Exercise 2-1 (10 minutes)

1. The cost of a hard drive installed in a computer: direct materials.

2. The cost of advertising in the *Puget Sound Computer User* newspaper: selling.

3. The wages of employees who assemble computers from components: direct labor.

4. Sales commissions paid to the company's salespeople: selling.

5. The wages of the assembly shop's supervisor: manufacturing overhead.

6. The wages of the company's accountant: administrative.

7. Depreciation on equipment used to test assembled computers before release to customers: manufacturing overhead.

8. Rent on the facility in the industrial park: a combination of manufacturing overhead, selling, and administrative. The rent would most likely be prorated on the basis of the amount of space occupied by manufacturing, selling, and administrative operations.

Exercise 2-2 (10 minutes)

1. Product costs:

Direct materials.....	$ 80,000
Direct labor.....	42,000
Manufacturing overhead	19,000
Total product costs.....	$141,000

2. Period costs:

Selling expenses	$22,000
Administrative expenses	35,000
Total period costs.....	$57,000

3. Conversion costs:

Direct labor.....	$42,000
Manufacturing overhead	19,000
Total conversion costs	$61,000

4. Prime costs:

Direct materials.....	$ 80,000
Direct labor.....	42,000
Total prime costs	$122,000

Exercise 2-3 (15 minutes)

	Product Cost	*Period Cost*
1. Depreciation on salespersons' cars		X
2. Rent on equipment used in the factory	X	
3. Lubricants used for machine maintenance.....	X	
4. Salaries of personnel who work in the finished goods warehouse		X
5. Soap and paper towels used by factory workers at the end of a shift.....	X	
6. Factory supervisors' salaries.....	X	
7. Heat, water, and power consumed in the factory....	X	
8. Materials used for boxing products for shipment overseas (units are not normally boxed).....		X
9. Advertising costs.....		X
10. Workers' compensation insurance for factory employees	X	
11. Depreciation on chairs and tables in the factory lunchroom	X	
12. The wages of the receptionist in the administrative offices		X
13. Cost of leasing the corporate jet used by the company's executives		X
14. The cost of renting rooms at a Florida resort for the annual sales conference.....		X
15. The cost of packaging the company's product	X	

Exercise 2-7 (15 minutes)

	Cost	*Cost Object*	*Direct Cost*	*Indirect Cost*
1.	The wages of pediatric nurses	The pediatric department	X	
2.	Prescription drugs	A particular patient	X	
3.	Heating the hospital	The pediatric department		X
4.	The salary of the head of pediatrics	The pediatric department	X	
5.	The salary of the head of pediatrics	A particular pediatric patient		X
6.	Hospital chaplain's salary	A particular patient		X
7.	Lab tests by outside contractor	A particular patient	X	
8.	Lab tests by outside contractor	A particular department	X	

Exercise 2-8 (15 minutes)

	Item	*Differential Cost*	*Opportunity Cost*	*Sunk Cost*
1.	Cost of the old X-ray machine....			X
2.	The salary of the head of the Radiology Department.....			
3.	The salary of the head of the Pediatrics Department			
4.	Cost of the new color laser printer.....	X		
5.	Rent on the space occupied by Radiology			
6.	The cost of maintaining the old machine	X		
7.	Benefits from a new DNA analyzer		X	
8.	Cost of electricity to run the X-ray machines.....	X		

Note: The costs of the salaries of the head of the Radiology Department and Pediatrics Department and the rent on the space occupied by Radiology are neither differential costs, nor opportunity costs, nor sunk costs. These costs do not differ between the alternatives and therefore are irrelevant in the decision, but they are not sunk costs because they occur in the future.

Exercise 2-9 (15 minutes)

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

Exercise 2-12 (30 minutes)

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

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

Problem 2-16 (45 minutes)

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

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	310,000	
Goods available for sale	350,000	
Deduct: Finished goods inventory, August 31	60,000	290,000
Gross margin		160,000
Selling and administrative expenses		142,000
Net operating income		$ 18,000

Problem 2-16 (continued)

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.

