

BUS 201W

Mathematical Problems and their solutions

(Covered Chapters: 2,5,6,7,9,11)

Chapter: 2

Review Problem 2: Schedule of Cost of Goods Manufactured and Income Statement

The following information has been taken from the accounting records of Klear-Seal Corporation for last year:

Selling expenses	\$140,000
Raw materials inventory, January 1	\$90,000
Raw materials inventory, December 31	\$60,000
Direct labor cost	\$150,000
Purchases of raw materials	\$750,000
Sales	\$2,500,000
Administrative expenses	\$270,000
Manufacturing overhead	\$640,000
Work in process inventory, January 1	\$180,000
Work in process inventory, December 31	\$100,000
Finished goods inventory, January 1	\$260,000
Finished goods inventory, December 31	\$210,000

Management wants these data organized in a better format so that financial statements can be prepared for the year.

Required:

1. Prepare a schedule of cost of goods manufactured as in Exhibit 2–6. Assume raw materials consists entirely of direct materials.
2. Compute the cost of goods sold as in Exhibit 2–4.
3. Prepare an income statement.

Solution to Q. No. 1-

Solution to Review Problem 2

1.

Klear-Seal Corporation Schedule of Cost of Goods Manufactured For the Year Ended December 31		
Direct materials:		
Raw materials inventory, January 1	\$ 90,000	
Add: Purchases of raw materials	<u>750,000</u>	
Raw materials available for use	840,000	
Deduct: Raw materials inventory, December 31	<u>60,000</u>	
Raw materials used in production		\$ 780,000
Direct labor		150,000
Manufacturing overhead		<u>640,000</u>
Total manufacturing cost		1,570,000
Add: Work in process inventory, January 1		<u>180,000</u>
		1,750,000
Deduct: Work in process inventory, December 31		<u>100,000</u>
Cost of goods manufactured		<u>\$1,650,000</u>

Solution to Q. No. 2-

2. The cost of goods sold would be computed as follows:

Finished goods inventory, January 1	\$ 260,000
Add: Cost of goods manufactured	1,650,000
Goods available for sale	<u>1,910,000</u>
Deduct: Finished goods inventory, December 31	<u>210,000</u>
Cost of goods sold*	<u><u>\$1,700,000</u></u>

*Further adjustments will be made to cost of goods sold in the next chapter.

Solution to Q. No. 3-

3.

Klear-Seal Corporation Income Statement For the Year Ended December 31		
Sales		\$2,500,000
Cost of goods sold (above)		<u>1,700,000</u>
Gross margin		800,000
Selling and administrative expenses:		
Selling expenses	\$140,000	
Administrative expenses	<u>270,000</u>	<u>410,000</u>
Net operating income		<u><u>\$ 390,000</u></u>

Exercise of Chapter: 2

EX. 2-5 :

EXERCISE 2-5 Prepare a Schedule of Cost of Goods Manufactured [LO5]

Lompac Products manufactures a variety of products in its factory. Data for the most recent month's operations appear below:

Beginning raw materials inventory	\$60,000
Purchases of raw materials	\$690,000
Ending raw materials inventory	\$45,000
Direct labor	\$135,000
Manufacturing overhead	\$370,000
Beginning work in process inventory	\$120,000
Ending work in process inventory	\$130,000

Required:

Prepare a schedule of cost of goods manufactured for the company for the month.

Soln. 2-5:

Lompac Products Schedule of Cost of Goods Manufactured

Direct materials:

Beginning raw materials inventory.....	\$ 60,000	
Add: Purchases of raw materials.....	<u>690,000</u>	
Raw materials available for use.....	750,000	
Deduct: Ending raw materials inventory...	<u>45,000</u>	
Raw materials used in production.....		\$ 705,000
Direct labor.....		135,000
Manufacturing overhead.....		<u>370,000</u>
Total manufacturing costs.....		1,210,000
Add: Beginning work in process inventory. .		<u>120,000</u>
		1,330,000
Deduct: Ending work in process inventory. .		<u>130,000</u>
Cost of goods manufactured.....		<u>\$1,200,000</u>

EX 2-9 :

EXERCISE 2-9 Definitions of Cost Terms [LO2, LO3, LO6, LO8]

Following are a number of cost terms introduced in the chapter:

Variable cost	Product cost
Fixed cost	Sunk cost
Prime cost	Conversion cost
Opportunity cost	Period cost

Required:

Choose the term or terms above that most appropriately describe the cost identified in each of the following situations. A cost term can be used more than once.

1. Lake Company produces a popular tote bag. The cloth used to manufacture the tote bag is direct materials and for financial accounting purposes is classified as a(n) _____. In terms of cost behavior, the cloth could also be described as a(n) _____.
 2. The direct labor cost required to produce the tote bags, combined with manufacturing overhead cost, is called _____.
 3. The company could have taken the funds that it has invested in production equipment and invested them in interest-bearing securities instead. The interest forgone on the securities is a(n) _____.
 4. Taken together, the direct materials cost and the direct labor cost required to produce tote bags is called _____.
 5. Formerly, the company produced a smaller tote bag that was not very popular. Three hundred of these smaller bags are stored in one of the company's warehouses. The amount invested in these bags is called a(n) _____.
 6. Tote bags are sold through agents who are paid a commission on each bag sold. For financial accounting purposes, these commissions are classified as a(n) _____. In terms of cost behavior, commissions are classified as a(n) _____.
 7. For financial accounting purposes, depreciation on the equipment used to produce tote bags is a(n) _____. However, for financial accounting purposes, depreciation on any equipment used by the company in selling and administrative activities is classified as a(n) _____. In terms of cost behavior, depreciation is usually a(n) _____.
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8. A(n) _____ is also known as an inventoriable cost, because such costs go into the Work in Process inventory account and then into the Finished Goods inventory account before appearing on the income statement as part of Cost of Goods Sold.
 9. For financial accounting purposes, the salary of Lake Company's president is classified as a(n) _____, because the salary will appear on the income statement as an expense in the time period in which it is incurred.
 10. Costs are often classified in several ways. For example, Lake Company pays \$5,000 rent each month on its factory building. The rent is part of manufacturing overhead. In terms of cost behavior, it would be classified as a(n) _____. The rent can also be classified as a(n) _____ and as a(n) _____.

Soln. 2-9:

1. Product cost; variable cost
2. Conversion cost
3. Opportunity cost
4. Prime cost
5. Sunk cost
6. Period cost; variable cost
7. Product cost; period cost; fixed cost
8. Product cost
9. Period cost
10. Fixed cost; product cost; conversion cost

Ex. 2-11:

EXERCISE 2-11 Preparing a Schedule of Costs of Goods Manufactured and Cost of Goods Sold

[L02, L04, L05]

The following cost and inventory data are taken from the accounting records of Mason Company for the year just completed:

Costs incurred:

Direct labor cost	\$70,000
Purchases of raw materials	\$118,000
Manufacturing overhead	\$80,000
Advertising expense	\$90,000
Sales salaries	\$50,000
Depreciation, office equipment	\$3,000

	Beginning of the Year	End of the Year
Inventories:		
Raw materials	\$7,000	\$15,000
Work in process	\$10,000	\$5,000
Finished goods	\$20,000	\$35,000

Required:

1. Prepare a schedule of cost of goods manufactured.
2. Prepare the cost of goods sold section of Mason Company's income statement for the year.

Soln. 2-11:

1.

Mason Company Schedule of Cost of Goods Manufactured

Direct materials:

Beginning raw materials inventory.....	\$ 7,000	
Add: Purchases of raw materials.....	118,000	
Raw materials available for use.....	125,000	
Deduct: Ending raw materials inventory.....	<u>15,000</u>	
Raw materials used in production.....		\$110,000
Direct labor.....		70,000
Manufacturing overhead.....		<u>80,000</u>
Total manufacturing costs.....		260,000
Add: Beginning work in process inventory.....		<u>10,000</u>
		270,000
Deduct: Ending work in process inventory.....		<u>5,000</u>
Cost of goods manufactured.....		<u>\$265,000</u>

2. The cost of goods sold section of Mason Company's income statement:

Beginning finished goods inventory.....	\$ 20,000
Add: Cost of goods manufactured.....	<u>265,000</u>
Goods available for sale.....	285,000
Deduct: Ending finished goods inventory.....	<u>35,000</u>
Cost of goods sold.....	<u>\$250,000</u>

Ex. 2-12:

EXERCISE 2-12 Product Cost Flows; Product versus Period Costs [LO3, LO4]

The Devon Motor Company produces motorcycles. During April, the company purchased 8,000 batteries at a cost of \$10 per battery. Devon withdrew 7,600 batteries from the storeroom during the month. Of these, 100 were used to replace batteries in motorcycles used by the company's traveling sales staff. The remaining 7,500 batteries withdrawn from the storeroom were placed in motorcycles being produced by the company. Of the motorcycles in production during April, 90% were completed and transferred from work in process to finished goods. Of the motorcycles completed during the month, 30% were unsold at April 30.

There were no inventories of any type on April 1.

Required:

- Determine the cost of batteries that would appear in each of the following accounts at April 30:
 - Raw Materials.
 - Work in Process.
 - Finished Goods.
 - Cost of Goods Sold.
 - Selling Expense.
- Specify whether each of the above accounts would appear on the balance sheet or on the income statement at April 30.

Soln. 2-12:

1.	a. Batteries purchased.....	8,000
	Batteries drawn from inventory.....	<u>7,600</u>
	Batteries remaining in inventory.....	400
	Cost per battery.....	<u>× \$10</u>
	Cost in Raw Materials Inventory at April 30.....	<u>\$4,000</u>
	b. Batteries used in production (7,600 – 100).....	7,500
	Motorcycles completed and transferred to Finished Goods (90% × 7,500).....	<u>6,750</u>
	Motorcycles still in Work in Process at April 30.....	750
	Cost per battery.....	<u>× \$10</u>
	Cost in Work in Process Inventory at April 30.....	<u>\$7,500</u>
	c. Motorcycles completed and transferred to Finished Goods (see above).....	6,750
	Motorcycles sold during the month (70% × 6,750).....	<u>4,725</u>
	Motorcycles still in Finished Goods at April 30.....	2,025
	Cost per battery.....	<u>× \$10</u>
	Cost in Finished Goods Inventory at April 30.....	<u>\$20,250</u>
	d. Motorcycles sold during the month (above).....	4,725
	Cost per battery.....	<u>× \$10</u>
	Cost in Cost of Goods Sold at April 30.....	<u>\$47,250</u>
	e. Batteries used in salespersons' motorcycles.....	100
	Cost per battery.....	<u>× \$10</u>
	Cost in Selling Expense at April 30.....	<u>\$ 1,000</u>
2.	Raw Materials Inventory—balance sheet	
	Work in Process Inventory—balance sheet	
	Finished Goods Inventory—balance sheet	
	Cost of Goods Sold—income statement	
	Selling Expense—income statement	

Ex. 2-16

PROBLEM 2-16 Schedule of Cost of Goods Manufactured; Income Statement [LO2, LO3, LO4, LO5]

Swift Company was organized on March 1 of the current year. After five months of start-up losses, management had expected to earn a profit during August. Management was disappointed, however, when the income statement for August also showed a loss. August's income statement follows:

Swift Company Income Statement For the Month Ended August 31		
Sales		\$450,000
Less operating expenses:		
Direct labor cost	\$ 70,000	
Raw materials purchased	165,000	
Manufacturing overhead	85,000	
Selling and administrative expenses	142,000	462,000
Net operating loss		<u>\$ (12,000)</u>

After seeing the \$12,000 loss for August, Swift's president stated, "I was sure we'd be profitable within six months, but our six months are up and this loss for August is even worse than July's. I think it's time to start looking for someone to buy out the company's assets—if we don't, within a few months there won't be any assets to sell. By the way, I don't see any reason to look for a new controller. We'll just limp along with Sam for the time being."

The company's controller resigned a month ago. Sam, a new assistant in the controller's office, prepared the income statement above. Sam has had little experience in manufacturing operations.

Inventory balances at the beginning and end of August were:

	August 1	August 31
Raw materials	\$8,000	\$13,000
Work in process	\$16,000	\$21,000
Finished goods	\$40,000	\$60,000

The president has asked you to check over the income statement and make a recommendation as to whether the company should look for a buyer for its assets.

Required:

- As one step in gathering data for a recommendation to the president, prepare a schedule of cost of goods manufactured for August.
- As a second step, prepare a new income statement for August.
- Based on your statements prepared in (1) and (2) above, would you recommend that the company look for a buyer?

Soln. 2-16:

1.

Swift Company
Schedule of Cost of Goods Manufactured
For the Month Ended August 31

Direct materials:

Raw materials inventory, August 1.....	\$ 8,000	
Add: Purchases of raw materials.....	<u>165,000</u>	
Raw materials available for use.....	173,000	
Deduct: Raw materials inventory, August 31...	<u>13,000</u>	
Raw materials used in production.....		\$160,000
Direct labor.....		70,000
Manufacturing overhead.....		<u>85,000</u>
Total manufacturing costs.....		315,000
Add: Work in process inventory, August 1.....		<u>16,000</u>
		331,000
Deduct: Work in process inventory, August 31. .		<u>21,000</u>
Cost of goods manufactured.....		<u>\$310,000</u>

2.

Swift Company
Income Statement
For the Month Ended August 31

Sales.....		\$450,000
Cost of goods sold:		
Finished goods inventory, August 1.....	\$ 40,000	
Add: Cost of goods manufactured.....	<u>310,000</u>	
Goods available for sale.....	350,000	
Deduct: Finished goods inventory, August 31.	<u>60,000</u>	<u>290,000</u>
Gross margin.....		160,000
Selling and administrative expenses.....		<u>142,000</u>
Net operating income.....		<u>\$ 18,000</u>

3. In preparing the income statement for August, Sam failed to distinguish between product costs and period costs, and he also failed to recognize the changes in inventories between the beginning and end of the month. Once these errors have been corrected, the financial condition of the company looks much better and selling the company may not be advisable.

Ex. 2-18:

PROBLEM 2-18 Schedule of Cost of Goods Manufactured; Income Statement; Cost Behavior [LO2, LO3, LO4, LO5, LO6]

Various cost and sales data for Meriwell Company for the just completed year appear in the worksheet below:



	A	B	C
1	Finished goods inventory, beginning	\$20,000	
2	Finished goods inventory, ending	\$40,000	
3	Administrative expenses	\$110,000	
4	Manufacturing overhead	\$105,000	
5	Purchases of raw materials	\$125,000	
6	Raw materials inventory, beginning	\$9,000	
7	Raw materials inventory, ending	\$6,000	
8	Direct labor	\$70,000	
9	Work in process inventory, beginning	\$17,000	
10	Work in process inventory, ending	\$30,000	
11	Sales	\$500,000	
12	Selling expenses	\$80,000	
13			

Of the \$105,000 of manufacturing overhead, \$15,000 is variable and \$90,000 is fixed.

Required:

1. Prepare a schedule of cost of goods manufactured.
2. Prepare an income statement.
3. Assume that the company produced the equivalent of 10,000 units of product during the year just completed. What was the average cost per unit for direct materials? What was the average cost per unit for fixed manufacturing overhead?
4. Assume that the company expects to produce 15,000 units of product during the coming year. What average cost per unit and what total cost would you expect the company to incur for direct materials at this level of activity? For fixed manufacturing overhead? Assume that direct materials is a variable cost.
5. As the manager responsible for production costs, explain to the president any difference in the average costs per unit between (3) and (4) above.

Soln. 2-18:

1.

Meriwell Company Schedule of Cost of Goods Manufactured

Direct materials:		
Raw materials inventory, beginning.....	\$ 9,000	
Add: Purchases of raw materials.....	<u>125,000</u>	
Raw materials available for use.....	134,000	
Deduct: Raw materials inventory, ending.....	<u>6,000</u>	
Raw materials used in production.....		\$128,000
Direct labor.....		70,000
Manufacturing overhead.....		<u>105,000</u>
Total manufacturing costs.....		303,000
Add: Work in process inventory, beginning.....		<u>17,000</u>
		320,000
Deduct: Work in process inventory, ending.....		<u>30,000</u>
Cost of goods manufactured.....		<u>\$290,000</u>

2.

Meriwell Company Income Statement

Sales.....		\$500,000
Cost of goods sold:		
Finished goods inventory, beginning.....	\$ 20,000	
Add: Cost of goods manufactured.....	<u>290,000</u>	
Goods available for sale.....	310,000	
Deduct: Finished goods inventory, ending.....	<u>40,000</u>	<u>270,000</u>
Gross margin.....		230,000
Selling and administrative expenses:		
Selling expenses.....	80,000	
Administrative expenses.....	<u>110,000</u>	<u>190,000</u>
Net operating income.....		<u>\$ 40,000</u>

3. Direct materials: $\$128,000 \div 10,000 \text{ units} = \12.80 per unit .
Fixed manufacturing overhead: $\$90,000 \div 10,000 \text{ units} = \9.00 per unit .
4. Direct materials:
Unit cost: \$12.80 (unchanged)
Total cost: 15,000 units \times \$12.80 per unit = \$192,000.
Fixed manufacturing overhead:
Unit cost: $\$90,000 \div 15,000 \text{ units} = \6.00 per unit .
Total cost: \$90,000 (unchanged)
5. Unit cost for fixed manufacturing overhead dropped from \$9.00 to \$6.00, because of the increase in production between the two years. Because fixed costs do not change *in total* as the activity level changes, they will decrease on a unit basis as the activity level rises.

