cash Flows from Operating Activities

Omicron Inc. reported net income of $120,000 for 20Y2. In addition, the income statement reported $12,000 of depreciation expense and a $15,000 loss on the disposal of equipment. The current operating assets and liabilities from the company's comparative balance sheet are as follows:

	12/31/20Y2	12/31/20Y1	Increase (Decrease)
Accounts receivable	$18,240	$13,240	$ 5,000
Accounts payable	11,200	13,200	(2,000)

Prepare the "Cash flows from operating activities" section of the statement of cash flows, using the indirect method.

Solution:

Cash flows from (used for) operating activities:	
Net income	$120,000
Adjustments to reconcile net income to cash flow from operating activities:	
Depreciation expense	12,000
Loss on disposal of equipment	15,000
Changes in current operating assets and liabilities:	
Increase in accounts receivable	(5,000)
Decrease in accounts payable	(2,000)
Net cash flow from operating activities	$140,000

Expenses that decrease net income but do not involve cash payments, such as depreciation, are added to net income.

Losses on the disposal of assets are added to and gains on the disposal of assets are deducted from net income.

Increases (decreases) in noncash current operating assets are deducted (added) from net income.

Increases (decreases) in current operating liabilities are added (subtracted) to net income.

Check Up Corner

Objective 3
Prepare the "Cash flows from investing activities" section of the statement of cash flows.

Cash Flows from Investing Activities

Cash flows from investing activities report the cash inflows and outflows related to changes in a company's long-term assets. **Rundell Inc.**'s comparative balance sheet in Exhibit 4 lists land, building, and accumulated depreciation—building as long-term assets. Similar to preparing the "Cash flows from operating activities" section, each change in each long-term asset account is analyzed for its effect on cash flows from investing activities.

Land

The $45,000 decline in the land account of **Rundell Inc.** was from two transactions, as follows:

Account *Land* Account No.

Date	Item	Debit	Credit	Balance Debit	Balance Credit
20Y8					
Jan. 1	Balance			125,000	
June 8	Sold for $72,000 cash		60,000	65,000	
Oct. 12	Purchased for $15,000 cash	15,000		80,000	

The June 8 transaction is the sale of land with a cost of $60,000 for $72,000 in cash. The $72,000 proceeds from the sale are reported in the "Cash flows from investing activities" section as follows:

Cash flows from investing activities:	
Cash received from sale of land	$72,000

The proceeds of $72,000 include the $12,000 gain on the sale of land and the $60,000 cost (book value) of the land. As shown in Exhibit 6, the $12,000 gain in deducted from net income in the "Cash flows from operating activities" section. This is so that the $12,000 cash inflow related to the gain is not included twice as a cash inflow.

The October 12 transaction is the purchase of land for cash of $15,000. This transaction is reported as an outflow of cash in the investing activities section as follows:

Cash flows from investing activities:
Cash paid for purchase of land ..... $(15,000)

Building and Accumulated Depreciation—Building

The building account of **Rundell Inc.** increased by $60,000 ($260,000 − $200,000), and the accumulated depreciation—building account increased by $7,000 ($65,300 − $58,300), as follows:

Account *Building* Account No.

Date	Item	Debit	Credit	Balance Debit	Balance Credit
20Y8					
Jan. 1	Balance			200,000	
Dec. 27	Purchased for cash	60,000		260,000	

Account *Accumulated Depreciation—Building* Account No.

Date	Item	Debit	Credit	Balance Debit	Balance Credit
20Y8					
Jan. 1	Balance				58,300
Dec. 31	Depreciation for the year		7,000		65,300

The purchase of a building for cash of $60,000 is reported as an outflow of cash in the "Cash flows from investing activities" section as follows:

Cash flows from investing activities:
Cash paid for purchase of building ..... $(60,000)

The credit in the accumulated depreciation—building account represents depreciation expense for the year. This depreciation expense of $7,000 on the building was added to net income in determining cash flows from operating activities, as reported in Exhibit 6.

In a recent statement of cash flows, **National Beverage Corp.** reported cash used for purchases of property, plant, and equipment of $12,140,000 and cash received for selling property, plant, and equipment of $116,0000 resulting in net cash used for investing activities of $12,024,000.

Link to National Beverage

Check Up Corner 15-3 Cash Flows from Investing Activities

Mercury Inc. reported net income of $100,000 for 20Y2. In addition, the income statement reported $20,000 of depreciation expense and a $10,000 gain on the sale of land. The noncurrent assets from the company's comparative balance sheet are as follows:

	12/31/20Y2	12/31/20Y1	Increase (Decrease)
Land	$ 125,000	$ 225,000	$(100,000)
Equipment	500,000	400,000	100,000
Accumulated depreciation—equipment	(120,000)	(100,000)	20,000

There were no disposals of equipment, and all purchases of equipment were for cash.
Prepare the "Cash flows from investing activities" section of the statement of cash flows.

(Continued)

Solution:

Cash flows from (used for) investing activities:	
Cash received from sale of land	$110,000
Cash paid for purchase of equipment	(100,000)
Net cash flow from investing activities	$10,000

Land was sold for $110,000 ($100,000 decrease in land account + $10,000 gain on the sale). This is the amount of cash received from the sale of land.

The increase in the balance of the equipment account comes from the purchase of equipment for cash.

Note: The increase in Accumulated Depreciation—Equipment is from 20Y2 depreciation expense, which is included in the "Cash flows from operating activities" section.

Check Up Corner

Objective 4
Prepare the "Cash flows from financing activities" section of the statement of cash flows.

Cash Flows from Financing Activities

Cash flows from financing activities reports the cash inflows and outflows related to changes in a company's long-term liabilities and stockholders' equity. **Rundell Inc.**'s comparative balance sheet in Exhibit 4 reports changes in bonds payable, common stock, and paid-in capital in excess of par. In addition, dividends payable has changed, which impacts retained earnings. Each change must be analyzed to determine its effect on cash flows from financing activities.

Bonds Payable

The bonds payable account of **Rundell Inc.** decreased by $50,000 ($100,000 − $150,000), as follows:

Account *Bonds Payable* Account No.

Date	Item	Debit	Credit	Balance Debit	Balance Credit
20Y8					
Jan. 1	Balance				150,000
June 1	Retired by payment of cash at face amount	50,000			100,000

This decrease is from retiring the bonds by a cash payment for their face amount. This cash outflow is reported in the financing activities section as follows:

Cash flows from (used for) financing activities:	
Cash paid to retire bonds payable	$(50,000)

Common Stock

The common stock account of **Rundell Inc.** increased by $8,000 ($24,000 − $16,000), and the paid-in capital in excess of par—common stock account increased by $40,000 ($120,000 − $80,000), as follows:

Account *Common Stock* Account No.

Date	Item	Debit	Credit	Balance Debit	Balance Credit
20Y8					
Jan. 1	Balance				16,000
Nov. 1	4,000 shares issued for cash		8,000		24,000

Account *Paid-In Capital in Excess of Par—Common Stock* Account No.

Date		Item	Debit	Credit	Balance Debit	Balance Credit
20Y8						
Jan.	1	Balance				80,000
Nov.	1	4,000 shares issued for cash		40,000		120,000

These increases were from issuing 4,000 shares of common stock for $12 per share. This cash inflow is reported in the financing activities section as follows:

Cash flows from financing activities:
Cash received from sale of common stock $48,000

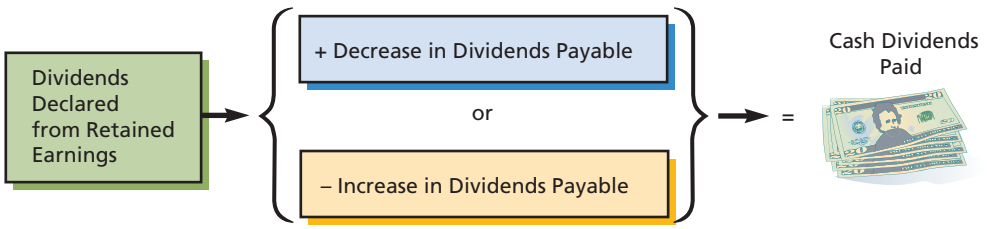
Dividends and Dividends Payable

The retained earnings account of **Rundell Inc.** indicates cash dividends of $28,000 ($14,000 + $14,000) were declared during the year. However, the following dividends payable account indicates that only $24,000 ($10,000 + $14,000) of dividends were paid during the year:

Account *Dividends Payable* Account No.

Date		Item	Debit	Credit	Balance Debit	Balance Credit
20Y8						
Jan.	1	Balance				10,000
	10	Cash paid	10,000		—	—
June	30	Dividends declared		14,000		14,000
July	10	Cash paid	14,000		—	—
Dec.	31	Dividends declared		14,000		14,000

Cash dividends paid during the year can also be computed by adjusting the dividends declared during the year for the change in the dividends payable account as follows:



The cash dividends paid by Rundell Inc. during 20Y8 are $24,000, computed as follows:

Dividends declared ($14,000 + $14,000)	$28,000
Increase in Dividends Payable	(4,000)
Cash dividends paid	$24,000

Because dividend payments are a financing activity, the cash dividends paid of $24,000 are reported in the financing activities section of the statement of cash flows, as follows:

Cash flows from financing activities:
Cash paid for dividends ..... $(24,000)

In a recent statement of cash flows, **National Beverage Corp.** reported cash used for dividends of $186,000; cash used for payment of debt of $10,000,000; and cash used for redeeming preferred stock of $6,000,000.

Link to National Beverage

Check Up Corner 15-4 Cash Flows from Financing Activities

Mohroman Inc. reported net income of $80,000 for 20Y2. The liability and equity accounts from the company's comparative balance sheet are as follows:

	12/31/20Y2	12/31/20Y1	Increase (Decrease)
Accounts payable	$ 42,680	$ 41,500	$ 1,180
Dividends payable	10,000	8,000	2,000
Bonds payable	210,000	300,000	(90,000)
Common stock, $10 par value	120,000	100,000	20,000
Paid-in capital in excess of par—common stock	300,000	200,000	100,000
Retained earnings	240,000	180,000	60,000

During the year, the company retired bonds payable at their face amount, declared dividends of $20,000, and issued 2,000 shares of common stock for $60 per share. Prepare the "Cash flows from financing activities" section of the statement of cash flows.

Solution:

Cash flows from (used for) financing activities:		
Cash paid to retire bonds	$ (90,000)	
Cash received from issuing common stock	120,000	
Cash paid for dividends	(18,000)	
Net cash flow from financing activities		$12,000

Bonds payable with a $90,000 face amount were retired. This is a cash outflow from financing activities.

$120,000 in cash was received from the issuance of common stock (2,000 shares × $60 per share).

$20,000 in dividends declared less the $2,000 increase in dividends payable

Pathways Challenge



This is Accounting!

Economic Activity

Laboratory Corporation of America (LH), commonly known as **LabCorp**, is a life sciences company that operates one of the largest clinical laboratory networks in the world. As part of its financing strategy, LabCorp issued notes payable with a 0% interest rate when the market interest rate was 2%. Each $1,000 note sold for $672, which is the present value of the face amount of the note. Because the notes have a 0% interest rate, there is no annual cash payment for interest. On the maturity date, LabCorp will pay investors $1,000 to redeem the notes. LabCorp uses the indirect method of reporting the statement of cash flows.

Critical Thinking/Judgment

Would the statement of cash flows report a yearly "cash outflow" for interest expense?
How would LabCorp report the redemption of each $1,000 note at maturity on the statement of cash flows?

Suggested answer at end of chapter.

Objective 5
Prepare a statement of cash flows.

Preparing the Statement of Cash Flows

The statement of cash flows for **Rundell Inc.**, using the indirect method, is shown in Exhibit 7. The statement of cash flows indicates that cash increased by $71,500 during the year. The most significant increase in net cash flows ($100,500) was from operating activities. The most

Exhibit 7
Statement of Cash Flows—Indirect Method

Rundell Inc.
Statement of Cash Flows
For the Year Ended December 31, 20Y8

Cash flows from (used for) operating activities:		
Net income	$108,000	
Adjustments to reconcile net income to net cash flow from operating activities:		
Depreciation	7,000	
Gain on sale of land	(12,000)	
Changes in current operating assets and liabilities:		
Increase in accounts receivable	(9,000)	
Decrease in inventories	8,000	
Decrease in accounts payable	(3,200)	
Increase in accrued expenses payable	2,200	
Decrease in income taxes payable	(500)	
Net cash flow from operating activities		$100,500
Cash flows from (used for) investing activities:		
Cash received from sale of land	$ 72,000	
Cash paid for purchase of land	(15,000)	
Cash paid for purchase of building	(60,000)	
Net cash flow used for investing activities		(3,000)
Cash flows from (used for) financing activities:		
Cash received from sale of common stock	$ 48,000	
Cash paid to retire bonds payable	(50,000)	
Cash paid for dividends	(24,000)	
Net cash flow used for financing activities		(26,000)
Net increase in cash		$ 71,500
Cash balance, January 1, 20Y8		26,000
Cash balance, December 31, 20Y8		$ 97,500

significant use of cash ($26,000) was for financing activities. The ending balance of cash on December 31, 20Y8, is $97,500. This ending cash balance is also reported on the December 31, 20Y8, balance sheet shown in Exhibit 4.

In a recent statement of cash flows, **National Beverage Corp.** reported net cash provided by operating activities of $78,955,000; net cash used for investing activities of $12,024,000; and net cash used for financing activities of $13,810,000 for a net increase in cash of $53,121,000 for the year.

Link to National Beverage

International Connection

IFRS

IFRS for Statement of Cash Flows

The statement of cash flows is required under International Financial Reporting Standards (IFRS). The statement of cash flows under IFRS is similar to that reported under U.S. GAAP in that the statement has separate sections for operating, investing, and financing activities. Like U.S. GAAP, IFRS also allow the use of either the indirect or direct method of reporting cash flows from operating activities. IFRS differ from U.S. GAAP in some minor areas, including:

- Interest paid can be reported as either an operating or a financing activity, while interest received can be reported as either an operating or an investing activity. In contrast, U.S. GAAP reports interest paid or received as an operating activity.
- Dividends paid can be reported as either an operating or a financing activity, while dividends received can be reported as either an operating or an investing activity. In contrast, U.S. GAAP reports dividends paid as a financing activity and dividends received as an operating activity.
- Cash flows to pay taxes are reported as a separate line in the operating activities, in contrast to U.S. GAAP, which does not require a separate line disclosure.

*IFRS are further discussed and illustrated in Appendix C.

Analysis for Decision Making

Objective 6
Describe and illustrate the use of free cash flow in evaluating a company's cash flow.

Free Cash Flow

A valuable tool for evaluating the profitability of a business is free cash flow. **Free cash flow** measures the operating cash flow available to a company after it purchases the property, plant, and equipment (PP&E) necessary to maintain its current operations. Since the investments in PP&E necessary to maintain current operations cannot often be determined from financial statements, analysts estimate this amount using the cash used to purchase PP&E, as shown in the statement of cash flows. Thus, free cash flow is computed as follows:

Cash flows from operating activities	XXX
Cash used to purchase property, plant, and equipment	(XXX)
Free cash flow	XXX

The free cash flow can be expressed as a percentage of sales in order to provide a measure that can be compared over time or to other companies. This ratio is computed as follows:

$$\text{Ratio of Free Cash Flow to Sales} = \frac{\text{Free Cash Flow}}{\text{Sales}}$$

Positive free cash flow is considered favorable. A company that has free cash flow is able to fund growth and acquisitions, retire debt, purchase treasury stock, and pay dividends. A company with no free cash flow may have limited financial flexibility, potentially leading to liquidity problems. As one analyst notes, "Free cash flow gives the company firepower to reduce debt and ultimately generate consistent, actual income."

To illustrate, information from the annual reports of **National Beverage Corp. (FIZZ)** for three recent years is as follows (in thousands):

	Year 3	Year 2	Year 1
Cash flows from operating activities	$ 78,955	$ 58,020	$ 52,382
Cash used to purchase property, plant, and equipment	12,140	11,630	12,124
Sales	704,785	645,825	641,135

The free cash flow is computed for the three years as follows:

	Year 3	Year 2	Year 1
Cash flows from operating activities	$ 78,955	$ 58,020	$ 52,382
Cash used to purchase property, plant, and equipment	(12,140)	(11,630)	(12,124)
Free cash flow	$ 66,815	$ 46,390	$ 40,258

As can be seen, free cash flow has increased across the three years. In Year 3, it is nearly 66% higher than in Year 1 [($66,815 − $40,258) ÷ $40,258]. The ratio of free cash flow to sales is as follows (rounded to one decimal place):

	Year 3	Year 2	Year 1
Ratio of free cash flow to sales	9.4% ($66,185 ÷ $704,785)	7.2% ($46,390 ÷ $645,825)	6.3% ($40,258 ÷ $641,135)

The ratio of free cash flow to sales has also increased across these three years, from 6.3% in Year 1 to 9.4% in Year 3, which is a 49% increase [(9.4% − 6.3%) ÷ 6.3%].

Make a Decision Free Cash Flow

Analyze and compare Amazon.com, Best Buy, and Wal-Mart (MAD 15-1) (Continuing company analysis)

Analyze and compare Apple, Coca-Cola, and Verizon (MAD 15-2)

Analyze Aeropostale (MAD 15-3)

Analyze and compare AT&T and Facebook (MAD 15-4)

Analyze Priceline (MAD 15-5)

Make a Decision

Why It Matters

Twenty Years After

The S&P 500 is made up of the 500 largest publicly traded companies in the United States. **Deutsche Bank**, one of the world's largest financial institutions, aggregated the free cash flow performance of today's S&P 500 companies and the S&P 500 companies from 20 years ago, as follows:

S&P 500 in aggregate (in billions, except ratio)	20 Years Ago	Currently
Free cash flow	$148	$958
Ratio of free cash flow to sales	6%	8%
Cash paid for dividends	$58	$426
Cash paid for treasury stock purchases	30	475
Total	$88	$901

As can be seen, the free cash flow has grown over six-fold, while the ratio of free cash flow to sales has improved from 6% 20 years ago to 8% currently. Twenty years ago, $88 billion of free cash flow, or nearly 60% of free cash flow ($88 ÷ $148), was used to pay dividends and treasury stock. Currently, $901 billion of free cash flow, or 94% of free cash flow ($901 ÷ $958), is used to pay dividends and treasury stock. Compared to twenty years ago, companies are using a much greater portion of their free cash flow to return cash to stockholders. This suggests companies are seeing fewer opportunities for internal investment than 20 years ago.

Appendix 1 Spreadsheet (Work Sheet) for Statement of Cash Flows—The Indirect Method

Objective App 1
Use a spreadsheet to prepare the statement of cash flows under the indirect method.

A spreadsheet (work sheet) may be used in preparing the statement of cash flows. However, whether or not a spreadsheet (work sheet) is used, the concepts presented in this chapter are not affected.

The data for **Rundell Inc.**, presented in Exhibit 4, are used as a basis for illustrating the spreadsheet (work sheet) for the indirect method. The steps in preparing this spreadsheet (work sheet), shown in Exhibit 8, are as follows:

- Step 1. List the title of each balance sheet account in the Accounts column.
- Step 2. For each balance sheet account, enter its balance as of December 31, 20Y7, in the first column and its balance as of December 31, 20Y8, in the last column. Place the credit balances in parentheses.
- Step 3. Add the December 31, 20Y7 and 20Y8 column totals, which should total to zero.
- Step 4. Analyze the change during the year in each noncash account to determine its net increase (decrease) and classify the change as affecting cash flows from operating activities, investing activities, financing activities, or noncash investing and financing activities.

Exhibit 8 End-of-Period Spreadsheet (Work Sheet) for Statement of Cash Flows—Indirect Method

Step 2

	A	B	C	D	E	F	G
1	Rundell Inc.						
2	End-of-Period Spreadsheet (Work Sheet) for Statement of Cash Flows						
3	For the Year Ended December 31, 20Y8						
4	Accounts	Balance,	Transactions				Balance,
5		Dec. 31, 20Y7	Debit		Credit		Dec. 31, 20Y8
6	Cash	26,000	(o)	71,500			97,500
7	Accounts receivable (net)	65,000	(n)	9,000			74,000
8	Inventories	180,000			(m)	8,000	172,000
9	Land	125,000	(k)	15,000	(l)	60,000	80,000
10	Building	200,000	(j)	60,000			260,000
11	Accumulated depreciation—building	(58,300)			(i)	7,000	(65,300)
12	Accounts payable (merchandise creditors)	(46,700)	(h)	3,200			(43,500)
13	Accrued expenses payable (operating expenses)	(24,300)			(g)	2,200	(26,500)
14	Income taxes payable	(8,400)	(f)	500			(7,900)
15	Dividends payable	(10,000)			(e)	4,000	(14,000)
16	Bonds payable	(150,000)	(d)	50,000			(100,000)
17	Common stock	(16,000)			(c)	8,000	(24,000)
18	Paid-in capital in excess of par	(80,000)			(c)	40,000	(120,000)
19	Retained earnings	(202,300)	(b)	28,000	(a)	108,000	(282,300)
20	Totals	0		237,200		237,200	0
21	Operating activities:						
22	Net income		(a)	108,000			
23	Depreciation of building		(i)	7,000			
24	Gain on sale of land				(l)	12,000	
25	Increase in accounts receivable				(n)	9,000	
26	Decrease in inventories		(m)	8,000			
27	Decrease in accounts payable				(h)	3,200	
28	Increase in accrued expenses payable		(g)	2,200			
29	Decrease in income taxes payable				(f)	500	
30	Investing activities:						
31	Sale of land		(l)	72,000			
32	Purchase of land				(k)	15,000	
33	Purchase of building				(j)	60,000	
34	Financing activities:						
35	Issued common stock		(c)	48,000			
36	Retired bonds payable				(d)	50,000	
37	Declared cash dividends				(b)	28,000	
38	Increase in dividends payable		(e)	4,000			
39	Net increase in cash				(o)	71,500	
40	Totals			249,200		249,200	
41							

Step 1

Step 3

Step 3

Steps 4–7

- Step 5. Indicate the effect of the change on cash flows by making entries in the Transactions columns.
- Step 6. After all noncash accounts have been analyzed, enter the net increase (decrease) in cash during the period.
- Step 7. Add the Debit and Credit Transactions columns. The totals should be equal.

Analyzing Accounts

In analyzing the noncash accounts (Step 4), try to determine the type of cash flow activity (operating, investing, or financing) that led to the change in the account. As each noncash account is analyzed, an entry (Step 5) is made on the spreadsheet (work sheet) for the type of

cash flow activity that caused the change. After all noncash accounts have been analyzed, an entry (Step 6) is made for the increase (decrease) in cash during the period.

The entries made on the spreadsheet are not posted to the ledger. They are only used in preparing and summarizing the data on the spreadsheet.

The order in which the accounts are analyzed is not important. However, it is more efficient to begin with Retained Earnings and proceed upward in the account listing.

Retained Earnings

The spreadsheet (work sheet) shows a Retained Earnings balance of $202,300 at December 31, 20Y7, and $282,300 at December 31, 20Y8. Thus, Retained Earnings increased $80,000 during the year. This increase is from the following:

- Net income of $108,000
- Declaring cash dividends of $28,000

To identify the cash flows from these activities, two entries are made on the spreadsheet.

The $108,000 is reported on the statement of cash flows as part of cash flows from operating activities. Thus, an entry is made in the Transactions columns on the spreadsheet, as follows:

(a)	Operating Activities—Net Income	108,000	
	Retained Earnings		108,000

The preceding entry accounts for the net income portion of the change to Retained Earnings. It also identifies the cash flow in the bottom portion of the spreadsheet as related to operating activities.

The $28,000 of dividends is reported as a financing activity on the statement of cash flows. Thus, an entry is made in the Transactions columns on the spreadsheet, as follows:

(b)	Retained Earnings	28,000	
	Financing Activities—Declared Cash Dividends		28,000

The preceding entry accounts for the dividends portion of the change to Retained Earnings. It also identifies the cash flow in the bottom portion of the spreadsheet as related to financing activities. The $28,000 of declared dividends will be adjusted later for the actual amount of cash dividends paid during the year.

Other Accounts

The entries for the other noncash accounts are made in the spreadsheet in a manner similar to entries (a) and (b). A summary of these entries follows:

(c)	Financing Activities—Issued Common Stock	48,000	
	Common Stock		8,000
	Paid-In Capital in Excess of Par—Common Stock		40,000
(d)	Bonds Payable	50,000	
	Financing Activities—Retired Bonds Payable		50,000
(e)	Financing Activities—Increase in Dividends Payable	4,000	
	Dividends Payable		4,000
(f)	Income Taxes Payable	500	
	Operating Activities—Decrease in Income Taxes Payable		500
(g)	Operating Activities—Increase in Accrued Expenses Payable	2,200	
	Accrued Expenses Payable		2,200
(h)	Accounts Payable	3,200	
	Operating Activities—Decrease in Accounts Payable		3,200
(i)	Operating Activities—Depreciation of Building	7,000	
	Accumulated Depreciation—Building		7,000
(j)	Building	60,000	
	Investing Activities—Purchase of Building		60,000

(k)	Land	15,000	
	Investing Activities—Purchase of Land		15,000
(l)	Investing Activities—Sale of Land	72,000	
	Operating Activities—Gain on Sale of Land		12,000
	Land		60,000
(m)	Operating Activities—Decrease in Inventories	8,000	
	Inventories		8,000
(n)	Accounts Receivable	9,000	
	Operating Activities—Increase in Accounts Receivable		9,000
(o)	Cash	71,500	
	Net Increase in Cash		71,500

After all the balance sheet accounts are analyzed and the entries made on the spreadsheet (work sheet), all the operating, investing, and financing activities are identified in the bottom portion of the spreadsheet. The accuracy of the entries is verified by totaling the Debit and Credit Transactions columns. The totals of the columns should be equal.

Preparing the Statement of Cash Flows

The statement of cash flows prepared from the spreadsheet is identical to the statement in Exhibit 7. The data for the three sections of the statement are obtained from the bottom portion of the spreadsheet.

Objective App 2
Prepare a statement of cash flows under the direct method.

Appendix 2 Preparing the Statement of Cash Flows—The Direct Method

The direct method reports cash flows from operating activities as follows:

Cash flows from (used for) operating activities:		
Cash received from customers	$ XXX	
Cash payments for merchandise	(XXX)	
Cash payments for operating expenses	(XXX)	
Cash payments for interest	(XXX)	
Cash payments for income taxes	(XXX)	
Net cash flow from operating activities		$XXX

The "Cash flows from investing activities" and "Cash flows from financing activities" sections of the statement of cash flows are exactly the same under both the direct and indirect methods. The amount of net cash flow from operating activities is also the same, but the manner in which it is reported is different.

Under the direct method, the income statement is adjusted to cash flows from operating activities as shown in Exhibit 9.

Exhibit 9
Converting Income Statement to Cash Flows from Operating Activities Using the Direct Method

Income Statement	Adjusted to	Cash Flows from Operating Activities
Sales	→	Cash received from customers
Cost of goods sold	→	Cash payments for merchandise
Operating expenses:		
Depreciation expense*	n/a	n/a
Other operating expenses	→	Cash payments for operating expenses
Gain (loss) on sale of land**	n/a	n/a
Interest expense	→	Cash payments for interest
Income tax expense	→	Cash payments for income taxes
Net income	→	Net cash flow from operating activities

* Depreciation does not affect cash and, thus, is not considered in the direct method.
** Gains (Losses) on sales of property, plant, and equipment are reported as part of investing activities.

As shown in Exhibit 9, depreciation expense is not adjusted or reported as part of cash flows from operating activities. This is because deprecation expense does not involve a cash outflow. The gain on the sale of the land is also not adjusted and is not reported as part of cash flows from operating activities. This is because the cash flow from operating activities is determined directly, rather than by reconciling net income. The cash proceeds from the sale of the land are reported as an investing activity.

To illustrate the direct method, the income statement and comparative balance sheet for **Rundell Inc.**, shown in Exhibit 4, are used.

Cash Received from Customers

The income statement (shown in Exhibit 4) of **Rundell Inc.** reports sales of $1,180,000. To determine the cash received from customers, the $1,180,000 is adjusted for any increase or decrease in accounts receivable. The adjustment is summarized in Exhibit 10.

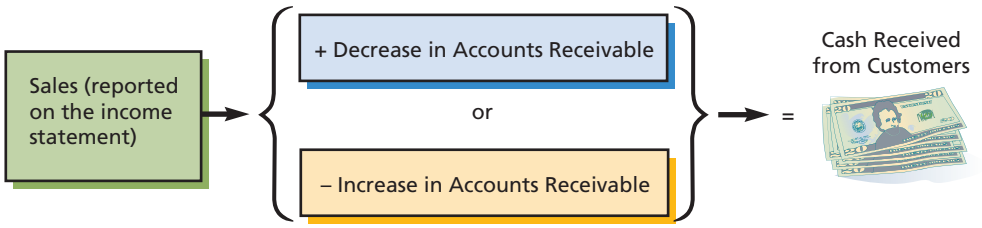


Exhibit 10
Determining the Cash Received from Customers

The cash received from customers is $1,171,000, computed as follows:

Sales	$1,180,000
Increase in accounts receivable	(9,000)
Cash received from customers	$1,171,000

The increase of $9,000 in accounts receivable (shown in Exhibit 4) during 20Y8 indicates that sales on account exceeded cash received from customers by $9,000. In other words, sales include $9,000 that did not result in a cash inflow during the year. Thus, $9,000 is deducted from sales to determine the cash received from customers.

Cash Payments for Merchandise

The income statement (shown in Exhibit 4) for **Rundell Inc.** reports cost of goods sold of $790,000. To determine the cash payments for merchandise, the $790,000 is adjusted for any increases or decreases in inventories and accounts payable. Assuming the accounts payable are owed to merchandise suppliers, the adjustment is summarized in Exhibit 11.

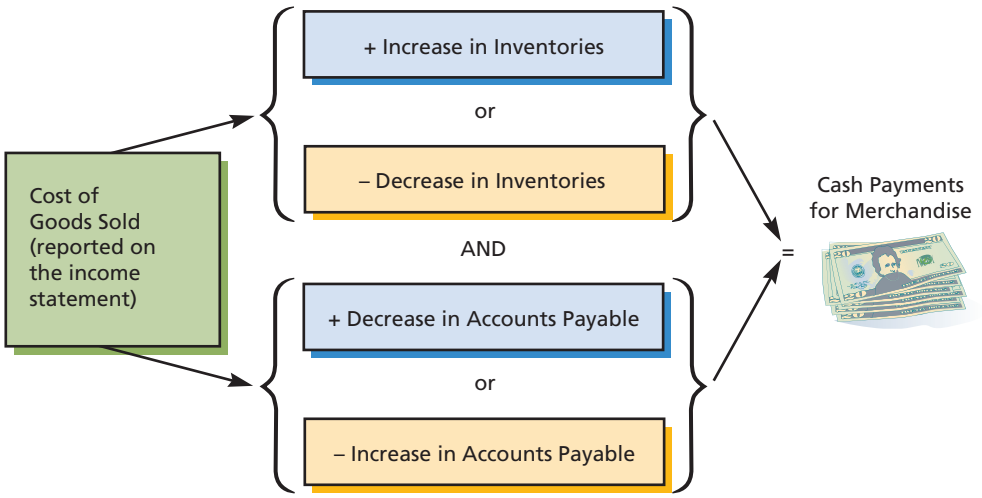


Exhibit 11
Determining the Cash Payments for Merchandise

The cash payments for merchandise are $785,200, computed as follows:

Cost of goods sold	$790,000
Decrease in inventories	(8,000)
Decrease in accounts payable	3,200
Cash payments for merchandise	$785,200

The $8,000 decrease in inventories (from Exhibit 4) indicates that the merchandise sold exceeded the cost of the merchandise purchased by $8,000. In other words, the cost of goods sold includes $8,000 of merchandise sold from inventory that did not require a cash outflow during the year. Thus, $8,000 is deducted from the cost of goods sold in determining the cash payments for merchandise.

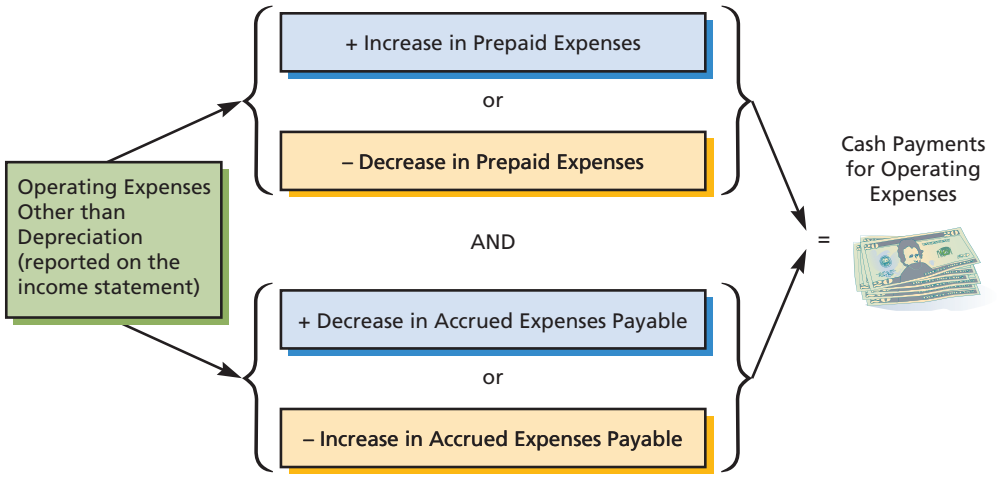
The $3,200 decrease in accounts payable (from Exhibit 4) indicates that cash payments for merchandise were $3,200 more than the purchases on account during 20Y8. Therefore, $3,200 is added to the cost of goods sold in determining the cash payments for merchandise.

Cash Payments for Operating Expenses

The income statement for **Rundell Inc.** (from Exhibit 4) reports total operating expenses of $203,000, which includes depreciation expense of $7,000. Because depreciation expense does not require a cash outflow, it is omitted from cash payments for operating expenses.

To determine the cash payments for operating expenses, the other operating expenses (excluding depreciation) of $196,000 ($203,000 − $7,000) are adjusted for any increases or decreases in prepaid expenses and accrued expenses payable. This adjustment is summarized in Exhibit 12.

Exhibit 12
Determining the Cash Payments for Operating Expenses



Since Rundell Inc. has no prepaid expenses, the cash payments for operating expenses are $193,800, computed as follows:

Operating expenses other than depreciation	$196,000
Increase in accrued expenses payable	(2,200)
Cash payments for operating expenses	$193,800

The increase in accrued expenses payable (from Exhibit 4) indicates that the cash payments for operating expenses were $2,200 less than the amount reported for operating expenses during the year. Thus, $2,200 is deducted from the operating expenses in determining the cash payments for operating expenses.

Gain on Sale of Land

The income statement for **Rundell Inc.** (from Exhibit 4) reports a gain of $12,000 on the sale of land. The sale of land is an investing activity. Thus, the proceeds from the sale, which include the gain, are reported as part of the cash flows from investing activities.

Interest Expense

The income statement for **Rundell Inc.** (from Exhibit 4) reports interest expense of $8,000. To determine the cash payments for interest, the $8,000 is adjusted for any increases or decreases in interest payable. The adjustment is summarized in Exhibit 13.

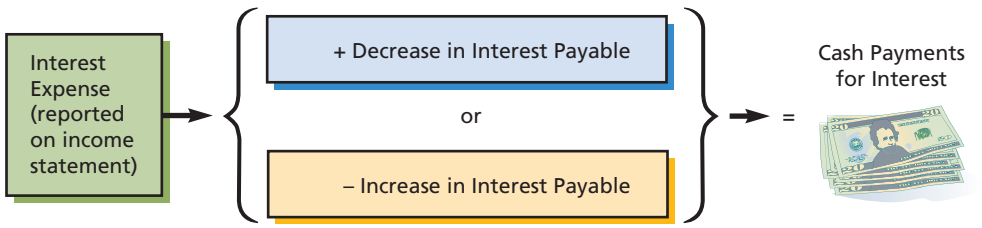


Exhibit 13
Determining the Cash Payments for Interest

The comparative balance sheet of Rundell in Exhibit 4 indicates no interest payable. This is because the interest expense on the bonds payable is paid on June 1 and December 31. Because there is no interest payable, no adjustment of the interest expense of $8,000 is necessary.

Cash Payments for Income Taxes

The income statement for **Rundell Inc.** (from Exhibit 4) reports income tax expense of $83,000. To determine the cash payments for income taxes, the $83,000 is adjusted for any increases or decreases in income taxes payable. The adjustment is summarized in Exhibit 14.

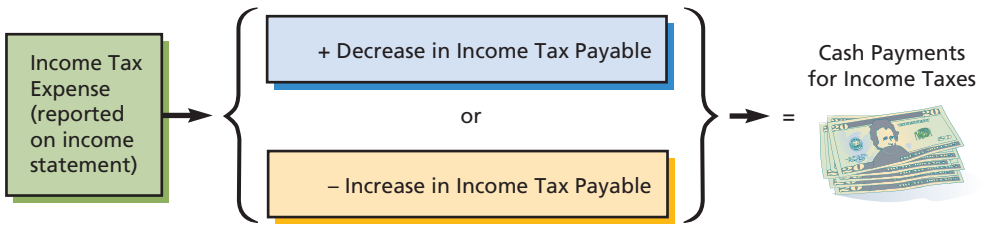


Exhibit 14
Determining the Cash Payments for Income Taxes

The cash payments for income taxes are $83,500, computed as follows:

Income tax expense	$83,000
Decrease in income taxes payable	500
Cash payments for income taxes	$83,500

The $500 decrease in income taxes payable (from Exhibit 4) indicates that the cash payments for income taxes were $500 more than the amount reported for income tax expense during 20Y8. Thus, $500 is added to the income tax expense in determining the cash payments for income taxes.

Reporting Cash Flows from Operating Activities—Direct Method

The statement of cash flows for **Rundell Inc.**, using the direct method for reporting cash flows from operating activities, is shown in Exhibit 15. The portions of the statement that differ from those prepared under the indirect method are highlighted.

Exhibit 15 also includes the separate schedule reconciling net income and net cash flow from operating activities. This schedule is included as part of the statement of cash flows when the direct method is used. This schedule is similar to the "Cash flows from operating activities" section prepared under the indirect method.

Exhibit 15
Statement of Cash Flows—Direct Method

Rundell Inc.
Statement of Cash Flows
For the Year Ended December 31, 20Y8

Cash flows from (used for) operating activities:		
Cash received from customers	$1,171,000	
Cash payments for merchandise	(785,200)	
Cash payments for operating expenses	(193,800)	
Cash payments for interest	(8,000)	
Cash payments for income taxes	(83,500)	
Net cash flow from operating activities		$100,500
Cash flows from (used for) investing activities:		
Cash received from sale of land	$ 72,000	
Cash paid for purchase of land	(15,000)	
Cash paid for purchase of building	(60,000)	
Net cash flow used for investing activities		(3,000)
Cash flows from (used for) financing activities:		
Cash received from sale of common stock	$ 48,000	
Cash paid to retire bonds payable	(50,000)	
Cash paid for dividends	(24,000)	
Net cash flow used for financing activities		(26,000)
Net increase in cash		$ 71,500
Cash balance, January 1, 20Y8		26,000
Cash balance, December 31, 20Y8		$ 97,500
Schedule Reconciling Net Income with Cash Flows from Operating Activities:		
Cash flows from (used for) operating activities:		
Net income		$108,000
Adjustments to reconcile net income to net cash flow from operating activities:		
Depreciation		7,000
Gain on sale of land		(12,000)
Changes in current operating assets and liabilities:		
Increase in accounts receivable		(9,000)
Decrease in inventories		8,000
Decrease in accounts payable		(3,200)
Increase in accrued expenses payable		2,200
Decrease in income taxes payable		(500)
Net cash flow from operating activities		$100,500

Let's Review

Chapter Summary

1. The statement of cash flows reports cash receipts and cash payments by three types of activities: operating activities, investing activities, and financing activities. Cash flows from operating activities reports the cash inflows and outflows from a company's day-to-day operations. Cash flows from investing activities reports the cash inflows and outflows related to changes in a company's long-term assets. Cash flows from financing activities reports the cash inflows and outflows related to changes in a company's long-term liabilities and stockholders' equity. Investing and financing for a business may be affected by transactions that do not involve cash. The effect of such transactions should be reported in a separate schedule accompanying the statement of cash flows.
2. The indirect method reports cash flows from operating activities by adjusting net income for revenues and expenses that do not involve the receipt or payment of cash. Noncash expenses such as depreciation are added back to net income. Gains and losses on the disposal of assets are added to or deducted from net income. Changes in current operating assets and liabilities are added to or subtracted from net income, depending on their effect on cash.
3. Cash flows from investing activities are reported below cash flows from operating activities on the statement of cash flows. Cash flows from investing activities reports the cash inflows and outflows related to changes in a company's long-term assets.
4. Cash flows from financing activities are reported below cash flows from operating activities on the statement of cash flows. Cash flows from financing activities reports the cash inflows and outflows related to changes in a company's long-term liabilities and stockholders' equity.
5. The statement of cash flows reports cash flows from operating activities followed by cash flows from investing and financing activities. The result of adding the net cash flows from operating, investing, and financing activities is the net increase or decrease in cash for the period. Cash at the beginning of the year is added to determine the cash at the end of the period. This ending cash amount must agree with cash reported on the end-of-period balance sheet.
6. Free cash flow measures the operating cash flow available to a company after it purchases the property, plant, and equipment necessary to maintain its current operations. It is computed as cash flows from operating activities minus cash used to purchase property, plant, and equipment. Free cash flow can be expressed as a percentage of sales in order to provide a relative measure that can be compared over time or to other companies. Positive free cash flow is considered favorable.

Key Terms

cash flow per share (705)
cash flows from financing activities (701)
cash flows from investing activities (700)
cash flows from operating activities (700)
direct method (701)
free cash flow (716)
indirect method (702)
statement of cash flows (700)

Practice

Multiple-Choice Questions

1. An example of a cash flow from an operating activity is:
   a. receipt of cash from the sale of stock.
   b. receipt of cash from the sale of bonds.
   c. payment of cash for dividends.
   d. receipt of cash from customers on account.

2. An example of a cash flow from an investing activity is:
   a. receipt of cash from the sale of equipment.
   b. receipt of cash from the sale of stock.
   c. payment of cash for dividends.
   d. payment of cash to acquire treasury stock.

3. An example of a cash flow from a financing activity is:
   a. receipt of cash from customers on account.
   b. receipt of cash from the sale of equipment.
   c. payment of cash for dividends.
   d. payment of cash to acquire land.

4. Which of the following methods of reporting cash flows from operating activities adjusts net income for revenues and expenses not involving the receipt or payment of cash?
   a. Direct method
   b. Purchase method
   c. Reciprocal method
   d. Indirect method

5. The net income reported on the income statement for the year was $55,000, and depreciation of fixed assets for the year was $22,000. The balances of the current asset and current liability accounts at the beginning and end of the year are as follows:

	End of Year	Beginning of Year
Cash	$ 65,000	$ 70,000
Accounts receivable	100,000	90,000
Inventories	145,000	150,000
Prepaid expenses	7,500	8,000
Accounts payable (merchandise creditors)	51,000	58,000

   The total amount reported for cash flows from operating activities on the statement of cash flows using the indirect method is:
   a. $33,000.
   b. $55,000.
   c. $65,500.
   d. $77,000.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Classifying cash flows **Obj. 1**

Identify whether each of the following would be reported as an operating, investing, or financing activity on the statement of cash flows:

a. Repurchase of common stock
b. Cash received from customers
c. Payment of accounts payable
d. Retirement of bonds payable
e. Purchase of equipment
f. Purchase of inventory for cash

2. Adjustments to net income—indirect method **Obj. 2**

Pearl Corporation's accumulated depreciation—furniture account increased by $8,400, while $3,080 of patent amortization was recognized between balance sheet dates. There were no purchases or sales of depreciable or intangible assets during the year. In addition, the income statement showed a loss of $4,480 from the sale of land. Reconcile a net income of $120,400 to net cash flow from operating activities.

