5.7. In an 11-week period, a work center produces 1050 standard hours of work. What is the measured capacity of the work center?

5.8. In 1 week, a work center produces 85 standard hours of work. The hours scheduled are 80, and 75 hours are actually worked. Calculate the utilization and efficiency of the work center.

Answer. Utilization is 93.75%; efficiency is 113.33%

5.9. A work center consisting of 3 machines operates 40 hours a week. In a 4-week period, it actually worked 355 hours and produced 475 standard hours of work. Calculate the utilization and efficiency of the work center. What is the demonstrated weekly capacity of the work center?

5.10. A firm wishes to determine the efficiency and utilization of a work center composed of 3 machines each working 16 hours per day for 5 days a week. A study undertaken by the materials management department found that over the past year the work center was available for work 12,000 hours, work was actually being done for 10,000 hours, and work was performed 11,480 standard hours. Calculate the utilization, efficiency, and demonstrated weekly capacity. Assume a 50-week year.

5.11. How many standard hours are needed to run an order of 200 pieces if the setup time is 1.3 hours and the run time 0.3 hours per piece? How many actual hours are needed at the work center if the efficiency is 130% and the utilization is 70%?

Answer. 61.3 standard hours; 67.4 actual hours

5.12. How many standard hours are needed to run an order of 500 pieces if the setup time is 3.0 hours and the run time 0.2 hours per piece? How many actual hours are needed at the work center if the efficiency is 125% and the utilization is 85%?

5.13. A work center has the following open and planned orders for week 4. Calculate the total standard time required (load).

		Order Quantity	Setup time (hours)	Run time (hours/piece)	Total time (hours)
Released Orders	120	300	1.00	0.10	
	340	200	2.50	0.30	
Planned Orders	560	300	3.00	0.25	
	780	500	2.00	0.15	
Total Time (standard hours)					

Answer. Total time = 248.5 standard hours

5.14. A work center has the following open and planned orders for week 4. Calculate the total standard time required (load).

		Order Quantity	Setup time (hours)	Run time (hours/piece)	Total time (hours)
Released Orders	125	200	0.25	0.12	
	345	70	0.70	0.05	
Planned Orders	565	80	1.00	0.25	
	785	35	1.50	0.15	
Total Time (standard hours)					

QUESTIONS

1. What are the five objectives of purchasing?
2. List the seven steps in the purchasing cycle.
3. Describe the purposes, similarities, and differences among purchase requisitions, purchase orders, and requests for quotation.
4. What are the responsibilities of the purchasing department in follow-up?
5. Describe the duties of the receiving department upon receipt of goods.
6. Besides functional specifications, what three other specifications must be determined? Why is each important?
7. Name two sources of specifications.
8. What is the difference between sole sourcing and single sourcing?
9. Describe the advantages and disadvantages of the following ways of describing functional requirements. Give examples of when each is used.
   a. By brand.
   b. By specification of physical and chemical characteristics, material and method of manufacture, and performance.
10. What are the advantages of using standard specifications?
11. Why is it important to select the right supplier and to maintain a relationship with that supplier?
12. Name and describe the three types of sourcing.
13. Describe six factors that should be used in selecting a supplier.
14. What is the concept of "best buy"?
15. Type of product is a factor that influences the approach to negotiation. Name the four categories of products and state what room there is for negotiation.
16. What are four savings that can result from adopting a supply chain management approach?
17. A company would like to reduce the amount of lead time in some of their soldered electronics. How can the purchasing department contribute to this endeavor?
18. Describe which of the 3 Rs of recycling has the most beneficial impact on the environment.

PROBLEMS

7.1. If purchases were 45% of sales and other expenses were 45% of sales, what would be the increase in profit if, through better purchasing, the cost of purchases was reduced to 43% of sales?

7.2. If suppliers were to be rated on the following basis, what would be the ranking of the two suppliers listed?

Factor	Weight	Rating of Suppliers		Ranking of Suppliers	
		Supplier A	Supplier B	Supplier A	Supplier B
Function	7	8	9		
Cost	5	9	5		
Technical Assistance	4	5	7		
Credit Terms	1	8	4		

7.3. A company is negotiating with a potential supplier for the purchase of 100,000 widgets. The company estimates that the supplier's variable costs are $5 per unit and that the fixed costs, depreciation, overhead, and so on, are $50,000. The supplier quotes a price of $10 per unit. Calculate the estimated average cost per unit. Do you think $10 is too much to pay? Could the purchasing department negotiate a better price? How?

5.15 Using the information in the following route file, open order file, and MRP planned orders, calculate the load on the work center.

Routing:
Part 123: Setup time = 2 standard hours
Run time per piece = 3 standard hours per piece
Part 456: Setup time = 3 standard hours
Run time per piece = 1 standard hour per piece

Open Orders for parts

Week	1	2	3
123	12	8	5
456	15	5	5

Planned Orders for parts

1	2	3
0	5	10
0	10	15

Load report

Week	1	2	3
Released Load 123			
456			
Planned Load 123			
456			
Total Load			

5.16. Complete the following load report and suggest possible courses of action.

Week	18	19	20	21	Total
Released Load	150	155	100	70	475
Planned Load	0	0	80	80	160
Total Load					
Rated Capacity	150	150	150	150	600
(Over)/Under					

5.17. Back schedule the following shop order. All times are given in days. Move time between operations is 1 day, and wait time is 1 day. Due date is day 150. Assume orders start at the beginning of a day and finish at the end of a day.