Ex. 2-21:

PROBLEM 2-21 Schedule of Cost of Goods Manufactured; Income Statement; Cost Behavior [L02, L03, L04, L05, L06]

Selected account balances for the year ended December 31 are provided below for Superior Company:

Selling and administrative salaries	\$110,000
Purchases of raw materials	\$290,000
Direct labor	?
Advertising expense	\$80,000
Manufacturing overhead	\$270,000
Sales commissions	\$50,000

Inventory balances at the beginning and end of the year were as follows:

	Beginning of the Year	End of the Year
Raw materials	\$40,000	\$10,000
Work in process	?	\$35,000
Finished goods	\$50,000	?

The total manufacturing costs for the year were \$683,000; the goods available for sale totaled \$740,000; and the cost of goods sold totaled \$660,000.

Required:

1. Prepare a schedule of cost of goods manufactured and the cost of goods sold section of the company's income statement for the year.
2. Assume that the dollar amounts given above are for the equivalent of 40,000 units produced during the year. Compute the average cost per unit for direct materials used and the average cost per unit for manufacturing overhead.
3. Assume that in the following year the company expects to produce 50,000 units and manufacturing overhead is fixed. What average cost per unit and total cost would you expect to be incurred for direct materials? For manufacturing overhead? (Assume that direct materials is a variable cost.)
4. As the manager in charge of production costs, explain to the president the reason for any difference in average cost per unit between (2) and (3) above.

Soln. 2-21:

1.

Superior Company
Schedule of Cost of Goods Manufactured
For the Year Ended December 31

Direct materials:

Raw materials inventory, beginning (given) ..	\$ 40,000	
Add: Purchases of raw materials (given).....	<u>290,000</u>	
Raw materials available for use.....	330,000	
Deduct: Raw materials inventory, ending (given).....	<u>10,000</u>	
Raw materials used in production.....		\$320,000
Direct labor.....		93,000 *
Manufacturing overhead (given).....	<u>270,000</u>	
Total manufacturing costs (given).....	683,000	
Add: Work in process inventory, beginning.....	<u>42,000</u> *	
	725,000	
Deduct: Work in process inventory, ending (given).....	<u>35,000</u>	
Cost of goods manufactured.....		<u>\$690,000</u>

The cost of goods sold section of the income statement follows:

Finished goods inventory, beginning (given)...	\$ 50,000	
Add: Cost of goods manufactured.....	<u>690,000</u> *	
Goods available for sale (given).....	740,000	
Deduct: Finished goods inventory, ending.....	<u>80,000</u> *	
Cost of goods sold (given).....		<u>\$660,000</u>

- * These items must be computed by working backwards up through the statements.
2. Direct materials: $\$320,000 \div 40,000 \text{ units} = \8.00 per unit .
Manufacturing overhead: $\$270,000 \div 40,000 \text{ units} = \6.75 per unit .
3. Direct materials: $\$8.00 \text{ per unit}$.
Manufacturing overhead: $\$270,000 \div 50,000 \text{ units} = \5.40 per unit .
4. The average cost per unit for manufacturing overhead dropped from $\$6.75$ to $\$5.40$ because of the increase in production between the two years. Because fixed costs do not change *in total* as the activity level changes, the average cost per unit will decrease as the activity level rises.

Ex. 2-24:

PROBLEM 2-24 Income Statement; Schedule of Cost of Goods Manufactured [LO2, LO3, LO4, LO5]

Visic Corporation, a manufacturing company, produces a single product. The following information has been taken from the company's production, sales, and cost records for the just completed year.

Production in units	29,000
Sales in units	?
Ending finished goods inventory in units	?
Sales in dollars	\$1,300,000
Costs:	
Direct labor	\$90,000
Raw materials purchased	\$480,000
Manufacturing overhead	\$300,000
Selling and administrative expenses	\$380,000

	Beginning of the Year	End of the Year
Inventories:		
Raw materials	\$20,000	\$30,000
Work in process	\$50,000	\$40,000
Finished goods	\$0	?

The finished goods inventory is being carried at the average unit production cost for the year. The selling price of the product is \$50 per unit.

Required:

1. Prepare a schedule of cost of goods manufactured for the year.
2. Compute the following:
 - a. The number of units in the finished goods inventory at the end of the year.
 - b. The cost of the units in the finished goods inventory at the end of the year.
3. Prepare an income statement for the year.

Soln. 2-24:

1.

Visic Corporation Schedule of Cost of Goods Manufactured

Direct materials:	
Raw materials inventory, beginning.....	\$ 20,000
Add: Purchases of raw materials.....	<u>480,000</u>
Raw materials available for use.....	500,000
Deduct: Raw materials inventory, ending.....	<u>30,000</u>
Raw materials used in production.....	\$470,000
Direct labor.....	90,000
Manufacturing overhead.....	<u>300,000</u>
Total manufacturing costs.....	860,000
Add: Work in process inventory, beginning.....	<u>50,000</u>
	910,000
Deduct: Work in process inventory, ending.....	<u>40,000</u>
Cost of goods manufactured.....	<u>\$870,000</u>

2. a. To compute the number of units in the finished goods inventory at the end of the year, we must first compute the number of units sold during the year.

$$\frac{\text{Total sales}}{\text{Unit selling price}} = \frac{\$1,300,000}{\$50 \text{ per unit sold}} = 26,000 \text{ units sold}$$

Units in the finished goods inventory, beginning.....	0
Units produced during the year.....	<u>29,000</u>
Units available for sale.....	29,000
Units sold during the year (above)	<u>26,000</u>
Units in the finished goods inventory, ending.....	<u>3,000</u>

- b. The average production cost per unit during the year is:

$$\frac{\text{Cost of goods manufactured}}{\text{Number of units produced}} = \frac{\$870,000}{29,000 \text{ units}} = \$30 \text{ per unit}$$

Thus, the cost of the units in the finished goods inventory at the end of the year is: 3,000 units × \$30 per unit = \$90,000.

3.

Visic Corporation Income Statement

Sales.....		\$1,300,000
Cost of goods sold:		
Finished goods inventory, beginning.....	\$ 0	
Add: Cost of goods manufactured.....	<u>870,000</u>	
Goods available for sale.....	870,000	
Finished goods inventory, ending.....	<u>90,000</u>	<u>780,000</u>
Gross margin.....		520,000
Selling and administrative expenses.....		<u>380,000</u>
Net operating income.....		<u>\$ 140,000</u>

Chapter – 5

Review Problem 2: High-Low Method

The administrator of Azalea Hills Hospital would like a cost formula linking the administrative costs involved in admitting patients to the number of patients admitted during a month. The Admitting Department's costs and the number of patients admitted during the immediately preceding eight months are given in the following table:



Month	Number of Patients Admitted	Admitting Department Costs
May	1,800	\$14,700
June	1,900	\$15,200
July	1,700	\$13,700
August	1,600	\$14,000
September	1,500	\$14,300
October	1,300	\$13,100
November	1,100	\$12,800
December	1,500	\$14,600

Required:

1. Use the high-low method to estimate the fixed and variable components of admitting costs.
2. Express the fixed and variable components of admitting costs as a cost formula in the form $Y = a + bX$.

Solution to Review Problem 2

1. The first step in the high-low method is to identify the periods of the lowest and highest activity. Those periods are November (1,100 patients admitted) and June (1,900 patients admitted).

The second step is to compute the variable cost per unit using those two data points:

Month	Number of Patients Admitted	Admitting Department Costs
High activity level (June)	1,900	\$15,200
Low activity level (November)	1,100	12,800
Change	<u>800</u>	<u>\$ 2,400</u>

$$\text{Variable cost} = \frac{\text{Change in cost}}{\text{Change in activity}} = \frac{\$2,400}{800 \text{ patients admitted}} = \$3 \text{ per patient admitted}$$

The third step is to compute the fixed cost element by deducting the variable cost element from the total cost at either the high or low activity. In the computation below, the high point of activity is used:

$$\begin{aligned} \text{Fixed cost element} &= \text{Total cost} - \text{Variable cost element} \\ &= \$15,200 - (\$3 \text{ per patient admitted} \times 1,900 \text{ patients admitted}) \\ &= \$9,500 \end{aligned}$$

2. The cost formula is $Y = \$9,500 + \$3X$.

Ex. 5-3:

EXERCISE 5-3 High-Low Method [LO3]

The Cheyenne Hotel in Big Sky, Montana, has accumulated records of the total electrical costs of the hotel and the number of occupancy-days over the last year. An occupancy-day represents a room rented out for one day. The hotel's business is highly seasonal, with peaks occurring during the ski season and in the summer.

Month	Occupancy-Days	Electrical Costs
January.....	1,736	\$4,127
February.....	1,904	\$4,207
March.....	2,356	\$5,083
April.....	960	\$2,857
May.....	360	\$1,871
June.....	744	\$2,696
July.....	2,108	\$4,670
August.....	2,406	\$5,148
September.....	840	\$2,691
October.....	124	\$1,588
November.....	720	\$2,454
December.....	1,364	\$3,529

Required:

1. Using the high-low method, estimate the fixed cost of electricity per month and the variable cost of electricity per occupancy-day. Round off the fixed cost to the nearest whole dollar and the variable cost to the nearest whole cent.
2. What other factors other than occupancy-days are likely to affect the variation in electrical costs from month to month?

Soln. 5-3:

1.	<i>Occupancy- Days</i>	<i>Electrical Costs</i>
High activity level (August) . .	2,406	\$5,148
Low activity level (October) ..	<u>124</u>	<u>1,588</u>
Change.....	<u>2,282</u>	<u>\$3,560</u>
Variable cost = Change in cost ÷ Change in activity		
= \$3,560 ÷ 2,282 occupancy-days		
= \$1.56 per occupancy-day		
Total cost (August).....		\$5,148
Variable cost element		
(\$1.56 per occupancy-day × 2,406 occupancy-days).		<u>3,753</u>
Fixed cost element.....		<u>\$1,395</u>

2. Electrical costs may reflect seasonal factors other than just the variation in occupancy days. For example, common areas such as the reception area must be lighted for longer periods during the winter than in the summer. This will result in seasonal fluctuations in the fixed electrical costs.

Additionally, fixed costs will be affected by the number of days in a month. In other words, costs like the costs of lighting common areas are variable with respect to the number of days in the month, but are fixed with respect to how many rooms are occupied during the month.

Other, less systematic, factors may also affect electrical costs such as the frugality of individual guests. Some guests will turn off lights when they leave a room. Others will not.

Ex. 5-6:

EXERCISE 5-6 High-Low Method; Scattergraph Analysis [LO2, LO3]

The following data relating to units shipped and total shipping expense have been assembled by Archer Company, a wholesaler of large, custom-built air-conditioning units for commercial buildings:

Month	Units Shipped	Total Shipping Expense
January	3	\$1,800
February	6	\$2,300
March	4	\$1,700
April	5	\$2,000
May	7	\$2,300
June	8	\$2,700
July	2	\$1,200

Required:

- Using the high-low method, estimate a cost formula for shipping expense.
- The president of the company has no confidence in the high-low method and would like you to check your results using a scattergraph.
 - Prepare a scattergraph, using the data given above. Plot cost on the vertical axis and activity on the horizontal axis. Use a ruler to fit a straight line to your plotted points.
 - Using your scattergraph, estimate the approximate variable cost per unit shipped and the approximate fixed cost per month with the quick-and-dirty method.
- What factors, other than the number of units shipped, are likely to affect the company's total shipping expense? Explain.

Soln. 5-6:

	Units Shipped	Shipping Expense
1. High activity level (June).....	8	\$2,700
Low activity level (July).....	2	<u>1,200</u>
Change.....	<u>6</u>	<u>\$1,500</u>

Variable cost element:

$$\frac{\text{Change in expense}}{\text{Change in activity}} = \frac{\$1,500}{6 \text{ units}} = \$250 \text{ per unit.}$$

Fixed cost element:

Shipping expense at high activity level.....	\$2,700
Less variable cost element (\$250 per unit × 8 units)...	<u>2,000</u>
Total fixed cost.....	<u>\$ 700</u>

The cost formula is \$700 per month plus \$250 per unit shipped or

$$Y = \$700 + \$250X,$$

where X is the number of units shipped.

2. a. See the scattergraph on the following page.
- b. (Note: Students' answers will vary due to the imprecision of this method of estimating variable and fixed costs.)

Total cost at 5 units shipped per month [a point falling on the regression line in (a)].....	\$2,000
Less fixed cost element (intersection of the Y axis)...	<u>1,000</u>
Variable cost element.....	<u>\$1,000</u>

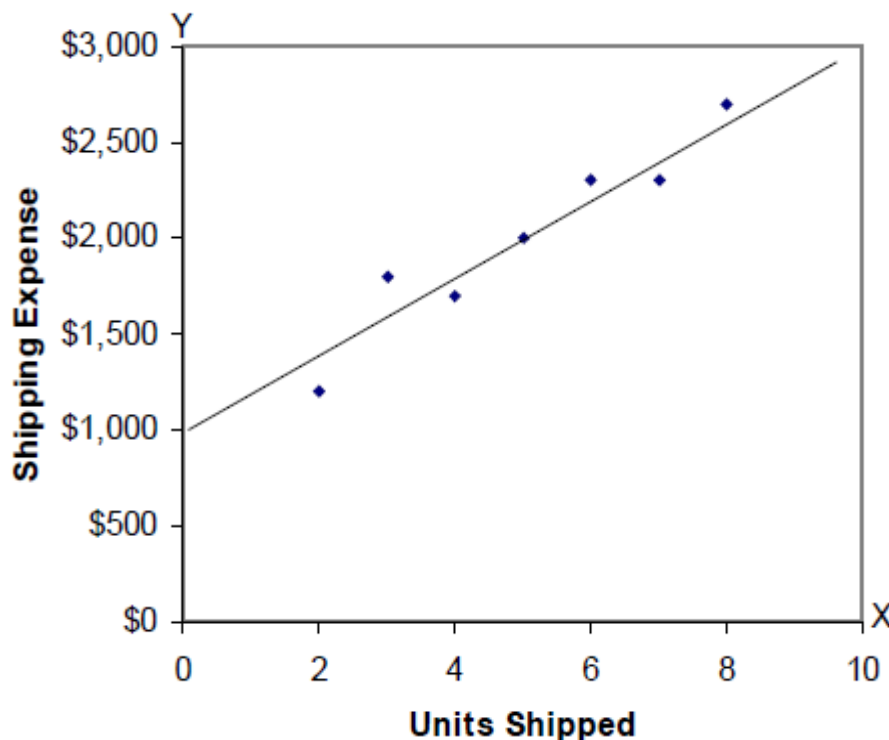
$$\$1,000 \div 5 \text{ units} = \$200 \text{ per unit}$$

The cost formula is \$1,000 per month plus \$200 per unit shipped or

$$Y = \$1,000 + \$200X$$

where X is the number of units shipped.

2. a. The scattergraph would be:



3. The cost of shipping units is likely to depend on the weight and volume of the units and the distance traveled, as well as on the number of units shipped. In addition, higher cost shipping might be necessary to meet a deadline.

Ex. 5-7:

EXERCISE 5-7 Cost Behavior; High-Low Method [LO1, LO3]

Hoi Chong Transport, Ltd., operates a fleet of delivery trucks in Singapore. The company has determined that if a truck is driven 105,000 kilometers during a year, the average operating cost is 11.4 cents per kilometer. If a truck is driven only 70,000 kilometers during a year, the average operating cost increases to 13.4 cents per kilometer. (The Singapore dollar is the currency used in Singapore.)

Required:

1. Using the high-low method, estimate the variable and fixed cost elements of the annual cost of the truck operation.
2. Express the variable and fixed costs in the form $Y = a + bX$.
3. If a truck were driven 80,000 kilometers during a year, what total cost would you expect to be incurred?

