

# Chapter 6

## Cost-Volume-Profit Relationships

### Solutions to Questions

**6-1** The contribution margin (CM) ratio is the ratio of the total contribution margin to total sales revenue. It can be used in a variety of ways. For example, the change in total contribution margin from a given change in total sales revenue can be estimated by multiplying the change in total sales revenue by the CM ratio. If fixed costs do not change, then a dollar increase in contribution margin results in a dollar increase in net operating income. The CM ratio can also be used in target profit and break-even analysis.

**6-2** Incremental analysis focuses on the changes in revenues and costs that will result from a particular action.

**6-3** All other things equal, Company B, with its higher fixed costs and lower variable costs, will have a higher contribution margin ratio than Company A. Therefore, it will tend to realize a larger increase in contribution margin and in profits when sales increase.

**6-4** Operating leverage measures the impact on net operating income of a given percentage change in sales. The degree of operating leverage at a given level of sales is computed by dividing the contribution margin at that level of sales by the net operating income at that level of sales.

**6-5** The break-even point is the level of sales at which profits are zero.

**6-6** (a) If the selling price decreased, then the total revenue line would rise less steeply, and the break-even point would occur at a higher unit volume. (b) If the fixed cost increased, then both the fixed cost line and the total cost line would shift upward and the break-even point would occur at a higher unit volume. (c) If the variable cost increased, then the total cost line would rise more steeply and the break-even point would occur at a higher unit volume.

**6-7** The margin of safety is the excess of budgeted (or actual) sales over the break-even volume of sales. It states the amount by which sales can drop before losses begin to be incurred.

**6-8** The sales mix is the relative proportions in which a company's products are sold. The usual assumption in cost-volume-profit analysis is that the sales mix will not change.

**6-9** A higher break-even point and a lower net operating income could result if the sales mix shifted from high contribution margin products to low contribution margin products. Such a shift would cause the average contribution margin ratio in the company to decline, resulting in less total contribution margin for a given amount of sales. Thus, net operating income would decline. With a lower contribution margin ratio, the break-even point would be higher because more sales would be required to cover the same amount of fixed costs.

**Exercise 6-1** (20 minutes)

1. The new income statement would be:

	<i>Total</i>	<i>Per Unit</i>
Sales (10,100 units).....	\$353,500	\$35.00
Variable expenses.....	<u>202,000</u>	<u>20.00</u>
Contribution margin.....	151,500	<u>\$15.00</u>
Fixed expenses.....	<u>135,000</u>	
Net operating income.....	<u>\$ 16,500</u>	

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).....	<u>1,500</u>
New net operating income.....	<u>\$16,500</u>

2. The new income statement would be:

	<i>Total</i>	<i>Per Unit</i>
Sales (9,900 units).....	\$346,500	\$35.00
Variable expenses.....	<u>198,000</u>	<u>20.00</u>
Contribution margin.....	148,500	<u>\$15.00</u>
Fixed expenses.....	<u>135,000</u>	
Net operating income.....	<u>\$ 13,500</u>	

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).....	<u>(1,500)</u>
New net operating income.....	<u>\$13,500</u>

**Exercise 6-1** (continued)

3. The new income statement would be:

	<i>Total</i>	<i>Per Unit</i>
Sales (9,000 units).....	\$315,000	\$35.00
Variable expenses.....	<u>180,000</u>	<u>20.00</u>
Contribution margin.....	135,000	<u>\$15.00</u>
Fixed expenses.....	<u>135,000</u>	
Net operating income....	<u>\$ 0</u>	

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

### Exercise 6-2 (30 minutes)

1. The CVP graph can be plotted using the three steps outlined in the text. The graph appears on the next page.

Step 1. Draw a line parallel to the volume axis to represent the total fixed expense. For this company, the total fixed expense is \$24,000.

Step 2. Choose some volume of sales and plot the point representing total expenses (fixed and variable) at the activity level you have selected. We'll use the sales level of 8,000 units.