3. Changes in current operating assets and liabilities—indirect method **Obj. 2**

Alpenrose Corporation's comparative balance sheet for current assets and liabilities was as follows:

	Dec. 31, 20Y2	Dec. 31, 20Y1
Accounts receivable	$27,000	$32,400
Inventory	18,000	15,480
Accounts payable	16,200	14,220
Dividends payable	49,500	53,100

Adjust net income of $207,000 for changes in operating assets and liabilities to arrive at net cash flow from operating activities.

4. Cash flows from operating activities—indirect method **Obj. 2**

Pettygrove Inc. reported the following data:

Net income	$405,000
Depreciation expense	45,000
Gain on disposal of equipment	36,900
Decrease in accounts receivable	25,200
Decrease in accounts payable	6,480

Prepare the "Cash flows from operating activities" section of the statement of cash flows, using the indirect method.

5. Land transactions on the statement of cash flows **Obj. 3**

Milo Corporation purchased land for $540,000. Later in the year, the company sold a different piece of land with a book value of $270,000 for $180,000. How are the effects of these transactions reported on the statement of cash flows?

6. Common stock transactions on the statement of cash flows **Obj. 4**

Wright Inc. received $1,200,000 from issuing shares of its common stock. During the year, Wright Inc. paid $500,000 to retire bonds and paid dividends of $250,000. How are the effects of these transactions reported on the statement of cash flows?

7. Free cash flow **Obj. 6**

McMahon Inc. reported the following on the company's statement of cash flows in 20Y8 and 20Y7:

	20Y8	20Y7
Net cash flow from operating activities	$ 294,000	$ 280,000
Net cash flow used for investing activities	(224,000)	(252,000)
Net cash flow used for financing activities	(63,000)	(42,000)

Seventy percent of the net cash flow used for investing activities was for the purchase of property, plant, and equipment.

a. Determine McMahon's free cash flow for both years.

b. Has McMahon's free cash flow improved or declined from 20Y7 to 20Y8?

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

The comparative balance sheet of Dowling Company for December 31, 20Y5 and 20Y4, is as follows:

Dowling Company
Comparative Balance Sheet
December 31, 20Y5 and 20Y4

	20Y5	20Y4
Assets		
Cash	$ 140,350	$ 95,900
Accounts receivable (net)	95,300	102,300
Inventories	165,200	157,900
Prepaid expenses	6,240	5,860
Investments (long-term)	35,700	84,700
Land	75,000	90,000
Buildings	375,000	260,000
Accumulated depreciation—buildings	(71,300)	(58,300)
Machinery and equipment	428,300	428,300
Accumulated depreciation—machinery and equipment	(148,500)	(138,000)
Patents	58,000	65,000
Total assets	$1,159,290	$1,093,660
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 43,500	$ 46,700
Accrued expenses payable (operating expenses)	14,000	12,500
Income taxes payable	7,900	8,400
Dividends payable	14,000	10,000
Mortgage note payable, due in 10 years	40,000	0
Bonds payable	150,000	250,000
Common stock, $30 par	450,000	375,000
Paid-in capital in excess of par—common stock	66,250	41,250
Retained earnings	373,640	349,810
Total liabilities and stockholders' equity	$1,159,290	$1,093,660

The income statement for Dowling Company follows:

Dowling Company
Income Statement
For the Year Ended December 31, 20Y5

Sales		$1,100,000
Cost of goods sold		(710,000)
Gross profit		$ 390,000
Operating expenses:		
Depreciation expense	$ 23,500	
Patent amortization	7,000	
Other operating expenses	196,000	
Total operating expenses		(226,500)
Operating income		$ 163,500
Other revenue and expense:		
Gain on sale of investments	$ 11,000	
Interest expense	(26,000)	(15,000)
Income before income tax		$ 148,500
Income tax expense		(50,000)
Net income		$ 98,500

An examination of the accounting records revealed the following additional information applicable to 20Y5:

a. Land costing $15,000 was sold for $15,000.
b. A mortgage note was issued for $40,000.
c. A building costing $115,000 was constructed.

d. 2,500 shares of common stock were issued at $40 in exchange for the bonds payable.
e. Cash dividends declared were $74,670.

Instructions

1. Prepare a statement of cash flows, using the indirect method of reporting cash flows from operating activities.
2. (*Appendix 2*) Prepare a statement of cash flows, using the direct method of reporting cash flows from operating activities.

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **d** Cash flows from operating activities affect transactions that enter into the determination of net income, such as the receipt of cash from customers on account (answer d). Receipts of cash from the sale of stock (answer a) and the sale of bonds (answer b) and payments of cash for dividends (answer c) are cash flows from financing activities.
2. **a** Cash flows from investing activities include receipts from the sale of noncurrent assets, such as equipment (answer a), and payments to acquire noncurrent assets. Receipts of cash from the sale of stock (answer b) and payments of cash for dividends (answer c) and to acquire treasury stock (answer d) are cash flows from financing activities.
3. **c** Payment of cash for dividends (answer c) is an example of a financing activity. The receipt of cash from customers on account (answer a) is an operating activity. The receipt of cash from the sale of equipment (answer b) and the payment of cash to acquire land (answer d) are examples of investing activities.
4. **d** The indirect method (answer d) reports cash flows from operating activities by beginning with net income and adjusting it for revenues and expenses not involving the receipt or payment of cash.
5. **c** The "Cash flows from operating activities" section of the statement of cash flows would report net cash flow from operating activities of $65,500, determined as follows:

Cash flow from (used for) operating activities:		
Net income	$ 55,000	
Adjustments to reconcile net income to net cash flow from operating activities:		
Depreciation expense	22,000	
Changes in current operating assets and liabilities:		
Increase in accounts receivable	(10,000)	
Decrease in inventories	5,000	
Decrease in prepaid expenses	500	
Decrease in accounts payable	(7,000)	
Net cash flow from operating activities		$65,500

Exercises

1. a. Financing
   b. Operating
   c. Operating
   d. Financing
   e. Investing
   f. Operating

2.

Net income	$120,400
Adjustments to reconcile net income to net cash flow from operating activities:	
Depreciation	8,400
Amortization of patents	3,080
Loss from sale of land	4,480
Net cash flow from operating activities	$136,360

3.

Net income	$207,000
Changes in current operating assets and liabilities:	
Decrease in accounts receivable	5,400
Increase in inventory	(2,520)
Increase in accounts payable	1,980
Net cash flow from operating activities	$211,860

Note: The change in dividends payable impacts the cash paid for dividends, which is disclosed under financing activities.

4.

Cash flows from operating activities:	
Net income	$405,000
Adjustments to reconcile net income to net cash flow from operating activities:	
Depreciation	45,000
Gain on disposal of equipment	(36,900)
Changes in current operating assets and liabilities:	
Decrease in accounts receivable	25,200
Decrease in accounts payable	(6,480)
Net cash flow from operating activities	$431,820

5. The loss on the sale of land is added to net income in the "Cash flows from operating activities" section.

Loss on sale of land	$90,000

The purchase and sale of land are reported as part of cash flows from investing activities as follows:

Cash received from sale of land	$ 180,000
Cash paid for purchase of land	(540,000)

6.

Cash flows from (used for) financing activities:	
Cash received from issuing common stock	$1,200,000
Cash paid to retire bonds	(500,000)
Cash paid for dividends	(250,000)
Net cash flow from financing activities	$ 450,000

7. a.

	20Y8	20Y7
Net cash flow from operating activities	$ 294,000	$ 280,000
Cash used to purchase property, plant, and equipment	(156,800)*	(176,400)**
Free cash flow	$ 137,200	$ 103,600

*70% × $224,000
**70% × $252,000

b. The change in free cash flow from $103,600 to $137,200 represents an improvement.

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

1.

Dowling Company
Statement of Cash Flows—Indirect Method
For the Year Ended December 31, 20Y5

Cash flows from (used for) operating activities:		
Net income	$ 98,500	
Adjustments to reconcile net income to net cash flow from operating activities:		
Depreciation	23,500	
Amortization of patents	7,000	
Gain on sale of investments	(11,000)	
Changes in current operating assets and liabilities:		
Decrease in accounts receivable	7,000	
Increase in inventories	(7,300)	
Increase in prepaid expenses	(380)	
Decrease in accounts payable	(3,200)	
Increase in accrued expenses payable	1,500	
Decrease in income taxes payable	(500)	
Net cash flow from operating activities		$115,120
Cash flows from (used for) investing activities:		
Cash received from sale of investments	$ 60,000[1]	
Cash received from sale of land	15,000	
Cash paid for construction of building	(115,000)	
Net cash flow used for investing activities		(40,000)
Cash flows from (used for) financing activities:		
Cash received from issuing mortgage note payable	$ 40,000	
Cash paid for dividends	(70,670)[2]	
Net cash flow used for financing activities		(30,670)
Net increase in cash		$ 44,450
Cash balance, January 1, 20Y5		95,900
Cash balance, December 31, 20Y5		$140,350
Schedule of Noncash Investing and Financing Activities:		
Issued common stock to retire bonds payable		$100,000

[1] $60,000 = $11,000 gain + $49,000 (decrease in investments)
[2] $70,670 = $74,670 – $4,000 (increase in dividends)

2.

Dowling Company
Statement of Cash Flows—Direct Method
For the Year Ended December 31, 20Y5

Cash flows from (used for) operating activities:		
Cash received from customers[1]	$1,107,000	
Cash paid for merchandise[2]	(720,500)	
Cash paid for operating expenses[3]	(194,880)	
Cash paid for interest expense	(26,000)	
Cash paid for income tax[4]	(50,500)	
Net cash flow from operating activities		$115,120
Cash flows from (used for) investing activities:		
Cash received from sale of investments	$ 60,000[5]	
Cash received from sale of land	15,000	
Cash paid for construction of building	(115,000)	
Net cash flow used for investing activities		(40,000)

(Continued)

Cash flows from (used for) financing activities:		
Cash received from issuing mortgage note payable	$ 40,000	
Cash paid for dividends[6]	(70,670)	
Net cash flow used for financing activities		(30,670)
Net increase in cash		$ 44,450
Cash balance, January 1, 20Y5		95,900
Cash balance, December 31, 20Y5		$140,350
Schedule of Noncash Investing and Financing Activities:		
Issued common stock to retire bonds payable		$100,000
Schedule Reconciling Net Income with Cash Flows from Operating Activities[7]		

Computations:

[1]$1,100,000 + $7,000 = $1,107,000
[2]$710,000 + $3,200 + $7,300 = $720,500
[3]$196,000 + $380 – $1,500 = $194,880
[4]$50,000 + $500 = $50,500
[5]$60,000 = $11,000 gain + $49,000 (decrease in investments)
[6]$74,670 + $10,000 – $14,000 = $70,670
[7]The content of this schedule is the same as the "Cash flows from operating activities" section of part (1) of this solution and is not reproduced here for the sake of brevity.

Discussion Questions

1. What is the principal disadvantage of the direct method of reporting cash flows from operating activities?
2. What are the major advantages of the indirect method of reporting cash flows from operating activities?
3. A corporation issued $2,000,000 of common stock in exchange for $2,000,000 of fixed assets. Where would this transaction be reported on the statement of cash flows?
4. A retail business, using the accrual method of accounting, owed merchandise creditors (accounts payable) $320,000 at the beginning of the year and $350,000 at the end of the year. How would the $30,000 increase be used to adjust net income in determining the amount of cash flows from operating activities by the indirect method? Explain.
5. If salaries payable was $100,000 at the beginning of the year and $75,000 at the end of the year, should the $25,000 decrease be added to or deducted from income to determine the amount of cash flows from operating activities by the indirect method? Explain.
6. A long-term investment in bonds with a cost of $500,000 was sold for $600,000 cash. (a) What was the gain or loss on the sale? (b) What was the effect of the transaction on cash flows? (c) How should the transaction be reported on the statement of cash flows if cash flows from operating activities are reported by the indirect method?
7. A corporation issued $2,000,000 of 20-year bonds for cash at 98. How would the transaction be reported on the statement of cash flows?
8. Fully depreciated equipment costing $50,000 was discarded. What was the effect of the transaction on cash flows if (a) $15,000 cash is received for the equipment, and (b) no cash is received for the equipment?
9. For the current year, Packers Company decided to switch from the indirect method to the direct method for reporting cash flows from operating activities on the statement of cash flows. Will the change cause the amount of net cash flow from operating activities to be larger, smaller, or the same as if the indirect method had been used? Explain.
10. Name five common major classes of operating cash receipts or operating cash payments presented on the statement of cash flows when the cash flows from operating activities are reported by the direct method.

Basic Exercises

SHOW ME HOW

BE 15-1 Classifying cash flows **Obj. 1**

Identify whether each of the following would be reported as an operating, investing, or financing activity on the statement of cash flows:

a. Purchase of investments
b. Disposal of equipment
c. Payment for selling expenses
d. Collection of accounts receivable
e. Cash sales
f. Issuance of bonds payable

SHOW ME HOW

BE 15-2 Adjustments to net income—indirect method **Obj. 2**

Ripley Corporation's accumulated depreciation—equipment account increased by $15,325 while $3,800 of patent amortization was recognized between balance sheet dates. There were no purchases or sales of depreciable or intangible assets during the year. In addition, the income statement showed a gain of $22,420 from the sale of investments. Reconcile a net income of $286,900 to net cash flow from operating activities.

SHOW ME HOW

BE 15-3 Changes in current operating assets and liabilities—indirect method **Obj. 2**

Huluduey Corporation's comparative balance sheet for current assets and liabilities was as follows:

	Dec. 31, 20Y2	Dec. 31, 20Y1
Accounts receivable	$17,500	$12,500
Inventory	51,650	44,200
Accounts payable	8,480	5,100
Dividends payable	9,480	6,100

Adjust net income of $75,800 for changes in operating assets and liabilities to arrive at net cash flow from operating activities.

SHOW ME HOW

BE 15-4 Cash flows from operating activities—indirect method **Obj. 2**

Staley Inc. reported the following data:

Net income	$396,200
Depreciation expense	61,250
Loss on disposal of equipment	27,600
Increase in accounts receivable	9,000
Increase in accounts payable	3,350

Prepare the "Cash flows from operating activities" section of the statement of cash flows, using the indirect method.

SHOW ME HOW

BE 15-5 Land transactions on the statement of cash flows **Obj. 3**

IZ Corporation purchased land for $500,000. Later in the year, the company sold a different piece of land with a book value of $250,000 for $280,000. How are the effects of these transactions reported on the statement of cash flows?

SHOW ME HOW

BE 15-6 Common stock transactions on the statement of cash flows **Obj. 4**

Jones Industries received $600,000 from issuing shares of its common stock and $400,000 from issuing bonds. During the year, Jones Industries also paid dividends of $60,000. How are the effects of these transactions reported on the statement of cash flows?

SHOW ME HOW

BE 15-7 Free cash flow **Obj. 6**

Dillin Inc. reported the following on the company's statement of cash flows in 20Y2 and 20Y1:

(Continued)

	20Y2	20Y1
Net cash flow from operating activities	$ 476,000	$ 455,000
Net cash flow used for investing activities	(427,000)	(378,000)
Net cash flow used for financing activities	(42,000)	(58,800)

Eighty percent of the net cash flow used for investing activities was used for the purchase of property, plant, and equipment.

a. Determine Dillin's free cash flow for both years.

b. Has Dillin's free cash flow improved or declined from 20Y1 to 20Y2?

SHOW ME HOW

Appendix 2
BE 15-8 Cash received from customers—direct method

Sales reported on the income statement were $225,000. The accounts receivable balance decreased $14,300 over the year. Determine the amount of cash received from customers.

SHOW ME HOW

Appendix 2
BE 15-9 Cash payments for merchandise—direct method

The cost of goods sold reported on the income statement was $185,000. The accounts payable balance increased $8,000, and the inventory balance increased by $11,100 over the year. Determine the amount of cash paid for merchandise.

Exercises

REAL WORLD

EX 15-1 Cash flows from operating activities—net loss **Obj. 1**

In a prior year, **United Continental Holdings, Inc. (UAL)**, the parent company of **United Airlines**, reported a net *loss* of $723 million from operations. However, on its statement of cash flows, it reported $935 million of cash flows from operating activities.

Explain this apparent contradiction between the loss and the positive cash flows.

✔ b. Cash receipt, $600,000

EX 15-2 Effect of transactions on cash flows **Obj. 1**

State the effect (cash receipt or cash payment and amount) of each of the following transactions, considered individually, on cash flows:

a. Retired $500,000 of bonds, on which there was $4,000 of unamortized discount, for $510,000.

b. Sold 20,000 shares of $5 par common stock for $30 per share.

c. Sold equipment with a book value of $68,900 for $72,400.

d. Purchased land for $825,000 cash.

e. Purchased a building by paying $30,000 cash and issuing a $570,000 mortgage note payable.

f. Sold a new issue of $400,000 of bonds at 98.

g. Purchased 10,000 shares of $10 par common stock as treasury stock at $22.50 per share.

h. Paid dividends of $1.25 per share. There were 1,000,000 shares issued and 180,000 shares of treasury stock.

EX 15-3 Classifying cash flows **Obj. 1**

Identify the type of cash flow activity for each of the following events (operating, investing, or financing):

a. Net income

b. Paid cash dividends

c. Issued common stock

d. Issued bonds

e. Redeemed bonds

f. Sold long-term investments

g. Purchased treasury stock

h. Sold equipment

i. Issued preferred stock

j. Purchased buildings

k. Purchased patents

EX 15-4 Cash flows from operating activities—indirect method

Obj. 2

Indicate whether each of the following would be added to or deducted from net income in determining net cash flow from operating activities by the indirect method:

a. Decrease in inventory
b. Increase in accounts receivable
c. Increase in accounts payable
d. Loss on retirement of long-term debt
e. Depreciation of fixed assets
f. Decrease in notes receivable due in 60 days from customers
g. Increase in salaries payable
h. Decrease in prepaid expenses
i. Amortization of patent
j. Increase in notes payable due in 120 days to vendors
k. Gain on disposal of fixed assets

EX 15-5 Cash flows from operating activities—indirect method

Obj. 1, 2

✔ Net cash flow from operating activities, $128,550



The net income reported on the income statement for the current year was $93,700. Depreciation recorded on store equipment for the year amounted to $31,200. Balances of the current asset and current liability accounts at the beginning and end of the year are as follows:

	End of Year	Beginning of Year
Cash	$24,100	$19,700
Accounts receivable (net)	65,000	56,000
Inventories	47,200	50,000
Prepaid expenses	3,250	8,000
Accounts payable (merchandise creditors)	23,400	17,200
Wages payable	5,300	6,400

a. Prepare the "Cash flows from operating activities" section of the statement of cash flows, using the indirect method.

b. Briefly explain why net cash flow from operating activities is different than net income.

EX 15-6 Cash flows from operating activities—indirect method

Obj. 1, 2

✔ Net cash flow from operating activities, $296,900



The net income reported on the income statement for the current year was $214,000. Depreciation recorded on equipment and a building amounted to $99,300 for the year. Balances of the current asset and current liability accounts at the beginning and end of the year are as follows:

	End of Year	Beginning of Year
Cash	$ 75,900	$ 86,150
Accounts receivable (net)	82,150	88,750
Inventories	181,600	178,000
Prepaid expenses	4,800	5,100
Accounts payable (merchandise creditors)	93,700	115,000
Salaries payable	6,500	4,900

a. Prepare the "Cash flows from operating activities" section of the statement of cash flows, using the indirect method.

b. If the direct method had been used, would the net cash flow from operating activities have been the same? Explain.

EX 15-7 Cash flows from operating activities—indirect method

Obj. 1, 2

✔ Net cash flow from operating activities, $525,410



The income statement disclosed the following items for the year:

Depreciation expense	$ 57,600
Gain on disposal of equipment	33,600
Net income	508,000

(Continued)

The changes in the current asset and liability accounts for the year are as follows:

	Increase (Decrease)
Accounts receivable	$ 8,960
Inventory	(5,120)
Prepaid insurance	(1,920)
Accounts payable	(6,080)
Income taxes payable	1,410
Dividends payable	2,200

a. Prepare the "Cash flows from operating activities" section of the statement of cash flows, using the indirect method.

b. Briefly explain why net cash flow from operating activities is different than net income.

EX 15-8 Reporting changes in equipment on statement of cash flows **Obj. 3**

An analysis of the general ledger accounts indicates that office equipment, which cost $245,000 and on which accumulated depreciation totaled $112,500 on the date of sale, was sold for $105,900 during the year. Using this information, indicate the items to be reported on the statement of cash flows.

EX 15-9 Reporting changes in equipment on statement of cash flows **Obj. 3**

An analysis of the general ledger accounts indicates that delivery equipment, which cost $75,000 and on which accumulated depreciation totaled $58,000 on the date of sale, was sold for $20,200 during the year. Using this information, indicate the items to be reported on the statement of cash flows.

EX 15-10 Reporting land transactions on statement of cash flows **Obj. 3**

On the basis of the details of the following fixed asset account, indicate the items to be reported on the statement of cash flows:

ACCOUNT ***Land*** **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Jan.	1	Balance			925,000	
Mar.	12	Purchased for cash	134,300		1,059,300	
Oct.	4	Sold for $106,800		89,400	969,900	

SHOW ME HOW

EX 15-11 Determining cash payments to stockholders **Obj. 4**

The board of directors declared cash dividends totaling $1,200,000 during the current year. The comparative balance sheet indicates dividends payable of $250,000 at the beginning of the year and $100,000 at the end of the year. What was the amount of cash payments to stockholders during the year?

EX 15-12 Reporting stockholders' equity items on statement of cash flows **Obj. 4**

On the basis of the following stockholders' equity accounts, indicate the items, exclusive of net income, to be reported on the statement of cash flows. There were no unpaid dividends at either the beginning or the end of the year.

ACCOUNT *Common Stock, $40 par* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Jan.	1	Balance, 120,000 shares				4,800,000
Apr.	2	30,000 shares issued for cash		1,200,000		6,000,000
June	30	5% stock dividend		300,000		6,300,000

ACCOUNT *Paid-In Capital in Excess of Par—Common Stock* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Jan.	1	Balance				360,000
Apr.	2	30,000 shares issued for cash		720,000		1,080,000
June	30	Stock dividend		150,000		1,230,000

ACCOUNT *Retained Earnings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Jan.	1	Balance				2,000,000
June	30	Stock dividend	450,000			1,550,000
Dec.	30	Cash dividend	315,000			1,235,000
	31	Net income		1,000,000		2,235,000

EX 15-13 Reporting land acquisition for cash and mortgage note on statement of cash flows **Obj. 3, 4**

On the basis of the details of the following fixed asset account, indicate the items to be reported on the statement of cash flows:

ACCOUNT *Land* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Jan.	1	Balance			156,000	
Feb.	10	Purchased for cash	246,000		402,000	
Nov.	20	Purchased with long-term mortgage note	324,000		726,000	

EX 15-14 Reporting issuance and retirement of long-term debt **Obj. 4**

On the basis of the details of the following bonds payable and related discount accounts, indicate the items to be reported in the "Cash flows from financing activities" section of the statement of cash flows, assuming no gain or loss on retiring the bonds:

ACCOUNT *Bonds Payable* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Jan.	1	Balance				750,000
	2	Retire bonds	150,000			600,000
June	30	Issue bonds		450,000		1,050,000

(Continued)

ACCOUNT *Discount on Bonds Payable* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
Jan.	1	Balance			33,750	
	2	Retire bonds		12,000	21,750	
June	30	Issue bonds	30,000		51,750	
Dec.	31	Amortize discount		2,625	49,125	

EX 15-15 Determining net income from net cash flow from operating activities **Obj. 2, 3, 4**

✔ Net income, $341,770



SHOW ME HOW

Curwen Inc. reported net cash flow from operating activities of $357,500 on its statement of cash flows for the year ended December 31. The following information was reported in the "Cash flows from operating activities" section of the statement of cash flows, using the indirect method:

Decrease in income taxes payable	$ 7,700
Decrease in inventories	19,140
Depreciation	29,480
Gain on sale of investments	13,200
Increase in accounts payable	5,280
Increase in prepaid expenses	2,970
Increase in accounts receivable	14,300

a. Determine the net income reported by Curwen Inc. for the year ended December 31.

b. Briefly explain why Curwen's net income is different than net cash flow from operating activities.

EX 15-16 Cash flows from operating activities—indirect method **Obj. 2**

✔ Net cash flow from operating activities, $58,020



EXCEL TEMPLATE



REAL WORLD

Selected data (in thousands) derived from the income statement and balance sheet of **National Beverage Corp.** for a recent year are as follows:

Income statement data:	
Net income	$49,311
Gain on disposal of property	1,188
Depreciation expense	11,580
Other items involving noncash expenses	1,383
Balance sheet data:	
Increase in accounts receivable	1,746
Decrease in inventory	990
Increase in prepaid expenses	605
Decrease in accounts payable	710
Decrease in accrued and other current liabilities	995

a. Prepare the "Cash flows from operating activities" section of the statement of cash flows, using the indirect method for National Beverage Corp.

b. Interpret your results in part (a).

EX 15-17 Statement of cash flows—indirect method

Obj. 2, 3, 4, 5

✔ Net cash flow from operating activities, $38


SHOW ME HOW


EXCEL TEMPLATE

The comparative balance sheet of Olson-Jones Industries Inc. for December 31, 20Y2 and 20Y1, is as follows:

	Dec. 31, 20Y2	Dec. 31, 20Y1
Assets		
Cash	$183	$ 14
Accounts receivable (net)	55	49
Inventories	117	99
Land	250	330
Equipment	205	175
Accumulated depreciation—equipment	(68)	(42)
Total assets	$742	$625
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 51	$ 37
Dividends payable	5	—
Common stock, $1 par	125	80
Paid-in capital in excess of par—common stock	85	70
Retained earnings	476	438
Total liabilities and stockholders' equity	$742	$625

The following additional information is taken from the records:

a. Land was sold for $120.

b. Equipment was acquired for cash.

c. There were no disposals of equipment during the year.

d. The common stock was issued for cash.

e. There was a $62 credit to Retained Earnings for net income.

f. There was a $24 debit to Retained Earnings for cash dividends declared.

a. Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

b. Was Olson-Jones's net cash flow from operations more or less than net income? What is the source of this difference?

EX 15-18 Statement of cash flows—indirect method

Obj. 2, 3, 4, 5

List the errors you find in the following statement of cash flows. The cash balance at the beginning of the year was $240,000. All other amounts are correct, except the cash balance at the end of the year.

Shasta Inc.
Statement of Cash Flows
For the Year Ended December 31, 20Y9

Cash flows from (used for) operating activities:		
Net income	$ 360,000	
Adjustments to reconcile net income to net cash flow from operating activities:		
Depreciation	100,800	
Gain on sale of investments	17,280	
Changes in current operating assets and liabilities:		
Increase in accounts receivable	27,360	
Increase in inventories	(36,000)	
Increase in accounts payable	(3,600)	
Decrease in accrued expenses payable	(2,400)	
Net cash flow from operating activities		$ 463,440
Cash flows from (used for) investing activities:		
Cash received from sale of investments	$ 240,000	
Cash paid for purchase of land	(259,200)	
Cash paid for purchase of equipment	(432,000)	
Net cash flow used for investing activities		(415,200)

(Continued)

Cash flows from (used for) financing activities:		
Cash received from sale of common stock	$ 312,000	
Cash paid for dividends	(132,000)	
Net cash flow from financing activities		180,000
Net increase in cash		$ 47,760
Cash balance, December 31, 20Y9		192,240
Cash balance, January 1, 20Y9		$ 240,000

Appendix 2

EX 15-19 Cash flows from operating activities—direct method

✔ a. $801,900

The cash flows from operating activities are reported by the direct method on the statement of cash flows. Determine the following:

a. If sales for the current year were $753,500 and accounts receivable decreased by $48,400 during the year, what was the amount of cash received from customers?

b. If income tax expense for the current year was $50,600 and income tax payable decreased by $5,500 during the year, what was the amount of cash payments for income taxes?

c. Briefly explain why the cash received from customers in (a) is different than sales.

Appendix 2

EX 15-20 Determining selected amounts for cash flows from operating activities—direct method

✔ a. $1,025,800

Selected data taken from the accounting records of Ginis Inc. for the current year ended December 31 are as follows:

	Balance, December 31	Balance, January 1
Accrued expenses payable (operating expenses)	$ 12,650	$ 14,030
Accounts payable (merchandise creditors)	96,140	105,800
Inventories	178,020	193,430
Prepaid expenses	7,360	8,970

During the current year, the cost of goods sold was $1,031,550, and the operating expenses other than depreciation were $179,400. The direct method is used for presenting the cash flows from operating activities on the statement of cash flows.

Determine the amount reported on the statement of cash flows for (a) cash payments for merchandise and (b) cash payments for operating expenses.

Appendix 2

EX 15-21 Cash flows from operating activities—direct method

✔ Net cash flow from operating activities, $96,040

The income statement of Booker T Industries Inc. for the current year ended June 30 is as follows:

Sales		$ 511,000
Cost of goods sold		(290,500)
Gross profit		$ 220,500
Operating expenses:		
Depreciation expense	$ 39,200	
Other operating expenses	105,000	
Total operating expenses		(144,200)
Income before income tax		$ 76,300
Income tax expense		(21,700)
Net income		$ 54,600

Changes in the balances of selected accounts from the beginning to the end of the current year are as follows:

	Increase (Decrease)
Accounts receivable (net)	$(11,760)
Inventories	3,920
Prepaid expenses	(3,780)
Accounts payable (merchandise creditors)	(7,980)
Accrued expenses payable (operating expenses)	1,260
Income tax payable	(2,660)

a. Prepare the "Cash flows from operating activities" section of the statement of cash flows, using the direct method.

b. What does the direct method show about a company's cash flows from operating activities that is not shown using the indirect method?

Appendix 2

EX 15-22 Cash flows from operating activities—direct method

✔ Net cash flow from operating activities, $123,860

The income statement for Rhino Company for the current year ended June 30 and balances of selected accounts at the beginning and the end of the year are as follows:

Sales		$ 445,500
Cost of goods sold		(154,000)
Gross profit		$ 291,500
Operating expenses:		
Depreciation expense	$ 38,500	
Other operating expenses	115,280	
Total operating expenses		(153,780)
Income before income tax		$ 137,720
Income tax expense		(39,600)
Net income		$ 98,120

	End of Year	Beginning of Year
Accounts receivable (net)	$36,300	$31,240
Inventories	92,400	80,300
Prepaid expenses	14,520	15,840
Accounts payable (merchandise creditors)	67,540	62,700
Accrued expenses payable (operating expenses)	19,140	20,900
Income tax payable	4,400	4,400

Prepare the "Cash flows from operating activities" section of the statement of cash flows, using the direct method.

Problems: Series A

✔ Net cash flow from operating activities, $490,000

SHOW ME HOW EXCEL TEMPLATE

PR 15-1A Statement of cash flows—indirect method **Obj. 2, 3, 4, 5**

The comparative balance sheet of Livers Inc. for December 31, 20Y3 and 20Y2, is shown as follows:

	Dec. 31, 20Y3	Dec. 31, 20Y2
Assets		
Cash	$ 155,000	$ 150,000
Accounts receivable (net)	450,000	400,000
Inventories	770,000	750,000
Investments	0	100,000
Land	500,000	0
Equipment	1,400,000	1,200,000
Accumulated depreciation—equipment	(600,000)	(500,000)
Total assets	$2,675,000	$2,100,000
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 340,000	$ 300,000
Accrued expenses payable (operating expenses)	45,000	50,000
Dividends payable	30,000	25,000
Common stock, $4 par	700,000	600,000
Paid-in capital in excess of par—common stock	200,000	175,000
Retained earnings	1,360,000	950,000
Total liabilities and stockholders' equity	$2,675,000	$2,100,000

Additional data obtained from an examination of the accounts in the ledger for 20Y3 are as follows:

a. The investments were sold for $175,000 cash.

b. Equipment and land were acquired for cash.

c. There were no disposals of equipment during the year.

d. The common stock was issued for cash.

e. There was a $500,000 credit to Retained Earnings for net income.

f. There was a $90,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

✔ Net cash flow from operating activities, $350,000

SHOW ME HOW EXCEL TEMPLATE

PR 15-2A Statement of cash flows—indirect method **Obj. 2, 3, 4, 5**

The comparative balance sheet of Yellow Dog Enterprises Inc. at December 31, 20Y8 and 20Y7, is as follows:

	Dec. 31, 20Y8	Dec. 31, 20Y7
Assets		
Cash	$ 95,000	$ 110,000
Accounts receivable (net)	260,000	280,000
Inventories	520,000	450,000
Prepaid expenses	15,000	5,000
Equipment	1,130,000	800,000
Accumulated depreciation—equipment	(235,000)	(190,000)
Total assets	$1,785,000	$1,455,000
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 100,000	$ 75,000
Mortgage note payable	0	500,000
Common stock, $10 par	500,000	200,000
Paid-in capital in excess of par—common stock	400,000	100,000
Retained earnings	785,000	580,000
Total liabilities and stockholders' equity	$1,785,000	$1,455,000

Additional data obtained from the income statement and from an examination of the accounts in the ledger for 20Y8 are as follows:

a. Net income, $250,000.

b. Depreciation reported on the income statement, $135,000.

c. Equipment was purchased at a cost of $420,000 and fully depreciated equipment costing $90,000 was discarded, with no salvage realized.

d. The mortgage note payable was not due for six years, but the terms permitted earlier payment without penalty.

e. 30,000 shares of common stock were issued at $20 for cash.

f. Cash dividends declared and paid, $45,000.

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

PR 15-3A Statement of cash flows—indirect method

Obj. 2, 3, 4, 5

✔ Net cash flow used for operating activities, $(169,600)



EXCEL TEMPLATE

The comparative balance sheet of Whitman Co. at December 31, 20Y2 and 20Y1, is as follows:

	Dec. 31, 20Y2	Dec. 31, 20Y1
Assets		
Cash	$ 918,000	$ 964,800
Accounts receivable (net)	828,900	761,940
Inventories	1,268,460	1,162,980
Prepaid expenses	29,340	35,100
Land	315,900	479,700
Buildings	1,462,500	900,900
Accumulated depreciation—buildings	(408,600)	(382,320)
Equipment	512,280	454,680
Accumulated depreciation—equipment	(141,300)	(158,760)
Total assets	$4,785,480	$4,219,020
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 922,500	$ 958,320
Bonds payable	270,000	0
Common stock, $25 par	317,000	117,000
Paid-in capital in excess of par—common stock	758,000	558,000
Retained earnings	2,517,980	2,585,700
Total liabilities and stockholders' equity	$4,785,480	$4,219,020

The noncurrent asset, noncurrent liability, and stockholders' equity accounts for 20Y2 are as follows:

ACCOUNT *Land* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance			479,700	
Apr.	20	Realized $151,200 cash from sale		163,800	315,900	

ACCOUNT *Buildings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance			900,900	
Apr.	20	Acquired for cash	561,600		1,462,500	

(Continued)

ACCOUNT *Accumulated Depreciation—Buildings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				382,320
Dec.	31	Depreciation for year		26,280		408,600

ACCOUNT *Equipment* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance			454,680	
	26	Discarded, no salvage		46,800	407,880	
Aug.	11	Purchased for cash	104,400		512,280	

ACCOUNT *Accumulated Depreciation—Equipment* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				158,760
	26	Equipment discarded	46,800			111,960
Dec.	31	Depreciation for year		29,340		141,300

ACCOUNT *Bonds Payable* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
May	1	Issued 20-year bonds		270,000		270,000

ACCOUNT *Common Stock, $25 par* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				117,000
Dec.	7	Issued 8,000 shares of common stock for $50 per share		200,000		317,000

ACCOUNT *Paid-In Capital in Excess of Par—Common Stock* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				558,000
Dec.	7	Issued 8,000 shares of common stock for $50 per share		200,000		758,000

ACCOUNT *Retained Earnings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				2,585,700
Dec.	31	Net loss	35,320			2,550,380
	31	Cash dividends	32,400			2,517,980

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

Appendix 2

PR 15-4A Statement of cash flows—direct method

✔ Net cash flow from operating activities, $293,600

SHOW ME HOW EXCEL TEMPLATE

The comparative balance sheet of Canace Products Inc. for December 31, 20Y6 and 20Y5, is as follows:

	Dec. 31, 20Y6	Dec. 31, 20Y5
Assets		
Cash	$ 643,400	$ 679,400
Accounts receivable (net)	566,800	547,400
Inventories	1,011,000	982,800
Investments	0	240,000
Land	520,000	0
Equipment	880,000	680,000
Accumulated depreciation	(244,400)	(200,400)
Total assets	$3,376,800	$2,929,200
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 771,800	$ 748,400
Accrued expenses payable (operating expenses)	63,400	70,800
Dividends payable	8,800	6,400
Common stock, $2 par	56,000	32,000
Paid-in capital in excess of par—common stock	408,000	192,000
Retained earnings	2,068,800	1,879,600
Total liabilities and stockholders' equity	$3,376,800	$2,929,200

The income statement for the year ended December 31, 20Y6, is as follows:

Sales		$ 5,980,000
Cost of goods sold		(2,452,000)
Gross profit		$ 3,528,000
Operating expenses:		
Depreciation expense	$ 44,000	
Other operating expenses	3,100,000	
Total operating expenses		(3,144,000)
Operating income		$ 384,000
Other expense:		
Loss on sale of investments		(64,000)
Income before income tax		$ 320,000
Income tax expense		(102,800)
Net income		$ 217,200

Additional data obtained from an examination of the accounts in the ledger for 20Y6 are as follows:

a. Equipment and land were acquired for cash.

b. There were no disposals of equipment during the year.

(Continued)

c. The investments were sold for $176,000 cash.

d. The common stock was issued for cash.

e. There was a $28,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the direct method of presenting cash flows from operating activities.

Appendix 2

PR 15-5A Statement of cash flows—direct method applied to PR 15-1A

✔ Net cash flow from operating activities, $490,000



EXCEL TEMPLATE

The comparative balance sheet of Livers Inc. for December 31, 20Y3 and 20Y2, is as follows:

	Dec. 31, 20Y3	Dec. 31, 20Y2
Assets		
Cash	$ 155,000	$ 150,000
Accounts receivable (net)	450,000	400,000
Inventories	770,000	750,000
Investments	0	100,000
Land	500,000	0
Equipment	1,400,000	1,200,000
Accumulated depreciation—equipment	(600,000)	(500,000)
Total assets	$2,675,000	$2,100,000
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 340,000	$ 300,000
Accrued expenses payable (operating expenses)	45,000	50,000
Dividends payable	30,000	25,000
Common stock, $4 par	700,000	600,000
Paid-in capital in excess of par—common stock	200,000	175,000
Retained earnings	1,360,000	950,000
Total liabilities and stockholders' equity	$2,675,000	$2,100,000

The income statement for the year ended December 31, 20Y3, is as follows:

Sales		$ 3,000,000
Cost of goods sold		(1,400,000)
Gross profit		$ 1,600,000
Operating expenses:		
Depreciation expense	$100,000	
Other operating expenses	950,000	
Total operating expenses		(1,050,000)
Operating income		$ 550,000
Other revenue:		
Gain on sale of investments		75,000
Income before income tax		$ 625,000
Income tax expense		(125,000)
Net income		$ 500,000

Additional data obtained from an examination of the accounts in the ledger for 20Y3 are as follows:

a. The investments were sold for $175,000 cash.

b. Equipment and land were acquired for cash.

c. There were no disposals of equipment during the year.

d. The common stock was issued for cash.

e. There was a $90,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the direct method of presenting cash flows from operating activities.

Problems: Series B

✔ Net cash flow from operating activities, $154,260

SHOW ME HOW EXCEL TEMPLATE

PR 15-1B Statement of cash flows—indirect method **Obj. 2, 3, 4, 5**

The comparative balance sheet of Merrick Equipment Co. for December 31, 20Y9 and 20Y8, is as follows:

	Dec. 31, 20Y9	Dec. 31, 20Y8
Assets		
Cash	$ 70,720	$ 47,940
Accounts receivable (net)	207,230	188,190
Inventories	298,520	289,850
Investments	0	102,000
Land	295,800	0
Equipment	438,600	358,020
Accumulated depreciation—equipment	(99,110)	(84,320)
Total assets	$1,211,760	$901,680
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 205,700	$194,140
Accrued expenses payable (operating expenses)	30,600	26,860
Dividends payable	25,500	20,400
Common stock, $1 par	202,000	102,000
Paid-in capital in excess of par—common stock	354,000	204,000
Retained earnings	393,960	354,280
Total liabilities and stockholders' equity	$1,211,760	$901,680

Additional data obtained from an examination of the accounts in the ledger for 20Y9 are as follows:

a. Equipment and land were acquired for cash.
b. There were no disposals of equipment during the year.
c. The investments were sold for $91,800 cash.
d. The common stock was issued for cash.
e. There was a $141,680 credit to Retained Earnings for net income.
f. There was a $102,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

✔ Net cash flow from operating activities, $561,400

SHOW ME HOW EXCEL TEMPLATE

PR 15-2B Statement of cash flows—indirect method **Obj. 2, 3, 4, 5**

The comparative balance sheet of Harris Industries Inc. at December 31, 20Y4 and 20Y3, is as follows:

	Dec. 31, 20Y4	Dec. 31, 20Y3
Assets		
Cash	$ 443,240	$ 360,920
Accounts receivable (net)	665,280	592,200
Inventories	887,880	1,022,560
Prepaid expenses	31,640	25,200
Land	302,400	302,400
Buildings	1,713,600	1,134,000
Accumulated depreciation—buildings	(466,200)	(414,540)
Machinery and equipment	781,200	781,200
Accumulated depreciation—machinery and equipment	(214,200)	(191,520)
Patents	106,960	112,000
Total assets	$4,251,800	$3,724,420

(Continued)

Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 837,480	$ 927,080
Dividends payable	32,760	25,200
Salaries payable	78,960	87,080
Mortgage note payable, due in nine years	224,000	0
Bonds payable	0	390,000
Common stock, $5 par	200,400	50,400
Paid-in capital in excess of par—common stock	366,000	126,000
Retained earnings	2,512,200	2,118,660
Total liabilities and stockholders' equity	$4,251,800	$3,724,420

An examination of the income statement and the accounting records revealed the following additional information applicable to 20Y4:

a. Net income, $524,580.

b. Depreciation expense reported on the income statement: buildings, $51,660; machinery and equipment, $22,680.

c. Patent amortization reported on the income statement, $5,040.

d. A building was constructed for $579,600.

e. A mortgage note for $224,000 was issued for cash.

f. 30,000 shares of common stock were issued at $13 in exchange for the bonds payable.

g. Cash dividends declared, $131,040.