Soln. 5-7:

1.	Kilometers Driven	Total Annual Cost*
High level of activity.....	105,000	\$11,970
Low level of activity.....	<u>70,000</u>	<u>9,380</u>
Change.....	<u>35,000</u>	<u>\$ 2,590</u>

105,000 kilometers \times \$0.114 per kilometer = \$11,970

70,000 kilometers \times \$0.134 per kilometer = \$9,380

Variable cost per kilometer:

$$\frac{\text{Change in cost}}{\text{Change in activity}} = \frac{\$2,590}{35,000 \text{ kilometers}} = \$0.074 \text{ per kilometer}$$

Fixed cost per year:

Total cost at 105,000 kilometers.....	\$11,970
Less variable portion:	
105,000 kilometers \times \$0.074 per kilometer....	<u>7,770</u>
Fixed cost per year.....	<u>\$ 4,200</u>

2. $Y = \$4,200 + \$0.074X$

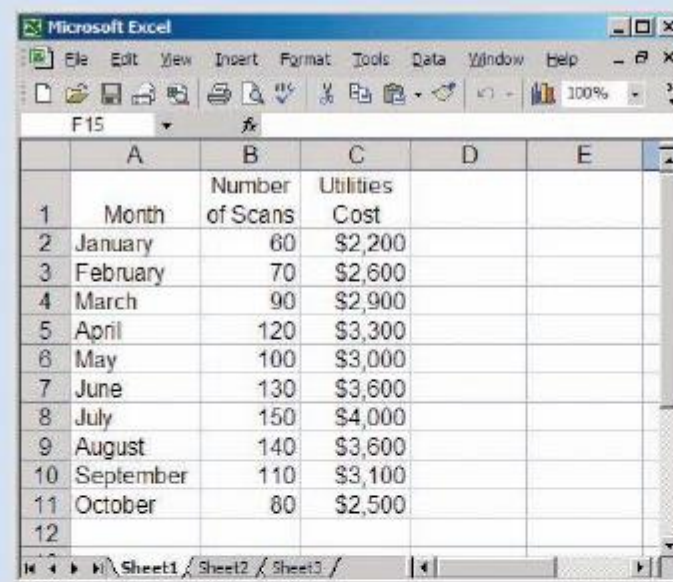
3. Fixed cost.....	\$ 4,200
Variable cost:	
80,000 kilometers \times \$0.074 per kilometer.....	<u>5,920</u>
Total annual cost.....	<u>\$10,120</u>

Ex. 5-14:

PROBLEM 5-14 High-Low and Scattergraph Analysis [LO2, LO3]

Pleasant View Hospital of British Columbia has just hired a new chief administrator who is anxious to employ sound management and planning techniques in the business affairs of the hospital. Accordingly, she has directed her assistant to summarize the cost structure of the various departments so that data will be available for planning purposes.

The assistant is unsure how to classify the utilities costs in the Radiology Department because these costs do not exhibit either strictly variable or fixed cost behavior. Utilities costs are very high in the department due to a CAT scanner that draws a large amount of power and is kept running at all times. The scanner can't be turned off due to the long warm-up period required for its use. When the scanner is used to scan a patient, it consumes an additional burst of power. The assistant has accumulated the following data on utilities costs and use of the scanner since the first of the year.



	A	B	C	D	E
1	Month	Number of Scans	Utilities Cost		
2	January	60	\$2,200		
3	February	70	\$2,600		
4	March	90	\$2,900		
5	April	120	\$3,300		
6	May	100	\$3,000		
7	June	130	\$3,600		
8	July	150	\$4,000		
9	August	140	\$3,600		
10	September	110	\$3,100		
11	October	80	\$2,500		
12					

The chief administrator has informed her assistant that the utilities cost is probably a mixed cost that will have to be broken down into its variable and fixed cost elements by use of a scattergraph. The assistant feels, however, that if an analysis of this type is necessary, then the high-low method should be used, since it is easier and quicker. The controller has suggested that there may be a better approach.

Required:

1. Using the high-low method, estimate a cost formula for utilities. Express the formula in the form $Y = a + bX$. (The variable rate should be stated in terms of cost per scan.)
2. Prepare a scattergraph using the data above. (The number of scans should be placed on the horizontal axis, and utilities cost should be placed on the vertical axis.) Fit a straight line to the plotted points using a ruler and estimate a cost formula for utilities using the quick-and-dirty method.

Soln. 5-14:

1. High-low method:

	Number of Scans	Utilities Cost
High level of activity . .	150	\$4,000
Low level of activity...	<u>60</u>	<u>2,200</u>
Change.....	<u>90</u>	<u>\$1,800</u>

Variable rate: $\frac{\text{Change in cost}}{\text{Change in activity}} = \frac{\$1,800}{90 \text{ scans}} = \20 per scan

Fixed cost: Total cost at high level of activity.....	\$4,000
Less variable element:	
150 scans × \$20 per scan.....	<u>3,000</u>
Fixed cost element.....	<u>\$1,000</u>

Therefore, the cost formula is: $Y = \$1,000 + \$20X$.

2. Scattergraph method (see the scattergraph on the following page):

(Note: Students' answers will vary due to the inherent imprecision of the quick-and-dirty method.)

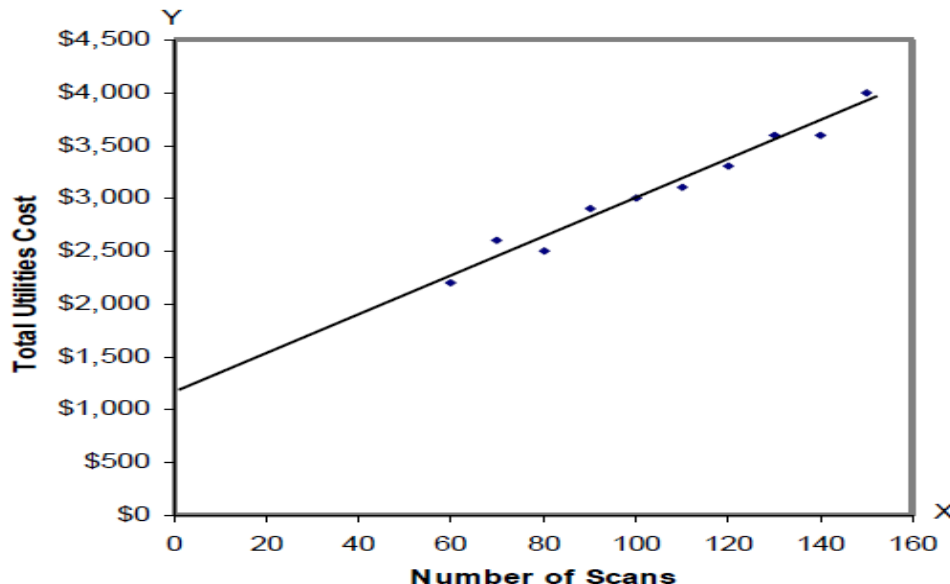
The line intersects the cost axis at about \$1,200. The variable cost can be estimated as follows:

Total cost at 100 scans (a point that falls on the line) . .	\$3,000
Less the fixed cost element.....	<u>1,200</u>
Variable cost element (total).....	<u>\$1,800</u>

$\$1,800 \div 100 \text{ scans} = \18 per scan

Therefore, the cost formula is: $Y = \$1,200 + \$18X$.

The completed scattergraph:



Ex. 5-17:

PROBLEM 5-17 High-Low Method; Predicting Cost [LO1, LO3]

Nova Company's total overhead cost at various levels of activity are presented below:

Month	Machine-Hours	Total Overhead Cost
April	70,000	\$198,000
May	60,000	\$174,000
June	80,000	\$222,000
July	90,000	\$246,000

Assume that the total overhead cost above consists of utilities, supervisory salaries, and maintenance. The breakdown of these costs at the 60,000 machine-hour level of activity is:

Utilities (variable)	\$ 48,000
Supervisory salaries (fixed)	21,000
Maintenance (mixed)	105,000
Total overhead cost	<u>\$174,000</u>

Nova Company's management wants to break down the maintenance cost into its variable and fixed cost elements.

Required:

1. Estimate how much of the \$246,000 of overhead cost in July was maintenance cost. (Hint: to do this, it may be helpful to first determine how much of the \$246,000 consisted of utilities and supervisory salaries. Think about the behavior of variable and fixed costs!)
2. Using the high-low method, estimate a cost formula for maintenance.
3. Express the company's *total* overhead cost in the linear equation form $Y = a + bX$.
4. What *total* overhead cost would you expect to be incurred at an operating activity level of 75,000 machine-hours?

Soln. 5-17:

1. Maintenance cost at the 90,000 machine-hour level of activity can be isolated as follows:

	<u>Level of Activity</u>	
	<u>60,000 MHs</u>	<u>90,000 MHs</u>
Total factory overhead cost.....	\$174,000	\$246,000
Deduct:		
Utilities cost @ \$0.80 per MH*..	48,000	72,000
Supervisory salaries.....	<u>21,000</u>	<u>21,000</u>
Maintenance cost.....	<u>\$105,000</u>	<u>\$153,000</u>

*\$48,000 ÷ 60,000 MHs = \$0.80 per MH

2. High-low analysis of maintenance cost:

	<i>Machine- Hours</i>	<i>Maintenance Cost</i>
High activity level.....	90,000	\$153,000
Low activity level.....	<u>60,000</u>	<u>105,000</u>
Change.....	<u>30,000</u>	<u>\$ 48,000</u>

Variable rate:

$$\frac{\text{Change in cost}}{\text{Change in activity}} = \frac{\$48,000}{30,000 \text{ MHs}} = \$1.60 \text{ per MH}$$

Total fixed cost:

Total maintenance cost at the high activity level...	\$153,000
Less variable cost element (90,000 MHs × \$1.60 per MH).....	<u>144,000</u>
Fixed cost element.....	<u>\$ 9,000</u>

Therefore, the cost formula for maintenance is \$9,000 per month plus \$1.60 per machine-hour or

$$Y = \$9,000 + \$1.60X.$$

3.

	<i>Variable Cost per Machine-Hour</i>	<i>Fixed Cost</i>
Utilities cost.....	\$0.80	
Supervisory salaries cost		\$21,000
Maintenance cost.....	<u>1.60</u>	<u>9,000</u>
Total overhead cost.....	<u>\$2.40</u>	<u>\$30,000</u>

Thus, the cost formula would be: $Y = \$30,000 + \$2.40X$.

4. Total overhead cost at an activity level of 75,000 machine-hours:

Fixed costs.....	\$ 30,000
Variable costs: 75,000 MHs × \$2.40 per MH.	<u>180,000</u>
Total overhead costs.....	<u>\$210,000</u>

Chapter - 6:

Review Problem: CVP Relationships

Voltar Company manufactures and sells a specialized cordless telephone for high electromagnetic radiation environments. The company's contribution format income statement for the most recent year is given below:

	Total	Per Unit	Percent of Sales
Sales (20,000 units)	\$1,200,000	\$60	100%
Variable expenses	900,000	45	? %
Contribution margin	300,000	\$15	? %
Fixed expenses	240,000		
Net operating income	\$ 60,000		

Management is anxious to increase the company's profit and has asked for an analysis of a number of items.

Required:

1. Compute the company's CM ratio and variable expense ratio.
 2. Compute the company's break-even point in both units and sales dollars. Use the equation method.
 3. Assume that sales increase by \$400,000 next year. If cost behavior patterns remain unchanged, by how much will the company's net operating income increase? Use the CM ratio to compute your answer.
 4. Refer to the original data. Assume that next year management wants the company to earn a profit of at least \$90,000. How many units will have to be sold to meet this target profit?
 5. Refer to the original data. Compute the company's margin of safety in both dollar and percentage form.
-
6.
 - a. Compute the company's degree of operating leverage at the present level of sales.
 - b. Assume that through a more intense effort by the sales staff, the company's sales increase by 8% next year. By what percentage would you expect net operating income to increase? Use the degree of operating leverage to obtain your answer.
 - c. Verify your answer to (b) by preparing a new contribution format income statement showing an 8% increase in sales.
 7. In an effort to increase sales and profits, management is considering the use of a higher-quality speaker. The higher-quality speaker would increase variable costs by \$3 per unit, but management could eliminate one quality inspector who is paid a salary of \$30,000 per year. The sales manager estimates that the higher-quality speaker would increase annual sales by at least 20%.
 - a. Assuming that changes are made as described above, prepare a projected contribution format income statement for next year. Show data on a total, per unit, and percentage basis.
 - b. Compute the company's new break-even point in both units and dollars of sales. Use the formula method.
 - c. Would you recommend that the changes be made?

Solution to Review Problem

1.

$$\text{CM ratio} = \frac{\text{Unit contribution margin}}{\text{Unit selling price}} = \frac{\$15}{\$60} = 25\%$$

$$\text{Variable expense ratio} = \frac{\text{Variable expense}}{\text{Selling price}} = \frac{\$45}{\$60} = 75\%$$

2.

$$\text{Profit} = \text{Unit CM} \times Q - \text{Fixed expenses}$$

$$\$0 = (\$60 - \$45) \times Q - \$240,000$$

$$\$15Q = \$240,000$$

$$Q = \$240,000 \div \$15$$

$$Q = 16,000 \text{ units; or at } \$60 \text{ per unit, } \$960,000$$

3.

Increase in sales	\$400,000
Multiply by the CM ratio	× 25%
Expected increase in contribution margin	<u><u>\$100,000</u></u>

Because the fixed expenses are not expected to change, net operating income will increase by the entire \$100,000 increase in contribution margin computed above.

4. Equation method:

$$\text{Profit} = \text{Unit CM} \times Q - \text{Fixed expenses}$$

$$\$90,000 = (\$60 - \$45) \times Q - \$240,000$$

$$\$15Q = \$90,000 + \$240,000$$

$$Q = \$330,000 \div \$15$$

$$Q = 22,000 \text{ units}$$

Formula method:

$$\text{Unit sales to attain the target profit} = \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Contribution margin per unit}} = \frac{\$90,000 + \$240,000}{\$15 \text{ per unit}} = 22,000 \text{ units}$$

5. $\text{Margin of safety in dollars} = \text{Total sales} - \text{Break-even sales}$

$$= \$1,200,000 - \$960,000 = \$240,000$$

$$\text{Margin of safety percentage} = \frac{\text{Margin of safety in dollars}}{\text{Total sales}} = \frac{\$240,000}{\$1,200,000} = 20\%$$

$$6. \quad a. \quad \text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}} = \frac{\$300,000}{\$60,000} = 5$$

b.

Expected increase in sales	8%
Degree of operating leverage	<u>× 5</u>
Expected increase in net operating income	<u>40%</u>

- c. If sales increase by 8%, then 21,600 units ($20,000 \times 1.08 = 21,600$) will be sold next year. The new contribution format income statement would be as follows:

	Total	Per Unit	Percent of Sales
Sales (21,600 units)	\$1,296,000	\$60	100%
Variable expenses	972,000	45	75%
Contribution margin	324,000	<u>\$15</u>	<u>25%</u>
Fixed expenses	240,000		
Net operating income	<u>\$ 84,000</u>		

Thus, the \$84,000 expected net operating income for next year represents a 40% increase over the \$60,000 net operating income earned during the current year:

$$\frac{\$84,000 - \$60,000}{\$60,000} = \frac{\$24,000}{\$60,000} = 40\% \text{ increase}$$

Note from the income statement above that the increase in sales from 20,000 to 21,600 units has increased *both* total sales and total variable expenses.

7. a. A 20% increase in sales would result in 24,000 units being sold next year: $20,000 \text{ units} \times 1.20 = 24,000 \text{ units}$.

	Total	Per Unit	Percent of Sales
Sales (24,000 units)	\$1,440,000	\$60	100%
Variable expenses	1,152,000	<u>48*</u>	<u>80%</u>
Contribution margin	288,000	<u>\$12</u>	<u>20%</u>
Fixed expenses	210,000†		
Net operating income	<u>\$ 78,000</u>		

*\$45 + \$3 = \$48; \$48 ÷ \$60 = 80%.

†\$240,000 - \$30,000 = \$210,000.

Note that the change in per unit variable expenses results in a change in both the per unit contribution margin and the CM ratio.

$$b. \quad \begin{aligned} \text{Unit sales to break even} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$210,000}{\$12 \text{ per unit}} = 17,500 \text{ units} \\ \text{Dollar sales to break even} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$210,000}{0.20} = \$1,050,000 \end{aligned}$$

- c. Yes, based on these data the changes should be made. The changes increase the company's net operating income from the present \$60,000 to \$78,000 per year. Although the changes also result in a higher break-even point (17,500 units as compared to the present 16,000 units), the company's margin of safety actually becomes greater than before:

$$\begin{aligned} \text{Margin of safety in dollars} &= \text{Total sales} - \text{Break-even sales} \\ &= \$1,440,000 - \$1,050,000 = \$390,000 \end{aligned}$$

As shown in (5) on the prior page, the company's present margin of safety is only \$240,000. Thus, several benefits will result from the proposed changes.

Ex. 6-6 :

EXERCISE 6-6 Compute the Level of Sales Required to Attain a Target Profit [LO5]

Lin Corporation has a single product whose selling price is \$120 and whose variable expense is \$80 per unit. The company's monthly fixed expense is \$50,000.

Required:

1. Using the equation method, solve for the unit sales that are required to earn a target profit of \$10,000.
2. Using the formula method, solve for the unit sales that are required to earn a target profit of \$15,000.