Fixed expenses.....	\$ 24,000
Variable expenses (8,000 units × \$18 per unit).....	<u>144,000</u>
Total expense.....	<u>\$168,000</u>

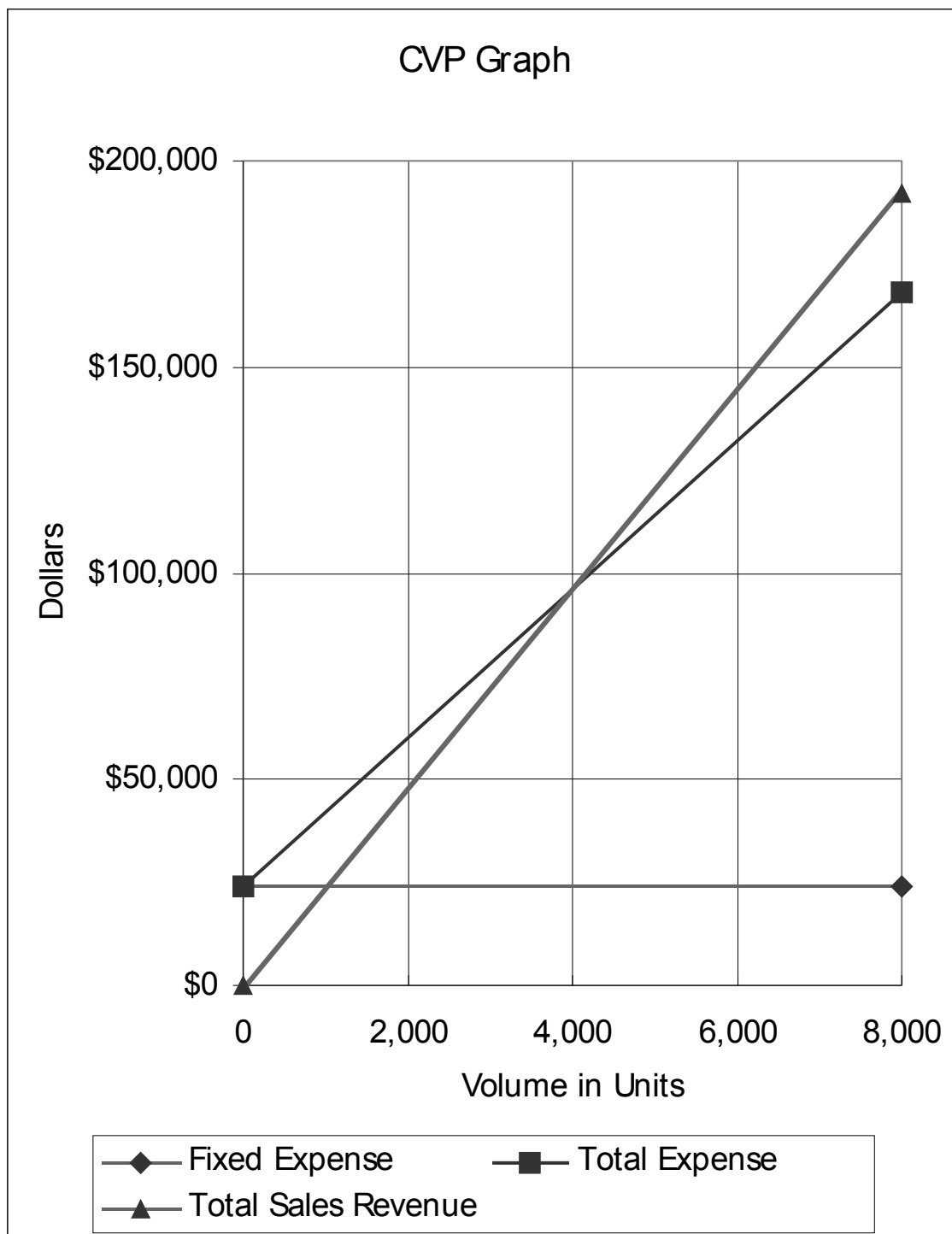
Step 3. Choose some volume of sales and plot the point representing total sales dollars at the activity level you have selected. We'll use the sales level of 8,000 units again.