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

PR 15-3B Statement of cash flows—indirect method

Obj. 2, 3, 4, 5

✔ Net cash flow from operating activities, $162,800

EXCEL TEMPLATE

The comparative balance sheet of Coulson, Inc. at December 31, 20Y2 and 20Y1, is as follows:

	Dec. 31, 20Y2	Dec. 31, 20Y1
Assets		
Cash	$ 300,600	$ 337,800
Accounts receivable (net)	704,400	609,600
Inventories	918,600	865,800
Prepaid expenses	18,600	26,400
Land	990,000	1,386,000
Buildings	1,980,000	990,000
Accumulated depreciation—buildings	(397,200)	(366,000)
Equipment	660,600	529,800
Accumulated depreciation—equipment	(133,200)	(162,000)
Total assets	$5,042,400	$4,217,400
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 594,000	$ 631,200
Income taxes payable	26,400	21,600
Bonds payable	330,000	0
Common stock, $20 par	320,000	180,000
Paid-in capital in excess of par—common stock	950,000	810,000
Retained earnings	2,822,000	2,574,600
Total liabilities and stockholders' equity	$5,042,400	$4,217,400

The noncurrent asset, noncurrent liability, and stockholders' equity accounts for 20Y2 are as follows:

ACCOUNT *Land* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance			1,386,000	
Apr.	20	Realized $456,000 cash from sale		396,000	990,000	

ACCOUNT *Buildings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance			990,000	
Apr.	20	Acquired for cash	990,000		1,980,000	

ACCOUNT *Accumulated Depreciation—Buildings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				366,000
Dec.	31	Depreciation for year		31,200		397,200

ACCOUNT *Equipment* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance			529,800	
	26	Discarded, no salvage		66,000	463,800	
Aug.	11	Purchased for cash	196,800		660,600	

ACCOUNT *Accumulated Depreciation—Equipment* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				162,000
	26	Equipment discarded	66,000			96,000
Dec.	31	Depreciation for year		37,200		133,200

ACCOUNT *Bonds Payable* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
May	1	Issued 20-year bonds		330,000		330,000

(Continued)

ACCOUNT *Common Stock, $20 par* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				180,000
Dec.	7	Issued 7,000 shares of common stock for $40 per share		140,000		320,000

ACCOUNT *Paid-In Capital in Excess of Par—Common Stock* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				810,000
Dec.	7	Issued 7,000 shares of common stock for $40 per share		140,000		950,000

ACCOUNT *Retained Earnings* **ACCOUNT NO.**

Date		Item	Debit	Credit	Balance	
					Debit	Credit
20Y2						
Jan.	1	Balance				2,574,600
Dec.	31	Net income		326,600		2,901,200
	31	Cash dividends	79,200			2,822,000

Instructions

Prepare a statement of cash flows, using the indirect method of presenting cash flows from operating activities.

Appendix 2
PR 15-4B Statement of cash flows—direct method

✔ Net cash flow from operating activities, $509,220


SHOW ME HOW


EXCEL TEMPLATE

The comparative balance sheet of Martinez Inc. for December 31, 20Y4 and 20Y3, is as follows:

	Dec. 31, 20Y4	Dec. 31, 20Y3
Assets		
Cash	$ 661,920	$ 683,100
Accounts receivable (net)	992,640	914,400
Inventories	1,394,400	1,363,800
Investments	0	432,000
Land	960,000	0
Equipment	1,224,000	984,000
Accumulated depreciation—equipment	(481,500)	(368,400)
Total assets	$4,751,460	$4,008,900
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$1,080,000	$ 966,600
Accrued expenses payable (operating expenses)	67,800	79,200
Dividends payable	100,800	91,200
Common stock, $5 par	130,000	30,000
Paid-in capital in excess of par—common stock	950,000	450,000
Retained earnings	2,422,860	2,391,900
Total liabilities and stockholders' equity	$4,751,460	$4,008,900

The income statement for the year ended December 31, 20Y3, is as follows:

Sales		$ 4,512,000
Cost of goods sold		(2,352,000)
Gross profit		$ 2,160,000
Operating expenses:		
Depreciation expense	$ 113,100	
Other operating expenses	1,344,840	
Total operating expenses		(1,457,940)
Operating income		$ 702,060
Other revenue:		
Gain on sale of investments		156,000
Income before income tax		$ 858,060
Income tax expense		(299,100)
Net income		$ 558,960

Additional data obtained from an examination of the accounts in the ledger for 20Y3 are as follows:

a. Equipment and land were acquired for cash.
b. There were no disposals of equipment during the year.
c. The investments were sold for $588,000 cash.
d. The common stock was issued for cash.
e. There was a $528,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the direct method of presenting cash flows from operating activities.

Appendix 2

PR 15-5B Statement of cash flows—direct method applied to PR 15-1B

✔ Net cash flow from operating activities, $154,260



EXCEL TEMPLATE

The comparative balance sheet of Merrick Equipment Co. for Dec. 31, 20Y9 and 20Y8, is:

	Dec. 31, 20Y9	Dec. 31, 20Y8
Assets		
Cash	$ 70,720	$ 47,940
Accounts receivable (net)	207,230	188,190
Inventories	298,520	289,850
Investments	0	102,000
Land	295,800	0
Equipment	438,600	358,020
Accumulated depreciation—equipment	(99,110)	(84,320)
Total assets	$1,211,760	$ 901,680
Liabilities and Stockholders' Equity		
Accounts payable (merchandise creditors)	$ 205,700	$ 194,140
Accrued expenses payable (operating expenses)	30,600	26,860
Dividends payable	25,500	20,400
Common stock, $1 par	202,000	102,000
Paid-in capital in excess of par—common stock	354,000	204,000
Retained earnings	393,960	354,280
Total liabilities and stockholders' equity	$1,211,760	$ 901,680

(Continued)

The income statement for the year ended December 31, 20Y9, is as follows:

Sales		$ 2,023,898
Cost of goods sold		(1,245,476)
Gross profit		$ 778,422
Operating expenses:		
Depreciation expense	$ 14,790	
Other operating expenses	517,299	
Total operating expenses		(532,089)
Operating income		$ 246,333
Other expenses:		
Loss on sale of investments		(10,200)
Income before income tax		$ 236,133
Income tax expense		(94,453)
Net income		$ 141,680

Additional data obtained from an examination of the accounts in the ledger for 20Y9 are as follows:

a. Equipment and land were acquired for cash.

b. There were no disposals of equipment during the year.

c. The investments were sold for $91,800 cash.

d. The common stock was issued for cash.

e. There was a $102,000 debit to Retained Earnings for cash dividends declared.

Instructions

Prepare a statement of cash flows, using the direct method of presenting cash flows from operating activities.

Make a Decision
Free Cash Flow

REAL WORLD

MAD 15-1 Analyze and compare Amazon.com, Best Buy, and Wal-Mart **Obj. 6**

Amazon.com, Inc. (AMZN) is one of the largest Internet retailers in the world. **Best Buy Co., Inc. (BBY)** is a leading retailer of consumer electronics and media products in the United States, while **Wal-Mart Stores, Inc. (WMT)** is the leading retailer in the United States. Amazon, Best Buy, and Wal-Mart compete in similar markets. Best Buy and Wal-Mart sell through both traditional retail stores and the Internet, while Amazon sells only through the Internet. Sales and cash flow information from recent annual reports for all three companies is as follows (in millions):

	Amazon	Best Buy	Wal-Mart
Sales	$135,987	$39,403	$485,873
Cash flows from operating activities	16,443	2,545	31,530
Purchases of property, plant, and equipment	(6,737)	(582)	(10,619)

a. Determine the free cash flow for all three companies.

b. Compute the ratio of free cash flow to sales for all three companies. Round percentages to one decimal place.

c. How does Amazon compare to the other two companies with respect to generating free cash flow?

REAL WORLD

MAD 15-2 Analyze and compare Apple, Coca-Cola, and Verizon **Obj. 6**

Financial information for **Apple Inc. (AAPL)**, **The Coca-Cola Company (KO)**, and **Verizon Communications (VZ)** follows (in millions):

	Apple	Coca-Cola	Verizon
Sales	$215,639	$41,863	$125,980
Cash flows from operating activities	65,824	8,796	22,715
Cash used to purchase property, plant, and equipment	(12,734)	(2,262)	(17,059)

a. Compute the free cash flow for each company.

b. Compute the ratio of free cash flow to sales for each company. Round to one decimal place.

c. Which company has the greatest free cash flow?

d. How does Verizon differ from the other two companies?

REAL WORLD

MAD 15-3 Analyze Aeropostale **Obj. 6**

Aeropostale, Inc. (AROPQ) is a specialty retailer of casual apparel and accessories for teens. Recently, the company declared bankruptcy to provide financial protection while attempting to reorganize its operations. Annual report information for the three most recent years prior to the bankruptcy are as follows (in millions):

	Year 3	Year 2	Year 1
Cash flows from operating activities	$ (68)	$ (56)	$ (38)
Cash used to purchase property, plant, and equipment	(16)	(24)	(84)
Sales	1,507	1,839	2,091

a. Determine the free cash flow.

b. Determine the ratio of free cash flow to sales. Round percentages to one decimal place.

c. Did the free cash flow information indicate financial stress? Explain.

REAL WORLD

MAD 15-4 Analyze and compare AT&T and Facebook **Obj. 6**

AT&T Inc. (T) is a leading global provider of telecommunication services. **Facebook, Inc. (FB)** is a major worldwide social media company. AT&T has a lengthy history and was founded by Alexander Graham Bell. Facebook has a short history and was founded by Mark Zuckerberg. Facebook uses telecommunication networks, like those of AT&T, to deliver social content to its users. Free cash flow and revenue information for both companies for three recent years is as follows (in millions):

AT&T

Information from the statement of cash flows:

	Year 3	Year 2	Year 1
Cash flows from operating activities	$ 39,344	$ 35,880	$ 31,338
Cash used to purchase property, plant, and equipment	(22,408)	(20,015)	(21,433)

Information from the income statement:

	Year 3	Year 2	Year 1
Revenue	$163,786	$146,801	$132,447

(Continued)

Facebook
Information from the statement of cash flows:

	Year 3	Year 2	Year 1
Cash flows from operating activities	$ 16,108	$ 10,320	$ 7,326
Cash used to purchase property, plant, and equipment	(4,491)	(2,523)	(1,831)

Information from the income statement:

	Year 3	Year 2	Year 1
Revenue	$27,638	$17,928	$12,466

a. Using total revenue, which company appears to be the larger at the end of Year 3?

b. Using total revenue, which company appears to be growing faster across the three years?

c. Compute the cash used to purchase property, plant, and equipment (PP&E) as a percent of the cash flows from operating activities for all three years for each company. Round to the nearest whole percent.

d. Using the computations in (c), which company appears to require more cash to purchase PP&E, and what impact does this have on free cash flow?

e. Compute the ratio of free cash flow to revenue for all three years for each company, and plot the data on a line chart with the years on the horizontal axis.

f. Interpret the chart.

REAL WORLD

MAD 15-5 Analyze Priceline **Obj. 6**

The Priceline Group Inc. (PCLN) is a leading provider of online travel reservation services, including brand names Priceline, KAYAK, and OpenTable. Selected cash flow information from the statement of cash flows for three recent years is as follows (in millions):

	Year 3	Year 2	Year 1
Net cash provided by operating activities	$ 3,925	$ 3,102	$ 2,914
Net cash used for investing activities	(3,333)	(3,895)	(2,358)
Net cash provided by (used for) financing activities	58	(730)	1,429
Additions to property, plant, and equipment	(220)	(174)	(132)
Repurchase common stock	(1,014)	(3,089)	(750)
Acquisitions and investments	(8)	(140)	(2,496)

a. Determine the net change in cash for each year.

b. Determine the free cash flow for each year.

c. How is the free cash flow being used based on the data provided?

d. Which is better for measuring the cash flow available for investment, dividends, debt repayments, and stock repurchases: the change in cash for the period or the free cash flow? Explain.

Take It Further

ETHICS

TIF 15-1 Cash flow per share

Head Donuts Inc. is a retailer of designer headphones, earphones, and hands-free audio devices. Polly Ester, the company president, is reviewing the company's financial statements after the close of the fiscal year and is troubled that earnings decreased by 10%. She shares her concerns with the company's chief accountant, Lucas Simmons, who points out that the drop in earnings was balanced by a 20% increase in cash flows, from operating activities. Polly is encouraged by the increase in cash flows from operating activities, but is worried that investors might miss this information because it is "buried" in the statement of cash flows. To make it easier for investors to find this information, she instructs Lucas to include an operating cash flow per share number on the face of the income statement, directly below earnings per share. While Lucas is concerned about using such an unconventional financial reporting tactic, he agrees to include the information on the income statement.

Is Lucas behaving in an ethical and professional manner? Explain your answer.

TEAM ACTIVITY REAL WORLD

TIF 15-2 Real-world annual report

In teams, select a public company that interests you. Obtain the company's most recent annual report on Form 10-K. The Form 10-K is a company's annually required filing with the Securities and Exchange Commission (SEC). It includes the company's financial statements and accompanying notes. The Form 10-K can be obtained either (a) from the investor relations section of the company's website or (b) by using the company search feature of the SEC's EDGAR database service found at www.sec.gov/edgar/searchedgar/companysearch.html.

1. Based on the information in the company's most recent annual report, answer the following questions:
   a. What is the net cash flows from operating activities reported by the company at the end of the most recent year?
   b. What is the net cash flows from investing activities reported by the company at the end of the most recent year?
   c. What is the net cash flows from financing activities reported by the company at the end of the most recent year?
   d. What was the net increase (or decrease) in cash during the year?
2. Evaluate the company's cash inflows and outflows.

COMMUNICATION

TIF 15-3 Financial condition

Tidewater Inc., a retailer, provided the following financial information for its most recent fiscal year:

Net income	$945,000
Return on invested capital	8%
Cash flows used for operating activities	$(1,428,000)
Cash flows from investing activities	$600,000
Cash flows from financing activities	$900,000

The company's "Cash flows from operating activities" section is as follows:

Net income	$ 945,000
Depreciation	210,000
Increase in accounts receivable	(1,134,000)
Increase in inventory	(1,260,000)
Decrease in accounts payable	(189,000)
Net cash flow used for operating activities	$ (1,428,000)

(Continued)

An examination of the financial statements revealed the following additional information:

- Revenues increased during the year as a result of an aggressive marketing campaign aimed at increasing the number of new "Tidewater Card" credit card customers. This is the company's branded credit card, which can only be used at Tidewater stores. The credit card balances are accounts receivable on Tidewater's balance sheet.
- Some suppliers have made their merchandise available at a deep discount. As a result, the company purchased large quantities of these goods in an attempt to improve the company's profitability.
- In recent years, the company has struggled to pay its accounts payable on time. The company has improved on this during the past year and is nearly caught up on overdue payables balances.
- The company reported net losses in each of the two prior years.

Write a brief memo to your instructor evaluating the financial condition of Tidewater Inc.

TIF 15-4 Using the statement of cash flows

You are considering an investment in a new start-up company, Giraffe Inc., an Internet service provider. A review of the company's financial statements reveals a negative retained earnings. In addition, it appears as though the company has been running a negative cash flow from operating activities since the company's inception.

How is the company staying in business under these circumstances? Could this be a good investment?

Pathways Challenge



This is Accounting!

Information/Consequences

The statement of cash flows would not report a yearly "cash outflow" for interest expense. However, the discount on the note payable of $328 ($1,000 – $672) must be amortized to interest expense each year, even though no cash is paid. The related interest expense is reported on the income statement as an expense. Since no cash is paid for interest, the interest expense must be added back to net income under the indirect method in the operating activities section of the statement of cash flows.

The payment on each note payable of $1,000 at the maturity date includes a payment for principal ($672) and interest ($328). The amount related to the principal of $672 is reported as a cash outflow in the financing activities section, while the interest portion of $328 is reported as a cash outflow in the operating activities section. Note that as described in the preceding paragraph, the amortized discount in the year of maturity is also reported in the operating activities section as an addition to net income under the indirect method.

Suggested Answer

Chapter

16 Financial Statement Analysis

Principles

Chapter 1 *Introduction to Managerial Accounting*

Developing Information

COST SYSTEMS

Chapter 2 *Job Order Costing*
Chapter 3 *Process Costing*
Chapter 4 *Activity-Based Costing*

COST ALLOCATIONS

Chapter 5 *Support Departments*
Chapter 5 *Joint Costs*

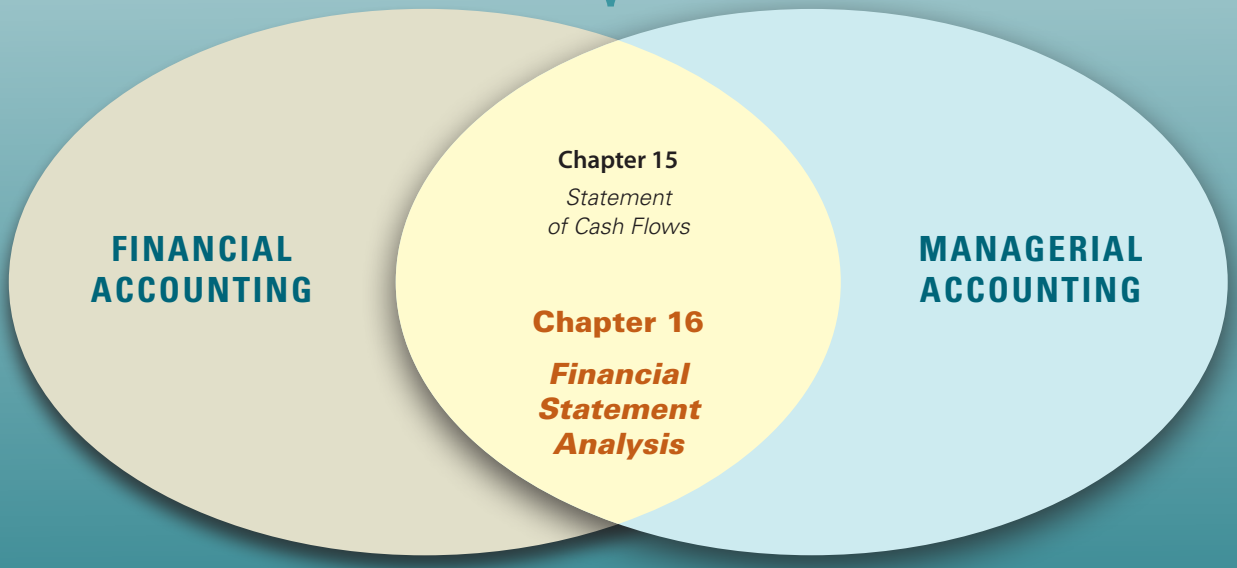
Decision Making

PLANNING AND EVALUATING TOOLS

Chapter 6 *Cost-Volume-Profit Analysis*
Chapter 7 *Variable Costing*
Chapter 8 *Budgeting Systems*
Chapter 9 *Standard Costing and Variances*
Chapter 10 *Decentralized Operations*
Chapter 11 *Differential Analysis*

STRATEGIC TOOLS

Chapter 12 *Capital Investment Analysis*
Chapter 13 *Lean Manufacturing*
Chapter 13 *Activity Analysis*
Chapter 14 *The Balanced Scorecard*
Chapter 14 *Corporate Social Responsibility*



Nike, Inc.

"Just do it." These three words identify one of the most recognizable brands in the world, **Nike, Inc. (NKE)**. While this phrase inspires athletes to "compete and achieve their potential," it also defines the company.

Nike began in 1964 as a partnership between University of Oregon track coach Bill Bowerman and one of his former student-athletes, Phil Knight. The two began by selling shoes imported from Japan out of the back of Knight's car to athletes at track-and-field events. As sales grew, the company opened retail outlets, calling itself **Blue Ribbon Sports**. The company also began to develop its own shoes. In 1971, the company commissioned a graphic design student at Portland State University to develop the swoosh logo for a fee of $35. In 1978, the company changed its name to Nike, and in 1980, it sold its first shares of stock to the public.

Nike would have been a great company to invest in at the time. If you had invested in Nike's common stock back in 1990, you would have paid $5 per share. As of November 2015, Nike's stock was worth over $130 per share. Unfortunately, you can't invest using hindsight.

How can you select companies in which to invest? Like any significant purchase, you should do some research to guide your investment decision. If you were buying a car, for example, you might go to **Edmunds.com** to obtain reviews, ratings, prices, specifications, options, and fuel economies to evaluate different vehicles. In selecting companies in which to invest, you can use financial analysis to gain insight into a company's past performance and future prospects. This chapter describes and illustrates common financial data that can be analyzed to assist you in making investment decisions such as whether or not to invest in Nike's stock.

Source: www.nikebiz.com/.



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Link to Nike . . . . . Pages 762, 763, 764, 765, 767, 770, 772, 773, 776, 778, 779, 781, 784

What's Covered

Financial Statement Analysis

Analyzing and Interpreting Financial Statements
- Value of Financial Statement Information (Obj. 1)
- Techniques (Obj. 1)

Analytical Methods
- Horizontal Analysis (Obj. 2)
- Vertical Analysis (Obj. 2)
- Common-Sized Statements (Obj. 2)

Liquidity
- Current Position (Obj. 3)
- Accounts Receivable (Obj. 3)
- Inventory (Obj. 3)

Solvency
- Fixed Assets to Long-Term Liabilities (Obj. 4)
- Liabilities to Stockholders' Equity (Obj. 4)
- Times Interest Earned (Obj. 4)

Profitability
- Asset Turnover (Obj. 5)
- Rates of Return (Obj. 5)
- Earnings per Share (Obj. 5)
- Price to Earnings (Obj. 5)
- Dividend Measures (Obj. 5)

Corpoate Annual Reports
- Management Discussion (Obj. 6)
- Internal Control (Obj. 6)
- Audit Report (Obj. 6)

Learning Objectives

Obj. 1 Describe the techniques and tools used to analyze financial statement information.

Obj. 2 Describe and illustrate basic financial statement analytical methods.

Obj. 3 Describe and illustrate how to use financial statement analysis to assess liquidity.

Obj. 4 Describe and illustrate how to use financial statement analysis to assess solvency.

Obj. 5 Describe and illustrate how to use financial statement analysis to assess profitability.

Obj. 6 Describe the contents of corporate annual reports.

Appendices 1 and 2

Obj. App 1 Describe the reporting of unusual items on the income statement.

Obj. App 2 Describe the concepts of fair value and comprehensive income.

Objective 1
Describe the techniques and tools used to analyze financial statement information.

Analyzing and Interpreting Financial Statements

The objective of accounting is to provide relevant and timely information to support the decision-making needs of financial statement users. Bankers, creditors, and investors all rely on financial statements to provide insight into a company's financial condition and performance. This chapter discusses the value of financial statement information, techniques used to evaluate financial statements, and the impact of that information on decision making.

The Value of Financial Statement Information

General-purpose financial statements are distributed to a wide range of potential users, providing each group with valuable information about a company's economic performance and financial condition. Users typically evaluate this information along three dimensions: liquidity, solvency, and profitability.

Liquidity Short-term creditors such as banks and financial institutions are primarily concerned with whether a company will be able to repay short-term borrowings such as loans and notes. As such, they are most interested in evaluating a company's ability to convert assets into cash, which is called **liquidity**.

Solvency Long-term creditors, such as bondholders, loan money for long periods of time. Thus, they are interested in evaluating a company's ability to make its periodic interest payments and repay the face amount of debt at maturity, which is called **solvency**.

Profitability Investors, such as stockholders, are the owners of the company. They benefit from increases in the price of a company's shares and are interested in evaluating the potential for the price of the company's stock to increase. The price of a company's stock depends on a variety of factors, including the company's current and potential future earnings. As such, investors focus on evaluating a company's ability to generate earnings, which is called **profitability**.

Techniques for Analyzing Financial Statements

Financial statement users rely on the following techniques to analyze and interpret a company's financial performance and condition:

- **Analytical methods** examine changes in the amount and percentage of financial statement items within and across periods.
- **Ratios** express a financial statement item or set of financial statement items as a percentage of another financial statement item, in order to measure an important economic relationship as a single number.

Both analytical methods and ratios can be used to compare a company's financial performance over time or to another company.

- *Comparisons Over Time:* The comparison of a financial statement item or ratio with the same item or ratio from a prior period often helps the user identify trends in a company's economic performance, financial condition, liquidity, solvency, and profitability.
- *Comparisons Among Companies:* The comparison of a financial statement item or ratio to other companies in the same industry can provide insight into a company's economic performance and financial condition relative to its competitors.

Analytical Methods

Objective 2
Describe and illustrate basic financial statement analytical methods.

Users analyze a company's financial statements using a variety of analytical methods. Three such methods are:

- Horizontal analysis
- Vertical analysis
- Common-sized statements

Horizontal Analysis

The analysis of increases and decreases in the amount and percentage of comparative financial statement items is called **horizontal analysis**. Each item on the most recent statement is compared with the same item on one or more earlier statements in terms of the following:

- *Amount* of increase or decrease
- *Percent* of increase or decrease

When comparing statements, the earlier statement is normally used as the base year for computing increases and decreases.

Exhibit 1 illustrates horizontal analysis for the December 31, 20Y6 and 20Y5 balance sheets of **Lincoln Company**. In Exhibit 1, the December 31, 20Y5, balance sheet (the earliest year presented) is used as the base year.

Exhibit 1 indicates that total assets decreased by $91,000 (7.4%), liabilities decreased by $133,000 (30.0%), and stockholders' equity increased by $42,000 (5.3%). Since the long-term investments account decreased by $82,500, it appears that most of the decrease in long-term liabilities of $100,000 was achieved through the sale of long-term investments.

Exhibit 1
Comparative Balance Sheet—Horizontal Analysis

Lincoln Company
Comparative Balance Sheet
December 31, 20Y6 and 20Y5

	Dec. 31, 20Y6	Dec. 31, 20Y5	Increase/(Decrease) Amount	Increase/(Decrease) Percent
Assets				
Current assets	$ 550,000	$ 533,000	$ 17,000	3.2%
Long-term investments	95,000	177,500	(82,500)	(46.5%)
Property, plant, and equipment (net)	444,500	470,000	(25,500)	(5.4%)
Intangible assets	50,000	50,000	—	—
Total assets	$1,139,500	$1,230,500	$ (91,000)	(7.4%)
Liabilities				
Current liabilities	$ 210,000	$ 243,000	$ (33,000)	(13.6%)
Long-term liabilities	100,000	200,000	(100,000)	(50.0%)
Total liabilities	$ 310,000	$ 443,000	$(133,000)	(30.0%)
Stockholders' Equity				
Preferred 6% stock, $100 par	$ 150,000	$ 150,000	—	—
Common stock, $10 par	500,000	500,000	—	—
Retained earnings	179,500	137,500	$ 42,000	30.5%
Total stockholders' equity	$ 829,500	$ 787,500	$ 42,000	5.3%
Total liabilities and stockholders' equity	$1,139,500	$1,230,500	$ (91,000)	(7.4%)

Link to Nike For a recent year, **Nike**'s current liabilities decreased by 15.4%.

The balance sheets in Exhibit 1 may be expanded or supported by a separate schedule that includes the individual asset and liability accounts. For example, Exhibit 2 is a supporting schedule of **Lincoln Company**'s current asset accounts.

Exhibit 2
Comparative Schedule of Current Assets—Horizontal Analysis

Lincoln Company
Comparative Schedule of Current Assets
December 31, 20Y6 and 20Y5

	Dec. 31, 20Y6	Dec. 31, 20Y5	Increase/(Decrease) Amount	Increase/(Decrease) Percent
Cash	$ 90,500	$ 64,700	$ 25,800	39.9%
Temporary investments	75,000	60,000	15,000	25.0%
Accounts receivable, net	115,000	120,000	(5,000)	(4.2%)
Inventories	264,000	283,000	(19,000)	(6.7%)
Prepaid expenses	5,500	5,300	200	3.8%
Total current assets	$550,000	$533,000	$ 17,000	3.2%

Exhibit 2 indicates that while cash and temporary investments increased, accounts receivable and inventories decreased. The decrease in accounts receivable could be caused by improved collection policies, which would increase cash. The decrease in inventories could be caused by increased sales.

Exhibit 3 illustrates horizontal analysis for the 20Y6 and 20Y5 income statements of **Lincoln Company**. Exhibit 3 indicates an increase in sales of $298,000, or 24.8%. However, the percentage increase in sales of 24.8% was accompanied by an even greater percentage increase in the cost of goods sold of 27.2%. Thus, gross profit increased by only 19.7% rather than by the 24.8% increase in sales.

Exhibit 3 also indicates that selling expenses increased by 29.9%. Thus, the 24.8% increase in sales could have been caused by an advertising campaign, which increased selling expenses.

Lincoln Company
Comparative Income Statement
For the Years Ended December 31, 20Y6 and 20Y5

	20Y6	20Y5	Increase/(Decrease) Amount	Increase/(Decrease) Percent
Sales	$ 1,498,000	$ 1,200,000	$298,000	24.8%
Cost of goods sold	(1,043,000)	(820,000)	223,000	27.2%
Gross profit	$ 455,000	$ 380,000	$ 75,000	19.7%
Selling expenses	$ (191,000)	$ (147,000)	$ 44,000	29.9%
Administrative expenses	(104,000)	(97,400)	6,600	6.8%
Total operating expenses	$ (295,000)	$ (244,400)	$ 50,600	20.7%
Operating income	$ 160,000	$ 135,600	$ 24,400	18.0%
Other revenue and expense:				
Other revenue	8,500	11,000	(2,500)	(22.7%)
Other expense (interest)	(6,000)	(12,000)	(6,000)	(50.0%)
Income before income tax expense	$ 162,500	$ 134,600	$ 27,900	20.7%
Income tax expense	(71,500)	(58,100)	13,400	23.1%
Net income	$ 91,000	$ 76,500	$ 14,500	19.0%

Exhibit 3
Comparative Income Statement—Horizontal Analysis

Administrative expenses increased by only 6.8%, total operating expenses increased by 20.7%, and operating income increased by 18.0%. Interest expense decreased by 50.0%. This decrease was probably caused by the 50.0% decrease in long-term liabilities (Exhibit 1). Overall, net income increased by 19.0%, a favorable result.

For a recent year, **Nike**'s net income increased by 14.9%.

Link to Nike

The comparative balance sheet in Exhibit 1 shows no change in the preferred stock or common stock accounts for 20Y5 and 20Y6. For this reason, a comparative statement of stockholders' equity is not shown. Instead, a comparative retained earnings statement is shown in Exhibit 4. Exhibit 4 indicates that retained earnings increased by 30.5% for the year. The increase is due to net income of $91,000 for the year, less dividends of $49,000.

Lincoln Company
Comparative Retained Earnings Statement
For the Years Ended December 31, 20Y6 and 20Y5

	20Y6	20Y5	Increase/(Decrease) Amount	Increase/(Decrease) Percent
Retained earnings, January 1	$137,500	$100,000	$ 37,500	37.5%
Net income	91,000	76,500	14,500	19.0%
Dividends:				
On preferred stock	(9,000)	(9,000)	—	—
On common stock	(40,000)	(30,000)	(10,000)	33.3%
Retained earnings, December 31	$179,500	$137,500	$ 42,000	30.5%

Exhibit 4
Comparative Retained Earnings Statement—Horizontal Analysis

Vertical Analysis

The percentage analysis of the relationship of each component in a financial statement to a total within the statement is called **vertical analysis**. Although vertical analysis is applied to a single statement, it may be applied on the same statement over time. This enhances the analysis by showing how the percentages of each item have changed over time.

In vertical analysis of the balance sheet, the percentages are computed as follows:

- Each asset item is stated as a percent of the total assets.
- Each liability and stockholders' equity item is stated as a percent of the total liabilities and stockholders' equity.

Exhibit 5 illustrates the vertical analysis of the December 31, 20Y6 and 20Y5 balance sheets of **Lincoln Company**. Exhibit 5 indicates that current assets have increased from 43.3% to 48.3% of total assets. Long-term investments decreased from 14.4% to 8.3% of total assets. Stockholders' equity increased from 64.0% to 72.8%, with a comparable decrease in liabilities.

Exhibit 5
Comparative Balance Sheet—Vertical Analysis

Lincoln Company
Comparative Balance Sheet
December 31, 20Y6 and 20Y5

	Dec. 31, 20Y6		Dec. 31, 20Y5	
	Amount	Percent	Amount	Percent
Assets				
Current assets	$ 550,000	48.3%	$ 533,000	43.3%
Long-term investments	95,000	8.3	177,500	14.4
Property, plant, and equipment (net)	444,500	39.0	470,000	38.2
Intangible assets	50,000	4.4	50,000	4.1
Total assets	$1,139,500	100.0%	$1,230,500	100.0%
Liabilities				
Current liabilities	$ 210,000	18.4%	$ 243,000	19.7%
Long-term liabilities	100,000	8.8	200,000	16.3
Total liabilities	$ 310,000	27.2%	$ 443,000	36.0%
Stockholders' Equity				
Preferred 6% stock, $100 par	$ 150,000	13.2%	$ 150,000	12.2%
Common stock, $10 par	500,000	43.9	500,000	40.6
Retained earnings	179,500	15.7	137,500	11.2
Total stockholders' equity	$ 829,500	72.8%	$ 787,500	64.0%
Total liabilities and stockholders' equity	$1,139,500	100.0%	$1,230,500	100.0%

Link to Nike For a recent year, **Nike**'s current assets were 70.2% of total assets.

In a vertical analysis of the income statement, each item is stated as a percent of sales. Exhibit 6 illustrates the vertical analysis of the 20Y6 and 20Y5 income statements of **Lincoln Company**.

Exhibit 6
Comparative Income Statement—Vertical Analysis

Lincoln Company
Comparative Income Statement
For the Years Ended December 31, 20Y6 and 20Y5

	20Y6		20Y5	
	Amount	Percent	Amount	Percent
Sales	$ 1,498,000	100.0%	$1,200,000	100.0%
Cost of goods sold	(1,043,000)	(69.6)	(820,000)	(68.3)
Gross profit	$ 455,000	30.4%	$ 380,000	31.7%
Selling expenses	$ (191,000)	(12.8)%	$ (147,000)	(12.3)%
Administrative expenses	(104,000)	(6.9)	(97,400)	(8.1)
Total operating expenses	$ (295,000)	(19.7)%	$ (244,400)	(20.4)%
Operating income	$ 160,000	10.7%	$ 135,600	11.3%
Other revenue and expense:				
Other revenue	8,500	0.6	11,000	0.9
Other expense (interest)	(6,000)	(0.4)	(12,000)	(1.0)
Income before income tax expense	$ 162,500	10.9%	$ 134,600	11.2%
Income tax expense	(71,500)	(4.8)	(58,100)	(4.8)
Net income	$ 91,000	6.1%	$ 76,500	6.4%

Exhibit 6 indicates a decrease in the gross profit rate from 31.7% in 20Y5 to 30.4% in 20Y6. Although this is only a 1.3 percentage point (31.7% – 30.4%) decrease, in dollars of potential gross profit, it represents a decrease of $19,474 (1.3% × $1,498,000) based on 20Y6 sales. Thus, a small percentage decrease can have a large dollar effect.

For a recent year, **Nike**'s net income was 11.6% of sales.

Link to Nike

Common-Sized Statements

In a **common-sized statement**, all items are expressed as percentages, with no dollar amounts shown. Common-sized statements are often useful for comparing one company with another or for comparing a company with industry averages.

Exhibit 7 illustrates common-sized income statements for **Lincoln Company** and Madison Corporation. Exhibit 7 indicates that Lincoln has a slightly higher gross profit percentage (30.4%) than Madison (30.0%). However, Lincoln has a higher percentage of selling expenses (12.8%) and administrative expenses (6.9%) than does Madison (11.5% and 4.1%). As a result, the operating income as a percentage of sales of Lincoln (10.7%) is less than that of Madison (14.4%).

Exhibit 7
Common-Sized Income Statements

	Lincoln Company	Madison Corporation
Sales	100.0%	100.0%
Cost of goods sold	(69.6)	(70.6)
Gross profit	30.4%	30.0%
Selling expenses	(12.8)%	(11.5)%
Administrative expenses	(6.9)	(4.1)
Total operating expenses	(19.7)%	(15.6)%
Operating income	10.7%	14.4%
Other revenue and expense:		
Other revenue	0.6	0.6
Other expense (interest)	(0.4)	(0.5)
Income before income tax expense	10.9%	14.5%
Income tax expense	(4.8)	(5.5)
Net income	6.1%	9.0%

The unfavorable difference of 3.7 (14.4% – 10.7%) percentage points in operating income would concern the managers and other stakeholders of Lincoln. The underlying causes of the difference should be investigated and possibly corrected. For example, Lincoln may decide to outsource some of its administrative duties so that its administrative expenses are more comparative to that of Madison.

Check Up Corner 16-1 Horizontal and Vertical Analyses

Select income statement data for Bukasy Company for two recent years ended December 31 are as follows:

	20Y2	20Y1
Sales	$ 2,200,000	$ 2,000,000
Cost of goods sold	(1,337,500)	(1,250,000)
Gross profit	$ 862,500	$ 750,000
Selling, general, and administrative expenses	(440,000)	(400,000)
Operating income	$ 422,500	$ 350,000

Prepare horizontal and vertical analyses of Bukasy's income statement. Round percentages to one decimal place.

Solution:

Horizontal Analysis

	20Y2	20Y1	Increase/(Decrease) Amount	Increase/(Decrease) Percent
Sales	$ 2,200,000	$ 2,000,000	$200,000	10.0%
Cost of goods sold	(1,337,500)	(1,250,000)	87,500	7.0%
Gross profit	$ 862,500	$ 750,000	$112,500	15.0%
Selling, general, and administrative expenses	(440,000)	(400,000)	40,000	10.0%
Operating income	$ 422,500	$ 350,000	$ 72,500	20.7%

Horizontal analysis shows increases and decreases in the amount and percentage of financial statement items. The amount and percentage of each item on the most recent statement is compared with the same item on one or more earlier statements.

Vertical Analysis

	20Y2		20Y1	
	Amount	Percent	Amount	Percent
Sales	$ 2,200,000	100.0%	$ 2,000,000	100.0%
Cost of goods sold	(1,337,500)	(60.8)	(1,250,000)	(62.5)
Gross profit	$ 862,500	39.2%	$ 750,000	37.5%
Selling, general, and administrative expenses	(440,000)	(20.0)	(400,000)	(20.0)
Operating income	$ 422,500	19.2%	$ 350,000	17.5%

Vertical analysis compares each component in a financial statement to a total within the statement. It can be applied to a single statement or to the same statement over time.

Check Up Corner

Objective 3
Describe and illustrate how to use financial statement analysis to assess liquidity.

Analyzing Liquidity

Liquidity analysis evaluates the ability of a company to convert current assets into cash. Banks and other short-term creditors rely heavily on liquidity analysis, because they are interested in evaluating a company's ability to repay loans and short-term notes. Exhibit 8 shows three categories of measures used to evaluate a company's liquidity. These ratios and measures focus upon a company's current position (current assets and liabilities), accounts receivable, and inventory.

Exhibit 8
Liquidity Ratios and Measures

Current Position Analysis	Accounts Receivable Analysis	Inventory Analysis
Working Capital	Accounts Receivable Turnover	Inventory Turnover
Current Ratio	Number of Days' Sales in Receivables	Number of Days' Sales in Inventory
Quick Ratio		

Current Position Analysis

Current position analysis evaluates a company's ability to pay its current liabilities. This information helps short-term creditors determine how quickly they will be repaid. This analysis includes:

- Working capital
- Current ratio
- Quick ratio

Working Capital A company's **working capital** is computed as follows:

$$\text{Working Capital} = \text{Current Assets} - \text{Current Liabilities}$$

To illustrate, the working capital for **Lincoln Company** for 20Y6 and 20Y5 is computed as follows:

	20Y6	20Y5
Current assets	$ 550,000	$ 533,000
Current liabilities	(210,000)	(243,000)
Working capital	$ 340,000	$ 290,000

The working capital is used to evaluate a company's ability to pay current liabilities. A company's working capital is often monitored monthly, quarterly, or yearly by creditors and other debtors. However, it is difficult to use working capital to compare companies of different sizes. For example, working capital of $250,000 may be adequate for a local sporting goods store, but it would be inadequate for **Nike**.

Current Ratio The **current ratio**, sometimes called the *working capital ratio*, is computed as follows:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

To illustrate, the current ratio for **Lincoln Company** is computed as follows:

	20Y6	20Y5
Current assets	$550,000	$533,000
Current liabilities	$210,000	$243,000
Current ratio	2.6 ($550,000 ÷ $210,000)	2.2 ($533,000 ÷ $243,000)

The current ratio is a more reliable indicator of a company's ability to pay its current liabilities than is working capital, and it is much easier to compare across companies. To illustrate, assume that as of December 31, 20Y6, the working capital of a competitor is much greater than Lincoln's $340,000, but its current ratio is only 1.3. Considering these facts alone, Lincoln is in a more favorable position to obtain short-term credit than the competitor because it has a higher current ratio.

For a recent five-year period, **Nike**'s average current ratio was 2.9. *Link to Nike*

Quick Ratio One limitation of working capital and the current ratio is that they do not consider the types of current assets a company has and how easily they can be turned into cash. Because of this, two companies may have the same working capital and current ratios but differ significantly in their ability to pay their current liabilities.

To illustrate, the current assets and liabilities for **Lincoln Company** and Jefferson Company as of December 31, 20Y6, are as follows:

	Lincoln Company	Jefferson Company
Current assets:		
Cash	$ 90,500	$ 45,500
Temporary investments	75,000	25,000
Accounts receivable (net)	115,000	90,000
Inventories	264,000	380,000
Prepaid expenses	5,500	9,500
Total current assets	$ 550,000	$ 550,000
Current assets	$ 550,000	$ 550,000
Current liabilities	(210,000)	(210,000)
Working capital	$ 340,000	$ 340,000
Current ratio (Current assets ÷ Current liabilities)	2.6	2.6

Lincoln and Jefferson both have a working capital of $340,000 and current ratios of 2.6. Jefferson, however, has more of its current assets in inventories. These inventories must be sold and the receivables collected before all the current liabilities can be paid. This takes time. In addition, if the market for its product declines, Jefferson may have difficulty selling its inventory. This, in turn, could impair its ability to pay its current liabilities.

In contrast, Lincoln's current assets contain more cash, temporary investments, and accounts receivable, which can easily be converted to cash. Thus, Lincoln is in a stronger current position than Jefferson to pay its current liabilities.

A ratio that captures this difference and measures the "instant" debt-paying ability of a company is the **quick ratio**, sometimes called the *acid-test ratio*. The quick ratio is computed as follows:

$$\text{Quick Ratio} = \frac{\text{Quick Assets}}{\text{Current Liabilities}}$$

Quick assets are cash and other current assets that can be easily converted to cash. Quick assets normally include cash, temporary investments, and receivables but exclude inventories and prepaid assets.

To illustrate, the quick ratios for **Lincoln Company** and Jefferson Company are computed as follows:

	Lincoln Company	Jefferson Company
Quick assets:		
Cash	$ 90,500	$ 45,500
Temporary investments	75,000	25,000
Accounts receivable (net)	115,000	90,000
Total quick assets	$280,500	$160,500
Current liabilities	$210,000	$210,000
Quick ratio	1.3 ($280,500 ÷ $210,000)	0.8 ($160,500 ÷ $210,000)

Accounts Receivable Analysis

A company's ability to collect its accounts receivable is called **accounts receivable analysis**. It includes the computation and analysis of the following:

- Accounts receivable turnover
- Number of days' sales in receivables

Collecting accounts receivable as quickly as possible improves a company's liquidity. In addition, the cash collected from receivables may be used to improve or expand operations. Quick collection of receivables also reduces the risk of uncollectible accounts.