Problem 2-17 (15 minutes)

1. The controller is correct that the salary cost should be classified as a selling (marketing) cost. The duties described in the problem have nothing to do with manufacturing a product, but rather deal with moving *finished units* from the factory to distribution warehouses. Selling costs include all costs necessary to secure customer orders and to get the finished product into the hands of customers. Coordination of shipments of finished units from the factory to distribution warehouses falls in this category.

2. No, the president is not correct. The reported net operating income for the year will differ depending on how the salary cost is classified. If the salary cost is classified as a selling expense all of it will appear on the income statement as a period cost. However, if the salary cost is classified as a manufacturing (product) cost, it will be added to Work in Process inventory along with other manufacturing costs for the period. To the extent that goods are still in process at the end of the period, part of the salary cost will remain with these goods in the Work in Process inventory account. Only that portion of the salary cost that has been assigned to finished units will leave the Work in Process inventory account and be transferred into the Finished Goods inventory account. In like manner, to the extent that goods are unsold at the end of the period, part of the salary cost will remain with these goods in the Finished Goods inventory account. Only the portion of the salary that has been assigned to finished units that are sold during the period will appear on the income statement as an expense (part of Cost of Goods Sold) for the period. The remainder of the salary costs will be on the balance sheet as part of inventories.

Problem 2-18 (45 minutes)

1.

Meriwell Company
Schedule of Cost of Goods Manufactured

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

2.

Meriwell Company
Income Statement

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

Problem 2-18 (continued)

3. Direct materials: $128,000 ÷ 10,000 units = $12.80 per unit.
   Fixed manufacturing overhead: $90,000 ÷ 10,000 units = $9.00 per unit.

4. Direct materials:
   Unit cost: $12.80 (unchanged)
   Total cost: 15,000 units × $12.80 per unit = $192,000.

   Fixed manufacturing overhead:
   Unit cost: $90,000 ÷ 15,000 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.

Exercise 3-1 (15 minutes)

1.

	Cups of Coffee Served in a Week		
	2,000	*2,100*	*2,200*
Fixed cost	$1,200	$1,200	$1,200
Variable cost	440	462	484
Total cost	$1,640	$1,662	$1,684
Average cost per cup of coffee served *	$0.820	$0.791	$0.765

* Total cost ÷ cups of coffee served in a week

2. The average cost of a cup of coffee declines as the number of cups of coffee served increases because the fixed cost is spread over more cups of coffee.

Exercise 3-3 (20 minutes)

1.

	Occupancy-Days	*Electrical Costs*
High activity level (August)	2,406	$5,148
Low activity level (October)	124	1,588
Change	2,282	$3,560

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)	3,753
Fixed cost element	$1,395

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.

Exercise 3-9 (15 minutes)

1. Traditional income statement

Cherokee, Inc.
Traditional Income Statement

Sales ($30 per unit × 20,000 units)		$600,000
Cost of goods sold ($24,000 + $180,000 – $44,000)		160,000
Gross margin		440,000
Selling and administrative expenses:		
Selling expenses ((($4 per unit × 20,000 units) + $40,000)	120,000	
Administrative expenses ((($2 per unit × 20,000 units) + $30,000)	70,000	190,000
Net operating income		$250,000

2. Contribution format income statement

Cherokee, Inc.
Contribution Format Income Statement

Sales		$600,000
Variable expenses:		
Cost of goods sold ($24,000 + $180,000 – $44,000)	$160,000	
Selling expenses ($4 per unit × 20,000 units)	80,000	
Administrative expenses ($2 per unit × 20,000 units)	40,000	280,000
Contribution margin		320,000
Fixed expenses:		
Selling expenses	40,000	
Administrative expenses	30,000	70,000
Net operating income		$250,000

Problem 3-11 (45 minutes)

1.