Total sales revenue (8,000 units × \$24 per unit).....	<u>\$192,000</u>
--	------------------

2. The break-even point is the point where the total sales revenue and the total expense lines intersect. This occurs at sales of 4,000 units. This can be verified as follows:

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ &= (\$24 - \$18) \times 4,000 - \$24,000 \\ &= \$6 \times 4,000 - \$24,000 \\ &= \$24,000 - \$24,000 = \$0\end{aligned}$$

**Exercise 6-2 (continued)**



### Exercise 6-3 (15 minutes)

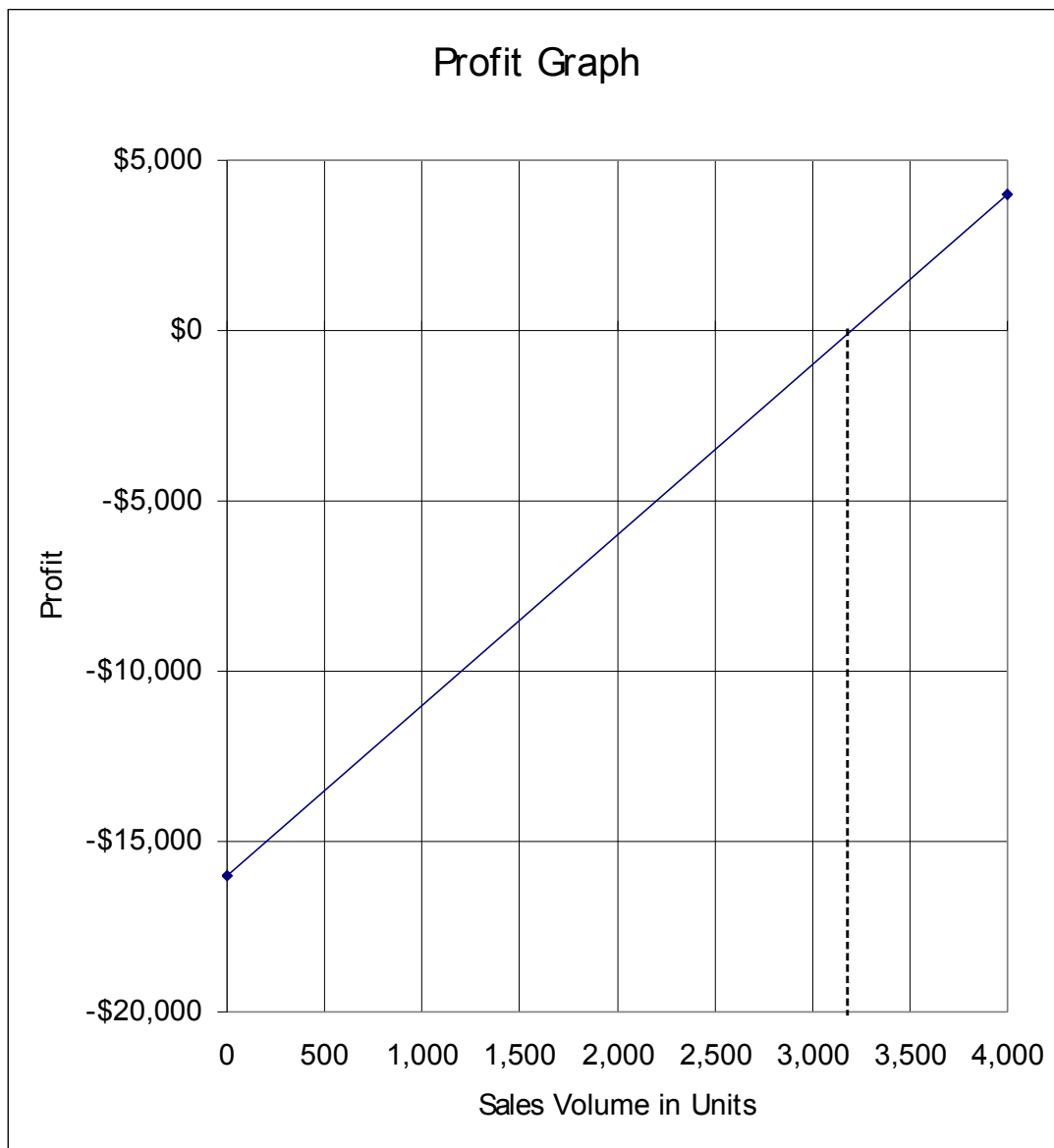
1. The profit graph is based on the following simple equation:

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

$$\text{Profit} = (\$16 - \$11) \times Q - \$16,000$$

$$\text{Profit} = \$5 \times Q - \$16,000$$

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  $-\$16,000$  ( $=\$5 \times 0 - \$16,000$ ) and  $\$4,000$  ( $=\$5 \times 4,000 - \$16,000$ ).



