*Required:*

1. Compute the materials price variance for the plates purchased last month, and compute a materials quantity variance for the plates used last month.
2. For labor cost in the lab:
   *a.* Compute a labor rate variance and a labor efficiency variance.
   *b.* In most hospitals, three-fourths of the workers in the lab are certified technicians and one-fourth are assistants. In an effort to reduce costs, Cottonwood Hospital employs only one-half certified technicians and one-half assistants. Would you recommend that this policy be continued? Explain.
3. Compute the variable overhead rate and efficiency variances. Is there any relation between the variable overhead efficiency variance and the labor efficiency variance? Explain.

**PROBLEM 11-11 Basic Variance Analysis [LO 11–1, LO 11–2, LO 11–3]**

Barberry, Inc., manufactures a product called Fruta. The company uses a standard cost system and has established the following standards for one unit of Fruta:

| | Standard Quality | Standard Price or Rate | Standard Cost |
|---|---|---|---|
| Direct materials | 1.5 pounds | $6.00 per pound | $ 9.00 |
| Direct labor | 0.6 hours | $12.00 per hour | 7.20 |
| Variable manufacturing overhead | 0.6 hours | $2.50 per hour | 1.50 |
| | | | $17.70 |

During June, the company recorded this activity related to production of Fruta:

a. The company produced 3,000 units during June.
b. A total of 8,000 pounds of material were purchased at a cost of $46,000.
c. There was no beginning inventory of materials; however, at the end of the month, 2,000 pounds of material remained in ending inventory.
d. The company employs 10 persons to work on the production of Fruta. During June, they worked an average of 160 hours at an average rate of $12.50 per hour.
e. Variable manufacturing overhead is assigned to Fruta on the basis of direct labor-hours. Variable manufacturing overhead costs during June totaled $3,600.

The company's management is anxious to determine the efficiency of Fruta production activities.

*Required:*

1. For direct materials:
   *a.* Compute the price and quantity variances.
   *b.* The materials were purchased from a new supplier who is anxious to enter into a long-term purchase contract. Would you recommend that the company sign the contract? Explain.
2. For labor employed in the production of Fruta:
   *a.* Compute the rate and efficiency variances.
   *b.* In the past, the 10 persons employed in the production of Fruta consisted of 4 senior workers and 6 assistants. During June, the company experimented with 5 senior workers and 5 assistants. Would you recommend that the new labor mix be continued? Explain.
3. Compute the variable overhead rate and efficiency variances. What relation can you see between this efficiency variance and the labor efficiency variance?

**PROBLEM 11–12 Basic Variance Analysis; the Impact of Variances on Unit Costs [LO 11–1, LO 11–2, LO 11–3]**

Landers Company manufactures a number of products. The standards relating to one of these products are shown below, along with actual cost data for May.

| | Standard Cost per Unit | Actual Cost per Unit |
|---|---|---|
| Direct materials: | | |
| Standard: 1.80 feet at $3.00 per foot | $ 5.40 | |
| Actual: 1.75 feet at $3.20 per foot | | $ 5.60 |
| Direct labor: | | |
| Standard: 0.90 hours at $18.00 per hour | 16.20 | |
| Actual: 0.95 hours at $17.40 per hour | | 16.53 |
| Variable overhead: | | |
| Standard: 0.90 hours at $5.00 per hour | 4.50 | |
| Actual: 0.95 hours at $4.60 per hour | | 4.37 |
| Total cost per unit | $26.10 | $26.50 |
| Excess of actual cost over standard cost per unit | $0.40 | |

The production superintendent was pleased when he saw this report and commented: "This $0.40 excess cost is well within the 2% limit management has set for acceptable variances. It's obvious that there's not much to worry about with this product."

Actual production for the month was 12,000 units. Variable overhead cost is assigned to products on the basis of direct labor-hours. There were no beginning or ending inventories of materials.

*Required:*

1. Compute the following variances for May:
   *a.* Materials price and quantity variances.
   *b.* Labor rate and efficiency variances.
   *c.* Variable overhead rate and efficiency variances.
2. How much of the $0.40 excess unit cost is traceable to each of the variances computed in (1) above.
3. How much of the $0.40 excess unit cost is traceable to apparent inefficient use of labor time?
4. Do you agree that the excess unit cost is not of concern?