Marwick's Pianos, Inc.
Income Statement
For the Month of August

Sales (40 pianos × $3,125 per piano)		$125,000
Cost of goods sold (40 pianos × $2,450 per piano)		98,000
Gross margin		27,000
Selling and administrative expenses:		
Selling expenses:		
Advertising	$ 700	
Sales salaries and commissions [$950 + (8% × $125,000)]	10,950	
Delivery of pianos (40 pianos × $30 per piano)	1,200	
Utilities	350	
Depreciation of sales facilities	800	
Total selling expenses	14,000	
Administrative expenses:		
Executive salaries	2,500	
Insurance	400	
Clerical [$1,000 + (40 pianos × $20 per piano)]	1,800	
Depreciation of office equipment	300	
Total administrative expenses	5,000	
Total selling and administrative expenses		19,000
Net operating income		$ 8,000

Problem 3-11 (continued)

2.

Marwick's Pianos, Inc.
Income Statement
For the Month of August

	Total	*Per Piano*
Sales (40 pianos × $3,125 per piano)	$125,000	$3,125
Variable expenses:		
Cost of goods sold (40 pianos × $2,450 per piano)	98,000	2,450
Sales commissions (8% × $125,000)	10,000	250
Delivery of pianos (40 pianos × $30 per piano)	1,200	30
Clerical (40 pianos × $20 per piano)	800	20
Total variable expenses	110,000	2,750
Contribution margin	15,000	$ 375
Fixed expenses:		
Advertising	700	
Sales salaries	950	
Utilities	350	
Depreciation of sales facilities	800	
Executive salaries	2,500	
Insurance	400	
Clerical	1,000	
Depreciation of office equipment	300	
Total fixed expenses	7,000	
Net operating income	$ 8,000	

3. Fixed costs remain constant in total but vary on a per unit basis inversely with changes in the activity level. As the activity level increases, for example, the fixed costs will decrease on a per unit basis. Showing fixed costs on a per unit basis on the income statement might mislead management into thinking that the fixed costs behave in the same way as the variable costs. That is, management might be misled into thinking that the per unit fixed costs would be the same regardless of how many pianos were sold during the month. For this reason, fixed costs generally are shown only in totals on a contribution format income statement.

Problem 3-12 (45 minutes)

1. Cost of goods sold ..... Variable
   Advertising expense ..... Fixed
   Shipping expense..... Mixed
   Salaries and commissions ..... Mixed
   Insurance expense ..... Fixed
   Depreciation expense ..... Fixed

2. Analysis of the mixed expenses:

	Units	*Shipping Expense*	*Salaries and Commissions Expense*
High level of activity	5,000	A$38,000	A$90,000
Low level of activity	4,000	34,000	78,000
Change	1,000	A$ 4,000	A$12,000

Variable cost element:

$$\text{Variable rate} = \frac{\text{Change in cost}}{\text{Change in activity}}$$

$$\text{Shipping expense: } \frac{\text{A\$4,000}}{\text{1,000 units}} = \text{A\$4 per unit}$$

$$\text{Salaries and commissions expense: } \frac{\text{A\$12,000}}{\text{1,000 units}} = \text{A\$12 per unit}$$

Fixed cost element:

	Shipping Expense	*Salaries and Commissions Expense*
Cost at high level of activity ...	A$38,000	A$90,000
Less variable cost element:		
5,000 units × A$4 per unit...	20,000	
5,000 units × A$12 per unit.		60,000
Fixed cost element	A$18,000	A$30,000

Problem 3-12 (continued)

The cost formulas are:

Shipping expense:

A$18,000 per month plus A$4 per unit

or

Y = A$18,000 + A$4X

Salaries and commissions expense:

A$30,000 per month plus A$12 per unit

or

Y = A$30,000 + A$12X

3.

Morrisey & Brown, Ltd.
Income Statement
For the Month Ended September 30

Sales (5,000 units × A$100 per unit)		A$500,000
Variable expenses:		
Cost of goods sold (5,000 units × A$60 per unit)	A$300,000	
Shipping expense (5,000 units × A$4 per unit)	20,000	
Salaries and commissions expense (5,000 units × A$12 per unit)	60,000	380,000
Contribution margin		120,000
Fixed expenses:		
Advertising expense	21,000	
Shipping expense	18,000	
Salaries and commissions expense	30,000	
Insurance expense	6,000	
Depreciation expense	15,000	90,000
Net operating income		A$ 30,000

Problem 3-17 (45 minutes)

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

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

*$48,000 ÷ 60,000 MHs = $0.80 per MH

2. High-low analysis of maintenance cost:

	Machine-Hours	*Maintenance Cost*
High activity level.....	90,000	$153,000
Low activity level.....	60,000	105,000
Change	30,000	$ 48,000

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).....	144,000
Fixed cost element	$ 9,000

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

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

Problem 3-17 (continued)

3.