**Exercise 6-3** (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 6-4** (10 minutes)

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

Total sales.....	\$200,000
Total variable expenses.....	<u>120,000</u>
= Total contribution margin.....	80,000
÷ Total sales.....	<u>\$200,000</u>
= CM ratio.....	<u>40%</u>

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.....	<u>40 %</u>
= Estimated change in net operating income.....	<u>\$ 400</u>

This computation can be verified as follows:

Total sales.....	\$200,000
÷ Total units sold.....	<u>50,000 units</u>
= Selling price per unit.....	<u>\$4.00 per unit</u>

Increase in total sales.....	\$1,000
÷ Selling price per unit.....	<u>\$4.00 per unit</u>
= Increase in unit sales....	250 units
Original total unit sales....	<u>50,000 units</u>
New total unit sales.....	<u>50,250 units</u>

	<i>Original</i>	<i>New</i>
Total unit sales.....	<u>50,000</u>	<u>50,250</u>
Sales.....	\$200,000	\$201,000
Variable expenses.....	<u>120,000</u>	<u>120,600</u>
Contribution margin.....	80,000	80,400
Fixed expenses.....	<u>65,000</u>	<u>65,000</u>
Net operating income.....	<u>\$ 15,000</u>	<u>\$ 15,400</u>



**Exercise 6-5** (20 minutes)

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

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

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 6-5 (continued)**

2. The \$2 increase in variable cost 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.....	<u>54,000</u>
----------------------------------	---------------

Change in total contribution margin.....	<u>\$ 1,000</u>
--	-----------------

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

**Exercise 6-6** (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:

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

**Exercise 6-7** (20 minutes)

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

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

$$\$0 = (\$15 - \$12) \times Q - \$4,200$$

$$\$0 = (\$3) \times Q - \$4,200$$

$$\$3Q = \$4,200$$

$$Q = \$4,200 \div \$3$$

$$Q = 1,400 \text{ baskets}$$

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

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

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

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

$$\$0 = 0.20 \times \text{Sales} - \$4,200$$

$$0.20 \times \text{Sales} = \$4,200$$

$$\text{Sales} = \$4,200 \div 0.20$$

$$\text{Sales} = \$21,000$$

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 6-7** (continued)

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

$$\begin{aligned}\text{Dollar sales to break even} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$4,200}{0.20} = \$21,000\end{aligned}$$

**Exercise 6-8** (10 minutes)

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

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

$$\$0 = (\$30 - \$20) \times Q - \$7,500$$

$$\$0 = (\$10) \times Q - \$7,500$$

$$\$10$$

$$Q = \$7,500$$

$$Q = \$7,500 \div \$10$$

$$Q = 750 \text{ units}$$

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

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

Margin of safety (in dollars).....	\$7,500
÷ Sales.....	<u>\$30,000</u>
Margin of safety percentage.....	<u>25%</u>

**Exercise 6-9** (20 minutes)

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

Contribution margin.....	\$48,000
÷ Net operating income.....	<u>\$10,000</u>
Degree of operating leverage. .	<u>4.8</u>

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

Degree of operating leverage.....	4.8
× Percent increase in sales.....	<u>5%</u>
Estimated percent increase in net operating income.....	<u>24%</u>

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

	<i>Amount</i>	<i>Percent of Sales</i>
Sales.....	\$84,000	100%
Variable expenses.....	<u>33,600</u>	<u>40%</u>
Contribution margin.....	50,400	<u>60%</u>
Fixed expenses.....	<u>38,000</u>	
Net operating income....	<u>\$12,400</u>	
Net operating income reflecting change in sales.....	\$12,400	
Original net operating income.....	\$10,000	
Percent change in net operating income.....		24%

**Exercise 6-10** (20 minutes)

1. The overall contribution margin ratio can be computed as follows:

$$\begin{aligned}\text{Overall CM ratio} &= \frac{\text{Total contribution margin}}{\text{Total sales}} \\ &= \frac{\$30,000}{\$100,000} = 30\%\end{aligned}$$

2. The overall break-even point in sales dollars can be computed as follows:

$$\begin{aligned}\text{Overall break-even} &= \frac{\text{Total fixed expenses}}{\text{Overall CM ratio}} \\ &= \frac{\$24,000}{30\%} = \$80,000\end{aligned}$$

3. To construct the required income statement, we must first determine the relative sales mix for the two products:

	<i>Claimjumper</i>	<i>Makeover</i>	<i>Total</i>
Original dollar sales.....	\$30,000	\$70,000	\$100,000
Percent of total.....	30%	70%	100%
Sales at break-even.....	\$24,000	\$56,000	\$80,000