Soln. 6-6:

1. The equation method yields the required unit sales, Q, as follows:

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ \$10,000 &= (\$120 - \$80) \times Q - \$50,000 \\ \$10,000 &= (\$40) \times Q - \$50,000 \\ \$40 \times Q &= \$10,000 + \$50,000 \\ Q &= \$60,000 \div \$40 \\ Q &= 1,500 \text{ units}\end{aligned}$$

2. The formula approach yields the required unit sales as follows:

$$\begin{aligned}\text{Units sold to attain} &= \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Unit contribution margin}} \\ \text{the target profit} &= \frac{\$15,000 + \$50,000}{\$40} \\ &= \frac{\$65,000}{\$40} = 1,625 \text{ units}\end{aligned}$$

Ex. 6-7:

EXERCISE 6-7 Compute the Break-Even Point [LO6]

Mauro Products distributes a single product, a woven basket whose selling price is \$15 and whose variable expense is \$12 per unit. The company's monthly fixed expense is \$4,200.

Required:

1. Solve for the company's break-even point in unit sales using the equation method.
2. Solve for the company's break-even point in sales dollars using the equation method and the CM ratio.
3. Solve for the company's break-even point in unit sales using the formula method.
4. Solve for the company's break-even point in sales dollars using the formula method and the CM ratio.

Soln. 6-7:

1. The equation method yields the break-even point in unit sales, Q, as follows:

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ \$0 &= (\$15 - \$12) \times Q - \$4,200 \\ \$0 &= (\$3) \times Q - \$4,200 \\ \$3Q &= \$4,200 \\ Q &= \$4,200 \div \$3 \\ Q &= 1,400 \text{ baskets}\end{aligned}$$

2. The equation method can be used to compute the break-even point in sales dollars as follows:

$$\begin{aligned}\text{CM ratio} &= \frac{\text{Unit contribution margin}}{\text{Unit selling price}} \\ &= \frac{\$3}{\$15} = 0.20\end{aligned}$$

$$\begin{aligned}\text{Profit} &= \text{CM ratio} \times \text{Sales} - \text{Fixed expenses} \\ \$0 &= 0.20 \times \text{Sales} - \$4,200 \\ 0.20 \times \text{Sales} &= \$4,200 \\ \text{Sales} &= \$4,200 \div 0.20 \\ \text{Sales} &= \$21,000\end{aligned}$$

3. The formula method gives an answer that is identical to the equation method for the break-even point in unit sales:

$$\begin{aligned}\text{Unit sales to break even} &= \frac{\text{Fixed expenses}}{\text{Unit CM}} \\ &= \frac{\$4,200}{\$3} = 1,400 \text{ baskets}\end{aligned}$$

Ex. 6-11:

EXERCISE 6-11 Using a Contribution Format Income Statement [LO1, LO4]

Miller Company's most recent contribution format income statement is shown below:

	Total	Per Unit
Sales (20,000 units)	\$300,000	\$15.00
Variable expenses	<u>180,000</u>	<u>9.00</u>
Contribution margin	120,000	<u>\$ 6.00</u>
Fixed expenses	<u>70,000</u>	
Net operating income	<u>\$ 50,000</u>	

Required:

Prepare a new contribution format income statement under each of the following conditions (consider each case independently):

- The number of units sold increases by 15%.
- The selling price decreases by \$1.50 per unit, and the number of units sold increases by 25%.
- The selling price increases by \$1.50 per unit, fixed expenses increase by \$20,000, and the number of units sold decreases by 5%.
- The selling price increases by 12%, variable expenses increase by 60 cents per unit, and the number of units sold decreases by 10%.

Soln. 6-11:

	Total	Per Unit
1. Sales (20,000 units \times 1.15 = 23,000 units).....	\$345,000	\$ 15.00
Variable expenses.....	<u>207,000</u>	<u>9.00</u>
Contribution margin.....	138,000	<u>\$ 6.00</u>
Fixed expenses.....	<u>70,000</u>	
Net operating income.....	<u>\$ 68,000</u>	
2. Sales (20,000 units \times 1.25 = 25,000 units).....	\$337,500	\$13.50
Variable expenses.....	<u>225,000</u>	<u>9.00</u>
Contribution margin.....	112,500	<u>\$ 4.50</u>
Fixed expenses.....	<u>70,000</u>	
Net operating income.....	<u>\$ 42,500</u>	
3. Sales (20,000 units \times 0.95 = 19,000 units).....	\$313,500	\$16.50
Variable expenses.....	<u>171,000</u>	<u>9.00</u>
Contribution margin.....	142,500	<u>\$ 7.50</u>
Fixed expenses.....	<u>90,000</u>	
Net operating income.....	<u>\$ 52,500</u>	
4. Sales (20,000 units \times 0.90 = 18,000 units).....	\$302,400	\$16.80
Variable expenses.....	<u>172,800</u>	<u>9.60</u>
Contribution margin.....	129,600	<u>\$ 7.20</u>
Fixed expenses.....	<u>70,000</u>	
Net operating income.....	<u>\$ 59,600</u>	

Ex. 6-12:

EXERCISE 6-12 Target Profit and Break-Even Analysis; Margin of Safety; CM Ratio [LO1, LO3, LO5, LO6, LO7]

Menlo Company distributes a single product. The company's sales and expenses for last month follow:

	Total	Per Unit
Sales	\$450,000	\$30
Variable expenses	180,000	12
Contribution margin	270,000	<u>\$18</u>
Fixed expenses	216,000	
Net operating income	<u>\$ 54,000</u>	

Required:

1. What is the monthly break-even point in units sold and in sales dollars?
 2. Without resorting to computations, what is the total contribution margin at the break-even point?
 3. How many units would have to be sold each month to earn a target profit of \$90,000? Use the formula method. Verify your answer by preparing a contribution format income statement at the target sales level.
-
4. Refer to the original data. Compute the company's margin of safety in both dollar and percentage terms.
 5. What is the company's CM ratio? If sales increase by \$50,000 per month and there is no change in fixed expenses, by how much would you expect monthly net operating income to increase?

Soln. 6-12:

1. Profit = Unit CM \times Q - Fixed expenses
\$0 = (\$30 - \$12) \times Q - \$216,000
\$0 = (\$18) \times Q - \$216,000
\$18Q = \$216,000
Q = \$216,000 \div \$18
Q = 12,000 units, or at \$30 per unit, \$360,000

Alternative solution:

$$\begin{aligned}\text{Unit sales to break even} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$216,000}{\$18} = 12,000 \text{ units}\end{aligned}$$

or at \$30 per unit, \$360,000

2. The contribution margin is \$216,000 because the contribution margin is equal to the fixed expenses at the break-even point.

$$3. \text{ Units sold to attain target profit} = \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Unit contribution margin}}$$

$$= \frac{\$90,000 + \$216,000}{\$18} = 17,000 \text{ units}$$

	<i>Total</i>	<i>Unit</i>
Sales (17,000 units × \$30 per unit).....	\$510,000	\$30
Variable expenses (17,000 units × \$12 per unit).....	<u>204,000</u>	<u>12</u>
Contribution margin.....	306,000	<u>\$18</u>
Fixed expenses.....	<u>216,000</u>	
Net operating income.....	<u>\$ 90,000</u>	

4. Margin of safety in dollar terms:

$$\begin{aligned} \text{Margin of safety in dollars} &= \text{Total sales} - \text{Break-even sales} \\ &= \$450,000 - \$360,000 = \$90,000 \end{aligned}$$

Margin of safety in percentage terms:

$$\begin{aligned} \text{Margin of safety percentage} &= \frac{\text{Margin of safety in dollars}}{\text{Total sales}} \\ &= \frac{\$90,000}{\$450,000} = 20\% \end{aligned}$$

5. The CM ratio is 60%.

Expected total contribution margin: (\$500,000 × 60%).....	\$300,000
Present total contribution margin: (\$450,000 × 60%).....	<u>270,000</u>
Increased contribution margin.....	<u>\$ 30,000</u>

Alternative solution:

$$\$50,000 \text{ incremental sales} \times 60\% \text{ CM ratio} = \$30,000$$

Given that the company's fixed expenses will not change, monthly net operating income will also increase by \$30,000.

Ex. 6-13:

EXERCISE 6-13 Target Profit and Break-Even Analysis [LO3, LO4, LO5, LO6]

Lindon Company is the exclusive distributor for an automotive product that sells for \$40 per unit and has a CM ratio of 30%. The company's fixed expenses are \$180,000 per year. The company plans to sell 16,000 units this year.

Required:

1. What are the variable expenses per unit?
2. Using the equation method:
 - a. What is the break-even point in units and sales dollars?
 - b. What sales level in units and in sales dollars is required to earn an annual profit of \$60,000?
 - c. Assume that by using a more efficient shipper, the company is able to reduce its variable expenses by \$4 per unit. What is the company's new break-even point in units and sales dollars?
3. Repeat (2) above using the formula method.

Soln. 6-13:

1. Variable expenses: $\$40 \times (100\% - 30\%) = \28

2. a. Selling price.....	\$40	100%
Variable expenses.....	28	70%
Contribution margin.....	<u>\$12</u>	<u>30%</u>

$$\text{Profit} = \text{Unit CM} \times Q - \text{Fixed expenses}$$

$$\$0 = \$12 \times Q - \$180,000$$

$$\$12Q = \$180,000$$

$$Q = \$180,000 \div \$12$$

$$Q = 15,000 \text{ units}$$

$$\text{In sales dollars: } 15,000 \text{ units} \times \$40 \text{ per unit} = \$600,000$$

Alternative solution:

$$\text{Profit} = \text{CM ratio} \times \text{Sales} - \text{Fixed expenses}$$

$$\$0 = 0.30 \times \text{Sales} - \$180,000$$

$$0.30 \times \text{Sales} = \$180,000$$

$$\text{Sales} = \$180,000 \div 0.30$$

$$\text{Sales} = \$600,000$$

$$\text{In units: } \$600,000 \div \$40 \text{ per unit} = 15,000 \text{ units}$$

b. $\text{Profit} = \text{Unit CM} \times Q - \text{Fixed expenses}$

$$\$60,000 = \$12 \times Q - \$180,000$$

$$\$12Q = \$60,000 + \$180,000$$

$$\$12Q = \$240,000$$

$$Q = \$240,000 \div \$12$$

$$Q = 20,000 \text{ units}$$

$$\text{In sales dollars: } 20,000 \text{ units} \times \$40 \text{ per unit} = \$800,000$$

Alternative solution:

$$\begin{aligned}\text{Profit} &= \text{CM ratio} \times \text{Sales} - \text{Fixed expenses} \\ \$60,000 &= 0.30 \times \text{Sales} - \$180,000 \\ 0.30 \times \text{Sales} &= \$240,000 \\ \text{Sales} &= \$240,000 \div 0.30 \\ \text{Sales} &= \$800,000\end{aligned}$$

$$\text{In units: } \$800,000 \div \$40 \text{ per unit} = 20,000 \text{ units}$$

c. The company's new cost/revenue relation will be:

Selling price.....	\$40	100%
Variable expenses (\$28 – \$4).....	24	60%
Contribution margin.....	<u>\$16</u>	<u>40%</u>

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ \$0 &= (\$40 - \$24) \times Q - \$180,000 \\ \$16Q &= \$180,000 \\ Q &= \$180,000 \div \$16 \text{ per unit} \\ Q &= 11,250 \text{ units}\end{aligned}$$

$$\text{In sales dollars: } 11,250 \text{ units} \times \$40 \text{ per unit} = \$450,000$$

Alternative solution:

$$\begin{aligned}\text{Profit} &= \text{CM ratio} \times \text{Sales} - \text{Fixed expenses} \\ \$0 &= 0.40 \times \text{Sales} - \$180,000 \\ 0.40 \times \text{Sales} &= \$180,000 \\ \text{Sales} &= \$180,000 \div 0.40 \\ \text{Sales} &= \$450,000\end{aligned}$$

$$\text{In units: } \$450,000 \div \$40 \text{ per unit} = 11,250 \text{ units}$$

3. a.

$$\begin{aligned}\text{Unit sales to break even} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$180,000}{\$12 \text{ per unit}} = 15,000 \text{ units}\end{aligned}$$

$$\text{In sales dollars: } 15,000 \text{ units} \times \$40 \text{ per unit} = \$600,000$$

Alternative solution:

$$\begin{aligned}\text{Dollar sales to break even} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$180,000}{0.30} = \$600,000\end{aligned}$$

$$\text{In units: } \$600,000 \div \$40 \text{ per unit} = 15,000 \text{ units}$$

b.

$$\begin{aligned}\text{Unit sales to attain target profit} &= \frac{\text{Fixed expenses} + \text{Target profit}}{\text{Unit contribution margin}} \\ &= \frac{\$180,000 + \$60,000}{\$12 \text{ per unit}} = 20,000 \text{ units}\end{aligned}$$

In sales dollars: 20,000 units × \$40 per unit = \$800,000

Alternative solution:

$$\begin{aligned}\text{Dollar sales to attain target profit} &= \frac{\text{Fixed expenses} + \text{Target profit}}{\text{CM ratio}} \\ &= \frac{\$180,000 + \$60,000}{0.30} = \$800,000\end{aligned}$$

In units: \$800,000 ÷ \$40 per unit = 20,000 units

c.

$$\begin{aligned}\text{Break-even point in unit sales} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$180,000}{\$16 \text{ per unit}} = 11,250 \text{ units}\end{aligned}$$

In sales dollars: 11,250 units × \$40 per unit = \$450,000

Alternative solution:

$$\begin{aligned}\text{Break-even point in sales dollars} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$180,000}{0.40} = \$450,000\end{aligned}$$

In units: \$450,000 ÷ \$40 per unit = 11,250 units

Ex- 6-16:

EXERCISE 6-16 Target Profit and Break-Even Analysis [LO4, LO5, LO6]

Outback Outfitters sells recreational equipment. One of the company's products, a small camp stove, sells for \$50 per unit. Variable expenses are \$32 per stove, and fixed expenses associated with the stove total \$108,000 per month.

Required:

1. Compute the break-even point in number of stoves and in total sales dollars.
2. If the variable expenses per stove increase as a percentage of the selling price, will it result in a higher or a lower break-even point? Why? (Assume that the fixed expenses remain unchanged.)
3. At present, the company is selling 8,000 stoves per month. The sales manager is convinced that a 10% reduction in the selling price would result in a 25% increase in monthly sales of stoves. Prepare two contribution format income statements, one under present operating conditions, and one as operations would appear after the proposed changes. Show both total and per unit data on your statements.
4. Refer to the data in (3) above. How many stoves would have to be sold at the new selling price to yield a minimum net operating income of \$35,000 per month?

$$\begin{aligned} 1. \quad \text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ \$0 &= (\$50 - \$32) \times Q - \$108,000 \\ \$0 &= (\$18) \times Q - \$108,000 \\ \$18Q &= \$108,000 \\ Q &= \$108,000 \div \$18 \\ Q &= 6,000 \text{ stoves, or at } \$50 \text{ per stove, } \$300,000 \text{ in sales} \end{aligned}$$

Alternative solution:

$$\begin{aligned} \text{Unit sales to} &= \frac{\text{Fixed expenses}}{\text{break even} \quad \text{Unit contribution margin}} \\ &= \frac{\$108,000}{\$18.00 \text{ per stove}} = 6,000 \text{ stoves} \end{aligned}$$

or at \$50 per stove, \$300,000 in sales.

2. An increase in variable expenses as a percentage of the selling price would result in a higher break-even point. If variable expenses increase as a percentage of sales, then the contribution margin will decrease as a percentage of sales. With a lower CM ratio, more stoves would have to be sold to generate enough contribution margin to cover the fixed costs.

3.

	<i>Present:</i> 8,000 Stoves		<i>Proposed:</i> 10,000 Stoves*		
	<i>Total</i>	<i>Per Unit</i>	<i>Total</i>	<i>Per Unit</i>	
Sales.....	\$400,000	\$50	\$450,000	\$45	**
Variable expenses.....	<u>256,000</u>	<u>32</u>	<u>320,000</u>	<u>32</u>	
Contribution margin.....	144,000	<u>\$18</u>	130,000	<u>\$13</u>	
Fixed expenses.....	<u>108,000</u>		<u>108,000</u>		
Net operating income....	<u>\$ 36,000</u>		<u>\$ 22,000</u>		

*8,000 stoves \times 1.25 = 10,000 stoves

**\$50 \times 0.9 = \$45

As shown above, a 25% increase in volume is not enough to offset a 10% reduction in the selling price; thus, net operating income decreases.