	Variable Cost per Machine-Hour	*Fixed Cost*
Utilities cost.....	$0.80	
Supervisory salaries cost..		$21,000
Maintenance cost.....	1.60	9,000
Total overhead cost.....	$2.40	$30,000

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.	180,000
Total overhead costs	$210,000

Exercise 4-1 (20 minutes)

1. The new income statement would be:

	Total	*Per Unit*
Sales (10,100 units)	$353,500	$35.00
Variable expenses	202,000	20.00
Contribution margin	151,500	$15.00
Fixed expenses	135,000	
Net operating income	$ 16,500	

You can get the same net operating income using the following approach:

Original net operating income	$15,000
Change in contribution margin (100 units × $15.00 per unit)	1,500
New net operating income	$16,500

2. The new income statement would be:

	Total	*Per Unit*
Sales (9,900 units)	$346,500	$35.00
Variable expenses	198,000	20.00
Contribution margin	148,500	$15.00
Fixed expenses	135,000	
Net operating income	$ 13,500	

You can get the same net operating income using the following approach:

Original net operating income	$15,000
Change in contribution margin (-100 units × $15.00 per unit)	(1,500)
New net operating income	$13,500

Exercise 4-1 (continued)

3. The new income statement would be:

	Total	*Per Unit*
Sales (9,000 units).....	$315,000	$35.00
Variable expenses.....	180,000	20.00
Contribution margin	135,000	$15.00
Fixed expenses.....	135,000	
Net operating income....	$ 0	

Note: This is the company's break-even point.