	<i>Claimjumper</i>	<i>Makeover</i>	<i>Total</i>
Sales.....	\$24,000	\$56,000	\$80,000
Variable expenses*.....	<u>16,000</u>	<u>40,000</u>	<u>56,000</u>
Contribution margin.....	<u>\$ 8,000</u>	<u>\$16,000</u>	<u>24,000</u>
Fixed expenses.....			<u>24,000</u>
Net operating income....			<u>\$ 0</u>

- \*Claimjumper variable expenses:  $(\$24,000/\$30,000) \times \$20,000 = \$16,000$   
 Makeover variable expenses:  $(\$56,000/\$70,000) \times \$50,000 = \$40,000$



**Exercise 6-11** (20 minutes)

	<i>Total</i>	<i>Per Unit</i>
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>	

**Exercise 6-12** (30 minutes)

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. 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 $\times$ \$30 per unit).....	\$510,000	\$30
Variable expenses		
(17,000 units $\times$ \$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>	

### Exercise 6-12 (continued)

#### 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.

**Exercise 6-13** (30 minutes)

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

2. a. Selling price.....	\$40	100%
Variable expenses.....	<u>28</u>	<u>70%</u>
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. Profit = Unit CM  $\times$  Q – Fixed expenses

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

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

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

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

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

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

### Exercise 6-13 (continued)

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).....	<u>24</u>	<u>60%</u>
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:

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

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

### Exercise 6-13 (continued)

3. a.

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

In sales dollars: 15,000 units × \$40 per unit = \$600,000

Alternative solution:

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

In units: \$600,000 ÷ \$40 per unit = 15,000 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

### Exercise 6-13 (continued)

c.

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

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

Alternative solution:

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

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

# **Exercise 6-14 (20 minutes)**

a.		<u>Case #1</u>		<u>Case #2</u>	
	Number of units sold....	<u>15,000</u> *		<u>4,000</u>	
	Sales.....	\$180,000 *	\$12	\$100,000 *	\$25
	Variable expenses.....	<u>120,000</u> *	<u>8</u>	<u>60,000</u>	<u>15</u>
	Contribution margin.....	60,000	<u>\$ 4</u>	40,000	<u>\$10</u> *
	Fixed expenses.....	<u>50,000</u> *		<u>32,000</u> *	
	Net operating income. .	<u>\$ 10,000</u>		<u>\$ 8,000</u> *	
		<u>Case #3</u>		<u>Case #4</u>	
	Number of units sold....	<u>10,000</u> *		<u>6,000</u> *	
	Sales.....	\$200,000	\$20	\$300,000 *	\$50
	Variable expenses.....	<u>70,000</u> *	<u>7</u>	<u>210,000</u>	<u>35</u>
	Contribution margin.....	130,000	<u>\$13</u> *	90,000	<u>\$15</u>
	Fixed expenses.....	<u>118,000</u>		<u>100,000</u> *	
	Net operating income. .	<u>\$ 12,000</u> *		<u>(\$ 10,000)</u> *	
b.		<u>Case #1</u>		<u>Case #2</u>	
	Sales.....	\$500,000 *	100%	\$400,000 *	100%
	Variable expenses.....	<u>400,000</u>	<u>80%</u>	<u>260,000</u> *	<u>65%</u>
	Contribution margin.....	100,000	<u>20%</u> *	140,000	<u>35%</u>
	Fixed expenses.....	<u>93,000</u>		<u>100,000</u> *	
	Net operating income...	<u>\$ 7,000</u> *		<u>\$ 40,000</u>	
		<u>Case #3</u>		<u>Case #4</u>	
	Sales.....	\$250,000	100%	\$600,000 *	100%
	Variable expenses.....	<u>100,000</u>	<u>40%</u>	<u>420,000</u> *	<u>70%</u>
	Contribution margin.....	150,000	<u>60%</u> *	180,000	<u>30%</u>
	Fixed expenses.....	<u>130,000</u> *		<u>185,000</u>	
	Net operating income. .	<u>\$ 20,000</u> *		<u>(\$ 5,000)</u> *	

\*Given



**Exercise 6-15** (15 minutes)

1.