4. Profit = Unit CM \times Q – Fixed expenses

$$\$35,000 = (\$45 - \$32) \times Q - \$108,000$$

$$\$35,000 = (\$13) \times Q - \$108,000$$

$$\$13 \times Q = \$143,000$$

$$Q = \$143,000 \div \$13$$

$$Q = 11,000 \text{ stoves}$$

Alternative solution:

$$\text{Unit sales to attain target profit} = \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Unit contribution margin}}$$

$$= \frac{\$35,000 + \$108,000}{\$13}$$

$$= 11,000 \text{ stoves}$$

Ex- 6-17:

EXERCISE 6-17 Break-Even Analysis and CVP Graphing [LO2, LO4, LO6]

The Hartford Symphony Guild is planning its annual dinner-dance. The dinner-dance committee has assembled the following expected costs for the event:

Dinner (per person)	\$18
Favors and program (per person)	\$2
Band	\$2,800
Rental of ballroom	\$900
Professional entertainment during intermission	\$1,000
Tickets and advertising	\$1,300

The committee members would like to charge \$35 per person for the evening's activities.

Required:

1. Compute the break-even point for the dinner-dance (in terms of the number of persons who must attend).
2. Assume that last year only 300 persons attended the dinner-dance. If the same number attend this year, what price per ticket must be charged in order to break even?
3. Refer to the original data (\$35 ticket price per person). Prepare a CVP graph for the dinner-dance from zero tickets up to 600 tickets sold.

1. The contribution margin per person would be:

Price per ticket.....	\$35
Variable expenses:	
Dinner.....	\$18
Favors and program.....	<u>2</u> <u>20</u>
Contribution margin per person.....	<u>\$15</u>

The fixed expenses of the dinner-dance total \$6,000. The break-even point would be:

$$\begin{aligned}
 \text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\
 \$0 &= (\$35 - \$20) \times Q - \$6,000 \\
 \$0 &= (\$15) \times Q - \$6,000 \\
 \$15Q &= \$6,000 \\
 Q &= \$6,000 \div \$15 \\
 Q &= 400 \text{ persons; or, at } \$35 \text{ per person, } \$14,000
 \end{aligned}$$

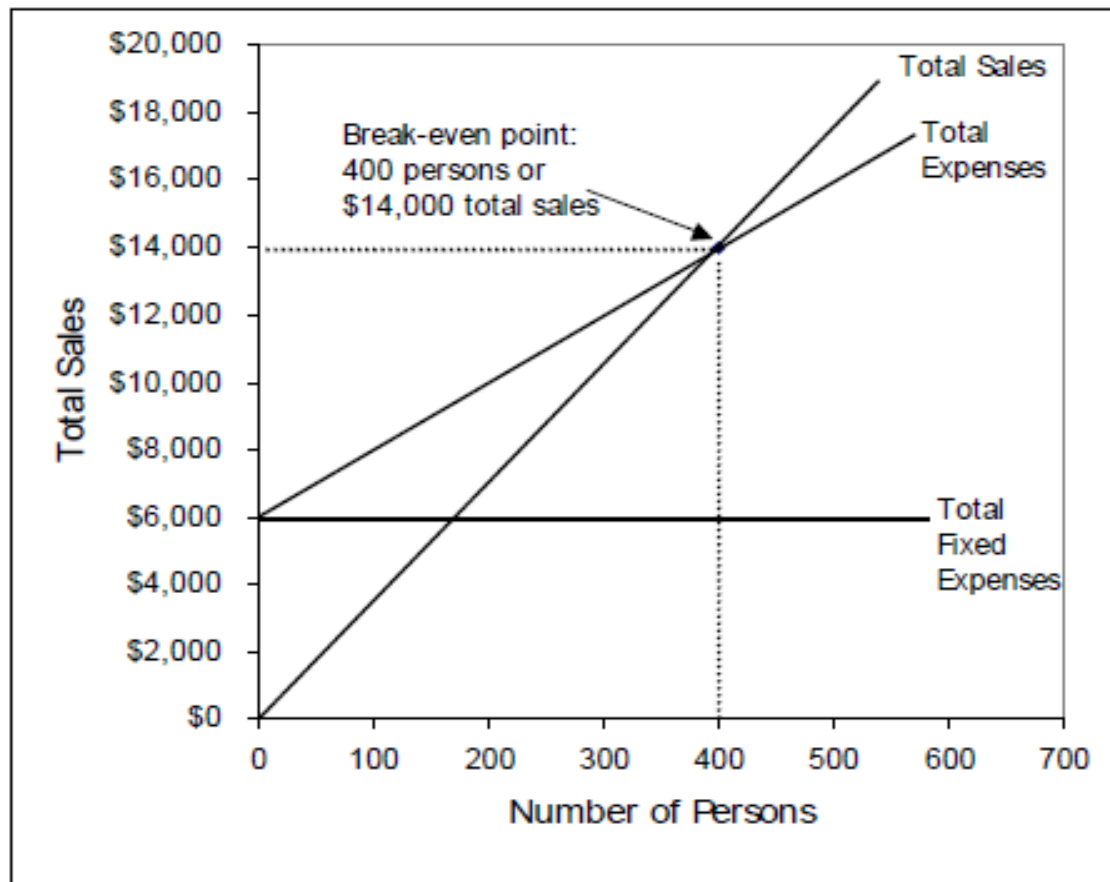
Alternative solution:

$$\begin{aligned}
 \text{Unit sales to} &= \frac{\text{Fixed expenses}}{\text{break even} \quad \text{Unit contribution margin}} \\
 &= \frac{\$6,000}{\$15} = 400 \text{ persons}
 \end{aligned}$$

or, at \$35 per person, \$14,000.

2. Variable cost per person (\$18 + \$2)..... \$20
- Fixed cost per person (\$6,000 ÷ 300 persons).... 20
- Ticket price per person to break even..... \$40

3. Cost-volume-profit graph:



Chapter – 7

Review Problem: Contrasting Variable and Absorption Costing

Dexter Corporation produces and sells a single product, a wooden hand loom for weaving small items such as scarves. Selected cost and operating data relating to the product for two years are given below:

Selling price per unit	\$50
Manufacturing costs:	
Variable per unit produced:	
Direct materials	\$11
Direct labor	\$6
Variable overhead	\$3
Fixed per year	\$120,000
Selling and administrative costs:	
Variable per unit sold	\$4
Fixed per year	\$70,000

	Year 1	Year 2
Units in beginning inventory	0	2,000
Units produced during the year	10,000	6,000
Units sold during the year	8,000	8,000
Units in ending inventory	2,000	0

Required:

- Assume the company uses absorption costing.
 - Compute the unit product cost in each year.
 - Prepare an income statement for each year.
- Assume the company uses variable costing.
 - Compute the unit product cost in each year.
 - Prepare an income statement for each year.
- Reconcile the variable costing and absorption costing net operating incomes.

Solution to Review Problem

- Under absorption costing, all manufacturing costs, variable and fixed, are included in unit product costs:

	Year 1	Year 2
Direct materials	\$11	\$11
Direct labor	6	6
Variable manufacturing overhead	3	3
Fixed manufacturing overhead		
(\$120,000 ÷ 10,000 units)	12	
(\$120,000 ÷ 6,000 units)		20
Absorption costing unit product cost	<u>\$32</u>	<u>\$40</u>

b. The absorption costing income statements follow:

	Year 1	Year 2
Sales (8,000 units × \$50 per unit)	\$400,000	\$400,000
Cost of goods sold (8,000 units × \$32 per unit; (2,000 units × \$32 per unit) + (6,000 units × \$40 per unit)	<u>256,000</u>	<u>304,000</u>
Gross margin	144,000	96,000
Selling and administrative expenses (8,000 units × \$4 per unit + \$70,000)	<u>102,000</u>	<u>102,000</u>
Net operating income (loss)	<u>\$ 42,000</u>	<u>\$ (6,000)</u>

2. a. Under variable costing, only the variable manufacturing costs are included in product costs:

	Year 1	Year 2
Direct materials	\$11	\$11
Direct labor	6	6
Variable manufacturing overhead	<u>3</u>	<u>3</u>
Variable costing unit product cost	<u>\$20</u>	<u>\$20</u>

b. The variable costing income statements follow.

	Year 1	Year 2
Sales (8,000 units × \$50 per unit)	\$400,000	\$400,000
Variable expenses:		
Variable cost of goods sold (8,000 units × \$20 per unit)	\$160,000	\$160,000
Variable selling and administrative expenses (8,000 units × \$4 per unit)	<u>32,000</u>	<u>32,000</u>
Contribution margin	208,000	208,000
Fixed expenses:		
Fixed manufacturing overhead	120,000	120,000
Fixed selling and administrative expenses	<u>70,000</u>	<u>70,000</u>
Net operating income	<u>\$ 18,000</u>	<u>\$ 18,000</u>

3. The reconciliation of the variable and absorption costing net operating incomes follows:

	Year 1	Year 2
Variable costing net operating income	\$18,000	\$18,000
Add fixed manufacturing overhead costs deferred in inventory under absorption costing (2,000 units × \$12 per unit)	24,000	
Deduct fixed manufacturing overhead costs released from inventory under absorption costing (2,000 units × \$12 per unit)		<u>(24,000)</u>
Absorption costing net operating income (loss)	<u>\$42,000</u>	<u>\$ (6,000)</u>

Ex. 7-1:

EXERCISE 7-1 Variable and Absorption Costing Unit Product Costs [LO1]

Ida Sidha Karya Company is a family-owned company located in the village of Gianyar on the island of Bali in Indonesia. The company produces a handcrafted Balinese musical instrument called a gamelan that is similar to a xylophone. The sounding bars are cast from brass and hand-filed to attain just the right sound. The bars are then mounted on an intricately hand-carved wooden base. The gamelans are sold for 850 (thousand) rupiahs. (The currency in Indonesia is the rupiah, which is denoted by Rp.) Selected data for the company's operations last year follow (all currency values are in thousands of rupiahs):

Units in beginning inventory.....	0
Units produced.....	250
Units sold.....	225
Units in ending inventory.....	25
Variable costs per unit:	
Direct materials.....	Rp100
Direct labor.....	Rp320
Variable manufacturing overhead.....	Rp40
Variable selling and administrative.....	Rp20
Fixed costs:	
Fixed manufacturing overhead.....	Rp60,000
Fixed selling and administrative.....	Rp20,000

Required:

1. Assume that the company uses absorption costing. Compute the unit product cost for one gamelan.
2. Assume that the company uses variable costing. Compute the unit product cost for one gamelan.

Soln. 7-1:

1. Under absorption costing, all manufacturing costs (variable and fixed) are included in product costs. (All currency values are in thousands of rupiah, denoted by Rp.)

Direct materials.....	Rp100
Direct labor.....	320
Variable manufacturing overhead.....	40
Fixed manufacturing overhead (Rp60,000 ÷ 250 units)...	240
Absorption costing unit product cost.....	<u>Rp700</u>

2. Under variable costing, only the variable manufacturing costs are included in product costs. (All currency values are in thousands of rupiah, denoted by Rp.)

Direct materials.....	Rp100
Direct labor.....	320
Variable manufacturing overhead.....	40
Variable costing unit product cost.....	<u>Rp460</u>

Note that selling and administrative expenses are not treated as product costs under either absorption or variable costing. These expenses are always treated as period costs and are charged against the current period's revenue.

Ex- 7-3:

EXERCISE 7-3 Reconciliation of Absorption and Variable Costing Net Operating Incomes [LO3]

Jorgansen Lighting, Inc., manufactures heavy-duty street lighting systems for municipalities. The company uses variable costing for internal management reports and absorption costing for external reports to shareholders, creditors, and the government. The company has provided the following data:

	Year 1	Year 2	Year 3
Inventories:			
Beginning (units)	200	170	180
Ending (units)	170	180	220
Variable costing net operating income	\$1,080,400	\$1,032,400	\$996,400

The company's fixed manufacturing overhead per unit was constant at \$560 for all three years.

Required:

1. Determine each year's absorption costing net operating income. Present your answer in the form of a reconciliation report as shown in Exhibit 7-4.
2. In Year 4, the company's variable costing net operating income was \$984,400 and its absorption costing net operating income was \$1,012,400. Did inventories increase or decrease during Year 4? How much fixed manufacturing overhead cost was deferred or released from inventory during Year 4?

Soln. 7-3:

1.	Year 1	Year 2	Year 3
Beginning inventories.....	200	170	180
Ending inventories.....	<u>170</u>	<u>180</u>	<u>220</u>
Change in inventories.....	<u>(30)</u>	<u>10</u>	<u>40</u>
Fixed manufacturing overhead in beginning inventories (@\$560 per unit).....	\$112,000	\$ 95,200	\$100,800
Fixed manufacturing overhead in ending inventories (@\$560 per unit).....	<u>95,200</u>	<u>100,800</u>	<u>123,200</u>
Fixed manufacturing overhead deferred in (released from) inventories (@\$560 per unit).....	<u>(\$ 16,800)</u>	<u>\$ 5,600</u>	<u>\$ 22,400</u>
Variable costing net operating income.....	\$1,080,400	\$1,032,400	\$ 996,400
Add (deduct) fixed manufacturing overhead cost deferred in (released from) inventory under absorption costing.....	<u>(16,800)</u>	<u>5,600</u>	<u>22,400</u>
Absorption costing net operating income.....	<u>\$1,063,600</u>	<u>\$1,038,000</u>	<u>\$1,018,800</u>

2. Because absorption costing net operating income was greater than variable costing net operating income in Year 4, inventories must have increased during the year and hence fixed manufacturing overhead was deferred in inventories. The amount of the deferral is the difference between the two net operating incomes, or $\$28,000 = \$1,012,400 - \$984,400$.

Ex. 7-5:

EXERCISE 7-5 Variable and Absorption Costing Unit Product Costs and Income Statements [LO1, LO2]

Lynch Company manufactures and sells a single product. The following costs were incurred during the company's first year of operations:

Variable costs per unit:	
Manufacturing:	
Direct materials	\$6
Direct labor	\$9
Variable manufacturing overhead	\$3
Variable selling and administrative	\$4
Fixed costs per year:	
Fixed manufacturing overhead	\$300,000
Fixed selling and administrative	\$190,000

During the year, the company produced 25,000 units and sold 20,000 units. The selling price of the company's product is \$50 per unit.

Required:

1. Assume that the company uses absorption costing:
 - a. Compute the unit product cost.
 - b. Prepare an income statement for the year.
2. Assume that the company uses variable costing:
 - a. Compute the unit product cost.
 - b. Prepare an income statement for the year.

1. a. The unit product cost under absorption costing would be:

Direct materials.....	\$ 6
Direct labor.....	9
Variable manufacturing overhead.....	3
Total variable costs.....	18
Fixed manufacturing overhead (\$300,000 ÷ 25,000 units).....	12
Absorption costing unit product cost.....	<u>\$30</u>

- b. The absorption costing income statement:

Sales (20,000 units × \$50 per unit).....	\$1,000,000
Cost of goods sold (20,000 units × \$30 per unit).....	<u>600,000</u>
Gross margin.....	400,000
Selling and administrative expenses [(20,000 units × \$4 per unit) + \$190,000].....	<u>270,000</u>
Net operating income.....	<u>\$ 130,000</u>

2. a. The unit product cost under variable costing would be:

Direct materials.....	\$ 6
Direct labor.....	9
Variable manufacturing overhead.....	3
Variable costing unit product cost.....	<u>\$18</u>

- b. The variable costing income statement:

Sales (20,000 units × \$50 per unit).....		\$1,000,000
Variable expenses:		
Variable cost of goods sold (20,000 units × \$18 per unit).....	\$360,000	
Variable selling expense (20,000 units × \$4 per unit).....	<u>80,000</u>	<u>440,000</u>
Contribution margin.....		560,000
Fixed expenses:		
Fixed manufacturing overhead.....	300,000	
Fixed selling and administrative expense.....	<u>190,000</u>	<u>490,000</u>
Net operating income.....		<u>\$ 70,000</u>

Ex. 7-6:

EXERCISE 7-6 Inferring Costing Method; Unit Product Cost [LO1, LO4]

Sierra Company incurs the following costs to produce and sell a single product.

Variable costs per unit:	
Direct materials	\$9
Direct labor	\$10
Variable manufacturing overhead	\$5
Variable selling and administrative expenses	\$3
Fixed costs per year:	
Fixed manufacturing overhead	\$150,000
Fixed selling and administrative expenses	\$400,000

During the last year, 25,000 units were produced and 22,000 units were sold. The Finished Goods inventory account at the end of the year shows a balance of \$72,000 for the 3,000 unsold units.

Required:

1. Is the company using absorption costing or variable costing to cost units in the Finished Goods inventory account? Show computations to support your answer.
2. Assume that the company wishes to prepare financial statements for the year to issue to its stockholders.
 - a. Is the \$72,000 figure for Finished Goods inventory the correct amount to use on these statements for external reporting purposes? Explain.
 - b. At what dollar amount *should* the 3,000 units be carried in the inventory for external reporting purposes?