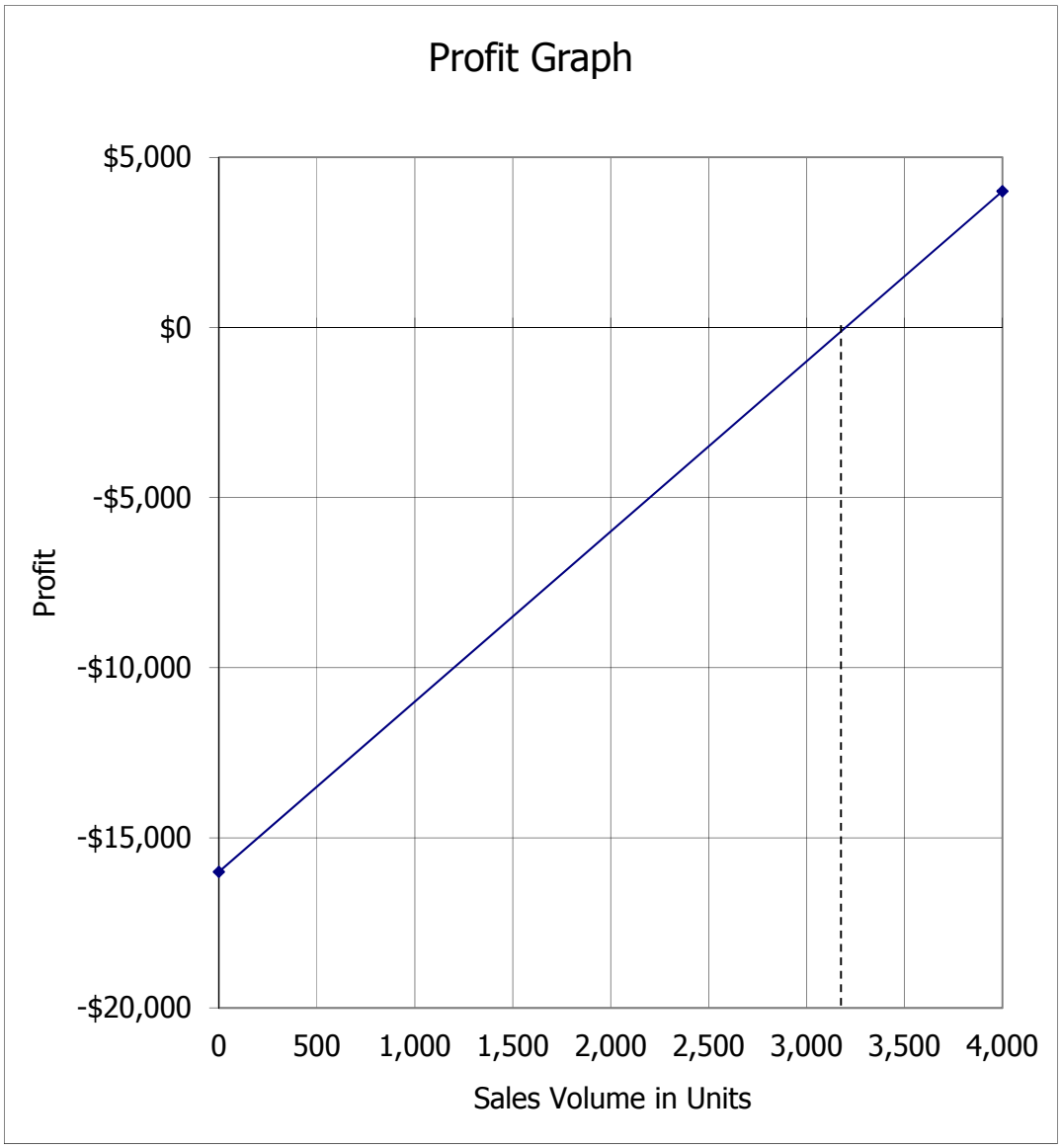
Using the BE% concept, BE% of 90% ($= \frac{\text{FE}}{\text{CM}} \text{x } 100\% = \frac{\$135{,}000}{\$150{,}000} \text{ x } 100\% = 90\%$) means that the company will need 90% of its sales to break-even, therefore, a drop of 10% in sales (from 1,000 to 900 units) will move the profitable position to break-even.

Exercise 4-3 (15 minutes)

1. The profit graph is based on the following simple equation:

   Profit = Unit CM × Q − Fixed expenses
   Profit = ($16 − $11) × Q − $16,000
   Profit = $5 × Q − $16,000

   To plot the graph, select two different levels of sales such as Q=0 and Q=4,000. The profit at these two levels of sales are -$16,000 (=$5 × 0 − $16,000) and $4,000 (= $5 × 4,000 − $16,000).



Exercise 4-3 (continued)

2. Looking at the graph, the break-even point appears to be 3,200 units. This can be verified as follows:

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ &= \$5 \times Q - \$16{,}000 \\ &= \$5 \times 3{,}200 - \$16{,}000 \\ &= \$16{,}000 - \$16{,}000 \\ &= \$0\end{aligned}$$

Exercise 4-4 (10 minutes)

1. The company's contribution margin (CM) ratio is:

Total sales	$200,000
Total variable expenses	120,000
= Total contribution margin	80,000
÷ Total sales	$200,000
= CM ratio	40%

2. The change in net operating income from an increase in total sales of $1,000 can be estimated by using the CM ratio as follows:

Change in total sales	$1,000
× CM ratio	40 %
= Estimated change in net operating income	$ 400

This computation can be verified as follows:

Total sales	$200,000	
÷ Total units sold	50,000	units
= Selling price per unit	$4.00	per unit

Increase in total sales	$1,000	
÷ Selling price per unit	$4.00	per unit
= Increase in unit sales	250	units
Original total unit sales	50,000	units
New total unit sales	50,250	units

	Original	*New*
Total unit sales	50,000	50,250
Sales	$200,000	$201,000
Variable expenses	120,000	120,600
Contribution margin	80,000	80,400
Fixed expenses	65,000	65,000
Net operating income	$ 15,000	$ 15,400

Exercise 4-5 (20 minutes)

1. The following table shows the effect of the proposed change in monthly advertising budget:

	Current Sales	*Sales With Additional Advertising Budget*	*Difference*
Sales	$180,000	$189,000	$ 9,000
Variable expenses	126,000	132,300	6,300
Contribution margin	54,000	56,700	2,700
Fixed expenses	30,000	35,000	5,000
Net operating income	$ 24,000	$ 21,700	$ (2,300)

Assuming no other important factors need to be considered, the increase in the advertising budget should not be approved because it would lead to a decrease in net operating income of $2,300.