Accounts Receivable Turnover

The **accounts receivable turnover** is computed as follows:

$$\text{Accounts Receivable Turnover} = \frac{\text{Sales}^{1}}{\text{Average Accounts Receivable}}$$

[1] If known, *credit* sales should be used in the numerator. Because credit sales are not normally known by external users, we use sales in the numerator.

To illustrate, the accounts receivable turnover for **Lincoln Company** for 20Y6 and 20Y5 is computed as follows. Lincoln's accounts receivable balance at the beginning of 20Y5 is $140,000.

	20Y6	20Y5
Sales	$1,498,000	$1,200,000
Accounts receivable (net):		
Beginning of year	$ 120,000	$ 140,000
End of year	115,000	120,000
Total	$ 235,000	$ 260,000
Average accounts receivable	$117,500 ($235,000 ÷ 2)	$130,000 ($260,000 ÷ 2)
Accounts receivable turnover	12.7 ($1,498,000 ÷ $117,500)	9.2 ($1,200,000 ÷ $130,000)

The increase in Lincoln's accounts receivable turnover from 9.2 to 12.7 indicates that the collection of receivables has improved during 20Y6. This may be due to a change in how credit is granted, collection practices, or both.

For Lincoln, the average accounts receivable was computed using the accounts receivable balance at the beginning and the end of the year. When sales are seasonal and, thus, vary throughout the year, monthly balances of receivables are often used. Also, if sales on account include notes receivable as well as accounts receivable, notes and accounts receivable are normally combined for analysis.

Number of Days' Sales in Receivables

The **number of days' sales in receivables** is computed as follows:

$$\text{Number of Days' Sales in Receivables} = \frac{\text{Average Accounts Receivable}}{\text{Average Daily Sales}}$$

where

$$\text{Average Daily Sales} = \frac{\text{Sales}}{\text{365 days}}$$

To illustrate, the number of days' sales in receivables for **Lincoln Company** is computed as follows:

	20Y6	20Y5
Average accounts receivable	$117,500 ($235,000 ÷ 2)	$130,000 ($260,000 ÷ 2)
Average daily sales	$4,104 ($1,498,000 ÷ 365)	$3,288 ($1,200,000 ÷ 365)
Number of days' sales in receivables	28.6 ($117,500 ÷ $4,104)	39.5 ($130,000 ÷ $3,288)

The number of days' sales in receivables is an estimate of the time (in days) that the accounts receivable have been outstanding. The number of days' sales in receivables is often compared with a company's credit terms to evaluate the efficiency of the collection of receivables.

To illustrate, if Lincoln's credit terms are 2/10, n/30, then Lincoln was very *inefficient* in collecting receivables in 20Y5. In other words, receivables should have been collected in 30 days or less but were being collected in 39.5 days. Although collections improved during 20Y6 to 28.6 days, there is probably still room for improvement. On the other hand, if Lincoln's credit terms are n/45, then there is probably little room for improving collections.

Inventory Analysis

A company's ability to manage its inventory effectively is evaluated using **inventory analysis**. It includes the computation and analysis of the following:

- Inventory turnover
- Number of days' sales in inventory

Excess inventory decreases liquidity by tying up funds (cash) in inventory. In addition, excess inventory increases insurance expense, property taxes, storage costs, and other related expenses. These expenses further reduce funds that could be used elsewhere to improve or expand operations.

Why It Matters

Flying Off the Shelves

Two companies with a fast inventory turnover relative to their industries are **Apple Inc. (AAPL)** and **Costco Wholesale Corporation (COST)**:

	Inventory Turnover	Industry	Industry Average
Apple	52.3	Technology	21.0
Costco	11.4	Retail	7.1

Apple turns over its inventory approximately every week. There are two primary reasons for this performance. First, Apple does not manufacture its products, but contracts their manufacture by others. Thus, Apple has no inventory related to manufacturing. Second, the Apple Store inventory moves very quickly due to the popularity of its products. Costco is one of the most effective companies within the retail industry for inventory turns. This is because Costco employs a club warehouse model that stocks a minimum variety of highly popular products. Products that don't sell quickly are removed from its offerings.

Excess inventory also increases the risk of losses because of price declines or obsolescence of the inventory. On the other hand, a company should keep enough inventory in stock so that it doesn't lose sales because of lack of inventory.

Inventory Turnover The **inventory turnover** is computed as follows:

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

To illustrate, the inventory turnover for **Lincoln Company** for 20Y6 and 20Y5 is computed as follows. Lincoln's inventory balance at the beginning of 20Y5 is $311,000.

	20Y6	20Y5
Cost of goods sold	$1,043,000	$820,000
Inventories:		
Beginning of year	$ 283,000	$311,000
End of year	264,000	283,000
Total	$ 547,000	$594,000
Average inventory	$273,500 ($547,000 ÷ 2)	$297,000 ($594,000 ÷ 2)
Inventory turnover	3.8 ($1,043,000 ÷ $273,500)	2.8 ($820,000 ÷ $297,000)

The increase in Lincoln's inventory turnover from 2.8 to 3.8 indicates that the management of inventory has improved in 20Y6. The inventory turnover improved because of an increase in the cost of goods sold, which indicates more sales and a decrease in the average inventories.

What is considered a good inventory turnover varies by type of inventory, company, and industry. For example, grocery stores have a higher inventory turnover than jewelers or furniture stores. Likewise, within a grocery store, perishable foods have a higher turnover than the soaps and cleansers.

Link to Nike For a recent five-year period, **Nike**'s average inventory turnover was 4.1.

Number of Days' Sales in Inventory The **number of days' sales in inventory** is computed as follows:

$$\text{Number of Days' Sales in Inventory} = \frac{\text{Average Inventory}}{\text{Average Daily Cost of Goods Sold}}$$

where

$$\text{Average Daily Cost of Goods Sold} = \frac{\text{Cost of Goods Sold}}{\text{365 days}}$$

To illustrate, the number of days' sales in inventory for **Lincoln Company** is computed as follows:

	20Y6	20Y5
Average inventory	$273,500 ($547,000 ÷ 2)	$297,000 ($594,000 ÷ 2)
Average daily cost of goods sold	$2,858 ($1,043,000 ÷ 365)	$2,247 ($820,000 ÷ 365)
Number of days' sales in inventory	95.7 ($273,500 ÷ $2,858)	132.2 ($297,000 ÷ $2,247)

The number of days' sales in inventory is a rough measure of the length of time it takes to purchase, sell, and replace the inventory. Lincoln's number of days' sales in inventory improved from 132.2 days to 95.7 days during 20Y6. This is a major improvement in managing inventory.

Check Up Corner 16-2 Liquidity Analysis

Select financial statement data for OM&M Inc. for two recent years follows:

	20Y2	20Y1
Select income statement information:		
Sales	$1,800,000	$1,740,000
Cost of goods sold	1,200,000	1,120,000
Select balance sheet information:		
Cash	$ 300,000	$ 290,000
Temporary investments	100,000	100,000
Accounts receivable (net)	200,000	160,000
Inventory	160,000	140,000
Accounts payable	400,000	350,000

Based on these data, calculate the following liquidity measures for 20Y2:

a. Current ratio
b. Quick ratio
c. Accounts receivable turnover
d. Inventory turnover

Solution:

a.

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}} = \frac{\$300{,}000 + \$100{,}000 + \$200{,}000 + \$160{,}000}{\$400{,}000} = \frac{\$760{,}000}{\$400{,}000} = 1.9$$

The current ratio is used to evaluate a company's ability to pay current liabilities.

b.

$$\text{Quick Ratio} = \frac{\text{Quick Assets}}{\text{Current Liabilities}} = \frac{\$300{,}000 + \$100{,}000 + \$200{,}000}{\$400{,}000} = \frac{\$600{,}000}{\$400{,}000} = 1.5$$

The quick ratio measures the "instant" debt-paying ability of a company. Quick assets are cash and other current assets that can be easily converted to cash.

c.

$$\text{Accounts Receivable Turnover} = \frac{\text{Sales}}{\text{Average Accounts Receivable}} = \frac{\$1{,}800{,}000}{(\$200{,}000 + \$160{,}000) \div 2} = \frac{\$1{,}800{,}000}{\$180{,}000} = 10.0$$

Accounts receivable turnover measures the speed with which a company collects its accounts receivable.

d.

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}} = \frac{\$1{,}200{,}000}{(\$160{,}000 + \$140{,}000) \div 2} = \frac{\$1{,}200{,}000}{\$150{,}000} = 8.0$$

Inventory turnover measures the number of times each year that a company sells its inventory.

Check Up Corner

Objective 4
Describe and illustrate how to use financial statement analysis to assess solvency.

Analyzing Solvency

Solvency analysis evaluates a company's ability to pay its long-term debts. Bondholders and other long-term creditors use solvency analysis to evaluate a company's ability to (i) repay the face amount of debt at maturity and (ii) make periodic interest payments. Three common solvency ratios are shown in Exhibit 9.

Exhibit 9
Solvency Ratios

Solvency Ratios		
Ratio of Fixed Assets to Long-Term Liabilities	Ratio of Liabilities to Stockholders' Equity	Times Interest Earned

Ratio of Fixed Assets to Long-Term Liabilities

Fixed assets are often pledged as security for long-term notes and bonds. The **ratio of fixed assets to long-term liabilities** provides a measure of how much fixed assets a company has to support its long-term debt. This measures a company's ability to repay the face amount of debt at maturity and is computed as follows:

$$\text{Ratio of Fixed Assets to Long-Term Liabilities} = \frac{\text{Fixed Assets (net)}}{\text{Long-Term Liabilities}}$$

To illustrate, the ratio of fixed assets to long-term liabilities for **Lincoln Company** is computed as follows:

	20Y6	20Y5
Fixed assets (net)	$444,500	$470,000
Long-term liabilities	$100,000	$200,000
Ratio of fixed assets to long-term liabilities	4.4 ($444,500 ÷ $100,000)	2.4 ($470,000 ÷ $200,000)

During 20Y6, Lincoln's ratio of fixed assets to long-term liabilities increased from 2.4 to 4.4. This increase was due primarily to Lincoln paying off one-half of its long-term liabilities in 20Y6.

Link to Nike For a recent year, **Nike**'s ratio of fixed assets to long-term liabilities was 0.9.

Ratio of Liabilities to Stockholders' Equity

The **ratio of liabilities to stockholders' equity** measures how much of the company is financed by debt and equity. It is computed as follows:

$$\text{Ratio of Liabilities to Stockholders' Equity} = \frac{\text{Total Liabilities}}{\text{Total Stockholders' Equity}}$$

To illustrate, the ratio of liabilities to stockholders' equity for **Lincoln Company** is computed as follows:

	20Y6	20Y5
Total liabilities	$310,000	$443,000
Total stockholders' equity	$829,500	$787,500
Ratio of liabilities to stockholders' equity	0.4 ($310,000 ÷ $829,500)	0.6 ($443,000 ÷ $787,500)

Lincoln's ratio of liabilities to stockholders' equity decreased from 0.6 to 0.4 during 20Y6. The lower ratio indicates that the proportion of Lincoln's liabilities and equity that is made up of liabilities is decreasing. This is an improvement and indicates that the margin of safety for Lincoln's creditors is improving.

For a recent five-year period, **Nike**'s average ratio of liabilities to stockholders' equity was 0.7. *Link to Nike*

Times Interest Earned

The **times interest earned**, sometimes called the *coverage ratio*, measures the risk that interest payments will not be made if earnings decrease. It is computed as follows:

$$\text{Times Interest Earned} = \frac{\text{Income Before Income Tax Expense + Interest Expense}}{\text{Interest Expense}}$$

Interest expense is paid before income taxes. In other words, interest expense is deducted in determining taxable income and, thus, income tax. For this reason, income *before taxes* is used in computing the times interest earned.

The *higher* the ratio, the more likely interest payments will be paid if earnings decrease. To illustrate, the times interest earned for **Lincoln Company** is computed as follows:

	20Y6	20Y5
Income before income tax expense	$162,500	$134,600
Interest expense	6,000	12,000
Amount available to pay interest	$168,500	$146,600
Times interest earned	28.1 ($168,500 ÷ $6,000)	12.2 ($146,600 ÷ $12,000)

The times interest earned improved from 12.2 to 28.1 during 20Y6. The higher ratio indicates that the relationship between the amount of income available to pay interest and the amount of interest expense has improved. Lincoln has more than enough earnings (28 times) to make its interest payments.

For a recent year, **Nike**'s times interest earned ratio was 12 1/2 times higher than the industry average. *Link to Nike*

Why It Matters

Liquidity Crunch

RadioShack Corporation, an electronics retailer, filed for bankruptcy protection. Information on the company's liquidity and solvency for the three years prior to bankruptcy follows:

	Year 3	Year 2	Year 1
Liquidity measures:			
Working capital (in thousands)	$748,400	$1,003,700	$1,176,700
Current ratio	2.3	2.0	2.9
Quick ratio	0.7	1.0	1.5
Solvency measures:			
Ratio of liabilities to stockholders' equity	6.7	2.8	1.9
Ratio of fixed assets to long-term liabilities	0.2	0.3	0.3

The data show that the company's liquidity and solvency measures deteriorated in the years prior to the firm's bankruptcy. All three of the company's liquidity measures declined significantly during the three-year period, indicating a growing risk that the company would not be able to repay its current liabilities. The ratio of liabilities to stockholders' equity also increased significantly during this period, indicating that the company might not be able to repay its long-term debts. Finally, the ratio of fixed assets to long-term liabilities began to deteriorate in Year 3, indicating that fewer assets would be available to secure the company's long-term liabilities.

Check Up Corner 16-3 Solvency Analysis

The following are select balance sheet and income statement data for Wilton Strand Inc. for the year ended December 31, 20Y3:

	Dec. 31, 20Y3
Assets	
Current assets	$ 560,000
Property, plant, and equipment (net)	1,400,000
Total assets	$1,960,000
Liabilities	
Current liabilities	$ 160,000
Long-term liabilities	400,000
Total liabilities	$ 560,000
Stockholders' Equity	
Common stock, $5 par	$ 200,000
Retained earnings	1,200,000
Total stockholders' equity	$1,400,000
Total liabilities and stockholders' equity	$1,960,000
Select income statement information:	
Interest expense	$ 100,000
Income before income tax expense	260,000

Based on these data, calculate the following solvency measures:

a. Ratio of fixed assets to long-term liabilities
b. Ratio of liabilities to stockholders' equity
c. Times interest earned

Solution:

a.

$$\text{Ratio of Fixed Assets to Long-Term Liabilities} = \frac{\text{Fixed Assets (net)}}{\text{Long-Term Liabilities}} = \frac{\$1,400,000}{\$400,000} = 3.5$$

Because fixed assets are often pledged as security for long-term notes and bonds, the ratio of fixed assets to long-term liabilities provides a measure of whether noteholders or bondholders will be paid.

b.

$$\text{Ratio of Liabilities to Stockholders' Equity} = \frac{\text{Total Liabilities}}{\text{Total Stockholders' Equity}} = \frac{\$560,000}{\$1,400,000} = 0.4$$

The ratio of liabilities to stockholders' equity measures how much of the company is financed by debt and equity.

c.

$$\text{Times Interest Earned} = \frac{\text{Income Before Income Tax Expense + Interest Expense}}{\text{Interest Expense}} = \frac{\$260,000 + \$100,000}{\$100,000} = \frac{\$360,000}{\$100,000} = 3.6$$

Times interest earned measures the risk that interest payments will not be made if earnings decrease.

Check Up Corner

Objective 5

Describe and illustrate how to use financial statement analysis to assess profitability.

Analyzing Profitability

Profitability analysis evaluates the ability of a company to generate future earnings. This ability depends on the relationship between the company's operating results and the assets the company has available for use in its operations. Thus, the relationships between income statement and balance sheet items are used to evaluate profitability.

Common profitability ratios are shown in Exhibit 10.

Exhibit 10
Profitability Ratios

Profitability Ratios		
Asset Turnover	Return on Stockholders' Equity	Price-Earnings Ratio
Return on Total Assets	Return on Common Stockholders' Equity	Dividends per Share
	Earnings per Share on Common Stock	Dividend Yield

Asset Turnover

The **asset turnover** ratio measures how effectively a company uses its assets. It is computed as follows:

$$\text{Asset Turnover} = \frac{\text{Sales}}{\text{Average Total Assets (excluding long-term investments)}}$$

Note that long-term investments are excluded in computing asset turnover. This is because long-term investments are unrelated to normal operations and sales.

To illustrate, the asset turnover for **Lincoln Company** is computed as follows. Total assets (excluding long-term investments) are $1,010,000 at the beginning of 20Y5.

	20Y6	20Y5
Sales	$1,498,000	$1,200,000
Total assets (excluding long-term investments):		
Beginning of year	$1,053,000*	$1,010,000
End of year	1,044,500**	1,053,000*
Total	$2,097,500	$2,063,000
Average total assets	$1,048,750 ($2,097,500 ÷ 2)	$1,031,500 ($2,063,000 ÷ 2)
Asset turnover	1.4 ($1,498,000 ÷ $1,048,750)	1.2 ($1,200,000 ÷ $1,031,500)

*($1,230,500 total assets – $177,500 long-term investments)
**($1,139,500 total assets – $95,000 long-term investments)

For Lincoln, the average total assets was computed using total assets (excluding long-term investments) at the beginning and end of the year. The average total assets could also be based on monthly or quarterly averages.

The asset turnover ratio indicates that Lincoln's use of its operating assets has improved in 20Y6. This was primarily due to the increase in sales in 20Y6.

Return on Total Assets

The **return on total assets** measures the profitability of total assets, without considering how the assets are financed. In other words, this ratio is not affected by the portion of assets financed by creditors or stockholders. It is computed as follows:

$$\text{Return on Total Assets} = \frac{\text{Net Income} + \text{Interest Expense}}{\text{Average Total Assets}}$$

The return on total assets is computed by adding interest expense to net income. By adding interest expense to net income, the effect of whether the assets are financed by creditors (debt) or stockholders (equity) is eliminated. Because net income includes any income earned from long-term investments, the average total assets includes long-term investments as well as the net operating assets.

To illustrate, the return on total assets by **Lincoln Company** is computed as follows. Total assets are $1,187,500 at the beginning of 20Y5.

	20Y6	20Y5
Net income	$ 91,000	$ 76,500
Interest expense	6,000	12,000
	$ 97,000	$ 88,500
Total assets:		
Beginning of year	$1,230,500	$1,187,500
End of year	1,139,500	1,230,500
Total	$2,370,000	$2,418,000
Average total assets	$1,185,000 ($2,370,000 ÷ 2)	$1,209,000 ($2,418,000 ÷ 2)
Return on total assets	8.2% ($97,000 ÷ $1,185,000)	7.3% ($88,500 ÷ $1,209,000)

The return on total assets improved from 7.3% to 8.2% during 20Y6.

The *return on operating assets* is sometimes computed when there are large amounts of nonoperating income and expense. It is computed as follows:

$$\text{Return on Operating Assets} = \frac{\text{Operating Income}}{\text{Average Operating Assets}}$$

Because Lincoln does not have a significant amount of nonoperating income and expense, the return on operating assets is not illustrated.

Link to Nike For a recent five-year period, **Nike**'s average return on total assets was 15.8%.

Return on Stockholders' Equity

The **return on stockholders' equity** measures the rate of income earned on the amount invested by the stockholders. It is computed as follows:

$$\text{Return on Stockholders' Equity} = \frac{\text{Net Income}}{\text{Average Total Stockholders' Equity}}$$

To illustrate, the return on stockholders' equity for **Lincoln Company** is computed as follows. Total stockholders' equity is $750,000 at the beginning of 20Y5.

	20Y6	20Y5
Net income	$ 91,000	$ 76,500
Total stockholders' equity:		
Beginning of year	$ 787,500	$ 750,000
End of year	829,500	787,500
Total	$1,617,000	$1,537,500
Average total stockholders' equity	$808,500 ($1,617,000 ÷ 2)	$768,750 ($1,537,500 ÷ 2)
Return on stockholders' equity	11.3% ($91,000 ÷ $808,500)	10.0% ($76,500 ÷ $768,750)

The return on stockholders' equity improved from 10.0% to 11.3% during 20Y6.

Leverage involves using debt to increase the return on an investment. The return on stockholders' equity is normally higher than the return on total assets. This is because of the effect of leverage.

For **Lincoln Company**, the effect of leverage for 20Y6 is 3.1% and for 20Y5 is 2.7% computed as follows:

	20Y6	20Y5
Return on stockholders' equity	11.3%	10.0%
Return on total assets	(8.2)	(7.3)
Effect of leverage	3.1%	2.7%

Exhibit 11 shows the 20Y6 and 20Y5 effects of leverage for Lincoln.

Link to Nike For a recent five-year period, **Nike**'s average return on stockholders' equity was 25.5%.

Why It Matters

The Accounting Equation

Another term for leverage is "financial gearing." **Exxon Mobil Corporation (XOM)**, a worldwide-integrated energy company, is an example of a company that uses leverage for financial advantage. Exxon had a return on total assets of 2.5% for a recent year, while its return on stockholders' equity was 5%. Thus, Exxon is "geared" 2:1 by using debt on its balance sheet. Exxon is very profitable; thus, leverage is beneficial. In contrast, **Chesapeake Energy Corporation (CHK)**, an oil and gas exploration company, had return on assets of –12.5% for a recent 12-month period, and return on stockholders' equity of –135%. In this case, the almost 11:1 leverage (135% ÷ 12.5%) creates a financial disadvantage because the company is experiencing losses.

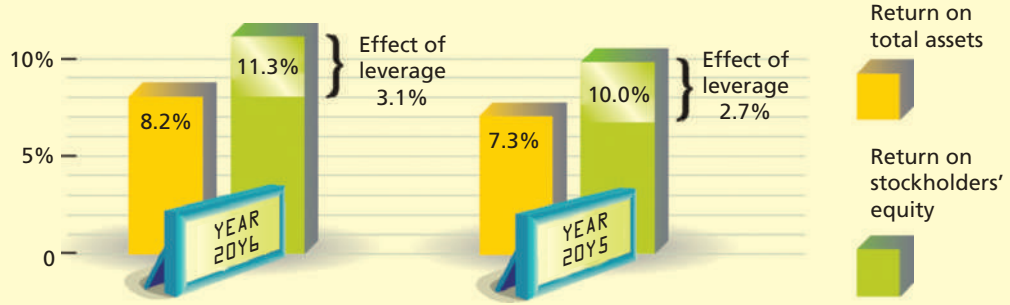


Exhibit 11
Effect of Leverage

Return on Common Stockholders' Equity

The **return on common stockholders' equity** measures the rate of profits earned on the amount invested by the common stockholders. It is computed as follows:

$$\text{Return on Common Stockholders' Equity} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Average Common Stockholders' Equity}}$$

Because preferred stockholders rank ahead of the common stockholders in their claim on earnings, any preferred dividends are subtracted from net income in computing the return on common stockholders' equity.

Lincoln Company had $150,000 par value of 6% preferred stock outstanding on December 31, 20Y6 and 20Y5. Thus, preferred dividends of $9,000 ($150,000 × 6%) are deducted from net income. Lincoln's common stockholders' equity is determined as follows:

	December 31		
	20Y6	20Y5	20Y4
Common stock, $10 par	$500,000	$500,000	$500,000
Retained earnings	179,500	137,500	100,000
Common stockholders' equity	$679,500	$637,500	$600,000

The retained earnings on December 31, 20Y4, of $100,000 is the same as the retained earnings on January 1, 20Y5, as shown in Lincoln's retained earnings statement in Exhibit 4.

Using this information, the return on common stockholders' equity for Lincoln is computed as follows:

	20Y6	20Y5
Net income	$ 91,000	$ 76,500
Preferred dividends	(9,000)	(9,000)
Total	$ 82,000	$ 67,500
Common stockholders' equity:		
Beginning of year	$ 637,500	$ 600,000
End of year	679,500*	637,500**
Total	$1,317,000	$1,237,500
Average common stockholders' equity	$658,500 ($1,317,000 ÷ 2)	$618,750 ($1,237,500 ÷ 2)
Return on common stockholders' equity	12.5% ($82,000 ÷ $658,500)	10.9% ($67,500 ÷ $618,750)

*($829,500 total stockholders' equity – $150,000 preferred 6% stock)
**($787,500 total stockholders' equity – $150,000 preferred 6% stock)

Lincoln's return on common stockholders' equity improved from 10.9% to 12.5% in 20Y6. This return differs from Lincoln's returns on total assets and stockholders' equity, which follow:

	20Y6	20Y5
Return on total assets	8.2%	7.3%
Return on stockholders' equity	11.3%	10.0%
Return on common stockholders' equity	12.5%	10.9%

These returns differ because of leverage, as discussed in the preceding section.

Link to Nike Over a recent five-year period, **Nike**'s return on equity was 25.5%.

Earnings per Share on Common Stock

Earnings per share (EPS) on common stock measures the share of profits that are earned by a share of common stock. Earnings per share must be reported on the income statement. As a result, earnings per share (EPS) is often reported in the financial press. It is computed as follows:

$$\text{Earnings per Share (EPS) on Common Stock} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Shares of Common Stock Outstanding}}$$

When preferred and common stock are outstanding, preferred dividends are subtracted from net income to determine the income related to the common shares.

To illustrate, the earnings per share (EPS) of common stock for **Lincoln Company** is computed as follows:

	20Y6	20Y5
Net income	$91,000	$76,500
Preferred dividends	(9,000)	(9,000)
Total	$82,000	$67,500
Shares of common stock outstanding	50,000	50,000
Earnings per share on common stock	$1.64 ($82,000 ÷ 50,000)	$1.35 ($67,500 ÷ 50,000)

Lincoln had $150,000 par value of 6% preferred stock outstanding on December 31, 20Y6 and 20Y5. Thus, preferred dividends of $9,000 ($150,000 × 6%) are deducted from net income in computing earnings per share on common stock.

Lincoln did not issue any additional shares of common stock in 20Y6. If Lincoln had issued additional shares in 20Y6, a weighted average of common shares outstanding during the year would have been used.

Lincoln's earnings per share (EPS) on common stock improved from $1.35 to $1.64 during 20Y6.

Lincoln has a simple capital structure with only common stock and preferred stock outstanding. Many corporations, however, have complex capital structures with various types of equity securities outstanding, such as convertible preferred stock, stock options, and stock warrants. In such cases, the possible effects of such securities on the shares of common stock outstanding are considered in reporting earnings per share. These possible effects are reported separately as *earnings per common share assuming dilution* or *diluted earnings per share*. This topic is described and illustrated in advanced accounting courses and textbooks.

Link to Nike On a recent income statement, **Nike** reported earnings per share of $2.21.

Pathways Challenge



This is Accounting!

Economic Activity

PayPal Holdings, Inc. (PYPL) is a leading provider of digital payments. In a recent annual report, PayPal reported the following information (in millions):

	From the Income Statement	Adjusted Amounts
Operating income	$1,586	$2,174
Net income	1,401	1,825

The adjusted amounts exclude expenses related to stock options and the amortization of some intangible assets. PayPal management excluded these expenses from the adjusted amounts because they felt these expenses did not reflect its "ongoing operations."

Critical Thinking/Judgment

Are the operating income and net income reported on the income statement in the annual report based on GAAP?
Should companies report adjusted (non-GAAP) amounts in their annual reports?
How would the adjusted (non-GAAP) amounts for PayPal affect the return on total assets, return on stockholders' equity, and earnings per share?
Can adjusted (non-GAAP) amounts provide better information about a company's operations than GAAP amounts?

Suggested answer at end of chapter.

Price-Earnings Ratio

The **price-earnings (P/E) ratio** on common stock measures a company's future earnings prospects. It is often quoted in the financial press and is computed as follows:

$$\text{Price-Earnings (P/E) Ratio} = \frac{\text{Market Price per Share of Common Stock}}{\text{Earnings per Share on Common Stock}}$$

To illustrate, the price-earnings (P/E) ratio for **Lincoln Company** is computed as follows:

	20Y6	20Y5
Market price per share of common stock	$41.00	$27.00
Earnings per share on common stock	$1.64	$1.35
Price-earnings ratio on common stock	25 ($41 ÷ $1.64)	20 ($27 ÷ $1.35)

The price-earnings ratio improved from 20 to 25 during 20Y6. In other words, a share of common stock of Lincoln was selling for 20 times earnings per share at the end of 20Y5. At the end of 20Y6, the common stock was selling for 25 times earnings per share. This indicates that the market expects Lincoln to experience favorable earnings in the future.

For a recent five-year period, **Nike**'s price-earnings ratio was 25. *Link to Nike*

Dividends per Share

Dividends per share measures the extent to which earnings are being distributed to common shareholders. It is computed as follows:

$$\text{Dividends per Share} = \frac{\text{Dividends on Common Stock}}{\text{Shares of Common Stock Outstanding}}$$

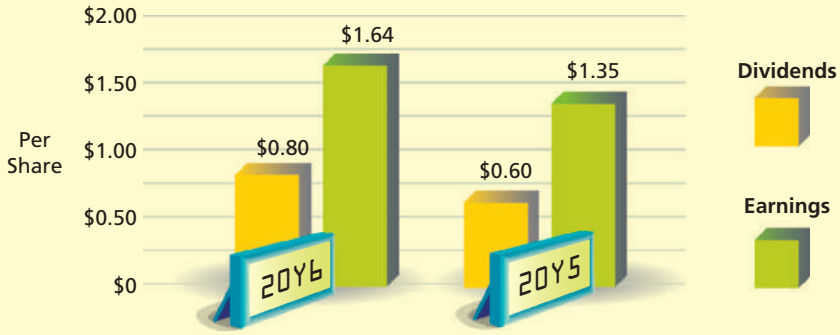
To illustrate, the dividends per share for **Lincoln Company** are computed as follows:

	20Y6	20Y5
Dividends on common stock	$40,000	$30,000
Shares of common stock outstanding	50,000	50,000
Dividends per share of common stock	$0.80 ($40,000 ÷ 50,000)	$0.60 ($30,000 ÷ 50,000)

The dividends per share of common stock increased from $0.60 to $0.80 during 20Y6.

Dividends per share are often reported with earnings per share. Comparing the two per-share amounts indicates the extent to which earnings are being retained for use in operations. To illustrate, the dividends and earnings per share for **Lincoln Company** are shown in Exhibit 12.

Exhibit 12
Dividends and Earnings per Share of Common Stock



Dividend Yield

The **dividend yield** on common stock measures the rate of return to common stockholders from cash dividends. It is of special interest to investors whose objective is to earn revenue (dividends) from their investment. It is computed as follows:

$$\text{Dividend Yield} = \frac{\text{Dividends per Share of Common Stock}}{\text{Market Price per Share of Common Stock}}$$

Why It Matters

CONCEPT CLIP

Investing for Yield

Companies that provide attractive dividend yields are often mature companies found in stable industries. Examples of such industries are public utilities and food. **Coca-Cola (KO)**, **Procter & Gamble (PG)**, **Kellogg's (K)**, **Consolidated Edison (ED)**, **Southern Company (SO)**, and **General Mills (GIS)** all have attractive dividend yields in excess of 3%. Procter & Gamble has had 58 consecutive years of dividend payouts, and Kellogg's has not reduced its dividend for 60 years. The stability of the food industry has allowed these companies to maintain dividends for many years. Growth companies, such as **Alphabet (GOOG)** or **Facebook (FB)**, do not pay dividends, because they use their cash to grow the business. Investors in such growth companies expect to make their return from stock price appreciation, rather than dividends. Mark Cuban, billionaire, Shark Tank® investor, and owner of the **Dallas Mavericks**, stated, "I believe non-dividend stocks aren't much more than baseball cards. They are worth what you can convince someone to pay for it."

Quote source: Tim Parker, "The Top Ten Dividend Quotes," *Dividend.com*, August 29, 2012.

To illustrate, the dividend yield for **Lincoln Company** is computed as follows:

	20Y6	20Y5
Dividends per share of common stock	$0.80	$0.60
Market price per share of common stock	$41.00	$27.00
Dividend yield on common stock	2.0% ($0.80 ÷ $41)	2.2% ($0.60 ÷ $27)

The dividend yield declined slightly from 2.2% to 2.0% in 20Y6. This decline was primarily due to the increase in the market price of Lincoln's common stock.

For a recent five-year period, **Nike**'s average dividend yield was 1.3%. *Link to Nike*

Check Up Corner 16-4 Profitability Analysis

The following data were taken from the financial statements of French Broad Steel Works Inc. for a recent year:

Shares of common stock outstanding	20,000
Sales	$2,400,000
Interest expense	40,000
Net income	250,000
Market price per share of common stock at year-end	120.00
Dividends per share of common stock	3.00
Average total assets (excluding long-term investments)	1,600,000
Average total assets	2,000,000
Average total stockholders' equity	1,000,000

Based on these data, determine the following profitability measures:

a. Asset turnover
b. Return on total assets
c. Return on stockholders' equity
d. Earnings per share
e. Price-earnings ratio
f. Dividend yield

Solution:

a.

$$\text{Asset Turnover} = \frac{\text{Sales}}{\text{Average Total Assets (excluding long-term investments)}} = \frac{\$2,400,000}{\$1,600,000} = 1.5$$

The asset turnover measures how effectively a company uses its assets.

b.

$$\text{Return on Total Assets} = \frac{\text{Net Income} + \text{Interest Expense}}{\text{Average Total Assets}} = \frac{\$250,000 + \$40,000}{\$2,000,000} = \frac{\$290,000}{\$2,000,000} = 14.5\%$$

The return on total assets measures the profitability of total assets, without considering how the assets are financed.

c.

$$\text{Return on Stockholders' Equity} = \frac{\text{Net Income}}{\text{Average Total Stockholders' Equity}} = \frac{\$250,000}{\$1,000,000} = 25.0\%$$

The return on stockholders' equity measures the return on the amount invested by stockholders.

d.

$$\text{Earnings per Share} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Shares of Common Stock Outstanding}} = \frac{\$250,000 - \$0}{20,000} = \$12.50$$

Earnings per share (EPS) measures the share of profits earned by each share of common stock.

e.

$$\text{Price-Earnings Ratio} = \frac{\text{Market Price per Share of Common Stock}}{\text{Earnings per Share on Common Stock}} = \frac{\$120.00}{\$12.50} = 9.6$$

The price-earnings (P/E) ratio measures a company's future earnings prospects.

f.

$$\text{Dividend Yield} = \frac{\text{Dividends per Share of Common Stock}}{\text{Market Price per Share of Common Stock}} = \frac{\$3.00}{\$120.00} = 2.5\%$$

The dividend yield measures the return to common stockholders from cash dividends.

Check Up Corner

Summary of Analytical Measures

Exhibit 13 shows a summary of the solvency and profitability measures discussed in this chapter. The type of industry and the company's operations usually affect which measures are used. In many cases, additional measures are used for a specific industry. For example, airlines use *revenue per passenger mile* and *cost per available seat* as profitability measures. Likewise, hotels use *occupancy rates* as a profitability measure.

The analytical measures shown in Exhibit 13 are a useful starting point for analyzing a company's liquidity, solvency and profitability. However, they are not a substitute for sound judgment. The general economic and business environment should always be considered in analyzing a company's future prospects. In addition, any trends and interrelationships among the measures should be carefully studied.

Exhibit 13 Summary of Analytical Measures

Liquidity Measures

	Method of Computation	Use
Working Capital	Current Assets – Current Liabilities	Measures the company's ability to pay current liabilities.
Current Ratio	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	
Quick Ratio	$\frac{\text{Quick Assets}}{\text{Current Liabilities}}$	Measures the company's instant debt-paying ability.
Accounts Receivable Turnover	$\frac{\text{Sales}}{\text{Average Accounts Receivable}}$	Measures the company's efficiency in collecting receivables and in the management of credit.
Numbers of Days' Sales in Receivables	$\frac{\text{Average Accounts Receivable}}{\text{Average Daily Sales}}$	
Inventory Turnover	$\frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$	Measures the company's efficiency in managing inventory.
Number of Days' Sales in Inventory	$\frac{\text{Average Inventory}}{\text{Average Daily Cost of Goods Sold}}$	

Solvency Measures

	Method of Computation	Use
Ratio of Fixed Assets to Long-Term Liabilities	$\frac{\text{Fixed Assets (net)}}{\text{Long-Term Liabilities}}$	Measures the margin of safety available to long-term creditors.
Ratio of Liabilities to Stockholders' Equity	$\frac{\text{Total Liabilities}}{\text{Total Stockholders' Equity}}$	Measures how much of the company is financed by debt and equity.
Times Interest Earned	$\frac{\text{Income Before Income Tax Expense + Interest Expense}}{\text{Interest Expense}}$	Measures the risk that interest payments will not be made if earnings decrease.

Exhibit 13 Summary of Analytical Measures *(Concluded)*

Profitability Measures

	Method of Computation	Use
Asset Turnover	$\frac{\text{Sales}}{\text{Average Total Assets (excluding long-term investments)}}$	Measures how effectively a company uses its assets.
Return on Total Assets	$\frac{\text{Net Income + Interest Expense}}{\text{Average Total Assets}}$	Measures the profitability of a company's assets.
Return on Stockholders' Equity	$\frac{\text{Net Income}}{\text{Average Total Stockholders' Equity}}$	Measures the profitability of the investment by stockholders.
Return on Common Stockholders' Equity	$\frac{\text{Net Income – Preferred Dividends}}{\text{Average Common Stockholders' Equity}}$	Measures the profitability of the investment by common stockholders.
Earnings per Share (EPS) on Common Stock	$\frac{\text{Net Income – Preferred Dividends}}{\text{Shares of Common Stock Outstanding}}$	Measures the profitability of the investment by common stockholders.
Price-Earnings (P/E) Ratio	$\frac{\text{Market Price per Share of Common Stock}}{\text{Earnings per Share on Common Stock}}$	Measures future earnings prospects, based on the relationship between market value of common stock and earnings.
Dividends per Share	$\frac{\text{Dividends on Common Stock}}{\text{Shares of Common Stock Outstanding}}$	Measures the extent to which earnings are being distributed to common stockholders.
Dividend Yield	$\frac{\text{Dividends per Share of Common Stock}}{\text{Market Price per Share of Common Stock}}$	Measures the rate of return to common stockholders in terms of dividends.

Corporate Annual Reports

Objective 6
Describe the contents of corporate annual reports.

IFRS
See Appendix C for more information.

Public corporations issue annual reports summarizing their operating activities for the past year and plans for the future. Such annual reports include the financial statements and the accompanying notes. In addition, annual reports normally include the following sections:

- Management discussion and analysis
- Report on internal control
- Report on fairness of the financial statements

Management Discussion and Analysis

Management's Discussion and Analysis (MD&A) is required in annual reports filed with the Securities and Exchange Commission. It includes management's analysis of current operations and its plans for the future. Typical items included in the MD&A are as follows:

- Management's analysis and explanations of any significant changes between the current and prior years' financial statements.
- Important accounting principles or policies that could affect interpretation of the financial statements, including the effect of changes in accounting principles or the adoption of new accounting principles.
- Management's assessment of the company's liquidity and the availability of capital to the company.
- Significant risk exposures that might affect the company.
- Any "off-balance-sheet" arrangements such as leases not included in the financial statements. Such arrangements are discussed in advanced accounting courses and textbooks.

Ethics: Don't Do It!

Characteristics of Financial Statement Fraud

Each year the Association of Certified Fraud Examiners conducts a worldwide survey examining the characteristics of corporate fraud. The most recent study found that:

- 39.1% of frauds were detected by a tip from an employee or someone close to the company;
- Frauds committed by owners and executives tended to be much larger than those caused by employees;
- Most people who are caught committing fraud are first-time offenders with clean employment histories; and
- In 78.9% of the cases, the person committing the fraud displayed one or more behavioral red flags, such as living beyond their means, financial difficulties, and excessive control issues.

Fraud examiners can use these trends to help them narrow their focus when searching for fraud.

Source: *2016 Report to the Nations*, Association of Certified Fraud Examiners, 2016.

Report on Internal Control

The Sarbanes-Oxley Act of 2002 requires a report on internal control by management. The report states management's responsibility for establishing and maintaining internal control. In addition, management's assessment of the effectiveness of internal controls over financial reporting is included in the report.

Sarbanes-Oxley also requires a public accounting firm to verify management's conclusions on internal control. Thus, two reports on internal control, one by management and one by a public accounting firm, are included in the annual report. In some situations, these may be combined into a single report on internal control.

Report on Fairness of the Financial Statements

All publicly held corporations are required to have an independent audit (examination) of their financial statements. The Certified Public Accounting (CPA) firm that conducts the audit renders an opinion, called the *Report of Independent Registered Public Accounting Firm*, on the fairness of the statements.

An opinion stating that the financial statements present fairly the financial position, results of operations, and cash flows of the company is said to be an *unmodified opinion*, sometimes called a *clean opinion*. Any report other than an unmodified opinion raises a "red flag" for financial statement users and requires further investigation as to its cause. The types and nature of audit opinions are covered in more detail in advanced courses on auditing.

Link to Nike

Nike's annual report (shown in Appendix E) includes Management Discussion and Analysis, a Report on Internal Control, and a Report of Independent Registered Public Accounting Firm.

Make a Decision

Analyze and compare Amazon.com, Best Buy, and Wal-Mart (MAD 16-1) (Continuing company analysis)

Analyze and compare Alphabet, PepsiCo, and Caterpillar (MAD 16-2)

Analyze Deere & Company (MAD 16-3)

Analyze and compare Marriott and Hyatt (MAD 16-4)

Make a Decision

Appendix 1 Unusual Items on the Income Statement

Objective App 1
Describe the reporting of unusual items on the income statement.

Generally accepted accounting principles require that unusual items be reported separately on the income statement. This is because such items do not occur frequently and are typically unrelated to current operations. Without separate reporting of these items, users of the financial statements might be misled about current and future operations.

Unusual items on the income statement are classified as one of the following:

- Affecting the *current period* income statement
- Affecting a *prior period* income statement

Unusual Items Affecting the Current Period's Income Statement

Discontinued operations are an unusual item that affects the current period's:

- Income statement presentation
- Earnings per share presentation

Discontinued operations are reported separately on the income statement for any period in which they occur.

Income Statement Presentation A company may discontinue a component of its operations by selling or abandoning the component's operations. For example, a retailer might decide to sell its product only online and, thus, discontinue selling its merchandise at its retail outlets (stores).

If the discontinued component is (1) the result of a strategic shift and (2) has a major effect on the entity's operations and financial results, any gain or loss on discontinued operations is reported on the income statement as a *Gain (or loss) from discontinued operations*. It is reported immediately following *Income from continuing operations*.

To illustrate, assume that Jones Corporation produces and sells electrical products, hardware supplies, and lawn equipment. Because of a lack of profits, Jones discontinues its electrical products operation and sells the remaining inventory and other assets at a loss of $100,000. Exhibit 14 illustrates the reporting of the loss on discontinued operations.[2]

Exhibit 14
Unusual Items in the Income Statement

Jones Corporation
Income Statement
For the Year Ended December 31, 20Y2

Sales	$12,350,000
Cost of goods sold	(5,800,000)
Gross profit	$ 6,550,000
Selling and administrative expenses	(5,240,000)
Income from continuing operations before income tax expense	$ 1,310,000
Income tax expense	(620,000)
Income from continuing operations	$ 690,000
Loss on discontinued operations	(100,000)
Net income	$ 590,000

[2] The gain or loss on discontinued operations is reported net of any tax effects. To simplify, the tax effects are not specifically identified in Exhibit 14.