Operation Number	Work Center	Operation Time (days)	Queue Time (days)	Arrival Date	Finish Date
10	111	2	4		
20	130	4	5		
30	155	1	2		
	Stores			150	

Planned Backlog	45						
Actual Backlog	45						

Answer. 37 units

6.16. Complete the following table to determine the run sequence for each of the sequencing rules.

Job	Process Time (days)	Arrival Date	Due Date	Operation Due Date	Sequencing Rule			
					FCFS	EDD	ODD	SPT
A	5	123	142	132				
B	2	124	144	131				
C	3	131	140	129				
D	6	132	146	135				

6.17. Jobs A, B, and C are in queue at work center 10 before being completed on work center 20. The following information pertains to the jobs and the work centers. For this problem, there is no move time. Today is day 1. If the jobs are scheduled by the earliest due date, can they be completed on time?

Job	Process Time (days)		Due Date
	Work Center 10	Work Center 20	
A	7	3	12
B	5	2	24
C	9	4	18

Job	Work Center 10		Work Center 20	
	Start Day	Stop Day	Start Day	Stop Day
A				
C				
B				

6.18. Calculate the critical ratios for the following orders and establish in what order they should be run. Today's date is 75.

Order	Due Date	Lead Time Remaining (days)	Actual Time Remaining (days)	CR
A	87	12		
B	95	26		
C	100	21		

PROBLEMS

6.1. Shop order 7777 is for 600 of part 8900. From the routing file, it is found that operation 20 is done on work center 300. The setup time is 3.5 hours, and run time is 0.233 hours per piece. What is the required capacity on work center 300 for shop order 7777?

Answer. 143.3 standard hours

6.2. An order for 100 of a product is processed on work centers A and B. The setup time on A is 50 minutes, and run time is 5 minutes per piece. The setup time on B is 60 minutes, and the run time is 5 minutes per piece. Wait time between the two operations is 5 hours. The move time between A and B is 40 minutes. Wait time after operation B is 5 hours, and the move time into stores is 3 hours. Queue at work center A is 25 hours and at B is 35 hours. Calculate the total manufacturing lead time for the order.

Answer. 92 hours and 10 minutes

6.3. In problem 6.2, what percent of the time is the order actually running?

Answer. 18.08%

6.4. An order for 50 of a product is processed on work centers A and B. The setup time on A is 60 minutes, and run time is 5 minutes per piece. The setup time on B is 30 minutes, and the run time is 6 minutes per piece. Wait time between the two operations is 10 hours. The move time between A and B is 60 minutes. Wait time after operation B is 8 hours, and the move time into stores is 2 hours. Queue at work center A is 40 hours and at B is 35 hours. Calculate the total manufacturing lead time for the order.

6.5. In problem 6.4, what percent of time is the order actually running?

6.6. Amalgamated Skyhooks, Inc., has an order for 200 Model SKY3 Skyhooks for delivery on day 200. The Skyhook consists of three parts. Components B and C form subassembly A. Subassembly A and component D form the final assembly. Following are the work centers and times for each operation. Using a piece of graph paper, draw a backward schedule based on the following. When must component C be started to meet the delivery date?

a. Only one machine is assigned to each operation.

b. The factory works one 8-hour shift 5 days a week.

c. All parts move in one lot of 200.

Part	Operation	Standard Time (days)
D	10	5
	20	7
B	10	5
	20	7
C	10	12
	20	5
Subassembly A		7
Final Assembly SKY3		5

Answer. Day 171

6.7. International Door Slammers has an order to deliver 500 door slammers on day 130. Draw up a backward schedule under the following conditions:

a. Only one machine is assigned to each operation.

b. Schedule one 8-hour shift per day for 5 days per week.

c. All parts are to move in one lot of 500 pieces.

d. Allow 8 hours between operations for queue and move times.

6.12. An order for 100 of a product is run on work center 40. The setup time is 4 hours, and the run time is 3 minutes per piece. Since the order is a rush and there are two machines in the work center, it is decided to split the order and run it on both machines. Calculate the manufacturing lead time before and after splitting.

6.13. In problem 6.12, what would be the manufacturing lead time if the second machine could not be set up until the setup on the first machine was completed? Would there be any reduction in manufacturing lead time?

6.14. Complete the following input/output report. What are the planned and actual backlogs at the end of period 4?

Period	1	2	3	4	Total
Planned Input	35	38	36	39	
Actual Input	33	33	31	40	
Cumulative Variance					

Planned Output	40	40	40	40	
Actual Output	38	35	40	38	
Cumulative Variance					

Planned Backlog	32					
Actual Backlog	32					

Answer. Planned backlog = 20 units. Actual backlog = 18 units

6.15. Complete the following input/output report. What is the actual backlog at the end of period 5?

Period	1	2	3	4	5	Total
Planned Input	78	78	78	78	78	
Actual Input	82	80	74	82	80	
Cumulative Variance						

Planned Output	80	80	80	80	80	
Actual Output	85	83	74	80	84	
Cumulative Variance						