	<i>Total</i>	<i>Per Unit</i>
Sales (15,000 games).....	\$300,000	\$20
Variable expenses.....	<u>90,000</u>	<u>6</u>
Contribution margin.....	210,000	<u>\$14</u>
Fixed expenses.....	<u>182,000</u>	
Net operating income.....	<u>\$ 28,000</u>	

The degree of operating leverage is:

$$\begin{aligned} \text{Degree of operating leverage} &= \frac{\text{Contribution margin}}{\text{Net operating income}} \\ &= \frac{\$210,000}{\$28,000} = 7.5 \end{aligned}$$

2. a. Sales of 18,000 games represent a 20% increase over last year's sales. Because the degree of operating leverage is 7.5, net operating income should increase by 7.5 times as much, or by 150% ( $7.5 \times 20\%$ ).

- b. The expected total dollar amount of net operating income for next year would be:

Last year's net operating income.....	\$28,000
Expected increase in net operating income next year ( $150\% \times \$28,000$ ).....	<u>42,000</u>
Total expected net operating income.....	<u>\$70,000</u>

**Exercise 6-16** (30 minutes)

- Profit = Unit CM  $\times$  Q – Fixed expenses  
 $\$0 = (\$50 - \$32) \times Q - \$108,000$   
 $\$0 = (\$18) \times Q - \$108,000$   
 $\$18Q = \$108,000$   
 $Q = \$108,000 \div \$18$   
 $Q = 6,000$  stoves, or at \$50 per stove, \$300,000 in sales

Alternative solution:

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

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

- 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.

	<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.

**Exercise 6-16** (continued)

4. Profit = Unit CM × Q – Fixed expenses  
\$35,000 = (\$45 – \$32) × Q – \$108,000  
\$35,000 = (\$13) × Q – \$108,000  
\$13 × Q = \$143,000  
Q = \$143,000 ÷ \$13  
Q = 11,000 stoves

Alternative solution:

$$\begin{aligned}\text{Unit sales to attain target profit} &= \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$35,000 + \$108,000}{\$13} \\ &= 11,000 \text{ stoves}\end{aligned}$$

**Exercise 6-17** (30 minutes)

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:

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

$$\$0 = (\$35 - \$20) \times Q - \$6,000$$

$$\$0 = (\$15) \times Q - \$6,000$$

$$\$15Q = \$6,000$$

$$Q = \$6,000 \div \$15$$

$$Q = 400 \text{ persons; or, at } \$35 \text{ per person, } \$14,000$$

Alternative solution:

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

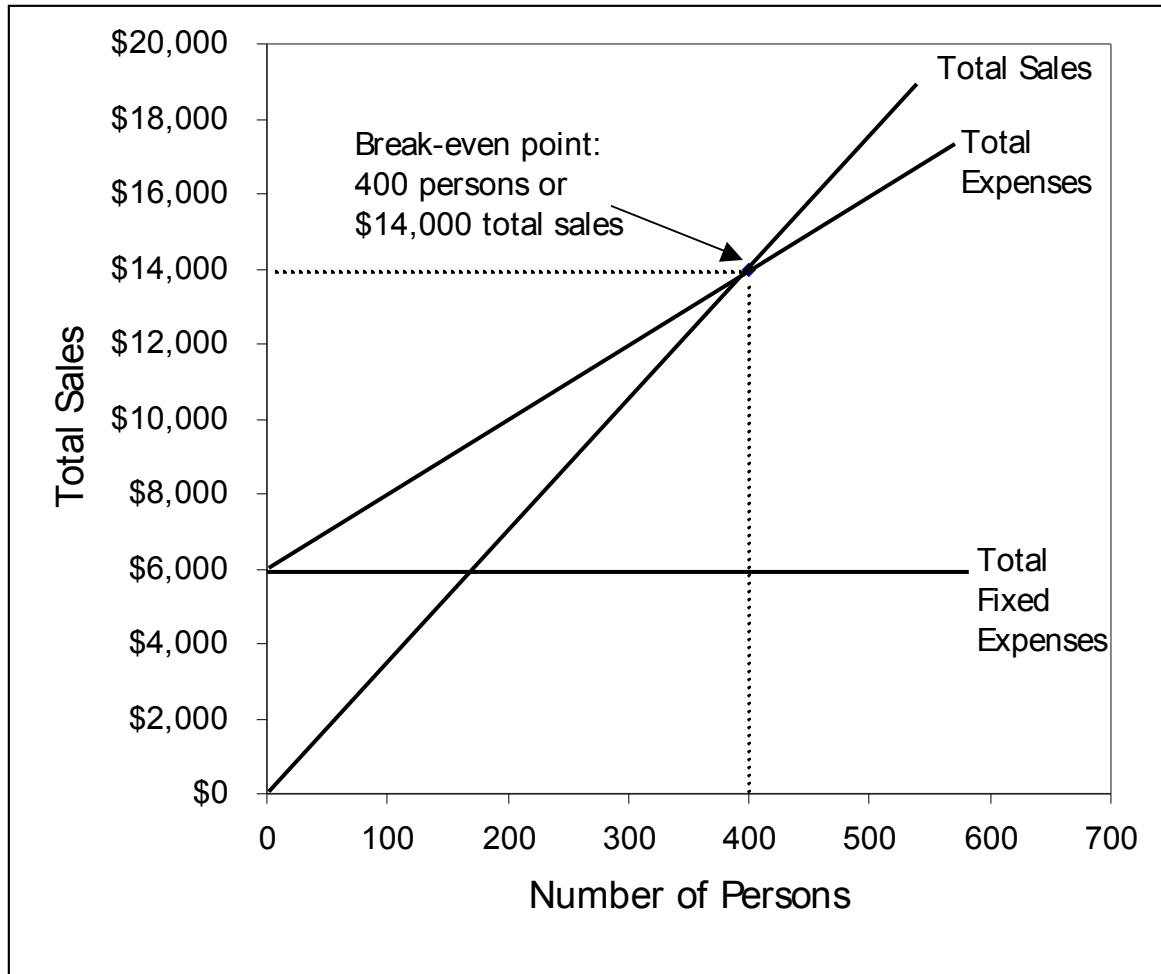
$$= \frac{\$6,000}{\$15} = 400 \text{ persons}$$