In addition, a note to the financial statements should describe the operations sold, including the date operations were discontinued, and details about the assets, liabilities, income, and expenses of the discontinued component.

Earnings per Share Presentation Earnings per common share should be reported separately for discontinued operations. To illustrate, a partial income statement for Jones Corporation is shown in Exhibit 15. The company has 200,000 shares of common stock outstanding.

Exhibit 15
Income Statement with Earnings per Share

Jones Corporation
Income Statement
For the Year Ended December 31, 20Y2

Earnings per common share:	
Income from continuing operations	$ 3.45
Loss on discontinued operations	(0.50)
Net income	$ 2.95

Exhibit 15 reports earnings per common share for income from continuing operations, discontinued operations, and net income. However, only earnings per share for income from continuing operations and net income are required by generally accepted accounting principles. The other per-share amounts may be presented in the notes to the financial statements.

Unusual Items Affecting the Prior Period's Income Statement

An unusual item may occur that affects a prior period's income statement. Two such items are as follows:

- Errors in applying generally accepted accounting principles
- Changes from one generally accepted accounting principle to another

If an error is discovered in a prior period's financial statement, the prior-period statement and all following statements are restated and thus corrected.

A company may change from one generally accepted accounting principle to another. In this case, the prior-period financial statements are restated as if the new accounting principle had always been used.[3]

For both of the preceding items, the current-period earnings are not affected. That is, only the earnings reported in prior periods are restated. However, because the prior earnings are restated, the beginning balance of Retained Earnings may also have to be restated. This, in turn, may cause the restatement of other balance sheet accounts. Illustrations of these types of adjustments and restatements are provided in advanced accounting courses.

Objective App 2
Describe the concepts of fair value and comprehensive income.

Appendix 2 Fair Value and Comprehensive Income

In previous chapters, assets have been reported on the balance sheet using the cost basis. Many companies, however, acquire assets that are required by GAAP to be reported on the balance sheet at a different measurement basis called fair value. When a company reports assets at fair value, the financial reporting becomes complex. In the following sections, the concepts of fair value and comprehensive income are introduced. A detailed discussion of these concepts is provided in intermediate and advanced accounting texts.

[3] Changes from one acceptable depreciation method to another acceptable depreciation method are an exception to this general rule and are to be treated prospectively as a change in estimate.

Fair Value

Fair value is the price that could be received for an asset if it were sold today. This differs from historical cost, in that the amount reported on the balance sheet changes each period to reflect the asset's fair (current) value at the balance sheet date. The change in an asset's fair value from one period to the next is recorded in the financial statements as either:

- a gain or loss on the income statement, or
- an increase or decrease in stockholders' equity reported as other comprehensive income.

Comprehensive Income

When a change in an asset's fair value is not recorded as a gain or loss on the income statement, it is recorded as an element of **other comprehensive income**.[4] These include changes in the fair value of certain investment securities, foreign currency exposures, and pension assets.

The elements of other comprehensive income are included in the computation of **comprehensive income**, which is defined as all changes in stockholders' equity during a period, except those resulting from dividends and stockholders' investments. Comprehensive income is determined by adding or subtracting *other comprehensive income* elements to (from) net income, as follows:

Net income	$XXX
Other comprehensive income	XXX
Comprehensive income	$XXX

Companies must report comprehensive income in the financial statements either:

- on the income statement, directly below net income, or
- in a separate statement of comprehensive income.

Reporting Comprehensive Income on the Income Statement Bart Company purchased investment securities during the year that had an increase of $2,600 in fair value. Because of the accounting methods selected by Bart Company, this increase in fair value is recorded as an element of other comprehensive income and is called an **unrealized gain**. If Bart Company elects to report other comprehensive income on the income statement, the elements of other comprehensive income are added to or subtracted from net income at the bottom of the income statement as follows:

Bart Company
Income Statement
For the Year Ended December 31, 20Y2

Sales	$1,200,000
Cost of goods sold	(960,000)
Gross profit	$ 240,000
Operating expenses	(144,500)
Operating income	$ 95,500
Income tax expense	(36,290)
Net income	$ 59,210
Other comprehensive income	2,600
Comprehensive income	$ 61,810

Reporting Comprehensive Income on the Statement of Comprehensive Income As an alternative to reporting comprehensive income on the income statement, companies may elect to report comprehensive income on a separate statement of comprehensive income.

[4] Fair value accounting is discussed in greater detail in intermediate and advanced accounting texts. A discussion of fair value accounting is also included in Appendix D.

This statement should immediately follow the income statement. Using the Bart Company example, the income statement and statement of comprehensive income would be presented as follows:

Bart Company
Income Statement
For the Year Ended December 31, 20Y2

Sales	$1,200,000
Cost of goods sold	(960,000)
Gross profit	$ 240,000
Operating expenses	(144,500)
Operating income	$ 95,500
Income tax expense	(36,290)
Net income	$ 59,210

Bart Company
Statement of Comprehensive Income
For the Year Ended December 31, 20Y2

Net income	$59,210
Other comprehensive income	2,600
Comprehensive income	$61,810

Reporting Accumulated Other Comprehensive Income on the Balance Sheet

The *cumulative* effect of the elements of other comprehensive income is reported on the balance sheet as **accumulated other comprehensive income**.

Continuing the Bart Company example, the unrealized gain of $2,600 would be reported as accumulated other comprehensive income in the "Stockholders' Equity" section of the balance sheet, as follows:

Bart Company
Balance Sheet
December 31, 20Y2

Stockholders' Equity	
Common stock	$ 20,000
Paid-in capital in excess of par	300,000
Retained earnings	250,000
Accumulated other comprehensive income	2,600
Total stockholders' equity	$572,600

Let's Review

Chapter Summary

1. The basic financial statements provide important information that users rely on to make economic decisions. Financial statement users typically evaluate this information along three dimensions: liquidity, solvency, and profitability. Two common techniques are used to analyze a company's financial performance and condition: analytical methods and ratios. Both analytical methods and ratios can be used to compare a company's financial performance over time or to another company.
2. Analytical methods are used to compare items on a current financial statement with related items on earlier statements or to examine relationships within a financial statement. Horizontal analysis is the analysis of percentage increases and decreases in related items in comparative financial statements. The analysis of the relationship of each component in a financial statement to a significant total within the statement is called vertical analysis. In a common-sized statement, all items are expressed as percentages with no dollar amounts shown.
3. Liquidity analysis evaluates a company's ability to convert current assets into cash. Short-term creditors use liquidity analysis to evaluate a company's ability to repay short-term debts by focusing on a company's current position, accounts receivable, and inventory. The measures and ratios used to evaluate a company's liquidity include: (1) working capital, (2) current ratio, (3) quick ratio, (4) accounts receivable turnover, (5) number of days' sales in receivables, (6) inventory turnover, and (7) number of days' sales in inventory.
4. Solvency analysis evaluates the ability of a company to pay its long-term debts. Long-term creditors use solvency analysis to evaluate a company's ability to make its periodic interest payments and repay the face amount of bonds at maturity. Solvency is normally assessed by examining (1) the ratio of fixed assets to long-term liabilities, (2) the ratio of liabilities to stockholders' equity, and (3) the times interest earned ratio.
5. Profitability analysis focuses on the relationship between operating results (income statement) and assets (balance sheet). Profitability analyses include (1) the asset turnover ratio, (2) the return on total assets, (3) the return on stockholders' equity, (4) the return on common stockholders' equity, (5) earnings per share on common stock, (6) the price-earnings ratio, (7) dividends per share, and (8) dividend yield.
6. Public corporations issue annual reports summarizing their operating activities for the past year and plans for the future. In addition to the financial statements and accompanying notes, annual reports include management discussion and analysis (MD&A), a report on internal control, and a report on fairness of the financial statements. Management discussion and analysis includes management's analysis of current operations and its plans for the future. The report on internal control states management's responsibility for establishing and maintaining internal controls. The report on fairness of the financial statements provides the CPA firm's opinion on whether the financial statements fairly present the financial position, results of operations, and cash flows of the company.

Key Terms

accounts receivable analysis (768)
accounts receivable turnover (768)
accumulated other comprehensive income (788)
analytical methods (761)
asset turnover (775)
common-sized statement (765)
comprehensive income (787)
current position analysis (767)
current ratio (767)
dividend yield (780)
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quick ratio (768)
ratio of fixed assets to long-term liabilities (772)
ratio of liabilities to stockholders' equity (772)
ratios (761)
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return on stockholders' equity (776)
return on total assets (775)
solvency (761)
times interest earned (773)
unrealized gain (787)
vertical analysis (763)
working capital (767)

Practice

Multiple-Choice Questions

1. What type of analysis is indicated by the following?

	Amount	Percent
Current assets	$100,000	20%
Property, plant, and equipment	400,000	80%
Total assets	$500,000	100%

   a. Vertical analysis
   b. Horizontal analysis
   c. Liquidity analysis
   d. Profitability analysis

2. The ability of a company to pay its debts is called:
   a. earnings per share.
   b. liquidity.
   c. profitability.
   d. solvency.

3. The ratio that measures how much of a company is financed by debt and equity is the:
   a. current ratio.
   b. ratio of fixed assets to long-term liabilities.
   c. ratio of liabilities to stockholders' equity.
   d. price-earnings ratio.

4. The ratio that measures the "instant" debt-paying ability of a firm, by focusing on current assets that can be easily converted to cash, is the:
   a. working capital.
   b. quick ratio.
   c. number of days' sales in inventory.
   d. ratio of fixed assets to long-term liabilities.

5. A measure useful in evaluating efficiency in the management of inventories is the:
   a. working capital.
   b. quick ratio.
   c. number of days' sales in inventory.
   d. ratio of fixed assets to long-term liabilities.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Exercises

1. Horizontal analysis **Obj. 2**

The comparative temporary investments and inventory balances of a company follow.

	Current Year	Previous Year
Temporary investments	$59,280	$52,000
Inventory	70,680	76,000

Based on this information, what is the amount and percentage of increase or decrease that would be shown on a balance sheet with horizontal analysis?

2. Vertical analysis **Obj. 2**

Income statement information for Axiom Corporation follows:

Sales	$725,000
Cost of goods sold	391,500
Gross profit	333,500

Prepare a vertical analysis of the income statement for Axiom Corporation.

3. Current position analysis **Obj. 3**

The following items are reported on a company's balance sheet:

Cash	$160,000
Marketable securities	75,000
Accounts receivable (net)	65,000
Inventory	140,000
Accounts payable	200,000

Determine (a) the current ratio and (b) the quick ratio. Round to one decimal place.

4. Accounts receivable analysis **Obj. 3**

A company reports the following:

Sales	$832,000
Average accounts receivable (net)	80,000

Determine (a) the accounts receivable turnover and (b) the number of days' sales in receivables. Round to one decimal place.

5. Inventory analysis **Obj. 3**

A company reports the following:

Cost of goods sold	$630,000
Average inventory	90,000

Determine (a) the inventory turnover and (b) the number of days' sales in inventory. Round to one decimal place.

6. Long-term solvency analysis **Obj. 4**

The following information was taken from Kellman Company's balance sheet:

Fixed assets (net)	$ 960,000
Long-term liabilities	800,000
Total liabilities	1,000,000
Total stockholders' equity	625,000

Determine the company's (a) ratio of fixed assets to long-term liabilities and (b) ratio of liabilities to stockholders' equity. Round to one decimal place.

7. Times interest earned **Obj. 4**

A company reports the following:

Income before income tax expense	$4,000,000
Interest expense	400,000

Determine the times interest earned ratio. Round to one decimal place.

8. Asset turnover **Obj. 5**

A company reports the following:

Sales	$1,800,000
Average total assets (excluding long-term investments)	1,125,000

Determine the asset turnover ratio. Round to one decimal place.

9. Return on total assets **Obj. 5**

A company reports the following income statement and balance sheet information for the current year:

Net income	$ 250,000
Interest expense	100,000
Average total assets	2,500,000

Determine the return on total assets. Round to one decimal place.

10. Common stockholders' profitability analysis **Obj. 5**

A company reports the following:

Net income	$ 375,000
Preferred dividends	75,000
Average stockholders' equity	2,500,000
Average common stockholders' equity	1,875,000

Determine (a) the return on stockholders' equity and (b) the return on common stockholders' equity. Round to one decimal place.

11. Earnings per share and price-earnings ratio **Obj. 5**

A company reports the following:

Net income	$185,000
Preferred dividends	$25,000
Shares of common stock outstanding	100,000
Market price per share of common stock	$20

a. Determine the company's earnings per share on common stock.

b. Determine the company's price-earnings ratio. Round to one decimal place.

Answers provided after Problem. Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Problem

Rainbow Paint Co.'s comparative financial statements for the years ending December 31, 20Y9 and 20Y8, are as follows. The market price of Rainbow Paint's common stock was $25 on December 31, 20Y9, and $30 on December 31, 20Y8.

Rainbow Paint Co.
Comparative Income Statement
For the Years Ended December 31, 20Y9 and 20Y8

	20Y9	20Y8
Sales	$ 5,000,000	$ 3,200,000
Cost of goods sold	(3,400,000)	(2,080,000)
Gross profit	$ 1,600,000	$ 1,120,000
Selling expenses	$ (650,000)	$ (464,000)
Administrative expenses	(325,000)	(224,000)
Total operating expenses	$ (975,000)	$ (688,000)
Operating income	$ 625,000	$ 432,000
Other revenue and expense:		
Other revenue	25,000	19,200
Other expense (interest)	(105,000)	(64,000)
Income before income tax expense	$ 545,000	$ 387,200
Income tax expense	(300,000)	(176,000)
Net income	$ 245,000	$ 211,200

Rainbow Paint Co.
Comparative Retained Earnings Statement
For the Years Ended December 31, 20Y9 and 20Y8

	20Y9	20Y8
Retained earnings, January 1	$723,000	$581,800
Net income	245,000	211,200
Dividends:		
On preferred stock	(40,000)	(40,000)
On common stock	(45,000)	(30,000)
Retained earnings, December 31	$883,000	$723,000

Rainbow Paint Co.
Comparative Balance Sheet
December 31, 20Y9 and 20Y8

	20Y9	20Y8
Assets		
Current assets:		
Cash	$ 175,000	$ 125,000
Temporary investments	150,000	50,000
Accounts receivable (net)	425,000	325,000
Inventories	720,000	480,000
Prepaid expenses	30,000	20,000
Total current assets	$1,500,000	$1,000,000
Long-term investments	250,000	225,000
Property, plant, and equipment (net)	2,093,000	1,948,000
Total assets	$3,843,000	$3,173,000
Liabilities		
Current liabilities	$ 750,000	$ 650,000
Long-term liabilities:		
Mortgage note payable, 10%, due in five years	$ 410,000	—
Bonds payable, 8%, due in fifteen years	800,000	$ 800,000
Total long-term liabilities	$1,210,000	$ 800,000
Total liabilities	$1,960,000	$1,450,000
Stockholders' Equity		
Preferred 8% stock, $100 par	$ 500,000	$ 500,000
Common stock, $10 par	500,000	500,000
Retained earnings	883,000	723,000
Total stockholders' equity	$1,883,000	$1,723,000
Total liabilities and stockholders' equity	$3,843,000	$3,173,000

Instructions

Determine the following measures for 20Y9. Round percentages and ratios other than per-share amounts to one decimal place.

1. Working capital
2. Current ratio
3. Quick ratio
4. Accounts receivable turnover
5. Number of days' sales in receivables
6. Inventory turnover
7. Number of days' sales in inventory
8. Ratio of fixed assets to long-term liabilities
9. Ratio of liabilities to stockholders' equity
10. Times interest earned
11. Asset turnover
12. Return on total assets
13. Return on stockholders' equity
14. Return on common stockholders' equity
15. Earnings per share on common stock
16. Price-earnings ratio
17. Dividends per share
18. Dividend yield

Need more practice? Find additional multiple-choice questions, exercises, and problems in CengageNOWv2.

Answers

Multiple-Choice Questions

1. **a** Vertical analysis compares each component in a financial statement to a total within the statement. Horizontal analysis (answer b) compares the amount and percentage of each item on the most recent statement to the same item on an earlier statement. Liquidity analysis (answer c) evaluates the ability of a company to convert current assets into cash. Profitability analysis (answer d) focuses on the ability of a company to earn profits by examining the relationship between operating results and the resources available.

2. **d** Solvency is a company's ability to pay its debts. Earnings per share (answer a) measures the share of profits that are earned by a share of common stock. Liquidity (answer b) is the ability of a company to convert current assets into cash. Profitability (answer c) focuses on the ability of a company to earn profits by examining the relationship between operating results and the resources available.

3. **c** The ratio of liabilities to stockholders' equity measures the relationship between debt and equity, which measures how much of the company is financed with debt and equity. The current ratio (answer a) measures a company's ability to pay its current liabilities. The ratio of fixed assets to long-term liabilities (answer b) provides a measure of whether noteholders or bondholders will be paid. The price-earnings ratio (answer d) measures a company's future earnings prospects.

4. **b** The quick ratio measures the "instant" debt-paying ability of a company. Working capital (answer a) is the difference between current assets and current liabilities. The number of days' sales in inventory (answer c) is a measure of the length of time it takes to purchase, sell, and replace the inventory. The ratio of fixed assets to long-term liabilities (answer d) provides a measure of whether noteholders or bondholders will be paid.

5. **c** The number of days' sales in inventory is a measure of the length of time it takes to purchase, sell, and replace the inventory. Working capital (answer a) is the difference between current assets and current liabilities. The quick ratio (answer b) measures the "instant" debt-paying ability of a company. The ratio of fixed assets to long-term liabilities (answer d) provides a measure of whether noteholders or bondholders will be paid.

Exercises

1. Temporary investments..... $7,280 increase ($59,280 – $52,000), or 14%

   Inventory ..... $5,320 decrease ($70,680 – $76,000), or –7%

2.

	Amount	Percentage	
Sales.....	$ 725,000	100%	($725,000 ÷ $725,000)
Cost of goods sold.....	(391,500)	(54)%	($391,500 ÷ $725,000)
Gross profit.....	$ 333,500	46%	($333,500 ÷ $725,000)

3. a. Current Ratio = Current Assets ÷ Current Liabilities

   = ($160,000 + $75,000 + $65,000 + $140,000) ÷ $200,000

   = 2.2

   b. Quick Ratio = Quick Assets ÷ Current Liabilities

   = ($160,000 + $75,000 + $65,000) ÷ $200,000

   = 1.5

4. a. Accounts Receivable Turnover = Sales ÷ Average Accounts Receivable

   = $832,000 ÷ $80,000

   = 10.4

b. Number of Days' Sales in Receivables = $\dfrac{\text{Average Accounts Receivable}}{\text{Average Daily Sales}}$

= \$80,000 ÷ (\$832,000 ÷ 365)

= \$80,000 ÷ \$2,279

= 35.1 days

5. a. Inventory Turnover = Cost of Goods Sold ÷ Average Inventory

= \$630,000 ÷ \$90,000

= 7.0

b. Number of Days' Sales in Inventory = $\dfrac{\text{Average Inventory}}{\text{Average Daily Cost of Goods Sold}}$

= \$90,000 ÷ (\$630,000 ÷ 365)

= \$90,000 ÷ \$1,726

= 52.1 days

6. a. Ratio of Fixed Assets to Long-Term Liabilities = $\dfrac{\text{Fixed Assets}}{\text{Long-Term Liabilities}}$

= \$960,000 ÷ \$800,000

= 1.2

b. Ratio of Liabilities to Stockholders' Equity = $\dfrac{\text{Total Liabilities}}{\text{Total Stockholders' Equity}}$

= \$1,000,000 ÷ \$625,000

= 1.6

7. Times Interest Earned = $\dfrac{\text{Income Before Income Tax Expense + Interest Expense}}{\text{Interest Expense}}$

$= \dfrac{\$4{,}000{,}000 + \$400{,}000}{\$400{,}000}$

= 11.0

8. Asset Turnover = Sales ÷ Average Total Assets

= \$1,800,000 ÷ \$1,125,000

= 1.6

9. Return on Total Assets = $\dfrac{\text{Net Income + Interest Expense}}{\text{Average Total Assets}}$

$= \dfrac{\$250{,}000 + \$100{,}000}{\$2{,}500{,}000}$

$= \dfrac{\$350{,}000}{\$2{,}500{,}000}$

= 14.0%

10. a. Return on Stockholders' Equity = $\dfrac{\text{Net Income}}{\text{Average Stockholders' Equity}}$

= \$375,000 ÷ \$2,500,000

= 15.0%

b. $$\text{Return on Common Stockholders' Equity} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Average Common Stockholders' Equity}}$$

$$= \frac{\$375{,}000 - \$75{,}000}{\$1{,}875{,}000}$$

$$= 16.0\%$$

11. a. $$\text{Earnings per Share on Common Stock} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Shares of Common Stock Outstanding}}$$

$$= (\$185{,}000 - \$25{,}000) \div 100{,}000$$

$$= \$1.60$$

b. $$\text{Price-Earnings Ratio} = \frac{\text{Market Price per Share of Common Stock}}{\text{Earnings per Share on Common Stock}}$$

$$= \$20.00 \div \$1.60$$

$$= 12.5$$

Need more help? Watch step-by-step videos of how to compute answers to these Exercises in CengageNOWv2.

Problem

Ratios are rounded to one decimal place.

1. Working capital: $750,000
   $1,500,000 – $750,000
2. Current ratio: 2.0
   $1,500,000 ÷ $750,000
3. Quick ratio: 1.0
   $750,000 ÷ $750,000
4. Accounts receivable turnover: 13.3
   $5,000,000 ÷ [($425,000 + $325,000) ÷ 2]
5. Number of days' sales in receivables: 27.4 days
   $5,000,000 ÷ 365 days = $13,699
   $375,000 ÷ $13,699
6. Inventory turnover: 5.7
   $3,400,000 ÷ [($720,000 + $480,000) ÷ 2]
7. Number of days' sales in inventory: 64.4 days
   $3,400,000 ÷ 365 days = $9,315
   $600,000 ÷ $9,315
8. Ratio of fixed assets to long-term liabilities: 1.7
   $2,093,000 ÷ $1,210,000
9. Ratio of liabilities to stockholders' equity: 1.0
   $1,960,000 ÷ $1,883,000
10. Times interest earned: 6.2
    ($545,000 + $105,000) ÷ $105,000
11. Asset turnover: 1.5
    $5,000,000 ÷ [($3,593,000 + $2,948,000) ÷ 2]
12. Return on total assets: 10.0%
    ($245,000 + $105,000) ÷ [($3,843,000 + $3,173,000) ÷ 2]

13. Return on stockholders' equity: 13.6%
    $245,000 ÷ [($1,883,000 + $1,723,000) ÷ 2]
14. Return on common stockholders' equity: 15.7%
    ($245,000 – $40,000) ÷ [($1,383,000 + $1,223,000) ÷ 2]
15. Earnings per share on common stock: $4.10
    ($245,000 – $40,000) ÷ 50,000 shares
16. Price-earnings ratio: 6.1
    $25 ÷ $4.10
17. Dividends per share: $0.90
    $45,000 ÷ 50,000 shares
18. Dividend yield: 3.6%
    $0.90 ÷ $25

Discussion Questions

1. Briefly explain the difference between liquidity, solvency, and profitability analysis.
2. What is the advantage of using comparative statements for financial analysis rather than statements for a single date or period?
3. A company's current year net income (after income tax) is 25% larger than that of the preceding year. Does this indicate improved operating performance? Why?
4. How would the current and quick ratios of a service business compare?
5. a. Why is a high inventory turnover considered to be a positive indicator?
   b. Is it possible to have a high inventory turnover and a high number of days' sales in inventory? Why?
6. What do the following data, taken from a comparative balance sheet, indicate about the company's ability to borrow additional long-term debt in the current year as compared to the preceding year?

	Current Year	Preceding Year
Fixed assets (net)	$1,260,000	$1,360,000
Total long-term liabilities	300,000	400,000

7. a. How does the return on total assets differ from the return on stockholders' equity?
   b. Which ratio is normally higher? Why?
8. REAL WORLD **The Kroger Company (KR),** a grocery store chain, recently had a price-earnings ratio of 13.7, while the average price-earnings ratio in the grocery store industry was 22.5. What might explain this difference?
9. REAL WORLD The dividend yield of **Suburban Propane Partners, L.P. (SPH)** was 7.7% in a recent year, and the dividend yield of **Alphabet Inc. (GOOG)** was 0% in the same year. What might explain the difference between these ratios?
10. Describe two reports provided by independent auditors in the annual report to shareholders.

Basic Exercises

SHOW ME HOW

BE 16-1 Horizontal analysis **Obj. 2**

The comparative accounts payable and long-term debt balances for a company follow.

	Current Year	Previous Year
Accounts payable	$114,240	$102,000
Long-term debt	127,200	120,000

Based on this information, what is the amount and percentage of increase or decrease that would be shown on a balance sheet with horizontal analysis?



BE 16-2 Vertical analysis **Obj. 2**

Income statement information for Einsworth Corporation follows:

Sales	$1,500,000
Cost of goods sold	900,000
Gross profit	600,000

Prepare a vertical analysis of the income statement for Einsworth Corporation.



BE 16-3 Current position analysis **Obj. 3**

The following items are reported on a company's balance sheet:

Cash	$225,000
Marketable securities	115,000
Accounts receivable (net)	112,000
Inventory	158,000
Accounts payable	244,000

Determine (a) the current ratio and (b) the quick ratio. Round to one decimal place.



BE 16-4 Accounts receivable analysis **Obj. 3**

A company reports the following:

Sales	$4,560,000
Average accounts receivable (net)	380,000

Determine (a) the accounts receivable turnover and (b) the number of days' sales in receivables. Round to one decimal place.



BE 16-5 Inventory analysis **Obj. 3**

A company reports the following:

Cost of goods sold	$500,000
Average inventory	62,500

Determine (a) the inventory turnover and (b) the number of days' sales in inventory. Round to one decimal place.



BE 16-6 Long-term solvency analysis **Obj. 4**

The following information was taken from Charu Company's balance sheet:

Fixed assets (net)	$910,000
Long-term liabilities	260,000
Total liabilities	800,000
Total stockholders' equity	320,000

Determine the company's (a) ratio of fixed assets to long-term liabilities and (b) ratio of liabilities to stockholders' equity. Round to one decimal place.



BE 16-7 Times interest earned **Obj. 4**

A company reports the following:

Income before income tax expense	$9,100,000
Interest expense	650,000

Determine the times interest earned. Round to one decimal place.

SHOW ME HOW

BE 16-8 Asset turnover **Obj. 5**

A company reports the following:

Sales	$6,750,000
Average total assets (excluding long-term investments)	2,500,000

Determine the asset turnover ratio. Round to one decimal place.

SHOW ME HOW

BE 16-9 Return on total assets **Obj. 5**

A company reports the following income statement and balance sheet information for the current year:

Net income	$ 424,000
Interest expense	80,000
Average total assets	4,200,000

Determine the return on total assets. Round percentage to one decimal place.

SHOW ME HOW

BE 16-10 Common stockholders' profitability analysis **Obj. 5**

A company reports the following:

Net income	$1,225,000
Preferred dividends	47,800
Average stockholders' equity	8,750,000
Average common stockholders' equity	5,400,000

Determine (a) the return on stockholders' equity and (b) the return on common stockholders' equity. Round percentages to one decimal place.

SHOW ME HOW

BE 16-11 Earnings per share and price-earnings ratio **Obj. 5**

A company reports the following:

Net income	$562,000
Preferred dividends	$50,000
Shares of common stock outstanding	80,000
Market price per share of common stock	$32

a. Determine the company's earnings per share on common stock.

b. Determine the company's price-earnings ratio. Round to one decimal place.

Exercises

✔ a. Current year net income: $360,000; 9% of sales

SHOW ME HOW

EX 16-1 Vertical analysis of income statement **Obj. 2**

Revenue and expense data for Innovation Quarter Inc. for two recent years are as follows:

	Current Year	Previous Year
Sales	$4,000,000	$3,600,000
Cost of goods sold	2,280,000	1,872,000
Selling expenses	600,000	648,000
Administrative expenses	520,000	360,000
Income tax expense	240,000	216,000

a. Prepare an income statement in comparative form, stating each item for both years as a percent of sales. Round to the nearest whole percentage.

b. Comment on the significant changes disclosed by the comparative income statement.

EX 16-2 Vertical analysis of income statement

Obj. 2

✔ a. Current fiscal year income from continuing operations, 11.9% of revenues

EXCEL TEMPLATE REAL WORLD

The following comparative income statement (in thousands of dollars) for two recent fiscal years was adapted from the annual report of **Speedway Motorsports, Inc. (TRK)**, owner and operator of several major motor speedways, such as the Atlanta, Texas, and Las Vegas Motor Speedways.

	Current Year	Previous Year
Revenues:		
Admissions	$ 90,639	$ 100,694
Event-related revenue	136,900	146,980
NASCAR broadcasting revenue	224,227	217,469
Other operating revenue	60,390	31,320
Total revenues	$ 512,156	$ 496,463
Expenses and other:		
Direct expense of events	$ (102,786)	$ (104,303)
NASCAR event management fees	(137,727)	(133,682)
Other direct expenses	(43,784)	(19,541)
General and administrative	(166,663)	(285,166)
Total expenses and other	$ (450,960)	$ (542,692)
Income from continuing operations	$ 61,196	$ (46,229)

a. Prepare a comparative income statement for these two years in vertical form, stating each item as a percent of revenues. Round percentages to one decimal place.

b. Comment on the significant changes.

EX 16-3 Common-sized income statement

Obj. 2

✔ a. Tannenhill net income: $120,000; 3% of sales

SHOW ME HOW

Revenue and expense data for the current calendar year for Tannenhill Company and for the electronics industry are as follows. Tannenhill's data are expressed in dollars. The electronics industry averages are expressed in percentages.

	Tannenhill Company	Electronics Industry Average
Sales	$ 4,000,000	100.0%
Cost of goods sold	(2,120,000)	(60.0)
Gross profit	$ 1,880,000	40.0%
Selling expenses	$ (1,080,000)	(24.0)%
Administrative expenses	(640,000)	(14.0)
Total operating expenses	$ (1,720,000)	(38.0)%
Operating income	$ 160,000	2.0%
Other revenue and expense:		
Other revenue	120,000	3.0
Other expense	(80,000)	(2.0)
Income before income tax expense	$ 200,000	3.0%
Income tax expense	(80,000)	(2.0)
Net income	$ 120,000	1.0%

a. Prepare a common-sized income statement comparing the results of operations for Tannenhill Company with the industry average. Round to the nearest whole percentage.

b. As far as the data permit, comment on significant relationships revealed by the comparisons.

EX 16-4 Vertical analysis of balance sheet

Obj. 2

✔ Retained earnings, current year, 36.8%

SHOW ME HOW EXCEL TEMPLATE

Balance sheet data for Alvarez Company on December 31, the end of two recent fiscal years, follow:

	Current Year	Previous Year
Current assets	$2,500,000	$1,840,000
Property, plant, and equipment	5,600,000	6,072,000
Intangible assets	1,900,000	1,288,000
Current liabilities	2,000,000	1,380,000
Long-term liabilities	3,400,000	3,680,000
Common stock	920,000	920,000
Retained earnings	3,680,000	3,220,000

Prepare a comparative balance sheet for both years, stating each asset as a percent of total assets and each liability and stockholders' equity item as a percent of the total liabilities and stockholders' equity. Round percentages to one decimal place.

EX 16-5 Horizontal analysis of the income statement

Obj. 2

✔ a. Net income increase, 78.0%

SHOW ME HOW EXCEL TEMPLATE

Income statement data for Winthrop Company for two recent years ended December 31 are as follows:

	Current Year	Previous Year
Sales	$ 2,240,000	$ 2,000,000
Cost of goods sold	(1,925,000)	(1,750,000)
Gross profit	$ 315,000	$ 250,000
Selling expenses	$ (152,500)	$ (125,000)
Administrative expenses	(118,000)	(100,000)
Total operating expenses	$ (270,500)	$ (225,000)
Income before income tax expense	$ 44,500	$ 25,000
Income tax expense	(17,800)	(10,000)
Net income	$ 26,700	$ 15,000

a. Prepare a comparative income statement with horizontal analysis, indicating the increase (decrease) for the current year when compared with the previous year. Round percentages to one decimal place.

b. What conclusions can be drawn from the horizontal analysis?

EX 16-6 Current position analysis

Obj. 3

✔ a. (1) Current year working capital, $1,090,000

SHOW ME HOW

The following data were taken from the balance sheet of Nilo Company at the end of two recent fiscal years:

	Current Year	Previous Year
Current assets:		
Cash	$ 391,000	$ 300,000
Marketable securities	515,000	354,000
Accounts and notes receivable (net)	634,000	426,000
Inventories	368,000	222,000
Prepaid expenses	182,000	138,000
Total current assets	$ 2,090,000	$1,440,000
Current liabilities:		
Accounts and notes payable (short-term)	$ 725,000	$ 600,000
Accrued liabilities	275,000	300,000
Total current liabilities	$1,000,000	$ 900,000

a. Determine for each year (1) the working capital, (2) the current ratio, and (3) the quick ratio. Round ratios to one decimal place.

b. What conclusions can be drawn from these data as to the company's ability to meet its currently maturing debts?

EX 16-7 Current position analysis — Obj. 3

✔ a. (1) Current year's current ratio, 1.3


REAL WORLD

PepsiCo, Inc. (PEP), the parent company of Frito-Lay snack foods and Pepsi beverages, had the following current assets and current liabilities at the end of two recent years:

	Current Year (in millions)	Previous Year (in millions)
Cash and cash equivalents	$ 9,158	$ 9,096
Short-term investments, at cost	6,967	2,913
Accounts and notes receivable, net	6,694	6,437
Inventories	2,723	2,720
Prepaid expenses and other current assets	1,547	1,865
Short-term obligations	6,892	4,071
Accounts payable	14,243	13,507

a. Determine the (1) current ratio and (2) quick ratio for both years. Round to one decimal place.

b. What conclusions can you draw from these data about PepsiCo's liquidity?

EX 16-8 Current position analysis — Obj. 3

The bond indenture for the 10-year, 9% debenture bonds issued January 2, 20Y5, required working capital of $100,000, a current ratio of 1.5, and a quick ratio of 1.0 at the end of each calendar year until the bonds mature. At December 31, 20Y6, the three measures were computed as follows:

1.	Current assets:		
	Cash	$102,000	
	Temporary investments	48,000	
	Accounts and notes receivable (net)	120,000	
	Inventories	36,000	
	Prepaid expenses	24,000	
	Intangible assets	124,800	
	Property, plant, and equipment	55,200	
	Total current assets (net)		$ 510,000
	Current liabilities:		
	Accounts and short-term notes payable	$ 96,000	
	Accrued liabilities	204,000	
	Total current liabilities		(300,000)
	Working capital		$ 210,000
2.	Current ratio	1.7	$ 510,000 ÷ $300,000
3.	Quick ratio	1.2	$ 115,200 ÷ $ 96,000

a. List the errors in the determination of the three measures of current position analysis.

b. Is the company satisfying the terms of the bond indenture?

EX 16-9 Accounts receivable analysis — Obj. 3

✔ a. (1) Accounts receivable turnover, 20Y3, 8.2


SHOW ME HOW

The following data are taken from the financial statements of Sigmon Inc. Terms of all sales are 2/10, n/45.

	20Y3	20Y2	20Y1
Accounts receivable, end of year	$ 725,000	$ 650,000	$600,000
Sales on account	5,637,500	4,687,500	

a. For 20Y2 and 20Y3, determine (1) the accounts receivable turnover and (2) the number of days' sales in receivables. Round to the nearest dollar and one decimal place.

b. What conclusions can be drawn from these data concerning accounts receivable and credit policies?

EX 16-10 Accounts receivable analysis — Obj. 3

✔ a. (1) Lestrade, 7.0

Xavier Stores Company and Lestrade Stores Inc. are large retail department stores. Both companies offer credit to their customers through their own credit card operations. Information from the financial statements for both companies for two recent years is as follows (in millions):

	Xavier	Lestrade
Sales	$8,500,000	$4,585,000
Credit card receivables—beginning	820,000	600,000
Credit card receviables—ending	880,000	710,000

a. Determine the (1) accounts receivable turnover and (2) the number of days' sales in receivables for both companies. Round to one decimal place.

b. Compare the two companies with regard to their credit card policies.

EX 16-11 Inventory analysis **Obj. 3**

✔ a. (1) Inventory turnover, current year, 9.0



The following data were extracted from the income statement of Keever Inc.:

	Current Year	Previous Year
Sales	$18,500,000	$20,000,000
Beginning inventories	940,000	860,000
Cost of goods sold	9,270,000	10,800,000
Ending inventories	1,120,000	940,000

a. Determine for each year (1) the inventory turnover and (2) the number of days' sales in inventory. Round to the nearest dollar and one decimal place.

b. What conclusions can be drawn from these data concerning the inventories?

EX 16-12 Inventory analysis **Obj. 3**

✔ a. (1) QT inventory turnover, 32.1

QT, Inc. and Elppa Computers, Inc. compete with each other in the personal computer market. QT assembles computers to customer orders, building and delivering a computer within four days of a customer entering an order online. Elppa, on the other hand, builds computers for inventory prior to receiving an order. These computers are sold from inventory once an order is received. Selected financial information for both companies from recent financial statements follows (in millions):

	QT	Elppa
Sales	$56,940	$120,357
Cost of goods sold	44,754	92,385
Inventory, beginning of period	1,382	6,317
Inventory, end of period	1,404	7,490

a. Determine for both companies (1) the inventory turnover and (2) the number of days' sales in inventory. Round to one decimal place.

b. Interpret the inventory ratios in the context of both companies' operating strategies.

EX 16-13 Ratio of liabilities to stockholders' equity and times interest earned **Obj. 4**

✔ a. Ratio of liabilities to stockholders' equity, current year, 0.9

The following data were taken from the financial statements of Hunter Inc. for December 31 of two recent years:

	Current Year	Previous Year
Accounts payable	$ 924,000	$ 800,000
Current maturities of serial bonds payable	200,000	200,000
Serial bonds payable, 10%	1,000,000	1,200,000
Common stock, $10 par value	250,000	250,000
Paid-in capital in excess of par	1,250,000	1,250,000
Retained earnings	860,000	500,000

The income before income tax expense was $480,000 and $420,000 for the current and previous years, respectively.

a. Determine the ratio of liabilities to stockholders' equity at the end of each year. Round to one decimal place.

b. Determine the times interest earned ratio for both years. Round to one decimal place.

c. What conclusions can be drawn from these data as to the company's ability to meet its currently maturing debts?

EX 16-14 Ratio of liabilities to stockholders' equity and times interest earned — Obj. 4

✔ a. Hasbro, 1.7



Hasbro, Inc. (HAS), and **Mattel, Inc. (MAT)**, are the two largest toy companies in North America. Condensed liabilities and stockholders' equity from a recent balance sheet are shown for each company as follows (in thousands):

	Hasbro	Mattel
Liabilities:		
Current liabilities	$1,617,859	$1,505,573
Long-term debt	1,588,067	2,580,439
Total liabilities	$3,205,926	$4,086,012
Total stockholders' equity	$1,862,736	$2,407,782
Total liabilities and stockholders' equity	$5,068,662	$6,493,794

The operating income and interest expense from the income statement for each company were as follows (in thousands):

	Hasbro	Mattel
Operating income (before income tax expense)	$692,489	$409,472
Interest expense	97,405	95,118

a. Determine the ratio of liabilities to stockholders' equity for both companies. Round to one decimal place.

b. Determine the times interest earned ratio for both companies. Round to one decimal place.

c. Interpret the ratio differences between the two companies.

EX 16-15 Ratio of liabilities to stockholders' equity and ratio of fixed assets to long-term liabilities — Obj. 4

✔ a. Mondelez International, Inc., 1.4



Recent balance sheet information for two companies in the food industry, **Mondelez International, Inc. (MDLZ)**, and **The Hershey Company (HSY)**, is as follows (in thousands):

	Mondelez	Hershey
Net property, plant, and equipment	$ 8,229,000	$2,177,248
Current liabilities	14,417,000	1,909,443
Long-term debt	13,217,000	2,347,455
Other long-term liabilities	8,689,000	439,748
Stockholders' equity	25,215,000	827,687

a. Determine the ratio of liabilities to stockholders' equity for both companies. Round to one decimal place.

b. Determine the ratio of fixed assets to long-term liabilities for both companies. Round to one decimal place.

c. Interpret the ratio differences between the two companies.

EX 16-16 Asset turnover — Obj. 5

✔ a. YRC, 2.6



Three major segments of the transportation industry are motor carriers, such as **YRC Worldwide (YRCW)**; railroads, such as **Union Pacific (UNP)**; and transportation logistics services, such as **C.H. Robinson Worldwide, Inc. (CHRW)**. Financial statement information for these three companies follows (in thousands):

	YRC	Union Pacific	C.H. Robinson
Sales	$4,697,500	$19,941,000	$13,144,413
Average total assets	1,824,700	55,159,000	3,436,058

a. Determine the asset turnover for all three companies. Round to one decimal place.

b. Assume that the asset turnover for each company represents their respective industry segment. Interpret the differences in the asset turnover in terms of the operating characteristics of each of the respective segments.

EX 16-17 Profitability ratios

Obj. 5

✔ a. Return on total assets, 20Y7, 12.0%



The following selected data were taken from the financial statements of Vidahill Inc. for December 31, 20Y7, 20Y6, and 20Y5:

	20Y7	20Y6	20Y5
Total assets	$4,800,000	$4,400,000	$4,000,000
Notes payable (8% interest)	2,250,000	2,250,000	2,250,000
Common stock	250,000	250,000	250,000
Preferred 4% stock, $100 par (no change during year)	500,000	500,000	500,000
Retained earnings	1,574,000	1,222,000	750,000

The 20Y7 net income was $372,000, and the 20Y6 net income was $492,000. No dividends on common stock were declared between 20Y5 and 20Y7. Preferred dividends were declared and paid in full in 20Y6 and 20Y7.

a. Determine the return on total assets, the return on stockholders' equity, and the return on common stockholders' equity for the years 20Y6 and 20Y7. Round percentages to one decimal place.

b. What conclusions can be drawn from these data as to the company's profitability?

EX 16-18 Profitability ratios

Obj. 5

✔ a. Year 3 return on total assets, 6.8%



Ralph Lauren Corporation (RL) sells apparel through company-owned retail stores. Financial information for Ralph Lauren follows (in thousands):

	Fiscal Year 3	Fiscal Year 2	
Net income	$396,400	$702,200	
Interest expense	21,000	16,700	
	Fiscal Year 3	**Fiscal Year 2**	**Fiscal Year 1**
Total assets (at end of fiscal year)	$6,213,100	$6,106,000	$6,088,000
Total stockholders' equity (at end of fiscal year)	3,743,500	3,891,000	4,034,000

Assume the apparel industry average return on total assets is 8.0%, and the average return on stockholders' equity is 15.0% for the year ended April 2, Year 3.

a. Determine the return on total assets for Ralph Lauren for fiscal Years 2 and 3. Round percentages to one decimal place.

b. Determine the return on stockholders' equity for Ralph Lauren for fiscal Years 2 and 3. Round percentages to one decimal place.

c. Evaluate the two-year trend for the profitability ratios determined in (a) and (b).

d. Evaluate Ralph Lauren's profit performance relative to the industry.

EX 16-19 Six measures of solvency or profitability

Obj. 4, 5

✔ c. Asset turnover, 4.2

The following data were taken from the financial statements of Gates Inc. for the current fiscal year.