Alternative Solution 1

Expected total contribution margin:	
$189,000 × 30% CM ratio	$56,700
Present total contribution margin:	
$180,000 × 30% CM ratio	54,000
Incremental contribution margin	2,700
Change in fixed expenses:	
Less incremental advertising expense	5,000
Change in net operating income	$ (2,300)

Alternative Solution 2

Incremental contribution margin:	
$9,000 × 30% CM ratio	$2,700
Less incremental advertising expense	5,000
Change in net operating income	$ (2,300)

Exercise 4-5 (continued)

2. The $2 increase in variable expense will cause the unit contribution margin to decrease from $27 to $25 with the following impact on net operating income:

Expected total contribution margin with the higher-quality components:	
2,200 units × $25 per unit	$55,000
Present total contribution margin:	
2,000 units × $27 per unit	54,000
Change in total contribution margin.....	$ 1,000

Assuming no change in fixed expenses and all other factors remain the same, the higher-quality components should be used.

Exercise 4-6 (20 minutes)

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 dollar sales as follows:

$$\text{CM ratio} = \frac{\text{Unit contribution margin}}{\text{Unit selling price}}$$

$$= \frac{\$3}{\$15} = 0.20$$

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

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

$$\text{Unit sales to break even} = \frac{\text{Fixed expenses}}{\text{Unit CM}}$$

$$= \frac{\$4{,}200}{\$3} = 1{,}400 \text{ baskets}$$

Exercise 4-6 (continued)

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

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}}$$

$$= \frac{\$4{,}200}{0.20} = \$21{,}000$$

Note: Not required by the question, the break-even point in sales value ($) and units can be calculated using the BE% method in the following:

$$\text{BE\%} = \frac{\text{FE}}{\text{CM}} \text{ x } 100\% = \frac{\$4{,}200}{\$(15-12)\text{ Q}} \text{ x } 100\%$$

We can assume Q be any quantity, say 100 units

then, we can compute $\text{BE\%} = \frac{\text{FE}}{\text{CM}} \text{ x } 100\% = \frac{\$4{,}200}{\$3 \text{ x } 100} \text{ x } 100\% = 1400\%$.

That means we need 14 times of current sales to break-even.

The current sales = 100 units (as assumed), therefore

The break-even sales units = 100 x 14 = 1,400 units

For breakeven sales value, it needs 14 times of the current sales value to breakeven:

Current sales = $15 per unit x 100 units = $1,500

Therefore the break-even sales value = $1,500 x 14 = $21,000.

This approach will work with any assumed quantity.

If fixed expenses and contribution margin per unit are given, then break-even unit calculation would be faster by using: $\text{BE unit} = \frac{\text{Fixed expense}}{\text{Unit contribution margin}}$

The BE% is a powerful method that can apply to multi-product break-even.

Exercise 4-7 (10 minutes)

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:

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

Note: The answers for questions 1 and 2 can also be achieved by using the BE% method:

1. The expected sales quantity $= \dfrac{\text{Break-even point}}{\text{new BE\%}} = \dfrac{\dfrac{\text{Fixed expenses}}{\text{Contribution margin per unit}}}{\dfrac{\text{Fixed expenses}}{\text{New Contribution margin}}}$

$$= \frac{\dfrac{\$50{,}000}{\$(120-80)}}{\dfrac{\$50{,}000}{\$50{,}000+10{,}000}} = \frac{60{,}000}{40} = 1{,}500 \text{ units}$$