Soln. 7-6:

1. The company is using variable costing. The computations are:

	Variable Costing	Absorption Costing
Direct materials.....	\$ 9	\$ 9
Direct labor.....	10	10
Variable manufacturing overhead..	5	5
Fixed manufacturing overhead (\$150,000 ÷ 25,000 units).....	—	6
Unit product cost.....	<u>\$24</u>	<u>\$30</u>
Total cost, 3,000 units.....	<u>\$72,000</u>	<u>\$90,000</u>

2. a. No, \$72,000 is not the correct figure to use because variable costing is not generally accepted for external reporting purposes or for tax purposes.
 - b. The Finished Goods inventory account should be stated at \$90,000, which represents the absorption cost of the 3,000 unsold units. Thus, the account should be increased by \$18,000 for external reporting purposes. This \$18,000 consists of the amount of fixed manufacturing overhead cost that is allocated to the 3,000 unsold units under absorption costing (3,000 units × \$6 per unit fixed manufacturing overhead cost = \$18,000).

Ex. 7-7:

EXERCISE 7-7 Variable Costing Income Statement; Reconciliation [LO2, LO3]

Whitman Company has just completed its first year of operations. The company's absorption costing income statement for the year appears below:

Whitman Company Income Statement	
Sales (35,000 units × \$25 per unit)	\$875,000
Cost of goods sold (35,000 units × \$16 per unit)	560,000
Gross margin	315,000
Selling and administrative expenses	280,000
Net operating income	<u>\$ 35,000</u>

The company's selling and administrative expenses consist of \$210,000 per year in fixed expenses and \$2 per unit sold in variable expenses. The \$16 per unit product cost given above is computed as follows:

Direct materials	\$ 5
Direct labor	6
Variable manufacturing overhead	1
Fixed manufacturing overhead (\$160,000 ÷ 40,000 units)	4
Absorption costing unit product cost	<u>\$16</u>

Required:

1. Redo the company's income statement in the contribution format using variable costing.
2. Reconcile any difference between the net operating income on your variable costing income statement and the net operating income on the absorption costing income statement above.

Soln. 7-7:

1. Sales (35,000 units × \$25 per unit).....		\$875,000
Variable expenses:		
Variable cost of goods sold (35,000 units × \$12 per unit*).....	\$420,000	
Variable selling and administrative expenses (35,000 units × \$2 per unit).....	<u>70,000</u>	<u>490,000</u>
Contribution margin.....		385,000
Fixed expenses:		
Fixed manufacturing overhead.....	160,000	
Fixed selling and administrative expenses...	<u>210,000</u>	<u>370,000</u>
Net operating income.....		<u>\$ 15,000</u>
* Direct materials.....	\$ 5	
Direct labor.....	6	
Variable manufacturing overhead....	<u>1</u>	
Total variable manufacturing cost....	<u>\$12</u>	

2. The difference in net operating income can be explained by the \$20,000 in fixed manufacturing overhead deferred in inventory under the absorption costing method:

Variable costing net operating income.....	\$15,000
Add fixed manufacturing overhead cost deferred in inventory under absorption costing (5,000 units × \$4 per unit in fixed manufacturing cost).....	<u>20,000</u>
Absorption costing net operating income.....	<u>\$35,000</u>

Ex. 7-11:

PROBLEM 7-11 Variable Costing Income Statement; Reconciliation [LO2, LO3]

During Heaton Company's first two years of operations, the company reported absorption costing net operating income as follows:

	Year 1	Year 2
Sales (@ \$25 per unit)	\$1,000,000	\$1,250,000
Cost of goods sold (@ \$18 per unit)	<u>720,000</u>	<u>900,000</u>
Gross margin	280,000	350,000
Selling and administrative expenses*	<u>210,000</u>	<u>230,000</u>
Net operating income	<u>\$ 70,000</u>	<u>\$ 120,000</u>

*\$2 per unit variable; \$130,000 fixed each year.

The company's \$18 unit product cost is computed as follows:

Direct materials	\$ 4
Direct labor	7
Variable manufacturing overhead	1
Fixed manufacturing overhead (\$270,000 ÷ 45,000 units)	<u>6</u>
Absorption costing unit product cost	<u>\$18</u>

Forty percent of fixed manufacturing overhead consists of wages and salaries; the remainder consists of depreciation charges on production equipment and buildings.

Production and cost data for the two years are:

	Year 1	Year 2
Units produced	45,000	45,000
Units sold	40,000	50,000

Required:

1. Prepare a variable costing contribution format income statement for each year.
2. Reconcile the absorption costing and the variable costing net operating income figures for each year.

Soln. 7-11:

1. The unit product cost under variable costing is computed as follows:

Direct materials.....	\$ 4
Direct labor.....	7
Variable manufacturing overhead.....	<u>1</u>
Variable costing unit product cost.....	<u>\$12</u>

With this figure, the variable costing income statements can be prepared:

	Year 1	Year 2
Unit sales.....	40,000 units	50,000 units
Sales.....	<u>\$1,000,000</u>	<u>\$1,250,000</u>
Variable expenses:		
Variable cost of goods sold		
(@ \$12 per unit).....	480,000	600,000
Variable selling and administrative		
expenses (@ \$2 per unit).....	<u>80,000</u>	<u>100,000</u>
Total variable expenses.....	<u>560,000</u>	<u>700,000</u>
Contribution margin.....	<u>440,000</u>	<u>550,000</u>
Fixed expenses:		
Fixed manufacturing overhead.....	270,000	270,000
Fixed selling and administrative expenses..	<u>130,000</u>	<u>130,000</u>
Total fixed expenses.....	<u>400,000</u>	<u>400,000</u>
Net operating income.....	<u>\$ 40,000</u>	<u>\$ 150,000</u>

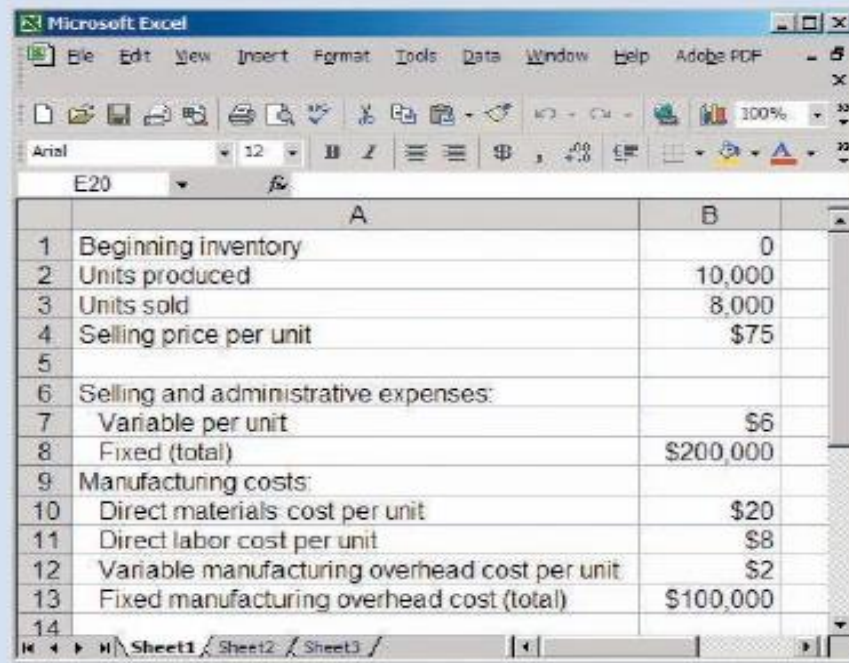
2. The reconciliation of absorption and variable costing follows:

	Year 1	Year 2
Variable costing net operating income.....	\$40,000	\$150,000
Add (deduct) fixed manufacturing overhead		
deferred in (released from) inventory		
under absorption costing (5,000 units × \$6		
per unit in Year 1; 5,000 units × \$6 per unit		
in Year 2).....	<u>30,000</u>	<u>(30,000)</u>
Absorption costing net operating income.....	<u>\$70,000</u>	<u>\$120,000</u>

Ex. 7-12:

PROBLEM 7-12 Variable and Absorption Costing Unit Product Costs and Income Statements; Explanation of Difference in Net Operating Income [LO1, LO2, LO3]

High Country, Inc., produces and sells many recreational products. The company has just opened a new plant to produce a folding camp cot that will be marketed throughout the United States. The following cost and revenue data relate to May, the first month of the plant's operation:



	A	B
1	Beginning inventory	0
2	Units produced	10,000
3	Units sold	8,000
4	Selling price per unit	\$75
5		
6	Selling and administrative expenses:	
7	Variable per unit	\$6
8	Fixed (total)	\$200,000
9	Manufacturing costs:	
10	Direct materials cost per unit	\$20
11	Direct labor cost per unit	\$8
12	Variable manufacturing overhead cost per unit	\$2
13	Fixed manufacturing overhead cost (total)	\$100,000
14		

Management is anxious to see how profitable the new camp cot will be and has asked that an income statement be prepared for May.

Required:

1. Assume that the company uses absorption costing.
 - a. Determine the unit product cost.
 - b. Prepare an income statement for May.
2. Assume that the company uses variable costing.
 - a. Determine the unit product cost.
 - b. Prepare a contribution format income statement for May.
3. Explain the reason for any difference in the ending inventory balances under the two costing methods and the impact of this difference on reported net operating income.

Solution Not Found 😞 😞

Chapter – 9

Review Problem: Budget Schedules

Mynor Corporation manufactures and sells a seasonal product that has peak sales in the third quarter. The following information concerns operations for Year 2—the coming year—and for the first two quarters of Year 3:

- a. The company's single product sells for \$8 per unit. Budgeted sales in units for the next six quarters are as follows (all sales are on credit):

	Year 2 Quarter				Year 3 Quarter	
	1	2	3	4	1	2
Budgeted unit sales	40,000	60,000	100,000	50,000	70,000	80,000

- b. Sales are collected in the following pattern: 75% in the quarter the sales are made, and the remaining 25% in the following quarter. On January 1, Year 2, the company's balance sheet showed \$65,000 in accounts receivable, all of which will be collected in the first quarter of the year. Bad debts are negligible and can be ignored.
- c. The company desires an ending finished goods inventory at the end of each quarter equal to 30% of the budgeted unit sales for the next quarter. On December 31, Year 1, the company had 12,000 units on hand.
- d. Five pounds of raw materials are required to complete one unit of product. The company requires ending raw materials inventory at the end of each quarter equal to 10% of the following quarter's production needs. On December 31, Year 1, the company had 23,000 pounds of raw materials on hand.
- e. The raw material costs \$0.80 per pound. Raw material purchases are paid for in the following pattern: 60% paid in the quarter the purchases are made, and the remaining 40% paid in the following quarter. On January 1, Year 2, the company's balance sheet showed \$81,500 in accounts payable for raw material purchases, all of which will be paid for in the first quarter of the year.

Required:

Prepare the following budgets and schedules for the year, showing both quarterly and total figures:

1. A sales budget and a schedule of expected cash collections.
2. A production budget.
3. A direct materials budget and a schedule of expected cash payments for purchases of materials.

Solution to Review Problem

1. The sales budget is prepared as follows:

	Year 2 Quarter				Year
	1	2	3	4	
Budgeted unit sales	40,000	60,000	100,000	50,000	250,000
Selling price per unit	×\$8	×\$8	×\$8	×\$8	×\$8
Total sales	<u>\$320,000</u>	<u>\$480,000</u>	<u>\$800,000</u>	<u>\$400,000</u>	<u>\$2,000,000</u>

Based on the budgeted sales above, the schedule of expected cash collections is prepared as follows:

	Year 2 Quarter				Year
	1	2	3	4	
Accounts receivable, beginning balance	\$ 65,000				\$ 65,000
First-quarter sales (\$320,000 × 75%, 25%)	240,000	\$ 80,000			320,000
Second-quarter sales (\$480,000 × 75%, 25%)		360,000	\$120,000		480,000
Third-quarter sales (\$800,000 × 75%, 25%)			600,000	\$200,000	800,000
Fourth-quarter sales (\$400,000 × 75%)				300,000	300,000
Total cash collections	<u>\$305,000</u>	<u>\$440,000</u>	<u>\$720,000</u>	<u>\$500,000</u>	<u>\$1,965,000</u>

2. Based on the sales budget in units, the production budget is prepared as follows:

	Year 2 Quarter				Year	Year 3 Quarter	
	1	2	3	4		1	2
Budgeted unit sales	40,000	60,000	100,000	50,000	250,000	70,000	80,000
Add desired ending finished goods inventory*.	18,000	30,000	15,000	21,000 [†]	21,000	24,000	
Total needs	58,000	90,000	115,000	71,000	271,000	94,000	
Less beginning finished goods inventory	12,000	18,000	30,000	15,000	12,000	21,000	
Required production	<u>46,000</u>	<u>72,000</u>	<u>85,000</u>	<u>56,000</u>	<u>259,000</u>	<u>73,000</u>	

*30% of the following quarter's budgeted sales in units.

[†]30% of the budgeted Year 3 first-quarter sales.

3. Based on the production budget, raw materials will need to be purchased during the year as follows:

	Year 2 Quarter				Year 2	Year 3 Quarter
	1	2	3	4		1
Required production (units)	46,000	72,000	85,000	56,000	259,000	73,000
Raw materials needed per unit (pounds)	×5	×5	×5	×5	×5	×5
Production needs (pounds)	230,000	360,000	425,000	280,000	1,295,000	365,000
Add desired ending inventory of raw materials (pounds)*	36,000	42,500	28,000	36,500 [†]	36,500	
Total needs (pounds)	266,000	402,500	453,000	316,500	1,331,500	
Less beginning inventory of raw materials (pounds)	23,000	36,000	42,500	28,000	23,000	
Raw materials to be purchased (pounds)	<u>243,000</u>	<u>366,500</u>	<u>410,500</u>	<u>288,500</u>	<u>1,308,500</u>	

*10% of the following quarter's production needs in pounds.
[†]10% of the Year 3 first-quarter production needs in pounds.

Based on the raw material purchases above, expected cash payments are computed as follows:

	Year 2 Quarter				Year 2
	1	2	3	4	
Cost of raw materials to be purchased at \$0.80 per pound	<u>\$194,400</u>	<u>\$293,200</u>	<u>\$328,400</u>	<u>\$230,800</u>	<u>\$1,046,800</u>
Accounts payable, beginning balance	\$ 81,500				\$ 81,500
First-quarter purchases (\$194,400 × 60%, 40%)	116,640	\$ 77,760			194,400
Second-quarter purchases (\$293,200 × 60%, 40%)		175,920	\$117,280		293,200
Third-quarter purchases (\$328,400 × 60%, 40%)			197,040	\$131,360	328,400
Fourth-quarter purchases (\$230,800 × 60%)				138,480	138,480
Total cash disbursements	<u>\$198,140</u>	<u>\$253,680</u>	<u>\$314,320</u>	<u>\$269,840</u>	<u>\$1,035,980</u>

Ex. 9-1

EXERCISE 9-1 Schedule of Expected Cash Collections [LO2]

Silver Company makes a product that is very popular as a Mother's Day gift. Thus, peak sales occur in May of each year, as shown in the company's sales budget for the second quarter given below:

	April	May	June	Total
Budgeted sales (all on account)	\$300,000	\$500,000	\$200,000	\$1,000,000

From past experience, the company has learned that 20% of a month's sales are collected in the month of sale, another 70% are collected in the month following sale, and the remaining 10% are collected in the second month following sale. Bad debts are negligible and can be ignored. February sales totaled \$230,000, and March sales totaled \$260,000.

Required:

1. Prepare a schedule of expected cash collections from sales, by month and in total, for the second quarter.
2. Assume that the company will prepare a budgeted balance sheet as of June 30. Compute the accounts receivable as of that date.

Soln. 9-1:

Exercise 9-1 (20 minutes)

1.	April	May	June	Total
February sales:				
\$230,000 × 10%.....	\$ 23,000			\$ 23,000
March sales: \$260,000				
× 70%, 10%.....	182,000	\$ 26,000		208,000
April sales: \$300,000 ×				
20%, 70%, 10%.....	60,000	210,000	\$ 30,000	300,000
May sales: \$500,000 ×				
20%, 70%.....		100,000	350,000	450,000
June sales: \$200,000 ×				
20%.....			40,000	40,000
Total cash collections.....	<u>\$265,000</u>	<u>\$336,000</u>	<u>\$420,000</u>	<u>\$1,021,000</u>

Observe that even though sales peak in May, cash collections peak in June. This occurs because the bulk of the company's customers pay in the month following sale. The lag in collections that this creates is even more pronounced in some companies. Indeed, it is not unusual for a company to have the least cash available in the months when sales are greatest.

2. Accounts receivable at June 30:

From May sales: \$500,000 × 10%.....	\$ 50,000
From June sales: \$200,000 × (70% + 10%).....	160,000
Total accounts receivable at June 30.....	<u>\$210,000</u>

Ex. 9-7:

EXERCISE 9-7 Cash Budget [LO8]

Garden Depot is a retailer that is preparing its budget for the upcoming fiscal year. Management has prepared the following summary of its budgeted cash flows:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Total cash receipts	\$180,000	\$330,000	\$210,000	\$230,000
Total cash disbursements . . .	\$260,000	\$230,000	\$220,000	\$240,000

The company's beginning cash balance for the upcoming fiscal year will be \$20,000. The company requires a minimum cash balance of \$10,000 and may borrow any amount needed from a local bank at a quarterly interest rate of 3%. The company may borrow any amount at the beginning of any quarter and may repay its loans, or any part of its loans, at the end of any quarter. Interest payments are due on any principal at the time it is repaid. For simplicity, assume that interest is not compounded.