Property, plant, and equipment (net)		$ 3,200,000
Liabilities:		
Current liabilities	$1,000,000	
Note payable, 6%, due in 15 years	2,000,000	
Total liabilities		$ 3,000,000
Stockholders' equity:		
Preferred $10 stock, $100 par (no change during year)		$ 1,000,000
Common stock, $10 par (no change during year)		2,000,000
Retained earnings:		
Balance, beginning of year	$1,570,000	
Net income	930,000	
Preferred dividends	(100,000)	
Common dividends	(400,000)	
Balance, end of year		2,000,000
Total stockholders' equity		$ 5,000,000
Sales		$18,900,000
Interest expense		$ 120,000

Assuming that long-term investments totaled $3,000,000 throughout the year and that total assets were $7,000,000 at the beginning of the current fiscal year, determine the following: (a) ratio of

(Continued)

fixed assets to long-term liabilities, (b) ratio of liabilities to stockholders' equity, (c) asset turnover, (d) return on total assets, (e) return on stockholders' equity, and (f) return on common stockholders' equity. Round ratios and percentages to one decimal place as appropriate.

EX 16-20 Five measures of solvency or profitability **Obj. 4, 5**

✔ c. Price-earnings ratio, 10.0

The balance sheet for Garcon Inc. at the end of the current fiscal year indicated the following:

Bonds payable, 8%	$5,000,000
Preferred $4 stock, $50 par	2,500,000
Common stock, $10 par	5,000,000

Income before income tax expense was $3,000,000, and income taxes were $1,200,000 for the current year. Cash dividends paid on common stock during the current year totaled $1,200,000. The common stock was selling for $32 per share at the end of the year. Determine each of the following: (a) times interest earned ratio (b) earnings per share on common stock, (c) price-earnings ratio, (d) dividends per share of common stock, and (e) dividend yield. Round ratios and percentages to one decimal place, except for per-share amounts.

EX 16-21 Earnings per share, price-earnings ratio, dividend yield **Obj. 5**

✔ b. Price-earnings ratio, 15.0



The following information was taken from the financial statements of Tolbert Inc. for December 31 of the current fiscal year:

Common stock, $20 par (no change during the year)	$10,000,000
Preferred $4 stock, $40 par (no change during the year)	2,500,000

The net income was $1,750,000 and the declared dividends on the common stock were $1,125,000 for the current year. The market price of the common stock is $45 per share.

For the common stock, determine (a) the earnings per share, (b) the price-earnings ratio, (c) the dividends per share, and (d) the dividend yield. Round ratios and percentages to one decimal place, except for per-share amounts.

EX 16-22 Price-earnings ratio; dividend yield **Obj. 5**

✔ a. Alphabet, 37.9



The table that follows shows the stock price, earnings per share, and dividends per share for three companies for a recent year:

	Price	Earnings per Share	Dividends per Share
Deere & Company (DE)	$103.04	$ 4.83	$2.40
Alphabet (GOOG)	792.45	20.91	0.00
The Coca-Cola Company (KO)	178.85	1.51	1.40

a. Determine the price-earnings ratio and dividend yield for the three companies. Round ratios and percentages to one decimal place as appropriate.

b. Explain the differences in these ratios across the three companies.

Appendix 1

EX 16-23 Earnings per share, discontinued operations

✔ b. Earnings per share on common stock, $7.60

The net income reported on the income statement of Cutler Co. was $4,000,000. There were 500,000 shares of $10 par common stock and 100,000 shares of $2 preferred stock outstanding throughout the current year. The income statement included a gain on discontinued operations of $400,000 after applicable income tax. Determine the per-share figures for common stock for (a) income before discontinued operations and (b) net income.

Appendix 1

EX 16-24 Income statement and earnings per share for discontinued operations

Apex Inc. reports the following for a recent year:

Income from continuing operations before income tax expense	$1,000,000
Loss from discontinued operations	$240,000*
Weighted average number of shares outstanding	20,000
Applicable tax rate	40%

*Net of any tax effect.

a. Prepare a partial income statement for Apex Inc., beginning with income from continuing operations before income tax expense.

b. Determine the earnings per common share for Apex Inc., including per-share amounts for unusual items.

Appendix 1
EX 16-25 Unusual items

Explain whether Colston Company correctly reported the following items in the financial statements:

a. In a recent year, the company discovered a clerical error in the prior year's accounting records. As a result, the reported net income for the previous year was overstated by $45,000. The company corrected this error by restating the prior-year financial statements.

b. In a recent year, the company voluntarily changed its method of accounting for long-term construction contracts from the percentage of completion method to the completed contract method. Both methods are acceptable under generally acceptable accounting principles. The cumulative effect of this change was reported as a separate component of income in the current period income statement.

Appendix 2
EX 16-26 Comprehensive income

Anson Industries, Inc., reported the following information on its 20Y1 income statement:

Sales	$4,000,000
Cost of goods sold	2,300,000
Operating expenses	1,000,000
Income tax expense	280,000
Other comprehensive income	450,000

Prepare the following for Anson Industries, Inc.:

a. Income statement, including comprehensive income.

b. Income statement and a separate statement of comprehensive income.

Problems: Series A

PR 16-1A Horizontal analysis of income statement

Obj. 2

✔ 1. Sales, 12.0% increase

SHOW ME HOW EXCEL TEMPLATE

For 20Y2, McDade Company reported a decline in net income. At the end of the year, T. Burrows, the president, is presented with the following condensed comparative income statement:

McDade Company
Comparative Income Statement
For the Years Ended December 31, 20Y2 and 20Y1

	20Y2	20Y1
Sales	$ 16,800,000	$ 15,000,000
Cost of goods sold	(11,500,000)	(10,000,000)
Gross profit	$ 5,300,000	$ 5,000,000
Selling expenses	$ (1,770,000)	$ (1,500,000)
Administrative expenses	(1,220,000)	(1,000,000)
Total operating expenses	$ (2,990,000)	$ (2,500,000)
Operating income	$ 2,310,000	$ 2,500,000
Other revenue	256,950	225,000
Income before income tax expense	$ 2,566,950	$ 2,725,000
Income tax expense	(1,413,000)	(1,500,000)
Net income	$ 1,153,950	$ 1,225,000

Instructions

1. Prepare a comparative income statement with horizontal analysis for the two-year period, using 20Y1 as the base year. Round percentages to one decimal place.
2. To the extent the data permit, comment on the significant relationships revealed by the horizontal analysis prepared in (1).

PR 16-2A Vertical analysis of income statement

Obj. 2

✔ 1. Net income, 20Y2, 10.0%



EXCEL TEMPLATE

For 20Y2, Tri-Comic Company initiated a sales promotion campaign that included the expenditure of an additional $50,000 for advertising. At the end of the year, Lumi Neer, the president, is presented with the following condensed comparative income statement:

Tri-Comic Company
Comparative Income Statement
For the Years Ended December 31, 20Y2 and 20Y1

	20Y2	20Y1
Sales	$1,500,000	$1,250,000
Cost of goods sold	(510,000)	(475,000)
Gross profit	$ 990,000	$ 775,000
Selling expenses	$ (270,000)	$ (200,000)
Administrative expenses	(180,000)	(156,250)
Total operating expenses	$ (450,000)	$ (356,250)
Operating income	$ 540,000	$ 418,750
Other revenue	60,000	50,000
Income before income tax expense	$ 600,000	$ 468,750
Income tax expense	(450,000)	(375,000)
Net income	$ 150,000	$ 93,750

Instructions

1. Prepare a comparative income statement for the two-year period, presenting an analysis of each item in relationship to sales for each of the years. Round percentages to one decimal place.
2. To the extent the data permit, comment on the significant relationships revealed by the vertical analysis prepared in (1).

PR 16-3A Effect of transactions on current position analysis

Obj. 3

✔ 2. c. Current ratio, 2.0



EXCEL TEMPLATE

Data pertaining to the current position of Forte Company follow:

Cash	$412,500
Marketable securities	187,500
Accounts and notes receivable (net)	300,000
Inventories	700,000
Prepaid expenses	50,000
Accounts payable	200,000
Notes payable (short-term)	250,000
Accrued expenses	300,000

Instructions

1. Compute (a) the working capital, (b) the current ratio, and (c) the quick ratio. Round to one decimal place.
2. List the following captions on a sheet of paper:

Transaction	Working Capital	Current Ratio	Quick Ratio

Compute the working capital, the current ratio, and the quick ratio after each of the following transactions, and record the results in the appropriate columns. *Consider each transaction separately* and assume that only that transaction affects the data given. Round to one decimal place.

a. Sold marketable securities at no gain or loss, $70,000.
b. Paid accounts payable, $125,000.
c. Purchased goods on account, $110,000.
d. Paid notes payable, $100,000.
e. Declared a cash dividend, $150,000.
f. Declared a common stock dividend on common stock, $50,000.
g. Borrowed cash from bank on a long-term note, $225,000.
h. Received cash on account, $125,000.
i. Issued additional shares of stock for cash, $600,000.
j. Paid cash for prepaid expenses, $10,000.

✔ 5. Number of days' sales in receivables, 18.3

EXCEL TEMPLATE

PR 16-4A Measures of liquidity, solvency, and profitability

Obj. 3, 4, 5

The comparative financial statements of Marshall Inc. are as follows. The market price of Marshall common stock was $82.60 on December 31, 20Y2.

Marshall Inc.
Comparative Retained Earnings Statement
For the Years Ended December 31, 20Y2 and 20Y1

	20Y2	20Y1
Retained earnings, January 1	$3,704,000	$3,264,000
Net income	$ 600,000	$ 550,000
Dividends:		
On preferred stock	(10,000)	(10,000)
On common stock	(100,000)	(100,000)
Increase in retained earnings	$ 490,000	$ 440,000
Retained earnings, December 31	$4,194,000	$3,704,000

Marshall Inc.
Comparative Income Statement
For the Years Ended December 31, 20Y2 and 20Y1

	20Y2	20Y1
Sales	$ 10,850,000	$10,000,000
Cost of goods sold	(6,000,000)	(5,450,000)
Gross profit	$ 4,850,000	$ 4,550,000
Selling expenses	$ (2,170,000)	$ (2,000,000)
Administrative expenses	(1,627,500)	(1,500,000)
Total operating expenses	$(3,797,500)	$ (3,500,000)
Operating income	$ 1,052,500	$ 1,050,000
Other revenue and expense:		
Other revenue	99,500	20,000
Other expense (interest)	(132,000)	(120,000)
Income before income tax expense	$ 1,020,000	$ 950,000
Income tax expense	(420,000)	(400,000)
Net income	$ 600,000	$ 550,000

Marshall Inc.
Comparative Balance Sheet
December 31, 20Y2 and 20Y1

	20Y2	20Y1
Assets		
Current assets:		
Cash	$1,050,000	$ 950,000
Marketable securities	301,000	420,000
Accounts receivable (net)	585,000	500,000
Inventories	420,000	380,000
Prepaid expenses	108,000	20,000
Total current assets	$ 2,464,000	$2,270,000
Long-term investments	800,000	800,000
Property, plant, and equipment (net)	5,760,000	5,184,000
Total assets	$ 9,024,000	$8,254,000
Liabilities		
Current liabilities	$ 880,000	$ 800,000
Long-term liabilities:		
Mortgage note payable, 6%	$ 200,000	$ 0
Bonds payable, 4%	3,000,000	3,000,000
Total long-term liabilities	$ 3,200,000	$3,000,000
Total liabilities	$ 4,080,000	$3,800,000
Stockholders' Equity		
Preferred 4% stock, $5 par	$ 250,000	$ 250,000
Common stock, $5 par	500,000	500,000
Retained earnings	4,194,000	3,704,000
Total stockholders' equity	$ 4,944,000	$4,454,000
Total liabilities and stockholders' equity	$ 9,024,000	$8,254,000

(Continued)

Instructions

Determine the following measures for 20Y2. Round to one decimal place, including percentages, except for per-share amounts, which should be rounded to the nearest cent.

1. Working capital
2. Current ratio
3. Quick ratio
4. Accounts receivable turnover
5. Number of days' sales in receivables
6. Inventory turnover
7. Number of days' sales in inventory
8. Ratio of fixed assets to long-term liabilities
9. Ratio of liabilities to stockholders' equity
10. Times interest earned
11. Asset turnover
12. Return on total assets
13. Return on stockholders' equity
14. Return on common stockholders' equity
15. Earnings per share on common stock
16. Price-earnings ratio
17. Dividends per share of common stock
18. Dividend yield

PR 16-5A Solvency and profitability trend analysis

Obj. 4, 5

✔ 1. b. 20Y7, 11.3%

Addai Company has provided the following comparative information:

	20Y8	20Y7	20Y6	20Y5	20Y4
Net income	$ 273,406	$ 367,976	$ 631,176	$ 884,000	$ 800,000
Interest expense	616,047	572,003	528,165	495,000	440,000
Income tax expense	31,749	53,560	106,720	160,000	200,000
Total assets (ending balance)	4,417,178	4,124,350	3,732,443	3,338,500	2,750,000
Total stockholders' equity (ending balance)	3,706,557	3,433,152	3,065,176	2,434,000	1,550,000
Average total assets	4,270,764	3,928,397	3,535,472	3,044,250	2,475,000
Average total stockholders' equity	3,569,855	3,249,164	2,749,588	1,992,000	1,150,000

You have been asked to evaluate the historical performance of the company over the last five years.

Selected industry ratios have remained relatively steady at the following levels for the last five years:

	20Y4–20Y8
Return on total assets	28%
Return on stockholders' equity	18%
Times interest earned	2.7
Ratio of liabilities to stockholders' equity	0.4

Instructions

1. Prepare four line graphs with the ratio on the vertical axis and the years on the horizontal axis for the following four ratios (round to one decimal place):
   a. Return on total assets
   b. Return on stockholders' equity
   c. Times interest earned
   d. Ratio of liabilities to stockholders' equity

   Display both the company ratio and the industry benchmark on each graph. That is, each graph should have two lines.
2. Prepare an analysis of the graphs in (1).

Problems: Series B

PR 16-1B Horizontal analysis of income statement

Obj. 2

✔ 1. Sales, 30.0% increase

SHOW ME HOW EXCEL TEMPLATE

For 20Y2, Macklin Inc. reported a significant increase in net income. At the end of the year, John Mayer, the president, is presented with the following condensed comparative income statement:

Macklin Inc.
Comparative Income Statement
For the Years Ended December 31, 20Y2 and 20Y1

	20Y2	20Y1
Sales	$ 910,000	$ 700,000
Cost of goods sold	(441,000)	(350,000)
Gross profit	$ 469,000	$ 350,000
Selling expenses	$ (139,150)	$ (115,000)
Administrative expenses	(99,450)	(85,000)
Total operating expenses	$ (238,600)	$ (200,000)
Operating income	$ 230,400	$ 150,000
Other revenue	65,000	50,000
Income before income tax expense	$ 295,400	$ 200,000
Income tax expense	(65,000)	(50,000)
Net income	$ 230,400	$ 150,000

Instructions

1. Prepare a comparative income statement with horizontal analysis for the two-year period, using 20Y1 as the base year. Round percentages to one decimal place.
2. To the extent the data permit, comment on the significant relationships revealed by the horizontal analysis prepared in (1).

PR 16-2B Vertical analysis of income statement

Obj. 2

✔ 1. Net income, 20Y1, 14.0%

EXCEL TEMPLATE

For 20Y2, Fielder Industries Inc. initiated a sales promotion campaign that included the expenditure of an additional $40,000 for advertising. At the end of the year, Leif Grando, the president, is presented with the following condensed comparative income statement:

Fielder Industries Inc.
Comparative Income Statement
For the Years Ended December 31, 20Y2 and 20Y1

	20Y2	20Y1
Sales	$1,300,000	$1,180,000
Cost of goods sold	(682,500)	(613,600)
Gross profit	$ 617,500	$ 566,400
Selling expenses	$ (260,000)	$ (188,800)
Adminstrative expenses	(169,000)	(177,000)
Total operating expenses	$ (429,000)	$ (365,800)
Operating income	$ 188,500	$ 200,600
Other revenue	78,000	70,800
Income before income tax expense	$ 266,500	$ 271,400
Income tax expense	(117,000)	(106,200)
Net income	$ 149,500	$ 165,200

Instructions

1. Prepare a comparative income statement for the two-year period, presenting an analysis of each item in relationship to sales for each of the years. Round percentages to one decimal place.
2. To the extent the data permit, comment on the significant relationships revealed by the vertical analysis prepared in (1).

PR 16-3B Effect of transactions on current position analysis — Obj. 3

✔ 2. g. Quick ratio, 1.6


EXCEL TEMPLATE

Data pertaining to the current position of Lucroy Industries Inc. follows:

Cash	$ 800,000
Marketable securities	550,000
Accounts and notes receivable (net)	850,000
Inventories	700,000
Prepaid expenses	300,000
Accounts payable	1,200,000
Notes payable (short-term)	700,000
Accrued expenses	100,000

Instructions

1. Compute (a) the working capital, (b) the current ratio, and (c) the quick ratio. Round to one decimal place.
2. List the following captions on a sheet of paper:

Transaction	Working Capital	Current Ratio	Quick Ratio

Compute the working capital, the current ratio, and the quick ratio after each of the following transactions, and record the results in the appropriate columns. *Consider each transaction separately* and assume that only that transaction affects the data given. Round to one decimal place.

a. Sold marketable securities at no gain or loss, $500,000.
b. Paid accounts payable, $287,500.
c. Purchased goods on account, $400,000.
d. Paid notes payable, $125,000.
e. Declared a cash dividend, $325,000.
f. Declared a common stock dividend on common stock, $150,000.
g. Borrowed cash from bank on a long-term note, $1,000,000.
h. Received cash on account, $75,000.
i. Issued additional shares of stock for cash, $2,000,000.
j. Paid cash for prepaid expenses, $200,000.

PR 16-4B Measures of liquidity, solvency and profitability — Obj. 3, 4, 5

✔ 9. Ratio of liabilities to stockholders' equity, 0.4


EXCEL TEMPLATE

The comparative financial statements of Stargel Inc. are as follows. The market price of Stargel common stock was $119.70 on December 31, 20Y2.

Stargel Inc.
Comparative Retained Earnings Statement
For the Years Ended December 31, 20Y2 and 20Y1

	20Y2	20Y1
Retained earnings, January 1	$5,375,000	$4,545,000
Net income	$ 900,000	$ 925,000
Dividends:		
On preferred stock	(45,000)	(45,000)
On common stock	(50,000)	(50,000)
Increase in retained earnings	$ 805,000	$ 830,000
Retained earnings, December 31	$6,180,000	$5,375,000

Stargel Inc.
Comparative Income Statement
For the Years Ended December 31, 20Y2 and 20Y1

	20Y2	20Y1
Sales	$ 10,000,000	$ 9,400,000
Cost of goods sold	(5,350,000)	(4,950,000)
Gross profit	$ 4,650,000	$ 4,450,000
Selling expenses	$ (2,000,000)	$ (1,880,000)
Administrative expenses	(1,500,000)	(1,410,000)
Total operating expenses	$ (3,500,000)	$ (3,290,000)
Operating income	$ 1,150,000	$ 1,160,000
Other revenue and expense:		
Other revenue	150,000	140,000
Other expense (interest)	(170,000)	(150,000)
Income before income tax expense:	$ 1,130,000	$ 1,150,000
Income tax expense	(230,000)	(225,000)
Net income	$ 900,000	$ 925,000

Stargel Inc.
Comparative Balance Sheet
December 31, 20Y2 and 20Y1

	20Y2	20Y1
Assets		
Current assets:		
Cash	$ 500,000	$ 400,000
Marketable securities	1,010,000	1,000,000
Accounts receivable (net)	740,000	510,000
Inventories	1,190,000	950,000
Prepaid expenses	250,000	229,000
Total current assets	$ 3,690,000	$ 3,089,000
Long-term investments	2,350,000	2,300,000
Property, plant, and equipment (net)	3,740,000	3,366,000
Total assets	$ 9,780,000	$ 8,755,000
Liabilities		
Current liabilities	$ 900,000	$ 880,000
Long-term liabilities:		
Mortgage note payable, 10%	$ 200,000	$ 0
Bonds payable, 10%	1,500,000	1,500,000
Total long-term liabilities	$ 1,700,000	$ 1,500,000
Total liabilities	$ 2,600,000	$ 2,380,000
Stockholders' Equity		
Preferred $0.90 stock, $10 par	$ 500,000	$ 500,000
Common stock, $5 par	500,000	500,000
Retained earnings	6,180,000	5,375,000
Total stockholders' equity	$ 7,180,000	$ 6,375,000
Total liabilities and stockholders' equity	$ 9,780,000	$ 8,755,000

Instructions

Determine the following measures for 20Y2. Round to one decimal place including percentages, except for per-share amounts, which should be rounded to the nearest cent.

1. Working capital
2. Current ratio
3. Quick ratio
4. Accounts receivable turnover
5. Number of days' sales in receivables
6. Inventory turnover
7. Number of days' sales in inventory

(Continued)

8. Ratio of fixed assets to long-term liabilities
9. Ratio of liabilities to stockholders' equity
10. Times interest earned
11. Asset turnover
12. Return on total assets
13. Return on stockholders' equity
14. Return on common stockholders' equity
15. Earnings per share on common stock
16. Price-earnings ratio
17. Dividends per share of common stock
18. Dividend yield

PR 16-5B Solvency and profitability trend analysis **Obj. 4, 5**

✔ 1. b. 20Y7, 32.9%

Crosby Company has provided the following comparative information:

	20Y8	20Y7	20Y6	20Y5	20Y4
Net income	$ 5,571,720	$ 3,714,480	$ 2,772,000	$ 1,848,000	$ 1,400,000
Interest expense	1,052,060	891,576	768,600	610,000	500,000
Income tax expense	1,225,572	845,222	640,320	441,600	320,000
Total assets (ending balance)	29,378,491	22,598,839	17,120,333	12,588,480	10,152,000
Total stockholders' equity (ending balance)	18,706,200	13,134,480	9,420,000	6,648,000	4,800,000
Average total assets	25,988,665	19,859,586	14,854,406	11,370,240	8,676,000
Average total stockholders' equity	15,920,340	11,277,240	8,034,000	5,724,000	4,100,000

You have been asked to evaluate the historical performance of the company over the last five years.

Selected industry ratios have remained relatively steady at the following levels for the last five years:

	20Y4–20Y8
Return on total assets	19%
Return on stockholders' equity	26%
Times interest earned	3.4
Ratio of liabilities to stockholders' equity	1.4

Instructions

1. Prepare four line graphs with the ratio on the vertical axis and the years on the horizontal axis for the following four ratios. Round ratios and percentages to one decimal place.
   a. Return on total assets
   b. Return on stockholders' equity
   c. Times interest earned
   d. Ratio of liabilities to stockholders' equity

   Display both the company ratio and the industry benchmark on each graph. That is, each graph should have two lines.
2. Prepare an analysis of the graphs in (1).

Make a Decision
Financial Statement Analysis

REAL WORLD

MAD 16-1 Analyze and compare Amazon.com, Best Buy, and Wal-Mart **Obj. 2**

The condensed income statements through operating income for **Amazon.com, Inc. (AMZN)**, **Best Buy Co., Inc. (BBY)**, and **Wal-Mart Stores, Inc. (WMT)**, for a recent fiscal year follow (in millions):

	Amazon	Best Buy	Wal-Mart
Sales	$135,987	$ 39,403	$ 485,873
Cost of sales	(88,265)	(29,963)	(361,256)
Gross profit	$ 47,722	$ 9,440	$ 124,617
Selling, general, and administrative expenses	(43,369)	(7,547)	(101,853)
Operating expenses	(167)	(39)	0
Operating income	$ 4,186	$ 1,854	$ 22,764

1. Prepare comparative common-sized income statements for each company. Round percentages to one decimal place.
2. Use the common-sized analysis to compare the financial performance of the three companies.

REAL WORLD

MAD 16-2 Analyze and compare Alphabet, PepsiCo, and Caterpillar **Obj. 5**

The following table shows the stock price, earnings per share, and dividends per share for **Alphabet Inc. (GOOG)**, **PepsiCo, Inc. (PEP)**, and **Caterpillar Inc. (CAT)** for a recent year:

	Alphabet	PepsiCo	Caterpillar
Market price of common stock at year-end	$778.01	$99.92	$67.96
Earnings per share	22.84	3.71	4.23
Dividends per share	0.00	2.76	3.01

1. For each company, determine the:
   a. Price-earnings ratio. Round to the nearest cent.
   b. Dividend yield. Round to one decimal place.
2. Based on the information available, which company would you expect to have the best potential for future common stock price appreciation? Why?

REAL WORLD

MAD 16-3 Analyze Deere & Company **Obj. 5**

Deere & Company (DE) manufactures and distributes farm and construction machinery that it sells around the world. In addition to its manufacturing operations, Deere's credit division loans money to customers to finance the purchase of their farm and construction equipment.

The following information is available for three recent years (in millions except per-share amounts):

	Year 3	Year 2	Year 1
Net income (loss)	$1,523.9	$1,940.0	$3,161.7
Preferred dividends	$0.00	$0.00	$0.00
Interest expense	$763.7	$680.0	$664.0
Shares outstanding for computing earnings per share	315	334	363
Cash dividend per share	$2.40	$2.40	$2.22
Average total assets	$57,965	$59,642	$60,429
Average stockholders' equity	$6,644	$7,912	$9,667
Average stock price per share	$92.03	$81.10	$85.58

1. Calculate the following ratios for each year. Round ratios and percentages to one decimal place, except for per-share amounts, which should be rounded to the nearest cent.
   a. Return on total assets
   b. Return on stockholders' equity

(Continued)

c. Earnings per share
d. Dividend yield
e. Price-earnings ratio

2. Based on these data, evaluate Deere's profitability.

REAL WORLD

MAD 16-4 Analyze and compare Marriott and Hyatt **Obj. 4, 5**

Marriott International, Inc. (MAR), and **Hyatt Hotels Corporation (H)** are two major owners and managers of lodging and resort properties in the United States. Abstracted income statement information for the two companies is as follows for a recent year (in millions):

	Marriott	Hyatt
Operating profit before other revenue and interest	$1,368	$299
Other revenue (expense)	50	66
Interest expense	(234)	(76)
Income before income tax expense	$1,184	$289
Income tax expense	(404)	(85)
Net income	$ 780	$204

Balance sheet information is as follows:

	Marriott	Hyatt
Total liabilities	$18,783	$3,841
Total stockholders' equity	5,357	3,908
Total liabilities and stockholders' equity	$24,140	$7,749

The average liabilities, average stockholders' equity, and average total assets are as follows:

	Marriott	Hyatt
Average total liabilities	$14,228	$3,719
Average total stockholders' equity	883	3,951
Average total assets	15,111	7,670

1. Determine the following ratios for both companies. Round ratios and percentages to one decimal place.
   a. Return on total assets
   b. Return on stockholders' equity
   c. Times interest earned
   d. Ratio of total liabilities to stockholders' equity
2. Based on the information in (1), analyze and compare the two companies' solvency and profitability.

Take It Further

ETHICS

TIF 16-1 Internal control

Rodgers Industries Inc. completed its fiscal year on December 31. Near the end of the fiscal year, the company's internal audit department determined that an important internal control procedure had not been functioning properly. The head of internal audit, Dash Riprock, reported the internal control failure to the company's chief accountant, Todd Barleywine. Todd reported the failure to the company's chief financial officer, Josh McCoy. After discussing the issue, Josh instructed Todd not to inform the external auditors of the internal control failure and to fix

the problem quietly after the end of the fiscal year. The external auditors did not discover the internal control failure during their audit. In March, after the audit was complete, the company released its annual report, including associated reports by management. As chief financial officer, Josh authorized the release of Management's Report on Internal Control, which stated that the management team believed that the company's internal controls were effective during the period covered by the annual report.

Did Josh behave ethically in this situation? Explain your answer.



TIF 16-2 Real-world annual report

The financial statements for **Nike, Inc. (NKE)**, are presented in Appendix E at the end of the text. The following additional information is available (in thousands):

Accounts receivable at May 31, 2015	$ 3,358
Inventories at May 31, 2015	4,337
Total assets at May 31, 2015	21,597
Stockholders' equity at May 31, 2015	12,707

Instructions

1. Determine the following measures for the fiscal years ended May 31, 2017, and May 31, 2016. Round ratios and percentages to one decimal place.
   a. Working capital
   b. Current ratio
   c. Quick ratio
   d. Accounts receivable turnover
   e. Number of days' sales in receivables
   f. Inventory turnover
   g. Number of days' sales in inventory
   h. Ratio of liabilities to stockholders' equity
   i. Asset turnover
   j. Return on total assets, assuming interest expense is $82 million for the year ending May 31, 2017, and $33 million for the year ending May 31, 2016.
   k. Return on common stockholders' equity
   l. Price-earnings ratio, assuming that the market price was $52.81 per share on May 31, 2017, and $54.35 per share on May 31, 2016.
   m. Percentage relationship of net income to sales
2. What conclusions can be drawn from these analyses?



TIF 16-3 Debt versus equity financing

The president of Freeman Industries Inc. made the following statement in the annual report to shareholders: "The founding family and majority shareholders of the company do not believe in using debt to finance future growth. The founding family learned from hard experience during Prohibition and the Great Depression that debt can cause loss of flexibility and eventual loss of corporate control. The company will not place itself at such risk again. As such, all future growth will be financed either by stock sales to the public or by internally generated resources."

Write a brief memo to the company's president, Boss Freeman, outlining the errors in his logic.

Pathways Challenge



This is Accounting!

Information/Consequences

Yes, the operating income and net income reported on the income statement in the annual report are based on GAAP.

Companies are allowed to report adjusted (non-GAAP) amounts in their annual reports. However, the adjusted amounts must be labeled as non-GAAP and a reconciliation to the GAAP amounts must be provided. Adjusted (non-GAAP) amounts are often reported when companies feel that GAAP reporting does not accurately reflect their operations, as was the case for **PayPal (PYPL)**.

Because the adjusted (non-GAAP) amounts are higher than the GAAP amounts, return on assets, return on stockholders' equity, and earnings per share will be higher.

Whether adjusted (non-GAAP) amounts provide better information than GAAP amounts is an area of current research. One study[5] concluded that GAAP earnings are more useful than adjusted earnings that exclude expenses related to stock options. However, it is still uncertain whether adjusted (non-GAAP) amounts, combined with GAAP amounts, provide more useful information than the GAAP amounts alone.

Suggested Answer

[5] Mary E. Barth, Ian D. Gow, and Daniel Taylor, "Why Do Pro Forma and Street Earnings Not Reflect Changes in GAAP? Evidence from SFAS 123R," *Review of Accounting Studies* (September 2012): 526–562.

Appendices

A Interest Tables

B Nike Inc., Form 10-K

Appendix A

Interest Tables

Present Value of $1 at Compound Interest Due in *n* Periods = $\frac{1}{(1+i)^n}$

Periods	4.0%	4.5%	5%	5.5%	6%	6.5%	7%
1	0.96154	0.95694	0.95238	0.94787	0.94340	0.93897	0.93458
2	0.92456	0.91573	0.90703	0.89845	0.89000	0.88166	0.87344
3	0.88900	0.87630	0.86384	0.85161	0.83962	0.82785	0.81630
4	0.85480	0.83856	0.82270	0.80722	0.79209	0.77732	0.76290
5	0.82193	0.80245	0.78353	0.76513	0.74726	0.72988	0.71299
6	0.79031	0.76790	0.74622	0.72525	0.70496	0.68533	0.66634
7	0.75992	0.73483	0.71068	0.68744	0.66506	0.64351	0.62275
8	0.73069	0.70319	0.67684	0.65160	0.62741	0.60423	0.58201
9	0.70259	0.67290	0.64461	0.61763	0.59190	0.56735	0.54393
10	0.67556	0.64393	0.61391	0.58543	0.55839	0.53273	0.50835
11	0.64958	0.61620	0.58468	0.55491	0.52679	0.50021	0.47509
12	0.62460	0.58966	0.55684	0.52598	0.49697	0.46968	0.44401
13	0.60057	0.56427	0.53032	0.49856	0.46884	0.44102	0.41496
14	0.57748	0.53997	0.50507	0.47257	0.44230	0.41410	0.38782
15	0.55526	0.51672	0.48102	0.44793	0.41727	0.38883	0.36245
16	0.53391	0.49447	0.45811	0.42458	0.39365	0.36510	0.33873
17	0.51337	0.47318	0.43630	0.40245	0.37136	0.34281	0.31657
18	0.49363	0.45280	0.41552	0.38147	0.35034	0.32189	0.29586
19	0.47464	0.43330	0.39573	0.36158	0.33051	0.30224	0.27651
20	0.45639	0.41464	0.37689	0.34273	0.31180	0.28380	0.25842
21	0.43883	0.39679	0.35894	0.32486	0.29416	0.26648	0.24151
22	0.42196	0.37970	0.34185	0.30793	0.27751	0.25021	0.22571
23	0.40573	0.36335	0.32557	0.29187	0.26180	0.23494	0.21095
24	0.39012	0.34770	0.31007	0.27666	0.24698	0.22060	0.19715
25	0.37512	0.33273	0.29530	0.26223	0.23300	0.20714	0.18425
26	0.36069	0.31840	0.28124	0.24856	0.21981	0.19450	0.17220
27	0.34682	0.30469	0.26785	0.23560	0.20737	0.18263	0.16093
28	0.33348	0.29157	0.25509	0.22332	0.19563	0.17148	0.15040
29	0.32065	0.27902	0.24295	0.21168	0.18456	0.16101	0.14056
30	0.30832	0.26700	0.23138	0.20064	0.17411	0.15119	0.13137
31	0.29646	0.25550	0.22036	0.19018	0.16425	0.14196	0.12277
32	0.28506	0.24450	0.20987	0.18027	0.15496	0.13329	0.11474
33	0.27409	0.23397	0.19987	0.17087	0.14619	0.12516	0.10723
34	0.26355	0.22390	0.19035	0.16196	0.13791	0.11752	0.10022
35	0.25342	0.21425	0.18129	0.15352	0.13011	0.11035	0.09366
40	0.20829	0.17193	0.14205	0.11746	0.09722	0.08054	0.06678
45	0.17120	0.13796	0.11130	0.08988	0.07265	0.05879	0.04761
50	0.14071	0.11071	0.08720	0.06877	0.05429	0.04291	0.03395

Present Value of $1 at Compound Interest Due in *n* Periods = $\frac{1}{(1+i)^n}$

Periods	8%	9%	10%	11%	12%	13%	14%
1	0.92593	0.91743	0.90909	0.90090	0.89286	0.88496	0.87719
2	0.85734	0.84168	0.82645	0.81162	0.79719	0.78315	0.76947
3	0.79383	0.77218	0.75131	0.73119	0.71178	0.69305	0.67497
4	0.73503	0.70843	0.68301	0.65873	0.63552	0.61332	0.59208
5	0.68058	0.64993	0.62092	0.59345	0.56743	0.54276	0.51937
6	0.63017	0.59627	0.56447	0.53464	0.50663	0.48032	0.45559
7	0.58349	0.54703	0.51316	0.48166	0.45235	0.42506	0.39964
8	0.54027	0.50187	0.46651	0.43393	0.40388	0.37616	0.35056
9	0.50025	0.46043	0.42410	0.39092	0.36061	0.33288	0.30751
10	0.46319	0.42241	0.38554	0.35218	0.32197	0.29459	0.26974
11	0.42888	0.38753	0.35049	0.31728	0.28748	0.26070	0.23662
12	0.39711	0.35553	0.31863	0.28584	0.25668	0.23071	0.20756
13	0.36770	0.32618	0.28966	0.25751	0.22917	0.20416	0.18207
14	0.34046	0.29925	0.26333	0.23199	0.20462	0.18068	0.15971
15	0.31524	0.27454	0.23939	0.20900	0.18270	0.15989	0.14010
16	0.29189	0.25187	0.21763	0.18829	0.16312	0.14150	0.12289
17	0.27027	0.23107	0.19784	0.16963	0.14564	0.12522	0.10780
18	0.25025	0.21199	0.17986	0.15282	0.13004	0.11081	0.09456
19	0.23171	0.19449	0.16351	0.13768	0.11611	0.09806	0.08295
20	0.21455	0.17843	0.14864	0.12403	0.10367	0.08678	0.07276
21	0.19866	0.16370	0.13513	0.11174	0.09256	0.07680	0.06383
22	0.18394	0.15018	0.12285	0.10067	0.08264	0.06796	0.05599
23	0.17032	0.13778	0.11168	0.09069	0.07379	0.06014	0.04911
24	0.15770	0.12640	0.10153	0.08170	0.06588	0.05323	0.04308
25	0.14602	0.11597	0.09230	0.07361	0.05882	0.04710	0.03779
26	0.13520	0.10639	0.08391	0.06631	0.05252	0.04168	0.03315
27	0.12519	0.09761	0.07628	0.05974	0.04689	0.03689	0.02908
28	0.11591	0.08955	0.06934	0.05382	0.04187	0.03264	0.02551
29	0.10733	0.08215	0.06304	0.04849	0.03738	0.02889	0.02237
30	0.09938	0.07537	0.05731	0.04368	0.03338	0.02557	0.01963
31	0.09202	0.06915	0.05210	0.03935	0.02980	0.02262	0.01722
32	0.08520	0.06344	0.04736	0.03545	0.02661	0.02002	0.01510
33	0.07889	0.05820	0.04306	0.03194	0.02376	0.01772	0.01325
34	0.07305	0.05339	0.03914	0.02878	0.02121	0.01568	0.01162
35	0.06763	0.04899	0.03558	0.02592	0.01894	0.01388	0.01019
40	0.04603	0.03184	0.02209	0.01538	0.01075	0.00753	0.00529
45	0.03133	0.02069	0.01372	0.00913	0.00610	0.00409	0.00275
50	0.02132	0.01345	0.00852	0.00542	0.00346	0.00222	0.00143

Present Value of Ordinary Annuity of $1 per Period = $\dfrac{1 - \dfrac{1}{(1+i)^n}}{i}$

Periods	4.0%	4.5%	5%	5.5%	6%	6.5%	7%
1	0.96154	0.95694	0.95238	0.94787	0.94340	0.93897	0.93458
2	1.88609	1.87267	1.85941	1.84632	1.83339	1.82063	1.80802
3	2.77509	2.74896	2.72325	2.69793	2.67301	2.64848	2.62432
4	3.62990	3.58753	3.54595	3.50515	3.46511	3.42580	3.38721
5	4.45182	4.38998	4.32948	4.27028	4.21236	4.15568	4.10020
6	5.24214	5.15787	5.07569	4.99553	4.91732	4.84101	4.76654
7	6.00205	5.89270	5.78637	5.68297	5.58238	5.48452	5.38929
8	6.73274	6.59589	6.46321	6.33457	6.20979	6.08875	5.97130
9	7.43533	7.26879	7.10782	6.95220	6.80169	6.65610	6.51523
10	8.11090	7.91272	7.72173	7.53763	7.36009	7.18883	7.02358
11	8.76048	8.52892	8.30641	8.09254	7.88687	7.68904	7.49867
12	9.38507	9.11858	8.86325	8.61852	8.38384	8.15873	7.94269
13	9.98565	9.68285	9.39357	9.11708	8.85268	8.59974	8.35765
14	10.56312	10.22283	9.89864	9.58965	9.29498	9.01384	8.74547
15	11.11839	10.73955	10.37966	10.03758	9.71225	9.40267	9.10791
16	11.65230	11.23402	10.83777	10.46216	10.10590	9.76776	9.44665
17	12.16567	11.70719	11.27407	10.86461	10.47726	10.11058	9.76322
18	12.65930	12.15999	11.68959	11.24607	10.82760	10.43247	10.05909
19	13.13394	12.59329	12.08532	11.60765	11.15812	10.73471	10.33560
20	13.59033	13.00794	12.46221	11.95038	11.46992	11.01851	10.59401
21	14.02916	13.40472	12.82115	12.27524	11.76408	11.28498	10.83553
22	14.45112	13.78442	13.16300	12.58317	12.04158	11.53520	11.06124
23	14.85684	14.14777	13.48857	12.87504	12.30338	11.77014	11.27219
24	15.24696	14.49548	13.79864	13.15170	12.55036	11.99074	11.46933
25	15.62208	14.82821	14.09394	13.41393	12.78336	12.19788	11.65358
26	15.98277	15.14661	14.37519	13.66250	13.00317	12.39237	11.82578
27	16.32959	15.45130	14.64303	13.89810	13.21053	12.57500	11.98671
28	16.66306	15.74287	14.89813	14.12142	13.40616	12.74648	12.13711
29	16.98371	16.02189	15.14107	14.33310	13.59072	12.90749	12.27767
30	17.29203	16.28889	15.37245	14.53375	13.76483	13.05868	12.40904
31	17.58849	16.54439	15.59281	14.72393	13.92909	13.20063	12.53181
32	17.87355	16.78889	15.80268	14.90420	14.08404	13.33393	12.64656
33	18.14765	17.02286	16.00255	15.07507	14.23023	13.45909	12.75379
34	18.41120	17.24676	16.19290	15.23703	14.36814	13.57661	12.85401
35	18.66461	17.46101	16.37419	15.39055	14.49825	13.68696	12.94767
40	19.79277	18.40158	17.15909	16.04612	15.04630	14.14553	13.33171
45	20.72004	19.15635	17.77407	16.54773	15.45583	14.48023	13.60552
50	21.48218	19.76201	18.25593	16.93152	15.76186	14.72452	13.80075

Present Value of Ordinary Annuity of $1 per Period = $\dfrac{1 - \dfrac{1}{(1+i)^n}}{i}$

Periods	8%	9%	10%	11%	12%	13%	14%
1	0.92593	0.91743	0.90909	0.90090	0.89286	0.88496	0.87719
2	1.78326	1.75911	1.73554	1.71252	1.69005	1.66810	1.64666
3	2.57710	2.53129	2.48685	2.44371	2.40183	2.36115	2.32163
4	3.31213	3.23972	3.16987	3.10245	3.03735	2.97447	2.91371
5	3.99271	3.88965	3.79079	3.69590	3.60478	3.51723	3.43308
6	4.62288	4.48592	4.35526	4.23054	4.11141	3.99755	3.88867
7	5.20637	5.03295	4.86842	4.71220	4.56376	4.42261	4.28830
8	5.74664	5.53482	5.33493	5.14612	4.96764	4.79677	4.63886
9	6.24689	5.99525	5.75902	5.53705	5.32825	5.13166	4.94637
10	6.71008	6.41766	6.14457	5.88923	5.65022	5.42624	5.21612
11	7.13896	6.80519	6.49506	6.20652	5.93770	5.68694	5.45273
12	7.53608	7.16073	6.81369	6.49236	6.19437	5.91765	5.66029
13	7.90378	7.48690	7.10336	6.74987	6.42355	6.12181	5.84236
14	8.22424	7.78615	7.36669	6.96187	6.62817	6.30249	6.00207
15	8.55948	8.06069	7.60608	7.19087	6.81086	6.46238	6.14217
16	8.85137	8.31256	7.82371	7.37916	6.97399	6.60388	6.26506
17	9.12164	8.54363	8.02155	7.54879	7.11963	6.72909	6.37286
18	9.37189	8.75563	8.20141	7.70162	7.24967	6.83991	6.46742
19	9.60360	8.95011	8.36492	7.83929	7.36578	6.93797	6.55037
20	9.81815	9.12855	8.51356	7.96333	7.46944	7.02475	6.62313
21	10.01680	9.29224	8.64869	8.07507	7.56200	7.10155	6.68696
22	10.20074	9.44243	8.77154	8.17574	7.64465	7.16951	6.74294
23	10.37106	9.58021	8.88322	8.26643	7.71843	7.22966	6.79206
24	10.52876	9.70661	8.98474	8.34814	7.78432	7.28288	6.83514
25	10.67478	9.82258	9.07704	8.42174	7.84314	7.32998	6.87293
26	10.80998	9.92897	9.16095	8.48806	7.89566	7.37167	6.90608
27	10.93516	10.02658	9.23722	8.54780	7.94255	7.40856	6.93515
28	11.05108	10.11613	9.30657	8.60162	7.98442	7.44120	6.96066
29	11.15841	10.19828	9.36961	8.65011	8.02181	7.47009	6.98304
30	11.25778	10.27365	9.42691	8.69379	8.05518	7.49565	7.00266
31	11.34980	10.34280	9.47901	8.73315	8.08499	7.51828	7.01988
32	11.43500	10.40624	9.52638	8.76860	8.11159	7.53830	7.03498
33	11.51389	10.46444	9.56943	8.80054	8.13535	7.55602	7.04823
34	11.58693	10.51784	9.60857	8.82932	8.15656	7.57170	7.05985
35	11.65457	10.56682	9.64416	8.85524	8.17550	7.58557	7.07005
40	11.92461	10.75736	9.77905	8.95105	8.24378	7.63438	7.10504
45	12.10840	10.88120	9.86281	9.00791	8.28252	7.66086	7.12322
50	12.23348	10.96168	9.91481	9.04165	8.30450	7.67524	7.13266

Appendix B

Nike Inc., Form 10-K for the Fiscal Year Ended May 31, 2017 Selected Excerpts*



NIKE, Inc .