2. The expected sales quantity $= \dfrac{\text{Break-even point}}{\text{new BE\%}} = \dfrac{\dfrac{\text{Fixed expenses}}{\text{Contribution margin per unit}}}{\dfrac{\text{Fixed expenses}}{\text{New Contribution margin}}}$

$$= \frac{\dfrac{\$50{,}000}{\$(120-80)}}{\dfrac{\$50{,}000}{\$50{,}000+15{,}000}} = \frac{\dfrac{50{,}000}{40}}{\dfrac{50{,}000}{65{,}000}} = \frac{65{,}000}{40} = 1{,}625 \text{ units}$$

Exercise 4-8 (10 minutes)

1. To compute the margin of safety, we must first compute the break-even unit sales.

   Profit = Unit CM × Q − Fixed expenses
   $0 = ($30 − $20) × Q − $7,500
   $0 = ($10) × Q − $7,500
   $10Q = $7,500
   Q = $7,500 ÷ $10
   Q = 750 units

Sales (at the budgeted volume of 1,000 units) .	$30,000
Less break-even sales (at 750 units).....	22,500
Margin of safety (in dollars).....	$ 7,500

2. The margin of safety as a percentage of sales is as follows:

Margin of safety (in dollars) (a).....	$7,500
Sales (b)	$30,000
Margin of safety percentage (a) ÷ (b)	25%

Exercise 4-9 (20 minutes)

1. The company's degree of operating leverage would be computed as follows:

Contribution margin (a)	$48,000
Net operating income (b)	$10,000
Degree of operating leverage (a) ÷ (b)	4.8

2. A 5% increase in sales should result in a 24% increase in net operating income, computed as follows:

Degree of operating leverage (a)	4.8
Percent increase in sales (b)	5%
Estimated percent increase in net operating income (a) × (b)	24%

3. The new income statement reflecting the change in sales is:

	Amount	*Percent of Sales*
Sales	$84,000	100%
Variable expenses	33,600	40%
Contribution margin	50,400	60%
Fixed expenses	38,000	
Net operating income	$12,400	

Net operating income reflecting change in sales	$12,400
Original net operating income (a)	10,000
Change in net operating income (b)	$ 2,400
Percent change in net operating income (b) ÷ (a)	24%

Exercise 5-1 (15 minutes)

1. Under absorption costing, all manufacturing costs (variable and fixed) are included in product costs.

Direct materials	$100
Direct labor	320
Variable manufacturing overhead	40
Fixed manufacturing overhead ($60,000 ÷ 250 units)	240
Absorption costing unit product cost	$700

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

Direct materials	$100
Direct labor	320
Variable manufacturing overhead	40
Variable costing unit product cost	$460

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.

Exercise 5-2 (20 minutes)

1. 25 units in ending inventory × $240 per unit fixed manufacturing overhead per unit = $6,000

2. The variable costing income statement appears below:

Sales		$191,250
Variable expenses:		
Variable cost of goods sold (225 units sold × $460 per unit)	$103,500	
Variable selling and administrative expenses (225 units × $20 per unit)	4,500	108,000
Contribution margin		83,250
Fixed expenses:		
Fixed manufacturing overhead	60,000	
Fixed selling and administrative expenses	20,000	80,000
Net operating income		$ 3,250

The difference in net operating income between variable and absorption costing can be explained by the deferral of fixed manufacturing overhead cost in inventory that has taken place under the absorption costing approach. Note from part (1) that $6,000 of fixed manufacturing overhead cost has been deferred in inventory to the next period. Thus, net operating income under the absorption costing approach is $6,000 higher than it is under variable costing.

Exercise 5-3 (20 minutes)

1.

	Year 1	*Year 2*	*Year 3*
Beginning inventories.....	200	170	180
Ending inventories	170	180	220
Change in inventories.....	(30)	10	40
Fixed manufacturing overhead in beginning inventories (@$560 per unit)	$112,000	$ 95,200	$100,800
Fixed manufacturing overhead in ending inventories (@$560 per unit)	95,200	100,800	123,200
Fixed manufacturing overhead deferred in (released from) inventories (@$560 per unit) ...	$ (16,800)	$ 5,600	$ 22,400
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.....	(16,800)	5,600	22,400
Absorption costing net operating income.....	$1,063,600	$1,038,000	$1,018,800

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.