Required:

Prepare the company's cash budget for the upcoming fiscal year.

Soln. 9-7:

Garden Depot Cash Budget					
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
Cash balance, beginning	\$ 20,000	\$ 10,000	\$ 35,800	\$ 25,800	\$ 20,000
Total cash receipts	180,000	330,000	210,000	230,000	950,000
Total cash available	200,000	340,000	245,800	255,800	970,000
Less total cash disbursements	260,000	230,000	220,000	240,000	950,000
Excess (deficiency) of cash available over disbursements	(60,000)	110,000	25,800	15,800	20,000
Financing:					
Borrowings (at beginnings of quarters)*	70,000				70,000
Repayments (at ends of quarters)		(70,000)			(70,000)
Interest [§]		(4,200)			(4,200)
Total financing	70,000	(74,200)			(4,200)
Cash balance, ending . . .	<u>\$ 10,000</u>	<u>\$ 35,800</u>	<u>\$ 25,800</u>	<u>\$ 15,800</u>	<u>\$ 15,800</u>

* Since the deficiency of cash available over disbursements is \$60,000, the company must borrow \$70,000 to maintain the desired ending cash balance of \$10,000.

§ $\$70,000 \times 3\% \times 2 = \$4,200$.

Ex. 9-11:

EXERCISE 9-11 Production and Direct Materials Budgets [LO3, LO4]

The marketing department of Gaeber Industries has submitted the following sales forecast for the upcoming fiscal year:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Budgeted unit sales	8,000	7,000	6,000	7,000

The company expects to start the first quarter with 1,600 units in finished goods inventory. Management desires an ending finished goods inventory in each quarter equal to 20% of the next quarter's budgeted sales. The desired ending finished goods inventory for the fourth quarter is 1,700 units.

In addition, the beginning raw materials inventory for the first quarter is budgeted to be 3,120 pounds and the beginning accounts payable for the first quarter is budgeted to be \$14,820.

Each unit requires 2 pounds of raw material that costs \$4.00 per pound. Management desires to end each quarter with an inventory of raw materials equal to 20% of the following quarter's production needs. The desired ending inventory for the fourth quarter is 3,140 pounds. Management plans to pay for 75% of raw material purchases in the quarter acquired and 25% in the following quarter.

Required:

1. Prepare the company's production budget for the upcoming fiscal year.
2. Prepare the company's direct materials budget and schedule of expected cash disbursements for purchases of materials for the upcoming fiscal year.

Soln. 9-11:

Exercise 9-11 (30 minutes)

	Gaeber Industries Production Budget				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
Budgeted unit sales.....	8,000	7,000	6,000	7,000	28,000
Add desired ending inventory..	<u>1,400</u>	<u>1,200</u>	<u>1,400</u>	<u>1,700</u>	<u>1,700</u>
Total units needed.....	9,400	8,200	7,400	8,700	29,700
Less beginning inventory.....	<u>1,600</u>	<u>1,400</u>	<u>1,200</u>	<u>1,400</u>	<u>1,600</u>
Required production.....	<u>7,800</u>	<u>6,800</u>	<u>6,200</u>	<u>7,300</u>	<u>28,100</u>

2.

Gaeber Industries
Direct Materials Budget

	<i>1st Quarter</i>	<i>2nd Quarter</i>	<i>3rd Quarter</i>	<i>4th Quarter</i>	<i>Year</i>
Required production.....	7,800	6,800	6,200	7,300	28,100
Raw materials per unit.....	<u>× 2</u>	<u>× 2</u>	<u>× 2</u>	<u>× 2</u>	<u>× 2</u>
Production needs.....	15,600	13,600	12,400	14,600	56,200
Add desired ending inventory.....	<u>2,720</u>	<u>2,480</u>	<u>2,920</u>	<u>3,140</u>	<u>3,140</u>
Total needs.....	18,320	16,080	15,320	17,740	59,340
Less beginning inventory.....	<u>3,120</u>	<u>2,720</u>	<u>2,480</u>	<u>2,920</u>	<u>3,120</u>
Raw materials to be purchased.....	<u>15,200</u>	<u>13,360</u>	<u>12,840</u>	<u>14,820</u>	<u>56,220</u>
Cost of raw materials to be purchased at \$4.00 per pound.....	<u>\$60,800</u>	<u>\$53,440</u>	<u>\$51,360</u>	<u>\$59,280</u>	<u>\$224,880</u>

Schedule of Expected Cash Disbursements for Materials

Accounts payable, beginning balance.....	\$14,820				\$ 14,820
1st Quarter purchases.....	45,600	\$15,200			60,800
2nd Quarter purchases.....		40,080	\$13,360		53,440
3rd Quarter purchases.....			38,520	\$12,840	51,360
4th Quarter purchases.....				44,460	44,460
Total cash disbursements for materials.....	<u>\$60,420</u>	<u>\$55,280</u>	<u>\$51,880</u>	<u>\$57,300</u>	<u>\$224,880</u>

Ex. 9-14:**EXERCISE 9-14 Direct Labor and Manufacturing Overhead Budgets [LO5, LO6]**

The production department of Raredon Corporation has submitted the following forecast of units to be produced by quarter for the upcoming fiscal year:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Units to be produced	12,000	14,000	13,000	11,000

Each unit requires 0.70 direct labor-hours, and direct labor-hour workers are paid \$10.50 per hour.

In addition, the variable manufacturing overhead rate is \$1.50 per direct labor-hour. The fixed manufacturing overhead is \$80,000 per quarter. The only noncash element of manufacturing overhead is depreciation, which is \$22,000 per quarter.

Required:

1. Prepare the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor workforce is adjusted each quarter to match the number of hours required to produce the forecasted number of units produced.
2. Prepare the company's manufacturing overhead budget.

Soln. 9-14:

1.	Raredon Corporation Direct Labor Budget				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
Units to be produced.....	12,000	14,000	13,000	11,000	50,000
Direct labor time per unit (hours).....	$\times 0.70$	$\times 0.70$	$\times 0.70$	$\times 0.70$	$\times 0.70$
Total direct labor-hours needed.....	8,400	9,800	9,100	7,700	35,000
Direct labor cost per hour.....	$\times \$10.50$	$\times \$10.50$	$\times \$10.50$	$\times \$10.50$	$\times \$10.50$
Total direct labor cost.....	<u>\$ 88,200</u>	<u>\$102,900</u>	<u>\$ 95,550</u>	<u>\$ 80,850</u>	<u>\$367,500</u>

2.	Raredon Corporation Manufacturing Overhead Budget				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
Budgeted direct labor-hours.....	8,400	9,800	9,100	7,700	35,000
Variable overhead rate.....	$\times \$1.50$	$\times \$1.50$	$\times \$1.50$	$\times \$1.50$	$\times \$1.50$
Variable manufacturing overhead.....	\$12,600	\$14,700	\$13,650	\$11,550	\$ 52,500
Fixed manufacturing overhead.....	80,000	80,000	80,000	80,000	320,000
Total manufacturing overhead.....	92,600	94,700	93,650	91,550	372,500
Less depreciation.....	<u>22,000</u>	<u>22,000</u>	<u>22,000</u>	<u>22,000</u>	<u>88,000</u>
Cash disbursements for manufacturing overhead.....	<u>\$70,600</u>	<u>\$72,700</u>	<u>\$71,650</u>	<u>\$69,550</u>	<u>\$284,500</u>

Ex. 9-16:

PROBLEM 9-16 Direct Labor and Manufacturing Overhead Budgets [LO5, LO6]

The Production Department of Hruska Corporation has submitted the following forecast of units to be produced by quarter for the upcoming fiscal year:

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Units to be produced	12,000	10,000	13,000	14,000

Each unit requires 0.2 direct labor-hours and direct laborers are paid \$12.00 per hour.

In addition, the variable manufacturing overhead rate is \$1.75 per direct labor-hour. The fixed manufacturing overhead is \$86,000 per quarter. The only noncash element of manufacturing overhead is depreciation, which is \$23,000 per quarter.

Required:

1. Prepare the company's direct labor budget for the upcoming fiscal year, assuming that the direct labor workforce is adjusted each quarter to match the number of hours required to produce the forecasted number of units produced.
2. Prepare the company's manufacturing overhead budget.

Soln. 9-16:

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	Hruska Corporation				
	Direct Labor Budget				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
Units to be produced.....	12,000	10,000	13,000	14,000	49,000
Direct labor time per unit (hours)...	<u>0.2</u>	<u>0.2</u>	<u>0.2</u>	<u>0.2</u>	<u>0.2</u>
Total direct labor-hours needed.....	2,400	2,000	2,600	2,800	9,800
Direct labor cost per hour.....	<u>\$12.00</u>	<u>\$12.00</u>	<u>\$12.00</u>	<u>\$12.00</u>	<u>\$12.00</u>
Total direct labor cost.....	<u>\$28,800</u>	<u>\$24,000</u>	<u>\$31,200</u>	<u>\$33,600</u>	<u>\$117,600</u>

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	Hruska Corporation				
	Manufacturing Overhead Budget				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
Budgeted direct labor-hours.....	2,400	2,000	2,600	2,800	9,800
Variable overhead rate.....	<u>\$1.75</u>	<u>\$1.75</u>	<u>\$1.75</u>	<u>\$1.75</u>	<u>\$1.75</u>
Variable manufacturing overhead..	\$ 4,200	\$ 3,500	\$ 4,550	\$ 4,900	\$ 17,150
Fixed manufacturing overhead.....	<u>86,000</u>	<u>86,000</u>	<u>86,000</u>	<u>86,000</u>	<u>344,000</u>
Total manufacturing overhead.....	90,200	89,500	90,550	90,900	361,150
Less depreciation.....	<u>23,000</u>	<u>23,000</u>	<u>23,000</u>	<u>23,000</u>	<u>92,000</u>
Cash disbursements for manufacturing overhead.....	<u>\$67,200</u>	<u>\$66,500</u>	<u>\$67,550</u>	<u>\$67,900</u>	<u>\$269,150</u>

Ex. 9-17:

PROBLEM 9-17 Schedules of Expected Cash Collections and Disbursements [LO2, LO4, LO8]

You have been asked to prepare a December cash budget for Ashton Company, a distributor of exercise equipment. The following information is available about the company's operations:

- The cash balance on December 1 is \$40,000.
- Actual sales for October and November and expected sales for December are as follows:

	October	November	December
Cash sales	\$65,000	\$70,000	\$83,000
Sales on account	\$400,000	\$525,000	\$600,000

Sales on account are collected over a three-month period as follows: 20% collected in the month of sale, 60% collected in the month following sale, and 18% collected in the second month following sale. The remaining 2% is uncollectible.

- Purchases of inventory will total \$280,000 for December. Thirty percent of a month's inventory purchases are paid during the month of purchase. The accounts payable remaining from November's inventory purchases total \$161,000, all of which will be paid in December.
- Selling and administrative expenses are budgeted at \$430,000 for December. Of this amount, \$50,000 is for depreciation.
- A new Web server for the Marketing Department costing \$76,000 will be purchased for cash during December, and dividends totaling \$9,000 will be paid during the month.
- The company maintains a minimum cash balance of \$20,000. An open line of credit is available from the company's bank to bolster the cash position as needed.

Required:

- Prepare a schedule of expected cash collections for December.
- Prepare a schedule of expected cash disbursements for merchandise purchases for December.
- Prepare a cash budget for December. Indicate in the financing section any borrowing that will be needed during the month. Assume that any interest will not be paid until the following month.

Soln. 9-17:

1. December cash sales.....	\$ 83,000
Collections on account:	
October sales: $\$400,000 \times 18\%$	72,000
November sales: $\$525,000 \times 60\%$	315,000
December sales: $\$600,000 \times 20\%$	<u>120,000</u>
Total cash collections.....	<u>\$590,000</u>
2. Payments to suppliers:	
November purchases (accounts payable)...	\$161,000
December purchases: $\$280,000 \times 30\%$	<u>84,000</u>
Total cash payments.....	<u>\$245,000</u>

3. Ashton Company
Cash Budget
For the Month of December

Cash balance, beginning.....	\$ 40,000
Add cash receipts: Collections from customers.....	<u>590,000</u>
Total cash available before current financing....	630,000
Less disbursements:	
Payments to suppliers for inventory.....	\$245,000
Selling and administrative expenses*.....	380,000
New web server.....	76,000
Dividends paid.....	<u>9,000</u>
Total disbursements.....	<u>710,000</u>
Excess (deficiency) of cash available over disbursements.....	<u>(80,000)</u>
Financing:	
Borrowings.....	100,000
Repayments.....	0
Interest.....	<u>0</u>
Total financing.....	<u>100,000</u>
Cash balance, ending.....	<u>\$ 20,000</u>

* $\$430,000 - \$50,000 = \$380,000$.

Chapter 11

Review Problem: Standard Costs

Xavier Company produces a single product. Variable manufacturing overhead is applied to products on the basis of direct labor-hours. The standard costs for one unit of product are as follows:

Direct material: 6 ounces at \$0.50 per ounce	\$ 3
Direct labor: 1.8 hours at \$10 per hour	18
Variable manufacturing overhead: 1.8 hours at \$5 per hour	9
Total standard variable cost per unit	<u>\$30</u>

During June, 2,000 units were produced. The costs associated with June's operations were as follows:

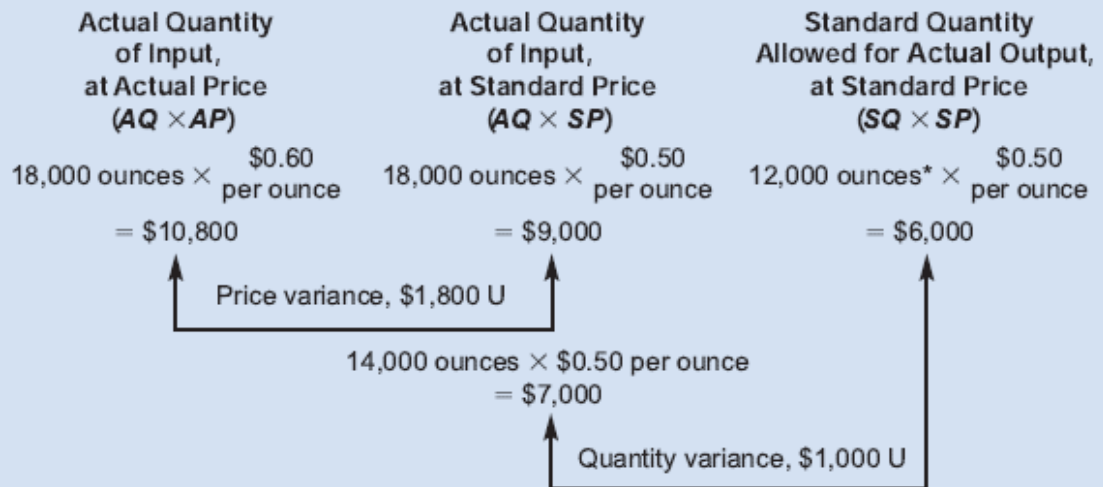
Material purchased: 18,000 ounces at \$0.60 per ounce	\$10,800
Material used in production: 14,000 ounces	—
Direct labor: 4,000 hours at \$9.75 per hour	\$39,000
Variable manufacturing overhead costs incurred	\$20,800

Required:

Compute the direct materials, direct labor, and variable manufacturing overhead variances.

Solution to the Review Problem

Direct Materials Variances



*2,000 units \times 6 ounces per unit = 12,000 ounces.

Using the formulas in the chapter, the same variances would be computed as follows:

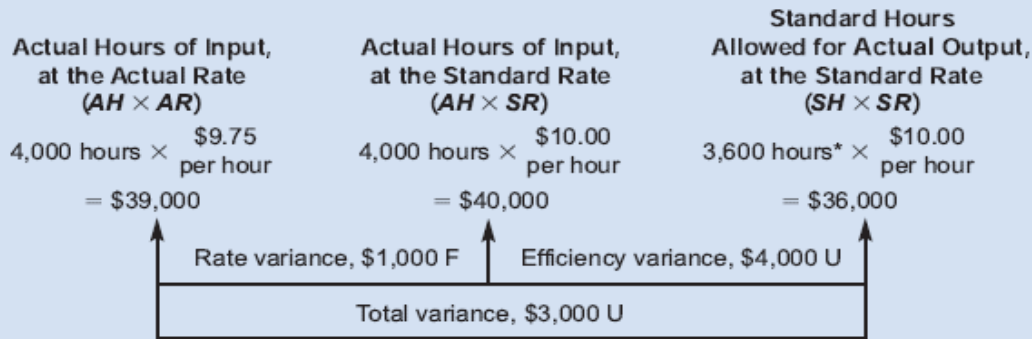
$$\text{Materials price variance} = AQ(AP - SP)$$

$$18,000 \text{ ounces } (\$0.60 \text{ per ounce} - \$0.50 \text{ per ounce}) = \$1,800 \text{ U}$$

$$\text{Materials quantity variance} = SP(AQ - SQ)$$

$$\$0.50 \text{ per ounce } (14,000 \text{ ounces} - 12,000 \text{ ounces}) = \$1,000 \text{ U}$$

Direct Labor Variances



*2,000 units \times 1.8 hours per unit = 3,600 hours.