**PROBLEM 11–13 Materials and Labor Variances; Computations from Incomplete Data [LO 11–1, LO 11–2]**

Topaz Company makes one product and has set the following standards for materials and labor:

| | Direct Materials | Direct Labor |
|---|---|---|
| Standard quantity or hours per unit | ? pounds | 2.5 hours |
| Standard price or rate | ? per pound | $9.00 per hour |
| Standard cost per unit | ? | $22.50 |

During the past month, the company purchased 6,000 pounds of direct materials at a cost of $16,500. All of this material was used in the production of 1,400 units of product. Direct labor cost totaled $28,500 for the month. The following variances have been computed:

| | |
|---|---|
| Materials quantity variance | $1,200 U |
| Total materials spending variance | $300 F |
| Labor efficiency variance | $4,500 F |

*Required:*

1. For direct materials:
   *a.* Compute the standard price per pound for materials.
   *b.* Compute the standard quantity allowed for materials for the month's production.
   *c.* Compute the standard quantity of materials allowed per unit of product.

2. For direct labor:
   *a.* Compute the actual direct labor cost per hour for the month.
   *b.* Compute the labor rate variance.

(Hint: In completing the problem, it may be helpful to move from known to unknown data either by using the variance formulas or by using the columnar format shown in Exhibits 11–5 and 11–6.)

**PROBLEM 11–14 Comprehensive Variance Analysis [LO 11–1, LO 11–2, LO 11–3]**

Vitalite, Inc., produces a number of products, including a body-wrap kit. Standard variable costs relating to a single kit are given below:

| | Standard Quantity or Hours | Standard Price or Rate | Standard Cost |
|---|---|---|---|
| Direct materials | ? | $6 per yard | $ ? |
| Direct labor | ? | ? | ? |
| Variable manufacturing overhead | ? | $2 per direct labor-hour | ? |
| Total standard cost per kit | | | $42 |

During August, 500 kits were manufactured and sold. Selected information relating to the month's production is given below:

| | Materials Used | Direct Labor | Variable Manufacturing Overhead |
|---|---|---|---|
| Total standard cost* | ? | $8,000 | $1,600 |
| Actual costs incurred | $10,000 | ? | $1,620 |
| Materials price variance | ? | | |
| Materials quantity variance | $600 U | | |
| Labor rate variance | | ? | |
| Labor efficiency variance | | ? | |
| Variable overhead rate variance | | | ? |
| Variable overhead efficiency variance | | | ? |

*For the month's production.

The following additional information is available for August's production of kits:

| | |
|---|---|
| Actual direct labor-hours | 900 |
| Difference between standard and actual cost per kit produced during August | $0.14 U |

*Required:*

1. What was the total standard cost of the materials used during August?
2. How many yards of material are required at standard per kit?
3. What was the materials price variance for August if there were no beginning or ending inventories of materials?
4. What is the standard direct labor rate per hour?
5. What was the labor rate variance for August? The labor efficiency variance?
6. What was the variable overhead rate variance for August? The variable overhead efficiency variance?
7. Complete the standard cost card for one kit shown at the beginning of the problem.

**PROBLEM 11–15 Comprehensive Variance Analysis [LO 11–1, LO 11–2, LO 11–3]**

Helix Company produces several products in its factory, including a karate robe. The company uses a standard cost system to assist in the control of costs. According to the standards that have

## Problems

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**PROBLEM 12–14 Return on Investment (ROI) and Residual Income [LO 12–1, LO 12–2]**

"I know headquarters wants us to add that new product line," said Fred Halloway, manager of Kirsi Products' East Division. "But I want to see the numbers before I make a move. Our division's return on investment (ROI) has led the company for three years, and I don't want any letdown."