Exercise 5-4 (30 minutes)

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	$24	$30
Total cost, 3,000 units	$72,000	$90,000

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).

Exercise 5-5 (20 minutes)

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)	70,000	490,000
Contribution margin		385,000
Fixed expenses:		
Fixed manufacturing overhead	160,000	
Fixed selling and administrative expenses	210,000	370,000
Net operating income		$ 15,000

*Direct materials	$ 5
Direct labor	6
Variable manufacturing overhead	1
Total variable manufacturing cost	$12

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)	20,000
Absorption costing net operating income	$35,000

Exercise 5-6 (30 minutes)

1. Under variable costing, only the variable manufacturing costs are included in product costs.

Direct materials	$ 50
Direct labor	80
Variable manufacturing overhead	20
Variable costing unit product cost	$150

Note that selling and administrative expenses are not treated as product costs; that is, they are not included in the costs that are inventoried. These expenses are always treated as period costs.

2. The variable costing income statement appears below:

Sales		$3,990,000
Variable expenses:		
Variable cost of goods sold (19,000 units × $150 per unit)	$2,850,000	
Variable selling and administrative expenses (19,000 units × $10 per unit)	190,000	3,040,000
Contribution margin		950,000
Fixed expenses:		
Fixed manufacturing overhead	700,000	
Fixed selling and administrative expenses	285,000	985,000
Net operating loss		$ (35,000)

3. The break-even point in units sold can be computed using the contribution margin per unit as follows:

Selling price per unit	$210
Variable cost per unit	160
Contribution margin per unit	$ 50

$$\text{Unit sales to break even} = \frac{\text{Fixed expenses}}{\text{Unit contribution margin}}$$

$$= \frac{\$985{,}000}{\$50 \text{ per unit}} = 19{,}700 \text{ units}$$

Problem 5-13 (45 minutes)

1. a. The unit product cost under absorption costing is:

Direct materials	$20
Direct labor	8
Variable manufacturing overhead	2
Fixed manufacturing overhead ($100,000 ÷ 10,000 units)	10
Absorption costing unit product cost	$40

b. The absorption costing income statement is:

Sales (8,000 units × $75 per unit)	$600,000
Cost of goods sold (8,000 units × $40 per unit)	320,000
Gross margin	280,000
Selling and administrative expenses [$200,000 + (8,000 units × $6 per unit)]	248,000
Net operating income	$ 32,000

2. a. The unit product cost under variable costing is:

Direct materials	$20
Direct labor	8
Variable manufacturing overhead	2
Variable costing unit product cost	$30

b. The variable costing income statement is:

Sales (8,000 units × $75 per unit)		$600,000
Variable expenses:		
Variable cost of goods sold (8,000 units × $30 per unit)	$240,000	
Variable selling expenses (8,000 units × $6 per unit)	48,000	288,000
Contribution margin		312,000
Fixed expenses:		
Fixed manufacturing overhead	100,000	
Fixed selling and administrative expenses	200,000	300,000
Net operating income		$ 12,000

Problem 5-13 (continued)

3. The difference in the ending inventory relates to a difference in the handling of fixed manufacturing overhead costs. Under variable costing, these costs have been expensed in full as period costs. Under absorption costing, these costs have been added to units of product at the rate of $10 per unit ($100,000 ÷ 10,000 units produced = $10 per unit). Thus, under absorption costing a portion of the $100,000 fixed manufacturing overhead cost for the month has been added to the inventory account rather than expensed on the income statement:

Added to the ending inventory (2,000 units × $10 per unit)	$ 20,000
Expensed as part of cost of goods sold (8,000 units × $10 per unit)	80,000
Total fixed manufacturing overhead cost for the month	$100,000

Because $20,000 of fixed manufacturing overhead cost has been deferred in inventory under absorption costing, the net operating income reported under that costing method is $20,000 higher than the net operating income under variable costing, as shown in parts (1) and (2) above.