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

### Exercise 6-17 (continued)

#### 3. Cost-volume-profit graph:



**Exercise 6-18** (30 minutes)

1.

	<i>Flight Dynamic</i>		<i>Sure Shot</i>		<i>Total Company</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales.....	P150,000	100	P250,000	100	P400,000	100.0
Variable expenses.....	<u>30,000</u>	<u>20</u>	<u>160,000</u>	<u>64</u>	<u>190,000</u>	<u>47.5</u>
Contribution margin.....	<u>P120,000</u>	<u>80</u>	<u>P 90,000</u>	<u>36</u>	<u>210,000</u>	<u>52.5*</u>
Fixed expenses					<u>183,750</u>	
Net operating income.....					<u>P 26,250</u>	

$$*P210,000 \div P400,000 = 52.5\%$$

2. The break-even point for the company as a whole is:

$$\begin{aligned} \text{Dollar sales to break even} &= \frac{\text{Fixed expenses}}{\text{Overall CM ratio}} \\ &= \frac{P183,750}{0.525} = P350,000 \end{aligned}$$

3. The additional contribution margin from the additional sales is computed as follows:

$$P100,000 \times 52.5\% \text{ CM ratio} = P52,500$$

Assuming no change in fixed expenses, all of this additional contribution margin of P52,500 should drop to the bottom line as increased net operating income.

This answer assumes no change in selling prices, variable costs per unit, fixed expense, or sales mix.

**Problem 6-19** (60 minutes)

1. Sales price.....	\$20.00	100%
Variable expenses.....	<u>8.00</u>	<u>40%</u>
Contribution margin.....	<u>\$12.00</u>	<u>60%</u>

$$\begin{aligned}
 2. \quad \text{Dollar sales to} &= \frac{\text{Fixed expenses}}{\text{break even} \quad \text{CM ratio}} \\
 &= \frac{\$180,000}{0.60} = \$300,000
 \end{aligned}$$

3. \$75,000 increased sales  $\times$  0.60 CM ratio = \$45,000 increased contribution margin. Because the fixed costs will not change, net operating income should also increase by \$45,000.

$$\begin{aligned}
 4. \quad a. \quad \text{Degree of} &= \frac{\text{Contribution margin}}{\text{operating leverage} \quad \text{Net operating income}} \\
 &= \frac{\$240,000}{\$60,000} = 4
 \end{aligned}$$

b.  $4 \times 20\% = 80\%$  increase in net operating income. In dollars, this increase would be  $80\% \times \$60,000 = \$48,000$ .