Using the formulas in the chapter, the same variances would be computed as:

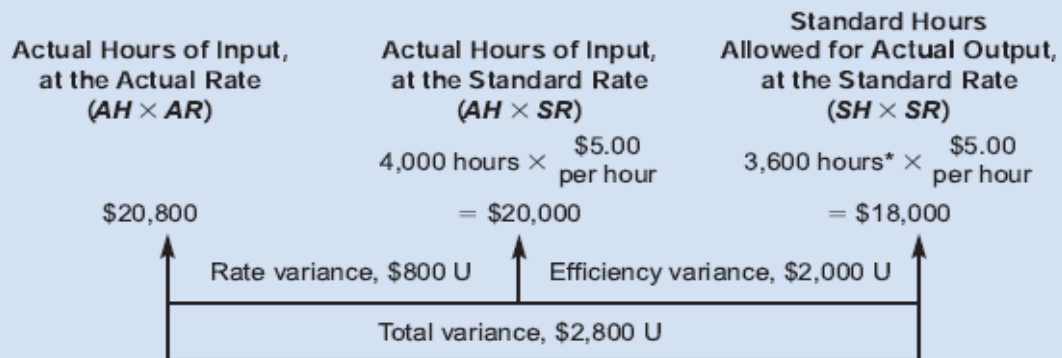
$$\text{Labor rate variance} = AH(AR - SR)$$

$$4,000 \text{ hours } (\$9.75 \text{ per hour} - \$10.00 \text{ per hour}) = \$1,000 \text{ F}$$

$$\text{Labor efficiency variance} = SR(AH - SH)$$

$$\$10.00 \text{ per hour } (4,000 \text{ hours} - 3,600 \text{ hours}) = \$4,000 \text{ U}$$

Variable Manufacturing Overhead Variances



*2,000 units \times 1.8 hours per unit = 3,600 hours.

Using the formulas in the chapter, the same variances would be computed as follows:

$$\text{Variable overhead rate variance} = AH(AR - SR)$$

$$AR = \$20,800 \div 4,000 \text{ hours} = \$5.20 \text{ per hour}$$

$$4,000 \text{ hours } (\$5.20 \text{ per hour} - \$5.00 \text{ per hour}) = \$800 \text{ U}$$

$$\text{Variable overhead efficiency variance} = SR(AH - SH)$$

$$\$5.00 \text{ per hour } (4,000 \text{ hours} - 3,600 \text{ hours}) = \$2,000 \text{ U}$$

Ex. 11-2:

EXERCISE 11-2 Direct Materials Variances [LO2]

Bandar Industries Berhad of Malaysia manufactures sporting equipment. One of the company's products, a football helmet for the North American market, requires a special plastic. During the quarter ending June 30, the company manufactured 35,000 helmets, using 22,500 kilograms of plastic. The plastic cost the company RM171,000. (The currency in Malaysia is the ringgit, which is denoted here by RM.)

According to the standard cost card, each helmet should require 0.6 kilograms of plastic, at a cost of RM8 per kilogram.

Required:

1. What cost for plastic should have been incurred to make 35,000 helmets? How much greater or less is this than the cost that was incurred?
2. Break down the difference computed in (1) above into a materials price variance and a materials quantity variance.

Soln. 11-2:

1. Number of helmets.....	35,000
Standard kilograms of plastic per helmet.....	<u>× 0.6</u>
Total standard kilograms allowed.....	21,000
Standard cost per kilogram.....	<u>× RM8</u>
Total standard cost.....	<u>RM168,000</u>
Actual cost incurred (given).....	RM171,000
Total standard cost (above).....	<u>168,000</u>
Total material variance—unfavorable.....	<u>RM 3,000</u>

2. Actual Quantity of Input, at Actual Price (AQ × AP)	Actual Quantity of Input, at Standard Price (AQ × SP)	Standard Quantity Allowed for Output, at Standard Price (SQ × SP)
RM171,000	22,500 kilograms × RM8 per kilogram = RM180,000	21,000 kilograms* × RM8 per kilogram = RM168,000
↑	↑	↑
<div> <div>Price Variance, RM9,000 F</div> <div>Quantity Variance, RM12,000 U</div> <div>Total Variance, RM3,000 U</div> </div>		

*35,000 helmets × 0.6 kilograms per helmet = 21,000 kilograms

Alternatively, the variances can be computed using the formulas:

Materials price variance = AQ (AP – SP)

22,500 kilograms (RM7.60 per kilogram* – RM8.00 per kilogram)
= RM9,000 F

* RM171,000 ÷ 22,500 kilograms = RM7.60 per kilogram

Materials quantity variance = SP (AQ – SQ)

RM8 per kilogram (22,500 kilograms – 21,000 kilograms)
= RM12,000 U

Ex. 11-3:

EXERCISE 11-3 Direct Labor Variances [LO3]

SkyChefs, Inc., prepares in-flight meals for a number of major airlines. One of the company's products is grilled salmon in dill sauce with baby new potatoes and spring vegetables. During the most recent week, the company prepared 4,000 of these meals using 960 direct labor-hours. The company paid these direct labor workers a total of \$9,600 for this work, or \$10.00 per hour.

According to the standard cost card for this meal, it should require 0.25 direct labor-hours at a cost of \$9.75 per hour.

Required:

1. What direct labor cost should have been incurred to prepare 4,000 meals? How much does this differ from the actual direct labor cost?
2. Break down the difference computed in (1) above into a labor rate variance and a labor efficiency variance.

Soln. 11-3:

1. Number of meals prepared.....	4,000
Standard direct labor-hours per meal.....	<u>× 0.25</u>
Total direct labor-hours allowed.....	1,000
Standard direct labor cost per hour.....	<u>× \$9.75</u>
Total standard direct labor cost.....	<u>\$9,750</u>
Actual cost incurred.....	\$9,600
Total standard direct labor cost (above).	<u>9,750</u>
Total direct labor variance.....	<u>\$ 150</u> Favorable

2. Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
<u>960 hours × \$10.00 per hour = \$9,600</u>	<u>960 hours × \$9.75 per hour = \$9,360</u>	<u>1,000 hours × \$9.75 per hour = \$9,750</u>
↑	↑	↑
<div style="display: flex; justify-content: space-around;"> <div>Rate Variance, \$240 U</div> <div>Efficiency Variance, \$390 F</div> </div> <div style="border: 1px solid black; padding: 5px; text-align: center; margin-top: 5px;"> Total Variance, \$150 F </div>		

Alternatively, the variances can be computed using the formulas:

$$\begin{aligned}
 \text{Labor rate variance} &= \text{AH}(\text{AR} - \text{SR}) \\
 &= 960 \text{ hours } (\$10.00 \text{ per hour} - \$9.75 \text{ per hour}) \\
 &= \$240 \text{ U}
 \end{aligned}$$

$$\begin{aligned}
 \text{Labor efficiency variance} &= \text{SR}(\text{AH} - \text{SH}) \\
 &= \$9.75 \text{ per hour } (960 \text{ hours} - 1,000 \text{ hours}) \\
 &= \$390 \text{ F}
 \end{aligned}$$

Ex. 11-7:

EXERCISE 11-7 Direct Materials and Direct Labor Variances [LO2, LO3]

Dawson Toys, Ltd., produces a toy called the Maze. The company has recently established a standard cost system to help control costs and has established the following standards for the Maze toy:

Direct materials: 6 microns per toy at \$0.50 per micron
Direct labor: 1.3 hours per toy at \$8 per hour

During July, the company produced 3,000 Maze toys. Production data for the month on the toy follow:

Direct materials: 25,000 microns were purchased at a cost of \$0.48 per micron. 5,000 of these microns were still in inventory at the end of the month.

Direct labor: 4,000 direct labor-hours were worked at a cost of \$36,000.

Required:

1. Compute the following variances for July:
 - a. Direct materials price and quantity variances.
 - b. Direct labor rate and efficiency variances.
2. Prepare a brief explanation of the possible causes of each variance.

Soln. 11-7:

- a. Notice in the solution below that the materials price variance is computed on the entire amount of materials purchased, whereas the materials quantity variance is computed only on the amount of materials used in production.

Actual Quantity of Input, at Actual Price (AQ × AP)	Actual Quantity of Input, at Standard Price (AQ × SP)	Standard Quantity Allowed for Output, at Standard Price (SQ × SP)
25,000 microns × \$0.48 per micron = \$12,000	25,000 microns × \$0.50 per micron = \$12,500	18,000 microns* × \$0.50 per micron = \$9,000
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> ↑ Price Variance, \$500 F 20,000 microns × \$0.50 per micron = \$10,000 </div> <div style="text-align: center;"> ↑ Quantity Variance, \$1,000 U </div> </div>		

*3,000 toys × 6 microns per toy = 18,000 microns

Alternatively, the variances can be computed using the formulas:

Materials price variance = AQ (AP – SP)

25,000 microns (\$0.48 per micron – \$0.50 per micron) = \$500 F

Materials quantity variance = SP (AQ – SQ)

\$0.50 per micron (20,000 microns – 18,000 microns) = \$1,000 U

- A variance usually has many possible explanations. In particular, we should always keep in mind that the standards themselves may be incorrect. Some of the other possible explanations for the variances observed at Dawson Toys appear below:

Materials Price Variance Since this variance is favorable, the actual price paid per unit for the material was less than the standard price. This could occur for a variety of reasons including the purchase of a lower grade material at a discount, buying in an unusually large quantity to take advantage of quantity discounts, a change in the market price of the material, or particularly sharp bargaining by the purchasing department.

Materials Quantity Variance Since this variance is unfavorable, more materials were used to produce the actual output than were called for by the standard. This could also occur for a variety of reasons. Some of the possibilities include poorly trained or supervised workers, improperly adjusted machines, and defective materials.

Labor Rate Variance Since this variance is unfavorable, the actual average wage rate was higher than the standard wage rate. Some of the possible explanations include an increase in wages that has not been reflected in the standards, unanticipated overtime, and a shift toward more highly paid workers.

Labor Efficiency Variance Since this variance is unfavorable, the actual number of labor hours was greater than the standard labor hours allowed for the actual output. As with the other variances, this variance could have been caused by any of a number of factors. Some of the possible explanations include poor supervision, poorly trained workers, low-quality materials requiring more labor time to process, and machine breakdowns. In addition, if the direct labor force is essentially fixed, an unfavorable labor efficiency variance could be caused by a reduction in output due to decreased demand for the company's products.

It is worth noting that all of these variances could have been caused by the purchase of low quality materials at a cut-rate price.

Ex. 11-8:

EXERCISE 11-8 Direct Materials and Direct Labor Variances [LO2, LO3]

Huron Company produces a commercial cleaning compound known as Zoom. The direct materials and direct labor standards for one unit of Zoom are given below:

	Standard Quantity or Hours	Standard Price or Rate	Standard Cost
Direct materials	4.6 pounds	\$2.50 per pound	\$11.50
Direct labor	0.2 hours	\$12.00 per hour	\$2.40

During the most recent month, the following activity was recorded:

- Twenty thousand pounds of material were purchased at a cost of \$2.35 per pound.
- All of the material purchased was used to produce 4,000 units of Zoom.
- 750 hours of direct labor time were recorded at a total labor cost of \$10,425.

Required:

- Compute the direct materials price and quantity variances for the month.
- Compute the direct labor rate and efficiency variances for the month.

Soln. 11-8:

1. Actual Quantity of Input, at Actual Price (AQ × AP)	Actual Quantity of Input, at Standard Price (AQ × SP)	Standard Quantity Allowed for Output, at Standard Price (SQ × SP)
20,000 pounds × \$2.35 per pound = \$47,000	20,000 pounds × \$2.50 per pound = \$50,000	18,400 pounds* × \$2.50 per pound = \$46,000
↑	↑	↑
Price Variance, \$3,000 F		Quantity Variance, \$4,000 U
Total Variance, \$1,000 U		

*4,000 units × 4.6 pounds per unit = 18,400 pounds

Alternatively, the variances can be computed using the formulas:

Materials price variance = AQ (AP – SP)

20,000 pounds (\$2.35 per pound – \$2.50 per pound) = \$3,000 F

Materials quantity variance = SP (AQ – SQ)

\$2.50 per pound (20,000 pounds – 18,400 pounds) = \$4,000 U

2. Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
<hr/>	<hr/>	<hr/>
\$10,425	750 hours × \$12.00 per hour = \$9,000	800 hours* × \$12.00 per hour = \$9,600
↑	↑	↑
<div> <div>Rate Variance, \$1,425 U</div> <div>Efficiency Variance, \$600 F</div> <div>Total Variance, \$825 U</div> </div>		

*4,000 units × 0.2 hours per unit = 800 hours

Alternatively, the variances can be computed using the formulas:

Labor rate variance = AH (AR – SR)

750 hours (\$13.90 per hour* – \$12.00 per hour) = \$1,425 U

*\$10,425 ÷ 750 hours = \$13.90 per hour

Labor efficiency variance = SR (AH – SH)

\$12.00 per hour (750 hours – 800 hours) = \$600 F

Ex. 11-10:

EXERCISE 11-10 Direct Labor and Variable Manufacturing Overhead Variances [LO3, LO4]

Erie Company manufactures a small CD player called the Jogging Mate. The company uses standards to control its costs. The labor standards that have been set for one Jogging Mate CD player are as follows:

Standard Hours	Standard Rate per Hour	Standard Cost
18 minutes	\$12.00	\$3.60

During August, 5,750 hours of direct labor time were needed to make 20,000 units of the Jogging Mate. The direct labor cost totaled \$73,600 for the month.

Required:

- What direct labor cost should have been incurred to make 20,000 units of the Jogging Mate? By how much does this differ from the cost that was incurred?
- Break down the difference in cost from (1) above into a labor rate variance and a labor efficiency variance.
- The budgeted variable manufacturing overhead rate is \$4 per direct labor-hour. During August, the company incurred \$21,850 in variable manufacturing overhead cost. Compute the variable overhead rate and efficiency variances for the month.

Soln. 11-10:

1. Number of units manufactured.....	20,000
Standard labor time per unit (18 minutes ÷ 60 minutes per hour).....	<u>× 0.3</u>
Total standard hours of labor time allowed.....	6,000
Standard direct labor rate per hour.....	<u>× \$12</u>
Total standard direct labor cost.....	<u>\$72,000</u>
Actual direct labor cost.....	\$73,600
Standard direct labor cost.....	<u>72,000</u>
Total variance—unfavorable.....	<u>\$ 1,600</u>

Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
<u>\$73,600</u>	<u>5,750 hours × \$12.00 per hour = \$69,000</u>	<u>6,000 hours* × \$12.00 per hour = \$72,000</u>
↑	↑	↑
Rate Variance, \$4,600 U	Efficiency Variance, \$3,000 F	
Total Variance, \$1,600 U		

*20,000 units × 0.3 hours per unit = 6,000 hours

Alternatively, the variances can be computed using the formulas:

Labor rate variance = AH (AR – SR)

5,750 hours (\$12.80 per hour* – \$12.00 per hour) = \$4,600 U

*\$73,600 ÷ 5,750 hours = \$12.80 per hour

Labor efficiency variance = SR (AH – SH)

\$12.00 per hour (5,750 hours – 6,000 hours) = \$3,000 F

3. Actual Hours of Input, at the Actual Rate (AH × AR)	Actual Hours of Input, at the Standard Rate (AH × SR)	Standard Hours Allowed for Output, at the Standard Rate (SH × SR)
<hr/>	<hr/>	<hr/>
\$21,850	5,750 hours × \$4.00 per hour = \$23,000	6,000 hours × \$4.00 per hour = \$24,000
↑	↑	↑
Rate Variance, \$1,150 F	Efficiency Variance, \$1,000 F	
Total Variance, \$2,150 F		

Alternatively, the variances can be computed using the formulas:

Variable overhead rate variance = AH (AR – SR)
 5,750 hours (\$3.80 per hour* – \$4.00 per hour) = \$1,150 F
 *\$21,850 ÷ 5,750 hours = \$3.80 per hour

Variable overhead efficiency variance = SR (AH – SH)
 \$4.00 per hour (5,750 hours – 6,000 hours) = \$1,000 F

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The END