(Exact name of Registrant as specified in its charter)

Management's Annual Report on Internal Control Over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Rule 13(a)—15(f) and Rule 15(d)—15(f) of the Securities Exchange Act of 1934, as amended. Internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of the financial statements for external purposes in accordance with generally accepted accounting principles in the United States of America. Internal control over financial reporting includes those policies and procedures that: (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of assets of the Company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of our management and directors; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of assets of the Company that could have a material effect on the financial statements.

While "reasonable assurance" is a high level of assurance, it does not mean absolute assurance. Because ofits inherent limitations, internal control over financial reporting may not prevent or detect every misstatement and instance of fraud. Controls are susceptible to manipulation, especially in instances of fraud caused by the collusion of two or more people, including our senior management. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Under the supervision and with the participation of our Chief Executive Officer and Chief Financial Officer, our management conducted an evaluation of the effectiveness of our internal control over financial reporting based upon the framework in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on the results of our evaluation, our management concluded that our internal control over financial reporting was effective as of May 31, 2017.

PricewaterhouseCoopers LLP, an independent registered public accounting firm, has audited (1) the Consolidated Financial Statements and (2) the effectiveness of our internal control over financial reporting as of May 31, 2017, as stated in their report herein.

Mark G. Parker
Chairman, President and Chief Executive Officer

Andrew Campion
Chief Financial Officer

* The entire Nike Inc., Form 10-K is available on the companion website at cengagebrain.com.

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of NIKE, Inc.:

In our opinion, the consolidated financial statements listed in the index appearing under Item 15(a)(1) present fairly, in all material respects, the financial position of NIKE, Inc. and its subsidiaries as of May 31, 2017 and 2016, and the results of their operations and their cash flows for each of the three years in the period ended May 31, 2017 in conformity with accounting principles generally accepted in the United States of America. In addition, in our opinion, the financial statement schedule listed in the index appearing under Item 15(a)(2) presents fairly, in all material respects, the information set forth therein when read in conjunction with the related consolidated financial statements. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of May 31, 2017, based on criteria established in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). The Company's management is responsible for these financial statements and financial statement schedule, for maintaining effective internal control over financial reporting and for its assessment of the effectiveness ofinternal control over financial reporting, included in Management's Annual Report on Internal Control over Financial Reporting appearing under Item 8. Our responsibility is to express opinions on these financial statements, on the financial statement schedule and on the Company's internal control over financial reporting based on our integrated audits. We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the financial statements are free of material misstatement and whether effective internal control over financial reporting was maintained in all material respects. Our audits of the financial statements included examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management and evaluating the overall financial statement presentation. Our audit ofinternal control over financial reporting included obtaining an understanding ofinternal control over financial reporting, assessing the risk that a material weakness exists and testing and evaluating the design and operating effectiveness ofinternal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because ofits inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/S/ PRICEWATERHOUSECOOPERS LLP

Portland, Oregon

July 20, 2017

NIKE, Inc. Consolidated Statements of Income

(In millions, except per share data)	Year Ended May 31, 2017	2016	2015
Revenues	$ 34,350	$ 32,376	$ 30,601
Cost of sales	19,038	17,405	16,534
Gross profit	15,312	14,971	14,067
Demand creation expense	3,341	3,278	3,213
Operating overhead expense	7,222	7,191	6,679
Total selling and administrative expense	10,563	10,469	9,892
Interest expense (income), net	59	19	28
Other (income) expense, net	(196)	(140)	(58)
Income before income taxes	4,886	4,623	4,205
Income tax expense	646	863	932
NET INCOME	**$ 4,240**	**$ 3,760**	**$ 3,273**
Earnings per common share:			
Basic	$ 2.56	$ 2.21	$ 1.90
Diluted	$ 2.51	$ 2.16	$ 1.85
Dividends declared per common share	$ 0.70	$ 0.62	$ 0.54

The accompanying Notes to the Consolidated Financial Statements are an integral part of this statement.

NIKE, Inc. Consolidated Statements of Comprehensive Income

(In millions)	Year Ended May 31, 2017	2016	2015
Net income	$ 4,240	$ 3,760	$ 3,273
Other comprehensive income (loss), net of tax:			
Change in net foreign currency translation adjustment	16	(176)	(20)
Change in net gains (losses) on cash flow hedges	(515)	(757)	1,188
Change in net gains (losses) on other	(32)	5	(7)
Total other comprehensive income (loss), net of tax	(531)	(928)	1,161
TOTAL COMPREHENSIVE INCOME	**$ 3,709**	**$ 2,832**	**$ 4,434**

The accompanying Notes to the Consolidated Financial Statements are an integral part of this statement.

NIKE, Inc. Consolidated Balance Sheets

(In millions)	May 31, 2017	2016
ASSETS		
Current assets:		
Cash and equivalents	$ 3,808	$ 3,138
Short-term investments	2,371	2,319
Accounts receivable, net	3,677	3,241
Inventories	5,055	4,838
Prepaid expenses and other current assets	1,150	1,489
Total current assets	16,061	15,025
Property, plant and equipment, net	3,989	3,520
Identifiable intangible assets, net	283	281
Goodwill	139	131
Deferred income taxes and other assets	2,787	2,422
TOTAL ASSETS	**$ 23,259**	**$ 21,379**
LIABILITIES AND SHAREHOLDERS' EQUITY		
Current liabilities:		
Current portion oflong-term debt	$ 6	$ 44
Notes payable	325	1
Accounts payable	2,048	2,191
Accrued liabilities	3,011	3,037
Income taxes payable	84	85
Total current liabilities	5,474	5,358
Long-term debt	3,471	1,993
Deferred income taxes and other liabilities	1,907	1,770
Commitments and contingencies		
Redeemable preferred stock	—	—
Shareholders' equity:		
Common stock at stated value:		
Class A convertible — 329 and 353 shares outstanding	—	—
Class B — 1,314 and 1,329 shares outstanding	3	3
Capital in excess of stated value	8,638	7,786
Accumulated other comprehensive (loss) income	(213)	318
Retained earnings	3,979	4,151
Total shareholders' equity	12,407	12,258
TOTAL LIABILITIES AND SHAREHOLDERS' EQUITY	**$ 23,259**	**$ 21,379**

The accompanying Notes to the Consolidated Financial Statements are an integral part of this statement.

NIKE, Inc. Consolidated Statements of Cash Flows

(In millions)	Year Ended May 31, 2017	2016	2015
Cash provided by operations:			
Net income	$ 4,240	$ 3,760	$ 3,273
Income charges (credits) not affecting cash:			
Depreciation	706	649	606
Deferred income taxes	(273)	(80)	(113)
Stock-based compensation	215	236	191
Amortization and other	10	13	43
Net foreign currency adjustments	(117)	98	424
Changes in certain working capital components and other assets and liabilities:			
(Increase) decrease in accounts receivable	(426)	60	(216)
(Increase) in inventories	(231)	(590)	(621)
(Increase) in prepaid expenses and other current assets	(120)	(161)	(144)
(Decrease) increase in accounts payable, accrued liabilities and income taxes payable	(364)	(889)	1,237
Cash provided by operations	3,640	3,096	4,680
Cash used by investing activities:			
Purchases of short-term investments	(5,928)	(5,367)	(4,936)
Maturities of short-term investments	3,623	2,924	3,655
Sales of short-term investments	2,423	2,386	2,216
Investments in reverse repurchase agreements	—	150	(150)
Additions to property, plant and equipment	(1,105)	(1,143)	(963)
Disposals of property, plant and equipment	13	10	3
Other investing activities	(34)	6	—
Cash used by investing activities	(1,008)	(1,034)	(175)
Cash used by financing activities:			
Net proceeds from long-term debt issuance	1,482	981	—
Long-term debt payments, including current portion	(44)	(106)	(7)
Increase (decrease) in notes payable	327	(67)	(63)
Payments on capital lease and other financing obligations	(17)	(7)	(19)
Proceeds from exercise of stock options and other stock issuances	489	507	514
Excess tax benefits from share-based payment arrangements	177	281	218
Repurchase of common stock	(3,223)	(3,238)	(2,534)
Dividends — common and preferred	(1,133)	(1,022)	(899)
Cash used by financing activities	(1,942)	(2,671)	(2,790)
Effect of exchange rate changes on cash and equivalents	(20)	(105)	(83)
Net increase (decrease) in cash and equivalents	670	(714)	1,632
Cash and equivalents, beginning of year	3,138	3,852	2,220
CASH AND EQUIVALENTS, END OF YEAR	**$ 3,808**	**$ 3,138**	**$ 3,852**
Supplemental disclosure of cash flow information:			
Cash paid during the year for:			
Interest, net of capitalized interest	$ 98	$ 70	$ 53
Income taxes	703	748	1,262
Non-cash additions to property, plant and equipment	266	252	206
Dividends declared and not paid	300	271	240

The accompanying Notes to the Consolidated Financial Statements are an integral part of this statement.

NIKE, Inc. Consolidated Statements of Shareholders' Equity

	Common Stock				Capital in Excess of Stated Value	Accumulated Other Comprehensive Income	Retained Earnings	Total
	Class A		Class B					
(In millions, except per share data)	Shares	Amount	Shares	Amount				
Balance at May 31, 2014	**355**	**$ —**	**1,385**	**$ 3**	**$ 5,865**	**$ 85**	**$ 4,871**	**$ 10,824**
Stock options exercised			27		639			639
Repurchase of Class B Common Stock			(58)		(9)		(2,525)	(2,534)
Dividends on common stock ($0.54 per share) and preferred stock ($0.10 per share)							(931)	(931)
Issuance of shares to employees, net of shares withheld for employee taxes			3		87		(3)	84
Stock-based compensation					191			191
Net income							3,273	3,273
Other comprehensive income (loss)						1,161		1,161
Balance at May 31, 2015	**355**	**$ —**	**1,357**	**$ 3**	**$ 6,773**	**$ 1,246**	**$ 4,685**	**$ 12,707**
Stock options exercised			22		680			680
Conversion to Class B Common Stock	(2)	—	2	—				—
Repurchase of Class B Common Stock			(55)		(8)		(3,230)	(3,238)
Dividends on common stock ($0.62 per share) and preferred stock ($0.10 per share)							(1,053)	(1,053)
Issuance of shares to employees, net of shares withheld for employee taxes			3		105		(11)	94
Stock-based compensation					236			236
Net income							3,760	3,760
Other comprehensive income (loss)						(928)		(928)
Balance at May 31, 2016	**353**	**$ —**	**1,329**	**$ 3**	**$ 7,786**	**$ 318**	**$ 4,151**	**$ 12,258**
Stock options exercised			17		525			525
Conversion to Class B Common Stock	(24)	—	24	—				—
Repurchase of Class B Common Stock			(60)		(9)		(3,240)	(3,249)
Dividends on common stock ($0.70 per share) and preferred stock ($0.10 per share)							(1,159)	(1,159)
Issuance of shares to employees, net of shares withheld for employee taxes			4		121		(13)	108
Stock-based compensation					215			215
Net income							4,240	4,240
Other comprehensive income (loss)						(531)		(531)
Balance at May 31, 2017	**329**	**$ —**	**1,314**	**$ 3**	**$ 8,638**	**$ (213)**	**$ 3,979**	**$ 12,407**

The accompanying Notes to the Consolidated Financial Statements are an integral part of this statement.

NOTE 1 — Summary of Significant Accounting Policies

Description of Business

NIKE, Inc. is a worldwide leader in the design, development and worldwide marketing and selling of athletic footwear, apparel, equipment, accessories and services. NIKE, Inc. portfolio brands include the NIKE Brand, Jordan Brand, Hurley and Converse. The NIKE Brand is focused on performance athletic footwear, apparel, equipment, accessories and services across a wide range of sport categories, amplified with sport-inspired sportswear products carrying the Swoosh trademark as well as other NIKE Brand trademarks. The Jordan Brand is focused on athletic and casual footwear, apparel and accessories using the Jumpman trademark. Sales and operating results of Jordan Brand products are reported within the respective NIKE Brand geographic operating segments. The Hurley brand is focused on surf and action sports and youth lifestyle footwear, apparel and accessories, using the Hurley trademark. Sales and operating results of Hurley brand products are reported within the NIKE Brand's North America geographic operating segment. Converse designs, distributes, markets and sells casual sneakers, apparel and accessories under the Converse, Chuck Taylor, All Star, One Star, Star Chevron and Jack Purcell trademarks. In some markets outside the U.S., these trademarks are licensed to third parties who design, distribute, market and sell similar products. Operating results of the Converse brand are reported on a stand-alone basis.

Basis of Consolidation

The Consolidated Financial Statements include the accounts of NIKE, Inc. and its subsidiaries (the "Company"). All significant intercompany transactions and balances have been eliminated.

On November 19, 2015, the Company announced a two-for-one split of both NIKE Class A and Class B Common Stock. The stock split was in the form of a 100 percent stock dividend payable on December 23, 2015 to shareholders of record at the close of business on December 9, 2015. Common stock began trading at the split-adjusted price on December 24, 2015. All share and per share amounts presented reflect the stock split.

Reclassifications

Certain prior year amounts have been reclassified to conform to fiscal 2017 presentation.

Revenue Recognition

Wholesale revenues are recognized when title and the risks and rewards of ownership have passed to the customer, based on the terms of sale. This occurs upon shipment or upon receipt by the customer depending on the country of the sale and the agreement with the customer. Retail store revenues are recorded at the time of sale and online store revenues are recorded upon delivery to the customer. Provisions for post-invoice sales discounts, returns and miscellaneous claims from customers are estimated and recorded as a reduction to revenue at the time of sale. Post-invoice sales discounts consist of contractual programs with certain customers or discretionary discounts that are expected to be granted to certain customers at a later date. Estimates of discretionary discounts, returns and claims are based on (1) historical rates, (2) specific identification of outstanding claims and outstanding returns not yet received from customers and (3) estimated discounts, returns and claims expected, but not yet finalized with customers. As of May 31, 2017 and 2016, the Company's reserve balances for post-invoice sales discounts, returns and miscellaneous claims were $643 million and $789 million, respectively.

Cost of Sales

Cost of sales consists primarily ofinventory costs, as well as warehousing costs (including the cost of warehouse labor), third-party royalties, certain foreign currency hedge gains and losses and research, design and development costs. Outbound shipping and handling costs are expensed as incurred and included in *Cost of sales*.

Demand Creation Expense

Demand creation expense consists of advertising and promotion costs, including costs of endorsement contracts, television, digital and print advertising, brand events and retail brand presentation. Advertising production costs are expensed the first time an advertisement is run. Advertising communication costs are expensed when the advertisement appears. Costs related to brand events are expensed when the event occurs. Costs related to retail brand presentation are expensed when the presentation is completed and delivered.

A significant amount of the Company's promotional expenses result from payments under endorsement contracts. Accounting for endorsement payments is based upon specific contract provisions. Generally, endorsement payments are expensed on a straight-line basis over the term of the contract after giving recognition to periodic performance compliance provisions of the contracts. Prepayments made under contracts are included in *Prepaid expenses and other current assets* or *Deferred income taxes and other assets* depending on the period to which the prepayment applies.

Certain contracts provide for contingent payments to endorsers based upon specific achievements in their sports (e.g., winning a championship). The Company records demand creation expense for these amounts when the endorser achieves the specific goal.

Certain contracts provide for variable payments based upon endorsers maintaining a level of performance in their sport over an extended period of time (e.g., maintaining a specified ranking in a sport for a year). When the Company determines payments are probable, the amounts are reported in *Demand creation expense* ratably over the contract period based on the Company's best estimate of the endorser's performance. In these instances, to the extent that actual payments to the endorser differ from the Company's estimate due to changes in the endorser's performance, increased or decreased demand creation expense may be recorded in a future period.

Certain contracts provide for royalty payments to endorsers based upon a predetermined percent of sales of particular products. The Company expenses these payments in *Cost of sales* as the related sales occur. In certain contracts, the Company offers minimum guaranteed royalty payments. For contracts for which the Company estimates it will not meet the minimum guaranteed amount of royalty fees through sales of product, the Company records the amount of the guaranteed payment in excess of that earned through sales of product in *Demand creation expense* uniformly over the contract period.

Through cooperative advertising programs, the Company reimburses customers for certain costs of advertising the Company's products. The Company records these costs in *Demand creation expense* at the point in time when it is obligated to its customers for the costs. This obligation may arise prior to the related advertisement being run.

Total advertising and promotion expenses were $3,341 million, $3,278 million and $3,213 million for the years ended May 31, 2017, 2016 and 2015, respectively. Prepaid advertising and promotion expenses totaled $558 million and $540 million at May 31, 2017 and 2016, respectively, of which $311 million and $272 million, respectively, was recorded in *Prepaid expenses and other current assets*, and $247 million and $268 million, respectively, was recorded in *Deferred income taxes and other assets,* depending on the period to which the prepayment applies.

Operating Overhead Expense

Operating overhead expense consists primarily of wage and benefit-related expenses as well as other administrative costs, such as rent, depreciation and amortization, professional services and meetings and travel.

Cash and Equivalents

Cash and equivalents represent cash and short-term, highly liquid investments, that are both readily convertible to known amounts of cash, and so near their maturity that they present insignificant risk of changes in value because of changes in interest rates, including commercial paper, U.S. Treasury, U.S. Agency, money market funds, time deposits and corporate debt securities with maturities of 90 days or less at the date of purchase.

Short-Term Investments

Short-term investments consist of highly liquid investments, including commercial paper, U.S. Treasury, U.S. Agency, time deposits and corporate debt securities, with maturities over 90 days at the date of purchase. Debt securities that the Company has the ability and positive intent to hold to maturity are carried at amortized cost. At May 31, 2017 and 2016, the Company did not hold any short-term investments that were classified as trading or held-to-maturity.

At May 31, 2017 and 2016, *Short-term investments* consisted of available-for-sale securities. Available-for-sale securities are recorded at fair value with unrealized gains and losses reported, net of tax, in *Accumulated other comprehensive income*, unless unrealized losses are determined to be other than temporary. Realized gains and losses on the sale of securities are determined by specific identification. The Company considers all available-for-sale securities, including those with maturity dates beyond 12 months, as available to support current operational liquidity needs and therefore classifies all securities with maturity dates beyond 90 days at the date of purchase as current assets within *Short-term investments* on the Consolidated Balance Sheets.

Refer to Note 6 — Fair Value Measurements for more information on the Company's short-term investments.

Allowance for Uncollectible Accounts Receivable

Accounts receivable, net consist primarily of amounts receivable from customers. The Company makes ongoing estimates relating to the collectability ofits accounts receivable and maintains an allowance for estimated losses resulting from the inability ofits customers to make required payments. In determining the amount of the allowance, the Company considers historical levels of credit losses and makes judgments about the creditworthiness of significant customers based on ongoing credit evaluations. Accounts receivable with anticipated collection dates greater than 12 months from the balance sheet date and related allowances are considered non-current and recorded in *Deferred income taxes and other assets*. The allowance for uncollectible accounts receivable was $19 million and $43 million at May 31, 2017 and 2016, respectively.

Inventory Valuation

Inventories are stated at lower of cost or market and valued on either an average or specific identification cost basis. For inventories in transit that represent direct shipments to customers, the related inventory and cost of sales are recognized on a specific identification basis. Inventory costs primarily consist of product cost from the Company's suppliers, as well as inbound freight, import duties, taxes, insurance and logistics and other handling fees.

Property, Plant and Equipment and Depreciation

Property, plant and equipment are recorded at cost. Depreciation is determined on a straight-line basis for land improvements, buildings and leasehold improvements over 2 to 40 years and for machinery and equipment over 2 to 15 years.

Depreciation and amortization of assets used in manufacturing, warehousing and product distribution are recorded in *Cost of sales*. Depreciation and amortization of all other assets are recorded in *Operating overhead expense*.

Software Development Costs

Internal Use Software: Expenditures for major software purchases and software developed for internal use are capitalized and amortized over a 2 to 12 year period on a straight-line basis. The Company's policy provides for the capitalization of external direct costs of materials and services associated with developing or obtaining internal use computer software. In addition, the Company also capitalizes certain payroll and payroll-related costs for employees who are directly associated with internal use computer software projects. The amount of capitalizable payroll costs with respect to these employees is limited to the time directly spent on such projects. Costs associated with preliminary project stage activities, training, maintenance and all other post-implementation stage activities are expensed as incurred.

Computer Software to be Sold, Leased or Otherwise Marketed: Development costs of computer software to be sold, leased or otherwise marketed as an integral part of a product are subject to capitalization beginning when a product's technological feasibility has been established and ending when a product is available for general release to customers. In most instances, the Company's products are released soon after technological feasibility has been established. Therefore, software development costs incurred subsequent to achievement of technological feasibility are usually not significant, and generally most software development costs have been expensed as incurred.

Impairment of Long-Lived Assets

The Company reviews the carrying value oflong-lived assets or asset groups to be used in operations whenever events or changes in circumstances indicate that the carrying amount of the assets might not be recoverable. Factors that would necessitate an impairment assessment include a significant adverse change in the extent or manner in which an asset is used, a significant adverse change in legal factors or the business climate that could affect the value of the asset or a significant decline in the observable market value of an asset, among others. If such facts indicate a potential impairment, the Company would assess the recoverability of an asset group by determining if the carrying value of the asset group exceeds the sum of the projected undiscounted cash flows expected to result from the use and eventual disposition of the assets over the remaining economic life of the primary asset in the asset group. If the recoverability test indicates that the carrying value of the asset group is not recoverable, the Company will estimate the fair value of the asset group using appropriate valuation methodologies, which would typically include an estimate of discounted cash flows. Any impairment would be measured as the difference between the asset group's carrying amount and its estimated fair value.

Goodwill and Indefinite-Lived Intangible Assets

The Company performs annual impairment tests on goodwill and intangible assets with indefinite lives in the fourth quarter of each fiscal year or when events occur or circumstances change that would, more likely than not, reduce the fair value of a reporting unit or an intangible asset with an indefinite life below its carrying value. Events or changes in circumstances that may trigger interim impairment reviews include significant changes in business climate, operating results, planned investments in the reporting unit, planned divestitures or an expectation that the carrying amount may not be

recoverable, among other factors. The Company may first assess qualitative factors to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount. If, after assessing the totality of events and circumstances, the Company determines that it is more likely than not that the fair value of the reporting unit is greater than its carrying amount, the two-step impairment test is unnecessary. The two-step impairment test first requires the Company to estimate the fair value ofits reporting units. If the carrying value of a reporting unit exceeds its fair value, the goodwill of that reporting unit is potentially impaired and the Company proceeds to step two of the impairment analysis. In step two of the analysis, the Company measures and records an impairment loss equal to the excess of the carrying value of the reporting unit's goodwill over its implied fair value, if any.

Indefinite-lived intangible assets primarily consist of acquired trade names and trademarks. The Company may first perform a qualitative assessment to determine whether it is more likely than not that an indefinite-lived intangible asset is impaired. If, after assessing the totality of events and circumstances, the Company determines that it is more likely than not that the indefinite-lived intangible asset is not impaired, no quantitative fair value measurement is necessary. If a quantitative fair value measurement calculation is required for these intangible assets, the Company utilizes the relief-from-royalty method. This method assumes that trade names and trademarks have value to the extent that their owner is relieved of the obligation to pay royalties for the benefits received from them. This method requires the Company to estimate the future revenue for the related brands, the appropriate royalty rate and the weighted average cost of capital.

Operating Leases

The Company leases retail store space, certain distribution and warehouse facilities, office space and other non-real estate assets under operating leases. Operating lease agreements may contain rent escalation clauses, renewal options, rent holidays or certain landlord incentives, including tenant improvement allowances. Rent expense for non-cancelable operating leases with scheduled rent increases or landlord incentives are recognized on a straight-line basis over the lease term, beginning with the effective lease commencement date, which is generally the date in which the Company takes possession of or controls the physical use of the property. Certain leases also provide for contingent rent, which is generally determined as a percent of sales in excess of specified levels. A contingent rent liability is recognized together with the corresponding rent expense when specified levels have been achieved or when the Company determines that achieving the specified levels during the period is probable.

Fair Value Measurements

The Company measures certain financial assets and liabilities at fair value on a recurring basis, including derivatives and available-for-sale securities. Fair value is the price the Company would receive to sell an asset or pay to transfer a liability in an orderly transaction with a market participant at the measurement date. The Company uses a three-level hierarchy established by the Financial Accounting Standards Board (FASB) that prioritizes fair value measurements based on the types ofinputs used for the various valuation techniques (market approach, income approach and cost approach).

The levels of the fair value hierarchy are described below:

- Level 1: Quoted prices in active markets for identical assets or liabilities.
- Level 2: Inputs other than quoted prices that are observable for the asset or liability, either directly or indirectly; these include quoted prices for similar assets or liabilities in active markets and quoted prices for identical or similar assets or liabilities in markets that are not active.
- Level 3: Unobservable inputs for which there is little or no market data available, which require the reporting entity to develop its own assumptions.

The Company's assessment of the significance of a particular input to the fair value measurement in its entirety requires judgment and considers factors specific to the asset or liability. Financial assets and liabilities are classified in their entirety based on the most conservative level ofinput that is significant to the fair value measurement.

Pricing vendors are utilized for a majority of Level 1 and Level 2 investments. These vendors either provide a quoted market price in an active market or use observable inputs without applying significant adjustments in their pricing. Observable inputs include broker quotes, interest rates and yield curves observable at commonly quoted intervals, volatilities and credit risks. The fair value of derivative contracts is determined using observable market inputs such as the daily market foreign currency rates, forward pricing curves, currency volatilities, currency correlations and interest rates and considers nonperformance risk of the Company and that ofits counterparties.

Level 1 investments include U.S. Treasury securities. Assets and liabilities included within Level 2 include commercial paper, U.S. Agency securities, money market funds, time deposits, corporate debt securities and derivative contracts. Level 3 investments are valued using internally developed models with unobservable inputs and are an immaterial portion of our portfolio.

The Company's fair value measurement process includes comparing fair values to another independent pricing vendor to ensure appropriate fair values are recorded.

Refer to Note 6 — Fair Value Measurements for additional information.

Foreign Currency Translation and Foreign Currency Transactions

Adjustments resulting from translating foreign functional currency financial statements into U.S. Dollars are included in the foreign currency translation adjustment, a component of *Accumulated other comprehensive income* in *Total shareholders' equity*.

The Company's global subsidiaries have various assets and liabilities, primarily receivables and payables, which are denominated in currencies other than their functional currency. These balance sheet items are subject to re-measurement, the impact of which is recorded in *Other (income) expense, net*, within the Consolidated Statements of Income.

Accounting for Derivatives and Hedging Activities

The Company uses derivative financial instruments to reduce its exposure to changes in foreign currency exchange rates and interest rates. All derivatives are recorded at fair value on the Consolidated Balance Sheets and changes in the fair value of derivative financial instruments are either recognized in *Accumulated other comprehensive income* (a component of *Total shareholders' equity*), *Long-term debt* or *Net income* depending on the nature of the underlying exposure, whether the derivative is formally designated as a hedge and, if designated, the extent to which the hedge is effective. The Company classifies the cash flows at settlement from derivatives in the same category as the cash flows from the related hedged items. For undesignated hedges and designated cash flow hedges, this is primarily within the *Cash provided by operations* component of the Consolidated Statements of Cash Flows. For designated net investment hedges, this is within the *Cash used by investing activities* component of the Consolidated Statements of Cash Flows. For the Company's fair value hedges, which are interest rate swaps used to mitigate the change in fair value ofits fixed-rate debt attributable to changes in interest rates, the related cash flows from periodic interest payments are reflected within the *Cash provided by operations* component of the Consolidated Statements of Cash Flows. Refer to Note 16 — Risk Management and Derivatives for more information on the Company's risk management program and derivatives.

Stock-Based Compensation

The Company estimates the fair value of options and stock appreciation rights granted under the NIKE, Inc. Stock Incentive Plan and employees' purchase

rights under the Employee Stock Purchase Plans (ESPPs) using the Black-Scholes option pricing model. The Company recognizes this fair value, net of estimated forfeitures, as *Operating overhead expense* in the Consolidated Statements of Income over the vesting period using the straight-line method.

Refer to Note 11 — Common Stock and Stock-Based Compensation for more information on the Company's stock-based compensation programs.

Income Taxes

The Company accounts for income taxes using the asset and liability method. This approach requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of temporary differences between the carrying amounts and the tax basis of assets and liabilities. The Company records a valuation allowance to reduce deferred tax assets to the amount management believes is more likely than not to be realized. United States income taxes are provided currently on financial statement earnings of non-U.S. subsidiaries that are expected to be repatriated. The Company determines annually the amount of undistributed non-U.S. earnings to invest indefinitely in its non-U.S. operations.

The Company recognizes a tax benefit from uncertain tax positions in the financial statements only when it is more likely than not that the position will be sustained upon examination by relevant tax authorities. The Company recognizes interest and penalties related to income tax matters in *Income tax expense*.

Refer to Note 9 — Income Taxes for further discussion.

Earnings Per Share

Basic earnings per common share is calculated by dividing *Net income* by the weighted average number of common shares outstanding during the year. Diluted earnings per common share is calculated by adjusting weighted average outstanding shares, assuming conversion of all potentially dilutive stock options and awards.

Refer to Note 12 — Earnings Per Share for further discussion.

Management Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates, including estimates relating to assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from these estimates.

Recently Adopted Accounting Standards

In April 2015, the FASB issued Accounting Standards Update (ASU) No. 2015-03, *Interest — Imputation of Interest (Subtopic 835-30): Simplifying the Presentation of Debt Issuance Costs.* The updated guidance requires debt issuance costs to be presented as a direct deduction from the carrying amount of the corresponding debt liability on the balance sheet. The Company adopted the standard on a retrospective basis in the first quarter of fiscal 2017. The adoption of this standard reduced both *Deferred income taxes and other assets* and *Long-term debt* by $17 million on the Consolidated Balance Sheet as of May 31, 2016.

Recently Issued Accounting Standards

In October 2016, the FASB issued ASU No. 2016-16, *Income Taxes (Topic 740): Intra-Entity Transfers of Assets Other Than Inventory*. The updated guidance requires companies to recognize the income tax consequences of an intra-entity transfer of an asset other than inventory when the transfer occurs. Income tax effects ofintra-entity transfers ofinventory will continue to be deferred until the inventory has been sold to a third party. The ASU is effective for the Company beginning June 1, 2018, using a modified retrospective approach, with the cumulative effect recognized through retained earnings at the date of adoption. Early adoption is permitted as of the beginning of an annual reporting period for which interim or annual financial statements have not been issued. The Company is evaluating the impact this update will have on its existing accounting policies and the Consolidated Financial Statements. The Company anticipates the updated guidance could have a material impact on the Consolidated Financial Statements at adoption through the recognition of a cumulative-effect adjustment to retained earnings of previously deferred charges.

In March 2016, the FASB issued ASU No. 2016-09, *Compensation — Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting*, which changes how companies account for certain aspects of share-based payment awards to employees. The updated guidance requires excess tax benefits and deficiencies from share-based payment awards to be recorded in income tax expense in the income statement. Currently, excess tax benefits and deficiencies are recognized in shareholders' equity on the balance sheet. This change is required to be applied prospectively. In addition, the updated guidance also changes the accounting for statutory tax withholding requirements, classification in the statement of cash flows and provides an option to continue to estimate forfeitures or account for forfeitures as they occur. The Company will adopt the standard on June 1, 2017 and will elect to continue to estimate forfeitures. The ASU is expected to result in increased volatility to the Company's income tax expense in future periods dependent upon, among other variables, the price ofits common stock and the timing and volume of share-based payment award activity, such as employee exercises of stock options and vesting of restricted stock awards.

In February 2016, the FASB issued ASU No. 2016-02, *Leases (Topic 842)*, that replaces existing lease accounting guidance. The new standard is intended to provide enhanced transparency and comparability by requiring lessees to record right-of-use assets and corresponding lease liabilities on the balance sheet. The new guidance will require the Company to continue to classify leases as either operating or financing, with classification affecting the pattern of expense recognition in the income statement. The Company will adopt the standard on June 1, 2019. The ASU is required to be applied using a modified retrospective approach at the beginning of the earliest period presented, with optional practical expedients. The Company is in the process of evaluating the effect the guidance will have on its existing accounting policies and the Consolidated Financial Statements, but expects there will be an increase in assets and liabilities on the Consolidated Balance Sheets at adoption due to the recording of right-of-use assets and corresponding lease liabilities, which may be material. Refer to Note 15 — Commitments and Contingencies for information about the Company's lease obligations.

In January 2016, the FASB issued ASU No. 2016-01, *Financial Instruments — Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities*. The updated guidance enhances the reporting model for financial instruments, which includes amendments to address aspects of recognition, measurement, presentation and disclosure. The update to the standard is effective for the Company beginning June 1, 2018. The Company does not expect the adoption to have a material impact on the Consolidated Financial Statements.

In May 2014, the FASB issued ASU No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*, that replaces existing revenue recognition guidance. The updated guidance requires companies to recognize revenue in a way that depicts the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. In addition, the new standard requires that reporting companies disclose the nature, amount, timing and uncertainty of revenue and cash flows arising from contracts with customers. The Company will adopt the standard on June 1, 2018 using a modified retrospective approach with the cumulative effective ofinitially applying the new standard recognized in retained earnings at the date ofinitial application. The Company is in the process of evaluating the new standard against its existing accounting policies, including the timing of revenue recognition, and its contracts with customers, to determine the effect the guidance will have on the Consolidated Financial Statements.

Notes 2-17 are available on the companion website at cengagebrain.com

Glossary

A

absorption costing The reporting of the costs of manufactured products, normally direct materials, direct labor, and factory overhead, as product costs. (Ch. 7)

accounts receivable analysis The evaluation of a company's ability to collect its accounts receivable. (Ch. 16)

accounts receivable turnover A measure of how frequently during the year the accounts receivable are being converted to cash, computed as sales divided by average accounts receivable. (Ch. 16)

accumulated other comprehensive income The cumulative effect of other comprehensive income items, which is reported separately in the "Stockholders' equity" section of the balance sheet. (Ch. 16)

activities The types of work, or actions, involved in a manufacturing or service process. (Ch. 4)

activity analysis The study of employee effort and other business records to determine the cost of activities. (Ch. 13)

activity base (driver) A measure of activity that is related to changes in cost. Used in analyzing and classifying cost behavior. Activity bases are also used in the denominator in computing the predetermined factory overhead rate to assign overhead costs to cost objects. (Chs. 2, 4, 6)

activity rates The estimated activity cost divided by estimated activity-base usage. (Ch. 4)

activity-based costing (ABC) method A cost allocation method that identifies activities causing the incurrence of costs and allocates these costs to products (or other cost objects), based on activity drivers (bases). (Chs. 2, 4)

analytical methods Techniques that involve the examination of changes in the amount and percentage of financial statement items within and across periods. (Ch. 16)

annuity A series of equal cash receipts spaced equally in time; a series of equal net cash flows at fixed time intervals. (Ch. 12)

appraisal costs The costs of activities that detect, measure, evaluate, and inspect products and processes to ensure that they meet customer needs. (Ch. 13)

asset turnover A profitability ratio that measures how effectively a business is using its assets to generate sales, computed as sales divided by average total assets (excluding long-term investments). (Ch. 16)

average rate of return A method of evaluating a capital investment proposal that focuses on the expected profitability of the investment; computed as average annual income divided by average investment. Also referred to as *accounting rate of return*. (Ch. 12)

B

backflush accounting A simplification of the accounting system by eliminating the accumulation and transfer of product costs by departments (intermediate departmental work in process accounts), but instead pulls the material and conversion costs directly to finished goods. (Ch. 13)

balanced scorecard A strategic performance measurement system that incorporates multiple performance dimensions by combining financial and nonfinancial measures. (Ch. 14)

batch size The amount of production in units of product that is produced after a setup. (Ch. 13)

break-even point The level of operations at which a company's revenues and expenses are equal. (Ch. 6)

budget An accounting device used to plan and control resources of operational departments and divisions. (Ch. 8)

budget performance report A report that summarizes actual costs, standard costs, and the differences for the units produced. (Ch. 9)

budgetary slack Excess resources set within a budget to provide for uncertain events. (Ch. 8)

budgeted variable factory overhead The standard variable overhead for the actual units produced. (Ch. 9)

by-products Goods of low value that are produced from a joint production process. (Ch. 5)

C

capital expenditures budget A budget summarizing plans for acquiring fixed assets. (Ch. 8)

capital investment analysis The process by which management plans, evaluates, and controls investments in fixed assets. (Ch. 12)

capital rationing The process by which management allocates funds among competing capital investment proposals. (Ch. 12)

cash budget A budget that estimates the expected receipts (inflows) and payments (outflows) of cash for a period of time. (Ch. 8)

cash flow per share The cash flow from operations divided by the number of common shares outstanding. (Ch. 15)

cash flows from financing activities The cash flows from transactions that affect the debt and equity of the company. (Ch. 15)

cash flows from investing activities The cash flows from transactions that affect the investments in the noncurrent assets of the company. (Ch. 15)

cash flows from operating activities The cash flows from transactions that affect the net income of the company. (Ch. 15)

cash payback period A method of evaluating a capital investment proposal that focuses on the expected period of time between the date of an investment and the recovery in cash of the amount invested. (Ch. 12)

chief accounting officer (CAO) A vice president of accounting who reports to the CFO and oversees technical accounting, accounting policy, credit, collections, tax, treasury, and internal audit functions. (Ch. 1)

chief executive officer (CEO) The highest-ranking person in a company. (Ch. 1)

chief financial officer (CFO) An executive vice president responsible for overseeing the financial activities of an entire company. (Ch. 1)

cognitive bias Holding onto one's preferences and beliefs regardless of contrary information, which results in decisions that are not economically accurate or rational. (Ch. 14)

common measures bias When managers focus on common performance metrics across divisions and ignore performance metrics that are unique to individual divisions. (Ch. 14)

common-sized statement A financial statement in which all items are expressed as percentages with no dollar amounts shown. (Ch. 16)

competition-based method A method of price setting based on the price offered by competitors. (Ch. 11)

comprehensive income All changes in stockholders' equity during a period, except those resulting from dividends and stockholders' investments. (Ch. 16)

continuous budgeting A method of budgeting that provides for maintaining a 12-month projection into the future. (Ch. 8)

continuous process improvement The philosophy of continually improving employees, business processes, and products with the objective of eliminating the source of problems and delivering the right products (services) in the right quantities at the right time. (Ch. 1)

contribution margin The excess of sales over variable costs; the excess of manufacturing margin over variable selling and administrative expenses. (Chs. 6, 7)

contribution margin ratio The percentage of each sales dollar that is available to cover the fixed costs and provide an operating income. Also called *profit-volume ratio*. (Ch. 6)

controllable costs For a level of management, the costs that can be influenced (increased, decreased, or eliminated) by management at that level. (Ch. 7)

controllable expenses Costs that can be influenced by the decisions of a manager. (Ch. 10)

controllable revenues Revenues earned by a profit center. (Ch. 10)

controllable variance The difference between the actual variable overhead costs and the budgeted variable overhead for actual production. (Ch. 9)

controller The manager of the accounting function of a vertical (business unit). (Ch. 1)

controlling A phase in the management process that consists of monitoring the operating results of implemented plans and comparing the actual results with the expected results. (Ch. 1)

conversion costs The combination of direct labor and factory overhead costs; in lean accounting, the account in which is accumulated the costs of direct labor and factory overhead. (Chs. 1, 13)

corporate social responsibility (CSR) The efforts of companies to take responsibility for the impact their operations have on society and to improve social well-being within and outside of the firm. (Ch. 14)

cost A sacrifice made to obtain some benefit. (Ch. 1)

cost accounting system A system that measures, records, and reports product costs. (Ch. 2)

cost allocation The process by which factory overhead or other costs are assigned to a cost object, such as a job. (Ch. 2)

cost behavior The manner in which a cost changes in relation to its activity base (driver). (Ch. 6)

cost center A decentralized unit in which the department or division manager has responsibility for the control of costs incurred and the authority to make decisions that affect these costs. (Ch. 10)

cost object A product, sales territory, department, or activity to which costs are assigned, depending on the decision-making needs of management. (Ch. 1)

cost of goods manufactured The total cost of making and finishing a product. (Ch. 1)

cost of goods sold The cost of merchandise sold recognized as an expense; the cost of finished goods available for sale minus the ending finished goods inventory. (Ch. 1)

cost of goods sold budget A budget of the estimated direct materials, direct labor, and factory overhead consumed by sold products. (Ch. 8)

cost of production report A report prepared periodically by a processing department, summarizing (1) the units for which the department is accountable and the disposition of those units and (2) the costs incurred by the department and the allocation of those costs between completed and incomplete production. (Ch. 3)

cost of quality report A report summarizing the costs, percent of total, and percent of sales by appraisal, prevention, internal failure, and external failure cost of quality categories. (Ch. 13)

cost per equivalent unit The rate used to allocate costs between completed and partially completed production. (Ch. 3)

cost price approach An approach to transfer pricing that uses cost as the basis for setting the transfer price. (Ch. 10)

cost variance The differences between actual and standard costs. (Ch. 9)

costs of quality The cost associated with controlling quality (prevention and appraisal) and failing to control quality (internal and external failure). (Ch. 13)

cost-plus methods Methods of price setting determined by the cost amount per unit plus a markup based on the desired profit per unit. (Ch. 11)

cost-volume-profit analysis The examination of the relationships among selling prices, sales and production volume, costs, expenses, and profits. (Ch. 6)

cost-volume-profit chart A chart that graphically shows sales, costs, and the related profit or loss for various levels of units sold. Also called a *break-even chart*. (Ch. 6)

currency exchange rates The rates at which the currencies of other countries can be exchanged for U.S. dollars. (Ch. 12)

current position analysis The evaluation of a company's ability to pay its current liabilities. (Ch. 16)

current ratio A financial ratio that expresses the relationship between current assets and current liabilities, computed by dividing current assets by current liabilities. (Ch. 16)