Kirsi Products is a decentralized wholesaler with four autonomous divisions. The divisions are evaluated on the basis of ROI, with year-end bonuses given to divisional managers who have the highest ROI. Operating results for the company's East Division for last year are given below:

| | |
|---|---|
| Sales | $21,000,000 |
| Variable expenses | 13,400,000 |
| Contribution margin | 7,600,000 |
| Fixed expenses | 5,920,000 |
| Net operating income | $ 1,680,000 |
| Divisional operating assets | $ 5,250,000 |

The company had an overall ROI of 18% last year (considering all divisions). The company's East Division has an opportunity to add a new product line that would require an investment of $3,000,000. The cost and revenue characteristics of the new product line per year would be as follows:

| | |
|---|---|
| Sales | $9,000,000 |
| Variable expenses | 65% of sales |
| Fixed expenses | $2,520,000 |

*Required:*

1. Compute the East Division's ROI for last year; also compute the ROI as it would appear if the new product line is added.
2. If you were in Fred Halloway's position, would you accept or reject the new product line? Explain.
3. Why do you suppose headquarters is anxious for the East Division to add the new product line?
4. Suppose that the company's minimum required rate of return on operating assets is 15% and that performance is evaluated using residual income.
   a. Compute the East Division's residual income for last year; also compute the residual income as it would appear if the new product line is added.
   b. Under these circumstances, if you were in Fred Halloway's position would you accept or reject the new product line? Explain.


**PROBLEM 12–15 Comparison of Performance Using Return on Investment (ROI) [LO 12–1]**

Comparative data on three companies in the same service industry are given below:

| | Company | | |
|---|---|---|---|
| | A | B | C |
| Sales | $4,000,000 | $1,500,000 | $ ? |
| Net operating income | $ 560,000 | $ 210,000 | $ ? |
| Average operating assets | $2,000,000 | ? | $3,000,000 |
| Margin | ? | ? | 3.5% |
| Turnover | ? | ? | 2 |
| Return on investment (ROI) | ? | 7% | ? |

*Required:*

1. What advantages are there to breaking down the ROI computation into two separate elements, margin and turnover?
2. Fill in the missing information above, and comment on the relative performance of the three companies in as much detail as the data permit. Make *specific recommendations* about how to improve the ROI.

(Adapted from National Association of Accountants, *Research Report No. 35*, p. 34)

**PROBLEM 12–16 Measures of Internal Business Process Performance** [LO 12–3]

MacIntyre Fabrications, Ltd., of Aberdeen, Scotland, has recently begun a continuous improvement campaign in conjunction with a move toward Lean Production. Management has developed new performance measures as part of this campaign. The following operating data have been gathered over the last four months:

| | Month | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Throughput time | ? | ? | ? | ? |
| Manufacturing cycle efficiency | ? | ? | ? | ? |
| Delivery cycle time | ? | ? | ? | ? |
| Percentage of on-time deliveries | 72% | 73% | 78% | 85% |
| Total sales (units) | 10,540 | 10,570 | 10,550 | 10,490 |

Management would like to know the company's throughput time, manufacturing cycle efficiency, and delivery cycle time. The data to compute these measures have been gathered and appear below:

| | Month | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Move time per unit, in days | 0.5 | 0.5 | 0.4 | 0.5 |
| Process time per unit, in days | 0.6 | 0.5 | 0.5 | 0.4 |
| Wait time per order before start of production, in days | 9.6 | 8.7 | 5.3 | 4.7 |
| Queue time per unit, in days | 3.6 | 3.6 | 2.6 | 1.7 |
| Inspection time per unit, in days | 0.7 | 0.7 | 0.4 | 0.3 |

*Required:*

1. For each month, compute the following:
   *a.* The throughput time.
   *b.* The manufacturing cycle efficiency (MCE).
   *c.* The delivery cycle time.
2. Using the performance measures given in the problem and those you computed in (1) above, identify whether the trend over the four months is generally favorable, generally unfavorable, or mixed. What areas apparently require improvement and how might they be improved?
3. Refer to the move time, process time, and so forth, given for month 4.
   *a.* Assume that in month 5 the move time, process time, and so forth, are the same as for month 4, except that through the implementation of Lean Production, the company is able to completely eliminate the queue time during production. Compute the new throughput time and MCE.
   *b.* Assume that in month 6 the move time, process time, and so forth, are the same as for month 4, except that the company is able to completely eliminate both the queue time during production and the inspection time. Compute the new throughput time and MCE.