D

decision making Choosing among alternative actions; a component inherent in the other management processes of planning, directing, controlling, and improving. (Ch. 1)

demand-based method A method of price setting based on the demand for the product. (Ch. 11)

differential analysis The area of accounting concerned with the effect of alternative courses of action on revenues and costs. Also called *incremental analysis*. (Ch. 11)

differential cost The amount of increase or decrease in cost expected from a particular course of action compared with an alternative. (Ch. 11)

differential profit (loss) The difference between the differential revenue and the differential costs. (Ch. 11)

differential revenue The amount of increase or decrease in revenue expected from a particular course of action as compared with an alternative. (Ch. 11)

direct costs Costs that are identified with and traced to a cost object. (Ch. 1)

direct labor cost The wages of factory workers who are directly involved in converting materials into a finished product. (Ch. 1)

direct labor cost budget A budget that estimates direct labor hours and related cost needed to support budgeted production. (Ch. 8)

direct labor rate variance The difference between the actual rate and the standard rate paid for direct labor multiplied by the actual direct labor hours used in producing a product. (Ch. 9)

direct labor time variance The difference between the actual hours and the standard hours of direct labor spent producing a product multiplied by the standard direct labor rate per hour. (Ch. 9)

direct materials cost The cost of materials that are an integral part of the finished product. (Ch. 1)

direct materials price variance The difference between the actual price and the standard price of direct materials multiplied by the actual quantity of direct materials used in producing a product. (Ch. 9)

direct materials purchases budget A budget that estimates the quantities of direct materials to be purchased to support budgeted production and desired inventory levels. (Ch. 8)

direct materials quantity variance The difference between the actual quantity and the standard quantity of direct materials used in producing a product multiplied by the standard direct material price. (Ch. 9)

direct method A method of reporting the cash flows from operating activities as the difference between the operating cash receipts and the operating cash payments. (Ch. 15)

direct method (of allocating support department costs) A method that allocates all support department costs directly to production departments without considering the services provided between service departments. (Ch. 5)

directing The process by which managers, given their assigned level of responsibilities, run day-to-day operations. (Ch. 1)

dividend yield A profitability ratio that measures the rate of return to common stockholders from cash dividends, computed by dividing the dividends per share of common stock by the market price per share of common stock. (Ch. 16)

dividends per share A profitability ratio that measures the extent to which earnings are being distributed to common shareholders, computed as dividends on common stock divided by shares of common stock outstanding. (Ch. 16)

DuPont formula An expanded expression of return on investment (ROI) determined by multiplying the profit margin by the investment turnover. (Ch. 10)

E

earnings per share (EPS) on common stock The profitability ratio that measures the share of profits that are earned by a share of common stock, computed as net income less preferred dividends divided by the shares of common stock outstanding. (Ch. 16)

EBITDA Term for earnings before interest, taxes, depreciation, and amortization; operating income expressed by adding back depreciation and amortization expense. (Ch. 7)

eco-efficiency measures A form of CSR information that helps managers evaluate the savings generated by using fewer natural resources in a company's operations. (Ch. 14)

electronic data interchange (EDI) The use of computers to electronically communicate orders, relay information, and make or receive payments from one organization to another. (Ch. 13)

employee involvement A management approach that grants employees the responsibility and authority to make decisions about operations. (Ch. 13)

engineering change order (ECO) The document that initiates changing a product or process. (Ch. 4)

enterprise resource planning (ERP) An integrated business and information system used by companies to plan and control both internal and supply chain operations. (Ch. 13)

equivalent units of production The number of production units that could have been completed within a given accounting period, given the resources consumed. (Ch. 3)

expected value analysis A form of analysis that assigns likelihoods (probabilities) to various inputs, thus incorporating uncertainty directly into the output (answer). (Ch. 12)

external failure costs The costs incurred after defective units or services have been delivered to consumers. (Ch. 13)

F

factory burden Another term for manufacturing overhead or factory overhead. (Ch. 1)

factory overhead cost All of the costs of producing a product except for direct materials and direct labor. (Ch. 1)

factory overhead cost budget A budget that estimates the cost for each item of factory overhead needed to support budgeted production. (Ch. 8)

factory overhead cost variance report A report that summarizes budgeted and actual costs for variable and fixed factory overhead along with the related controllable and volume variances. (Ch. 9)

fair value The price that would be received for an asset if it were sold today. (Ch. 16)

favorable cost variance A variance that occurs when the actual cost is less than standard cost. (Ch. 9)

feedback Measures provided to operational employees or managers on the performance of subunits of the organization. These measures are used by employees to adjust a process or a behavior to achieve goals. (Ch. 1)

financial accounting The branch of accounting that is concerned with recording transactions using generally accepted accounting principles (GAAP) for a business or other economic unit and with a periodic preparation of various statements from such records. (Ch. 1)

finished goods inventory The direct materials costs, direct labor costs, and factory overhead costs of finished products that have not been sold. (Ch. 1)

finished goods ledger The subsidiary ledger that contains the individual accounts for each kind of commodity or product produced, containing cost data for the units manufactured, units sold, and units on hand. Also called a *stock ledger*. (Ch. 2)

first-in, first-out (FIFO) inventory cost flow method The method of inventory costing based on the assumption that the costs of merchandise sold should be charged against revenue in the order in which the costs were incurred. (Ch. 3)

fixed costs Costs that tend to remain the same in amount, regardless of variations in the level of activity. (Ch. 6)

flexible budget A budget that shows the expected results of a responsibility center for several activity levels. (Ch. 8)

franchise The right or license granted to an individual or group to market a company's goods or services. (Ch. 10)

franchisee The entity that pays for a franchise. (Ch. 10)

franchisor The entity that provides a franchise. (Ch. 10)

free cash flow The amount of operating cash flow available to a company after it purchases the property, plant, and equipment necessary to maintain its current operations, computed as cash flows from operating activities less cash used to purchase property, plant, and equipment. (Ch. 15)

G

Global Reporting Initiative An international organization that develops and encourages the use of sustainability reporting standards. (Ch. 14)

goal conflict A condition that occurs when individual objectives conflict with organizational objectives. (Ch. 8)

H

high-low method A technique that uses the highest and lowest total costs as a basis for estimating the variable cost per unit and the fixed cost component of a mixed cost. (Ch. 6)

horizontal analysis Financial analysis that compares an item in a current statement with the same item in prior statements in terms of the amount and percentage of change. (Ch. 16)

horizontals Departments within a company that do not develop products but provide services to the various verticals and other horizontals. (Ch. 1)

I

ideal standards Standards that can be achieved only under perfect operating conditions, such as no idle time, no machine breakdowns, and no materials spoilage; also called *theoretical standards*. (Ch. 9)

indirect costs Costs that are not identified with or traced to a cost object. (Ch. 1)

indirect labor Any labor needed to make a product that is not directly traced to the product. (Ch. 2)

indirect materials Any materials needed to make a product that are not directly traced to the product. (Ch. 2)

indirect method A method of reporting the cash flows from operating activities that begins with net income and adjusts for revenues and expenses that do not involve the receipt or payment of cash. (Ch. 15)

inflation A period when prices in general are rising and the purchasing power of money is declining. (Ch. 12)

internal failure costs The costs associated with defects that are discovered before the product or service is delivered to the consumer. (Ch. 13)

internal rate of return (IRR) method A method of analysis of proposed capital investments that uses present value concepts to compute the rate of return from the net cash flows expected from the investment. (Ch. 12)

inventory analysis The evaluation of a company's ability to manage its inventory effectively. (Ch. 16)

inventory turnover A measure of the number of times inventory is turned into goods sold during the year, computed by dividing the cost of goods sold by the average inventory. (Ch. 16)

investment center A decentralized unit in which the manager has the responsibility and authority to make decisions that affect not only costs and revenues but also the fixed assets invested in the center. (Ch. 10)

investment turnover The ratio of sales to invested assets. (Ch. 10)

J

job cost sheet An account in the work in process subsidiary ledger in which the costs charged to a particular job order are recorded. (Ch. 2)

job order cost system A type of cost accounting system that provides for a separate record of the cost of each quantity of product (job) that is manufactured. (Ch. 2)

joint costs The costs incurred in a joint manufacturing process. (Ch. 5)

joint manufacturing process A single manufacturing process that generates multiple outputs. (Ch. 5)

joint products The outputs generated from a joint manufacturing process. (Ch. 5)

L

lagging indicator Any metric where performance is predicted by performance in another metric. (Ch. 14)

lead time The elapsed time between starting a unit of product into the beginning of a process and its completion. Also called *throughput time*. (Ch. 13)

leading indicator Any metric where performance is predictive of performance in another metric. (Ch. 14)

lean accounting An accounting system characterized by fewer transactions, combined accounts, nonfinancial performance measures, and direct tracing of overhead. (Ch. 13)

lean enterprise A business that produces products or services with high quality, low cost, fast response, and immediate availability using lean principles. (Ch. 13)

lean manufacturing The use of lean principles to accomplish high quality, low cost, fast response, and immediate availability in a manufacturing setting. Also called *just-in-time (JIT) processing*. (Ch. 13)

lean principles Principles associated with the lean enterprise that include reducing inventory, reducing lead time, reducing setup time, product-/customer-oriented layouts, employee involvement, pull scheduling, zero defects, and supply chain management. (Ch. 13)

leverage The use of debt to increase the return on an investment. (Ch. 16)

liquidity A company's ability to convert assets into cash. (Ch. 16)

M

management by exception The philosophy of controlling by comparing actual and expected results and isolating areas for further investigation and possible remedial action. (Ch. 1)

management process The five basic management functions of (1) planning, (2) directing, (3) controlling, (4) improving, and (5) decision making. (Ch. 1)

Management's Discussion and Analysis (MD&A) An annual report disclosure that provides management's analysis of the results of current operations and financial condition, as well as plans for the future. (Ch. 16)

managerial accounting The branch of accounting that uses both historical and estimated data in providing information that management uses in conducting daily operations, in planning future operations, and in developing overall business strategies. (Ch. 1)

manufacturing margin The excess of sales over variable cost of goods sold. (Ch. 7)

manufacturing overhead Costs, other than direct materials and direct labor costs, that are incurred in the manufacturing process. (Ch. 1)

margin of safety A figure that indicates the possible decrease in sales that may occur before an operating loss results; may be expressed in terms of sales dollars, sales units, or percent of current sales. (Ch. 6)

market price approach An approach to transfer pricing that uses the price at which the product or service transferred could be sold to outside buyers as the transfer price. (Ch. 10)

market segment A portion of a company that can be analyzed using sales, costs, and expenses to determine its profitability. (Ch. 7)

market value at split-off method (of allocating joint costs to products) A method of allocating joint costs to products based on each product's total market value at the split-off point. (Ch. 5)

master budget An integrated set of operating and financial budgets for a period of time. (Ch. 8)

materials inventory The cost of materials that have not yet entered into the manufacturing process. (Ch.1)

materials ledger The subsidiary ledger containing the individual accounts for each type of material. (Ch. 2)

materials requisition The form or electronic transmission used by a manufacturing department to authorize materials issuances from the storeroom. (Ch. 2)

measure map Arrows added to the balanced scorecard showing the expected relationships among performance metrics. (Ch. 14)

mixed costs Costs with both variable and fixed characteristics, sometimes called *semivariable* or *semifixed costs*. (Ch. 6)

motivated reasoning The tendency for a person to see what he or she wants to see in data. (Ch. 14)

multiple production department factory overhead rate method A method that uses different rates for each production department to allocate factory overhead costs to products. (Ch. 4)

multiple production department rates A method of applying overhead to products in which overhead costs are first directly traced or distributed to support and production departments. (Ch. 5)

N

negotiated price approach An approach to transfer pricing that allows managers of decentralized units to agree (negotiate) among themselves as to the transfer price. (Ch. 10)

net present value method A method of analysis of proposed capital investments that focuses on the present value of the cash flows expected from the investments. (Ch. 12)

net realizable value (of a joint product) The estimated selling price of a product less any costs necessary to further process the product beyond the split-off point. (Ch. 5)

noncontrollable costs For a level of management, the costs that another level of management controls. (Ch. 7)

nonfinancial measure A performance measure that has not been stated in dollar terms. (Ch. 13)

non-value-added activity An activity that is not necessary to meet customer requirements but occurs because of mistakes, errors, omissions, and process failures. (Ch. 13)

non-value-added lead time The time spent while a unit of product is waiting to enter the next production process or is moved from one process to another. (Ch. 13)

normal standards Standards that represent levels of operation that can be attained with reasonable effort. Also called *currently attainable standards*. (Ch. 9)

number of days' sales in inventory The measure of the length of time it takes to acquire, sell, and replace inventory, computed by dividing the average inventory by the average daily cost of goods sold. (Ch. 16)

number of days' sales in receivables An estimate of the length of time the accounts receivable have been outstanding, computed as average accounts receivable divided by average daily sales. (Ch. 16)

O

objectives (goals) Developed in the planning stage, these reflect the direction and desired outcomes of certain courses of action. (Ch. 1)

operating leverage A measure of the relative mix of a business's variable costs and fixed costs, computed as contribution margin divided by operating income. (Ch. 6)

operational planning Developing short-term actions for managing the day-to-day operations of a company. (Ch. 1)

opportunity cost The revenue that is foregone from an alternative use of an asset, such as cash. (Ch. 11)

other comprehensive income Specified items that are reported separately from net income, including foreign currency items, pension liability adjustments, and unrealized gains and losses on investments. (Ch. 16)

overapplied factory overhead The amount of factory overhead applied in excess of the actual factory overhead costs incurred for production during a period. (Ch. 2)

P

Pareto chart A bar chart that shows the totals of a particular attribute for a number of categories, ranked left to right from the largest to smallest totals. (Ch. 13)

performance measurement systems Systems used by the management of a company to assess how well employees or units within a company meet the company's goals and objectives. (Ch. 14)

performance metrics A measure used to assess performance in achieving strategic objectives. (Ch. 14)

performance perspectives Performance categories for assessment on the balanced scorecard, traditionally made up of financial, internal processes, learning and growth, and customer perspectives. (Ch. 14)

performance targets Levels or rates of improvement that management wants to achieve for performance metrics. (Ch. 14)

period costs Selling and administrative expenses incurred in marketing the product, delivering the product, or managing the company and not directly related to manufacturing the product. (Ch. 1)

personal scorecards Employee-specific balanced scorecards used to show how an employee's job relates to division- and corporate-level scorecards. (Ch. 14)

physical units method (of allocating joint costs to products) A method of allocating joint costs to products based on a physical measure of the products at the split-off point, such as pounds, gallons, or inches. (Ch. 5)

planning A phase of the management process whereby objectives are outlined and courses of action determined. (Ch. 1)

predetermined factory overhead rate The rate used to apply factory overhead costs to the goods manufactured. The rate is determined by dividing the estimated total factory overhead costs by the estimated activity base at the beginning of the fiscal period. (Ch. 2)

present value concepts Concepts that recognize that cash to be received (or paid) in the future is not the equivalent of the same amount of money received at an earlier date. (Ch. 12)

present value index An index computed by dividing the total present value of the net cash flow to be received from a proposed capital investment by the amount to be invested. (Ch. 12)

present value of an annuity The sum of the present values of a series of equal cash receipts spaced equally in time; the amount of cash needed today to yield a series of equal net cash flows at fixed time intervals in the future. (Ch. 12)

prevention costs Costs incurred to prevent defects before or during the manufacture of a product or the delivery of a service. (Ch. 13)

price-earnings (P/E) ratio A profitability ratio that measures a company's future earnings prospects, computed as the market price per share of common stock divided by earnings per share on common stock. (Ch. 16)

prime costs The combination of direct materials and direct labor costs. (Ch. 1)

process A series of activities that converts an input into an output. (Ch. 13)

process cost system A type of cost accounting system that provides product costs for each manufacturing department or process; a type of cost system that records product costs for each manufacturing department or process within a manufacturing facility. (Chs. 2, 3)

process manufacturer A manufacturer that produces products that are indistinguishable from each other using a continuous production process. (Ch. 3)

process-oriented layout The organization of work around a process (task). (Ch. 13)

product cost method A cost-plus method of price setting in which only the costs of manufacturing the product are included in the cost amount to which the markup is added. (Ch. 11)

product costing Determining the cost of a product. (Ch. 4)

product costs The three components of manufacturing cost: direct materials, direct labor, and factory overhead costs. (Ch. 1)

production bottleneck A point in the manufacturing process where the demand for a company's product exceeds the ability to produce the product. Also referred to as a *constraint*. (Ch. 11)

production budget A budget of estimated units to be manufactured to meet budgeted sales and desired inventory levels. (Ch. 8)

production department factory overhead rate A rate for applying factory overhead determined by dividing the budgeted production department factory overhead by the budgeted allocation base for each department. (Ch. 4)

product-oriented layout The organization of manufacturing processes around a product. Also referred to as *product cells*. (Ch. 13)

profit center A decentralized unit in which the manager has the responsibility and the authority to make decisions that affect both costs and revenues (and thus profits). (Ch. 10)

profit margin The ratio of operating income to sales. (Ch. 10)

profit-volume chart A chart plotting only the difference between total sales and total costs for various levels of units sold. (Ch. 6)

profitability The ability of a firm to earn income. (Ch. 16)

pull manufacturing An important lean practice in which products are manufactured only as they are needed by the customer. (Ch. 13)

push manufacturing The traditional approach to manufacturing in which products are manufactured according to a production schedule based on estimated sales; the schedule pushes product into inventory before customer orders are received. (Ch. 13)

Q

quick assets Cash and other current assets that can be easily converted to cash, such as temporary investments and accounts receivable. (Ch. 16)

quick ratio A financial ratio that measures a company's "instant" debt-paying ability, computed as quick assets divided by current liabilities. (Ch. 16)

R

radio frequency identification devices (RFID) Electronic tags (chips) placed on or embedded within products that can be read by radio waves that allow instant monitoring of product location. (Ch. 13)

ratio The expression of a financial statement item or set of items as a percentage of another financial statement item in order to measure an important economic relationship as a single number. (Ch. 16)

ratio of fixed assets to long-term liabilities A solvency ratio that provides a measure of how much fixed assets a company has to support its long-term debt, calculated as net fixed assets divided by long-term liabilities. (Ch. 16)

ratio of liabilities to stockholders' equity A comprehensive leverage ratio that measures the relationship of the claims of creditors to stockholders' equity; a solvency ratio that measures how much of the company is financed by debt and equity, computed as total liabilities divided by total stockholders' equity. (Ch. 16)

Raw and In Process (RIP) Inventory In lean accounting, the asset account in which is accumulated the combined costs of all in-process work and raw materials. (Ch. 13)

receiving report The form or electronic transmission used by the receiving personnel to indicate that materials have been received and inspected. (Ch. 2)

reciprocal services method (of allocating support department costs) A method of allocating support department costs to production departments that considers all inter-support-department services. (Ch. 5)

relevant range The range of activity over which changes in cost are of interest to management. (Ch. 6)

residual income The excess of operating income over a minimum acceptable operating income. (Ch. 10)

responsibility accounting The process of measuring and reporting operating data by areas of responsibility. (Ch. 10)

responsibility center An organizational unit for which a manager is assigned responsibility over costs, revenues, or assets. (Ch. 8)

return on common stockholders' equity A profitability ratio that measures the rate of profits earned on the amount invested by common stockholders, computed as net income less preferred dividends divided by average common stockholders' equity. (Ch. 16)

return on investment (ROI) A measure of managerial efficiency in the use of investments in assets, computed as operating income divided by invested assets. (Ch. 10)

return on stockholders' equity A profitability ratio that measures the rate of income earned on the amount invested by the stockholders, computed as net income divided by average total stockholders' equity. (Ch. 16)

return on total assets A profitability ratio that measures the profitability of total assets without considering how the assets are financed, computed as income plus interest expense divided by average total assets. (Ch. 16)

revenue price variance The difference between the planned and actual unit sales price multiplied by the actual units sold. (Ch. 9)

revenue variances The differences between expected (planned) revenues and actual revenues. (Ch. 9)

revenue volume variance The difference between the planned and actual units sold multiplied by the planned sales price. (Ch. 9)

S

sales budget One of the major elements of the income statement budget that indicates the quantity of estimated sales and the expected unit selling price. (Ch. 8)

sales mix The relative distribution of sales among a company's various products. Also referred to as *product mix*. (Chs. 6, 7)

scorecard cascading The use of multiple scorecards, with scorecards divided into smaller, division- and job-specific scorecards so that all individuals throughout a company support the overriding strategy of the company. (Ch. 14)

sensitivity analysis A form of analysis that considers the impact of changing one or more inputs or assumptions on the resulting outcome. (Ch. 12)

sequential method (of allocating support department costs) A method of allocating support department costs to production departments that considers some inter-support-department services in a sequential or step-down fashion. Also known as the *step-down method*. (Ch. 5)

service department A department that provides a necessary service to produce a product, but is not directly involved in the production process. Also known as a *support department*. (Ch. 5)

setup An overhead activity that consists of changing tooling in machines in preparation for making a new product. (Ch. 4)

single plantwide factory overhead rate method A method that allocates factory overhead to products using a single factory overhead rate across all departments. (Ch. 4)

single plantwide overhead rate A method of applying overhead to products in which support department costs are combined with all other overhead costs, and the total overhead cost is then applied to the products using a single cost driver. (Ch. 5)

Six Sigma A quality improvement process developed by Motorola Corporation consisting of five steps: define, measure, analyze, improve, and control (DMAIC). (Ch. 13)

solvency The ability of a firm to pay its debts as they come due. (Ch. 16)

split-off point The point in a joint manufacturing process where the joint products become separable. (Ch. 5)

standard cost A detailed estimate of what a product should cost. (Ch. 9)

standard cost systems Accounting systems that use standards for each element of manufacturing cost entering into the finished product. (Ch. 9)

standards Performance goals, often relating to how much a product should cost. (Ch. 9)

statement of cash flows A summary of the cash receipts and cash payments for a specific period of time, such as a month or a year. (Ch. 15)

statement of cost of goods manufactured A statement prepared by manufacturing companies that summarizes the cost of goods manufactured during the period. (Ch. 1)

static budget A budget that shows the expected results of a responsibility center for only one activity level; it is not changed, even if the activity changes. (Ch. 8)

step-down method (of allocating support department costs) A method of allocating support department costs to production departments that considers some inter-support-department services in a sequential or step-down fashion. Also known as the *sequential method*. (Ch. 5)

strategic initiatives Action plans that management implements to achieve strategic objectives. (Ch. 14)

strategic learning The process of using performance metrics to verify strategic objective expectations and, if necessary, adjusting them. (Ch. 14)

strategic objective A result that a business aims to achieve that defines the purpose of an action taken; a subcomponent of the overall entity's mission statement or strategy. (Ch. 14)

strategic performance measurement systems A performance measurement system, such as the balanced scorecard, that defines and links strategic objectives to the performance metrics of a company. (Ch. 14)

strategic planning Developing long-term actions to achieve a company's objectives. (Ch. 1)

strategies Planned long-term actions by which business goals and objectives will be achieved. (Ch. 1)

strategy map Arrows added to the balanced scorecard showing the expected cause-and-effect relationships among strategic objectives. (Ch. 14)

sunk costs Costs that have been incurred in the past, cannot be recouped, and are not relevant to future decisions. (Ch. 11)

supply chain management The coordination and control of the flow of materials, services, information, and finances with suppliers, manufacturers, and customers. (Ch. 13)

support activity cost Under activity-based costing (ABC), the cost of providing a necessary service to produce a product that is not directly involved in the production process. (Ch. 5)

support department A department that provides a necessary service to produce a product but is not directly involved in the production process. Also known as a *service department*. (Ch. 5)

support department allocations The costs of services provided by an internal support department and assigned to profit centers based on the usage of the service by each profit center. (Ch. 10)

support department cost allocation The costs of services provided by a support department transferred to production departments. (Ch. 5)

surrogation The tendency to behave like the company's performance metrics are the strategic objectives. (Ch. 14)

sustainability Meeting current needs without compromising the ability of future generations to meet their needs, such as with efforts that protect the environment. (Ch. 14)

sustainability balanced scorecard (SBSC) A balanced scorecard on which a company's CSR strategic objectives have been integrated into the four perspectives of learning and growth, internal processes, customer, and financial. (Ch. 14)

T

target costing A method of price setting that combines market-based pricing with a cost-reduction emphasis; the target cost is the expected selling price less the desired profit. (Ch. 11)

theory of constraints (TOC) A manufacturing strategy that focuses on reducing the influence of bottlenecks (constraints) on production processes. (Ch. 11)

time tickets The form on which the amount of time spent by each employee and the labor cost incurred for each individual job, or for factory overhead, are recorded. (Ch. 2)

time value of money concept The concept that recognizes that a dollar today is worth more than a dollar tomorrow, because today's dollar can earn interest. (Ch. 12)

times interest earned A ratio that assesses the risk that bondholders will not receive their interest payments or that interest payments will not be made if earnings decrease. The ratio is computed as income before income tax expense plus interest expense divided by interest expense. (Ch. 16)

total cost method A cost-plus method of price setting in which all the costs of manufacturing the product plus the selling and administrative expenses are included in the cost amount to which the markup is added. (Ch. 11)

total manufacturing cost variance The difference between total standard costs and total actual costs for the units produced. (Ch. 9)

transfer price The price charged one decentralized unit by another for the goods or services provided. (Ch. 10)

triple bottom line Reporting that includes financial performance, social performance, and environmental performance. (Ch. 14)

U

underapplied factory overhead The amount of actual factory overhead in excess of the factory overhead applied to production during a period. (Ch. 2)

unfavorable cost variance A variance that occurs when the actual cost exceeds the standard cost. (Ch. 9)

unit contribution margin The dollars available from each unit of sales to cover fixed costs and provide operating profits. (Ch. 6)

unrealized gain An increase in the fair value of equity or debt securities for a period. (Ch. 16)

utilization rate A measure of the use of a fixed asset in serving customers relative to the asset's capacity. (Ch. 1)

V

value-added activity An activity that is needed to meet customer requirements. (Ch. 13)

value-added lead time The time spent in converting raw materials into a finished unit of product. (Ch. 13)

value-added ratio The ratio of the value-added lead time to the total lead time. (Ch. 13)

variable cost method A cost-plus method of pricing setting in which only the variable costs are included in the cost amount to which the markup is added. (Ch. 11)

variable cost of goods sold Consists of direct materials, direct labor, and variable factory overhead for the units sold. (Ch. 7)

variable costing The concept that considers the cost of products manufactured to be composed only of those manufacturing costs that increase or decrease as the volume of production rises or falls (direct materials, direct labor, and variable factory overhead). (Ch. 7)

variable costs Costs that vary in proportion to changes in the activity base. (Ch. 6)

vertical analysis An analysis that compares each item in a current statement with a total or key amount within the same statement. (Ch. 16)

verticals Business units often structured as separate businesses within a parent company that develop products sold directly to consumers. (Ch. 1)

volume variance The difference between the budgeted fixed overhead at 100% of normal capacity and the standard fixed overhead for the actual units produced. (Ch. 9)

W

weight factor A factor assigned to each product in a joint manufacturing process representing its importance in comparison to the other products. (Ch. 5)

weighted average inventory cost flow method A method of inventory costing in which the cost of the units sold and in ending inventory is a weighted average of the purchase costs. (Ch. 3)

weighted average method (of allocating joint costs to products) A method of allocating joint costs to products based on weight factors for each product. (Ch. 5)

whole units The number of units in production during a period, whether completed or not. (Ch. 3)

work in process inventory The direct materials costs, the direct labor costs, and the applied factory overhead costs that have entered into the manufacturing process but are associated with products that have not been finished. (Ch. 1)

working capital The excess of the current assets of a business over its current liabilities. (Ch. 16)

Y

yield pricing A type of differential analysis focused on whether to accept business at a special price. (Ch. 11)

Z

zero-based budgeting A concept of budgeting that requires managers to estimate sales, production, and other operating data as though operations are being started for the first time. (Ch. 8)

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The Basics

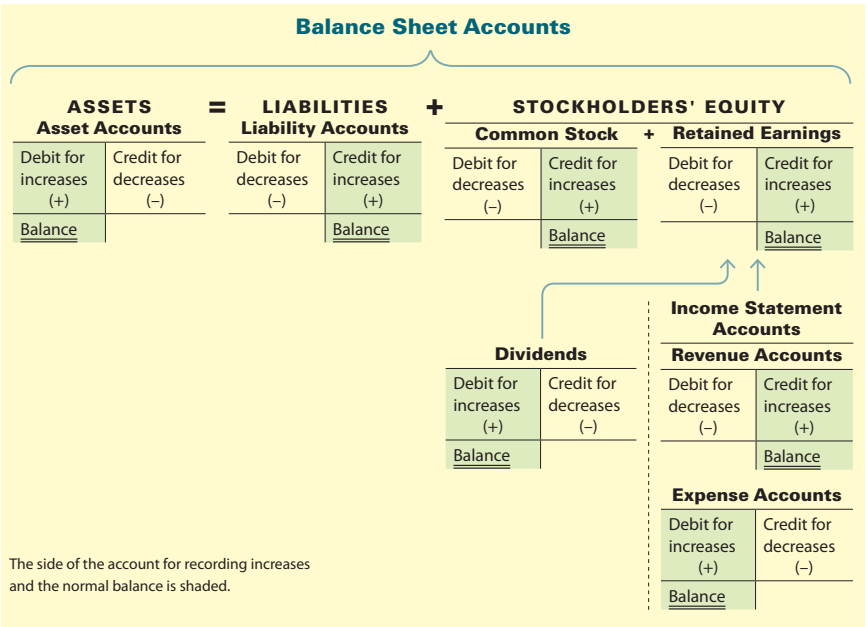
Accounting Equation:

Assets = Liabilities + Stockholders' Equity

T Account:

Account Title	
Left side	Right side
debit	credit

Rules of Debit and Credit, Normal Balances:



- **Balance sheet:** A list of the assets, liabilities, and stockholders' equity as of a specific date, usually at the close of the last day of a month or a year.
- **Statement of cash flows:** A summary of the cash receipts and cash payments for a specific period of time, such as a month or a year.

Accounting Cycle:

1. Transactions are analyzed and recorded in the journal.
2. Transactions are posted to the ledger.
3. An unadjusted trial balance is prepared.
4. Adjustment data are assembled and analyzed.
5. An optional end-of-period spreadsheet is prepared.
6. Adjusting entries are journalized and posted to the ledger.
7. An adjusted trial balance is prepared.
8. Financial statements are prepared.
9. Closing entries are journalized and posted to the ledger.
10. A post-closing trial balance is prepared.

Types of Adjusting Entries:

- Accrued revenue (accrued asset)
- Accrued expense (accrued liability)
- Unearned revenue (deferred revenue)
- Prepaid expense (deferred expense)
- Depreciation expense

Each entry will always affect both a balance sheet account and an income statement account.

Analyzing and Journalizing Transactions:

1. Carefully read the description of the transaction to determine whether an asset, liability, common stock, retained earnings, revenue, expense, or dividends account is affected.
2. For each account affected by the transaction, determine whether the account increases or decreases.
3. Determine whether each increase or decrease should be recorded as a debit or a credit, following the rules of debit and credit.
4. Record the transaction using a journal entry.
5. Periodically post journal entries to the accounts in the ledger.
6. Prepare an unadjusted trial balance at the end of the period.

Financial Statements:

- **Income statement:** A summary of the revenue and expenses for a specific period of time, such as a month or a year.
- **Statement of stockholders' equity:** A summary of the changes in stockholders' equity that have occurred during a specific period of time, such as a month or a year.

Closing Entries:

1. Revenue and expense account balances are transferred to the retained earnings account.
2. The balance of the dividends account is transferred to the retained earnings account.

Shipping Terms:

	FOB Shipping Point	FOB Destination
Ownership (title) passes to buyer when merchandise is	delivered to freight carrier	delivered to buyer
Freight costs are paid by	buyer	seller

Format for Bank Reconciliation:

Cash balance according to bank statement	$ XXX
Add: Deposits in transit	XXX
Deduct: Outstanding checks not paid by bank	(XXX)
Adjusted balance	$ XXX

Cash balance according to company's records	$ XXX
Add: Credit memos that have not been recorded (notes collected by bank)	XXX
Deduct: Debit memos that have not been recorded (NSF checks, service charges)	(XXX)
Adjusted balance	$ XXX

Inventory Costing Methods:

- First-in, First-out (FIFO)
- Last-in, First-out (LIFO)
- Average Cost

Interest Computations:

$$\text{Interest} = \text{Face Amount (or Principal)} \times \text{Rate} \times \text{Time}$$

Methods of Determining Depreciation:

Straight-Line: $\dfrac{\text{Cost} - \text{Estimated Residual Value}}{\text{Estimated Life}}$

Units-of-Activity: $\dfrac{\text{Cost} - \text{Estimated Residual Value}}{\text{Total Estimated Units of Activity}} \times \text{Units of Activity}$

Double-Declining-Balance: Rate* × Book Value at Beginning of Period

*Rate is commonly twice the straight-line rate (1 ÷ Estimated Life).

Adjustments to Net Income (Loss) Using the Indirect Method:

Net income (loss)	$ XXX
Adjustments to reconcile net income to net cash flow from operating activities:	
Depreciation of fixed assets	XXX
Amortization of intangible assets	XXX
Losses on disposal of assets	XXX
Gains on disposal of assets	(XXX)
Changes in current operating assets and liabilities:	
Increases in noncash current operating assets	(XXX)
Decreases in noncash current operating assets	XXX
Increases in current operating liabilities	XXX
Decreases in current operating liabilities	(XXX)
Net cash flow from operating activities	$XXX

Subtract

- Increases in accounts receivable
- Increases in inventory
- Increases in prepaid expenses
- Decreases in accounts payable
- Decreases in accrued expenses payable
- Decreases in income taxes payable

Add

- Decreases in accounts receivable
- Decreases in inventory
- Decreases in prepaid expenses
- Increases in accounts payable
- Increases in accrued expenses payable
- Increases in income taxes payable

Contribution Margin Ratio $= \dfrac{\text{Sales} - \text{Variable Costs}}{\text{Sales}}$

Break-Even Sales (Units) $= \dfrac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$

Sales (Units) $= \dfrac{\text{Fixed Costs} + \text{Target Profit}}{\text{Unit Contribution Margin}}$

Margin of Safety $= \dfrac{\text{Sales} - \text{Sales at Break-Even Point}}{\text{Sales}}$

Operating Leverage $= \dfrac{\text{Contribution Margin}}{\text{Income from Operations}}$

Variances:

$$\text{Direct Materials Price Variance} = \left(\text{Actual Price} - \text{Standard Price}\right) \times \text{Actual Quantity}$$

$$\text{Direct Materials Quantity Variance} = \left(\text{Actual Quantity} - \text{Standard Quantity}\right) \times \text{Standard Price}$$

$$\text{Direct Labor Rate Variance} = \left(\text{Actual Rate per Hour} - \text{Standard Rate per Hour}\right) \times \text{Actual Hours}$$

$$\text{Direct Labor Time Variance} = \left(\text{Actual Direct Labor Hours} - \text{Standard Direct Labor Hours}\right) \times \text{Standard Rate per Hour}$$

$$\text{Variable Factory Overhead Controllable Variance} = \text{Actual Variable Factory Overhead} - \text{Budgeted Variable Factory Overhead}$$

$$\text{Fixed Factory Overhead Volume Variance} = \left(\text{Standard Hours for 100\% of Normal Capacity} - \text{Standard Hours for Actual Units Produced}\right) \times \text{Fixed Factory Overhead Rate}$$

Return on Investment (ROI) $= \dfrac{\text{Income from Operations}}{\text{Invested Assets}}$

Alternative ROI Computation:

$$\text{ROI} = \frac{\text{Income from Operations}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Invested Assets}}$$

Capital Investment Analysis Methods:

Methods That Ignore Present Values:

- Average Rate of Return Method
- Cash Payback Method

Methods That Use Present Values:

- Net Present Value Method
- Internal Rate of Return Method

Average Rate of Return $= \dfrac{\text{Estimated Average Annual Income}}{\text{Average Investment}}$

Present Value Index $= \dfrac{\text{Total Present Value of Net Cash Flow}}{\text{Amount to Be Invested}}$

Present Value Factor for an Annuity of $1 $= \dfrac{\text{Amount to Be Invested}}{\text{Equal Annual Net Cash Flows}}$

Abbreviations and Acronyms Commonly Used in Business and Accounting

AAA	American Accounting Association
ABC	Activity-based costing
AICPA	American Institute of Certified Public Accountants
B2B	Business-to-business
B2C	Business-to-consumer
CFO	Chief Financial Officer
CMA	Certified Management Accountant
COGM	Cost of goods manufactured
COGS	Cost of goods sold
CPA	Certified Public Accountant
Cr.	Credit
CVP	Cost-volume-profit
Dr.	Debit
EFT	Electronic funds transfer
EPS	Earnings per share
ERP	Enterprise resource planning
FASB	Financial Accounting Standards Board
FICA tax	Federal Insurance Contributions Act tax
FIFO	First-in, first-out
FOB	Free on board
FUTA	Federal unemployment compensation tax
GAAP	Generally accepted accounting principles
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standards
IMA	Institute of Management Accountants
IRC	Internal Revenue Code
IRR	Internal rate of return
IRS	Internal Revenue Service
JIT	Just-in-time
LIFO	Last-in, first-out
LCM	Lower of cost or market
MACRS	Modified Accelerated Cost Recovery System
MD&A	Management's Discussion and Analysis
n/30	Net 30
n/eom	Net, end-of-month
NPV	Net present value
NSF	Not sufficient funds
P/E ratio	Price-earnings ratio
POS	Point of sale
ROI	Return on investment
R&D	Research and development
SCM	Supply chain management
SEC	Securities and Exchange Commission
SOX	Sarbanes-Oxley Act
TQC	Total quality control
W-4	Employee's Withholding Allowance Certificate
WIP	Work in process

Classification of Accounts

Account Title	*Account Classification*	*Normal Balance*	*Financial Statement*
Accounts Payable	Current liability	Credit	Balance sheet
Accounts Receivable	Current asset	Debit	Balance sheet
Accumulated Depletion	Contra fixed asset	Credit	Balance sheet
Accumulated Depreciation	Contra fixed asset	Credit	Balance sheet
Advertising Expense	Operating expense	Debit	Income statement
Allowance for Doubtful Accounts	Contra current asset	Credit	Balance sheet
Amortization Expense	Operating expense	Debit	Income statement
Bad Debt Expense	Operating expense	Debit	Income statement
Bonds Payable	Long-term liability	Credit	Balance sheet
Building	Fixed asset	Debit	Balance sheet
Cash	Current asset	Debit	Balance sheet
Cash Dividends	Stockholders' equity	Debit	Statement of stockholders' equity
Cash Dividends Payable	Current liability	Credit	Balance sheet
Common Stock	Stockholders' equity	Credit	Balance sheet
Cost of Goods Sold	Cost of goods sold	Debit	Income statement
Customer Refunds Payable	Current liability	Credit	Balance sheet
Delivery Expense	Operating expense	Debit	Income statement
Depletion Expense	Operating expense	Debit	Income statement
Discount on Bonds Payable	Long-term liability	Debit	Balance sheet
Dividend Revenue	Other income	Credit	Income statement
Dividends	Stockholders' equity	Debit	Statement of stockholders' equity
Employees Federal Income Tax Payable	Current liability	Credit	Balance sheet
Equipment	Fixed asset	Debit	Balance sheet
Estimated Returns Inventory	Current asset	Debit	Balance sheet
Federal Income Tax Payable	Current liability	Credit	Balance sheet
Federal Unemployment Tax Payable	Current liability	Credit	Balance sheet
Fees Earned	Revenue	Credit	Income statement
Finished Goods	Current asset	Debit	Balance sheet
Freight In	Cost of goods sold	Debit	Income statement
Freight Out	Operating expense	Debit	Income statement
Gain on Disposal of Fixed Assets	Other income	Credit	Income statement
Gain on Redemption of Bonds	Other income	Credit	Income statement
Gain on Sale of Investments	Other income	Credit	Income statement
Goodwill	Intangible asset	Debit	Balance sheet
Income Tax Expense	Income tax	Debit	Income statement
Income Tax Payable	Current liability	Credit	Balance sheet
Insurance Expense	Operating expense	Debit	Income statement
Interest Expense	Other expense	Debit	Income statement
Interest Receivable	Current asset	Debit	Balance sheet
Interest Revenue	Other income	Credit	Income statement
Inventory	Current asset/Cost of goods sold	Debit	Balance sheet/Income statement
Investment in Bonds	Investment	Debit	Balance sheet
Investment in Stocks	Investment	Debit	Balance sheet
Investment in Subsidiary	Investment	Debit	Balance sheet
Land	Fixed asset	Debit	Balance sheet
Loss on Disposal of Fixed Assets	Other expense	Debit	Income statement
Loss on Redemption of Bonds	Other expense	Debit	Income statement

Account Title	*Account Classification*	*Normal Balance*	*Financial Statement*
Loss on Sale of Investments	Other expense	Debit	Income statement
Marketable Securities	Current asset	Debit	Balance sheet
Medicare Tax Payable	Current liability	Credit	Balance sheet
Notes Payable	Current liability/Long-term liability	Credit	Balance sheet
Notes Receivable	Current asset/Investment	Debit	Balance sheet
Patents	Intangible asset	Debit	Balance sheet
Paid-In Capital from Sale of Treasury Stock	Stockholders' equity	Credit	Balance sheet
Paid-In Capital in Excess of Par (Stated Value)	Stockholders' equity	Credit	Balance sheet
Payroll Tax Expense	Operating expense	Debit	Income statement
Pension Expense	Operating expense	Debit	Income statement
Petty Cash	Current asset	Debit	Balance sheet
Preferred Stock	Stockholders' equity	Credit	Balance sheet
Premium on Bonds Payable	Long-term liability	Credit	Balance sheet
Prepaid Insurance	Current asset	Debit	Balance sheet
Prepaid Rent	Current asset	Debit	Balance sheet
Purchases	Cost of goods sold	Debit	Income statement
Purchases Discounts	Cost of goods sold	Credit	Income statement
Purchases Returns and Allowances	Cost of goods sold	Credit	Income statement
Rent Expense	Operating expense	Debit	Income statement
Rent Revenue	Other income	Credit	Income statement
Retained Earnings	Stockholders' equity	Credit	Balance sheet/Statement of stockholders' equity
Salaries Expense	Operating expense	Debit	Income statement
Salaries Payable	Current liability	Credit	Balance sheet
Sales	Revenue	Credit	Income statement
Sales Tax Payable	Current liability	Credit	Balance sheet
Social Security Tax Payable	Current liability	Credit	Balance sheet
State Unemployment Tax Payable	Current liability	Credit	Balance sheet
Stock Dividends	Stockholders' equity	Debit	Statement of stockholders' equity
Stock Dividends Distributable	Stockholders' equity	Credit	Balance sheet
Supplies	Current asset	Debit	Balance sheet
Supplies Expense	Operating expense	Debit	Income statement
Treasury Stock	Stockholders' equity	Debit	Balance sheet
Unearned Rent	Current liability	Credit	Balance sheet
Utilities Expense	Operating expense	Debit	Income statement
Vacation Pay Expense	Operating expense	Debit	Income statement
Vacation Pay Payable	Current liability/Long-term liability	Credit	Balance sheet
Work in Process	Current asset	Debit	Balance sheet