5.	<i>Last Year:</i> <i>18,000 units</i>		<i>Proposed:</i> <i>24,000 units*</i>		
	<i>Amount</i>	<i>Per Unit</i>	<i>Amount</i>	<i>Per Unit</i>	
Sales.....	\$360,000	\$20.00	\$432,000	\$18.00	**
Variable expenses.....	<u>144,000</u>	<u>8.00</u>	<u>192,000</u>	<u>8.00</u>	
Contribution margin.....	216,000	<u>\$12.00</u>	240,000	<u>\$10.00</u>	
Fixed expenses.....	<u>180,000</u>		<u>210,000</u>		
Net operating income....	<u>\$ 36,000</u>		<u>\$ 30,000</u>		

\*18,000 units + 6,000 units = 24,000 units

\*\*\$20.00  $\times$  0.9 = \$18.00

No, the changes should not be made.

**Problem 6-19** (continued)

6. Expected total contribution margin:	
18,000 units × 1.25 × \$11.00 per unit* .....	\$247,500
Present total contribution margin:	
18,000 units × \$12.00 per unit.....	<u>216,000</u>
Incremental contribution margin, and the amount by which advertising can be increased with net operating income remaining unchanged.....	<u>\$ 31,500</u>
* $\$20.00 - (\$8.00 + \$1.00) = \$11.00$	



**Problem 6-20** (30 minutes)

1.

	<i>Product</i>						<i>Total</i>	
	<i>White</i>		<i>Fragrant</i>		<i>Loonzain</i>			
Percentage of total sales.....	40%		24%		36%		100%	
Sales.....	B300,000	100%	B180,000	100%	B270,000	100%	B750,000	100%
Variable expenses...	<u>216,000</u>	<u>72%</u>	<u>36,000</u>	<u>20%</u>	<u>108,000</u>	<u>40%</u>	<u>360,000</u>	<u>48%</u>
Contribution margin.	<u>B 84,000</u>	<u>28%</u>	<u>B144,000</u>	<u>80%</u>	<u>B162,000</u>	<u>60%</u>	<u>390,000</u>	<u>52% *</u>
Fixed expenses.....							<u>449,280</u>	
Net operating income (loss).....							( <u>B 59,280</u> )	

\*B390,000 ÷ B750,000 = 52%

2. Break-even sales would be:

$$\begin{aligned}
 \text{Dollar sales to break even} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\
 &= \frac{\text{B}449,280}{0.520} = \text{B}864,000
 \end{aligned}$$

### **Problem 6-20 (continued)**

#### **3. Memo to the president:**

Although the company met its sales budget of B750,000 for the month, the mix of products changed substantially from that budgeted. This is the reason the budgeted net operating income was not met, and the reason the break-even sales were greater than budgeted. The company's sales mix was planned at 20% White, 52% Fragrant, and 28% Loonzain. The actual sales mix was 40% White, 24% Fragrant, and 36% Loonzain.

As shown by these data, sales shifted away from Fragrant Rice, which provides our greatest contribution per dollar of sales, and shifted toward White Rice, which provides our least contribution per dollar of sales. Although the company met its budgeted level of sales, these sales provided considerably less contribution margin than we had planned, with a resulting decrease in net operating income. Notice from the attached statements that the company's overall CM ratio was only 52%, as compared to a planned CM ratio of 64%. This also explains why the break-even point was higher than planned. With less average contribution margin per dollar of sales, a greater level of sales had to be achieved to provide sufficient contribution margin to cover fixed costs.

**Problem 6-21** (60 minutes)

1. Profit = Unit CM × Q – Fixed expenses

$$\$0 = (\$30 - \$18) \times Q - \$150,000$$

$$\$0 = (\$12) \times Q - \$150,000$$

$$\$12Q = \$150,000$$

$$Q = \$150,000 \div \$12$$

$$Q = 12,500 \text{ pairs}$$

$$12,500 \text{ pairs} \times \$30 \text{ per pair} = \$375,000 \text{ in sales}$$

Alternative solution:

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

$$= \frac{\$150,000}{\$12.00} = 12,500 \text{ pairs}$$

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

$$= \frac{\$150,000}{0.40} = \$375,000 \text{ in sales}$$

2. See the graph on the following page.

3. The simplest approach is:

Break-even sales.....	12,500 pairs
Actual sales.....	<u>12,000</u> pairs
Sales short of break-even.....	<u>500</u> pairs

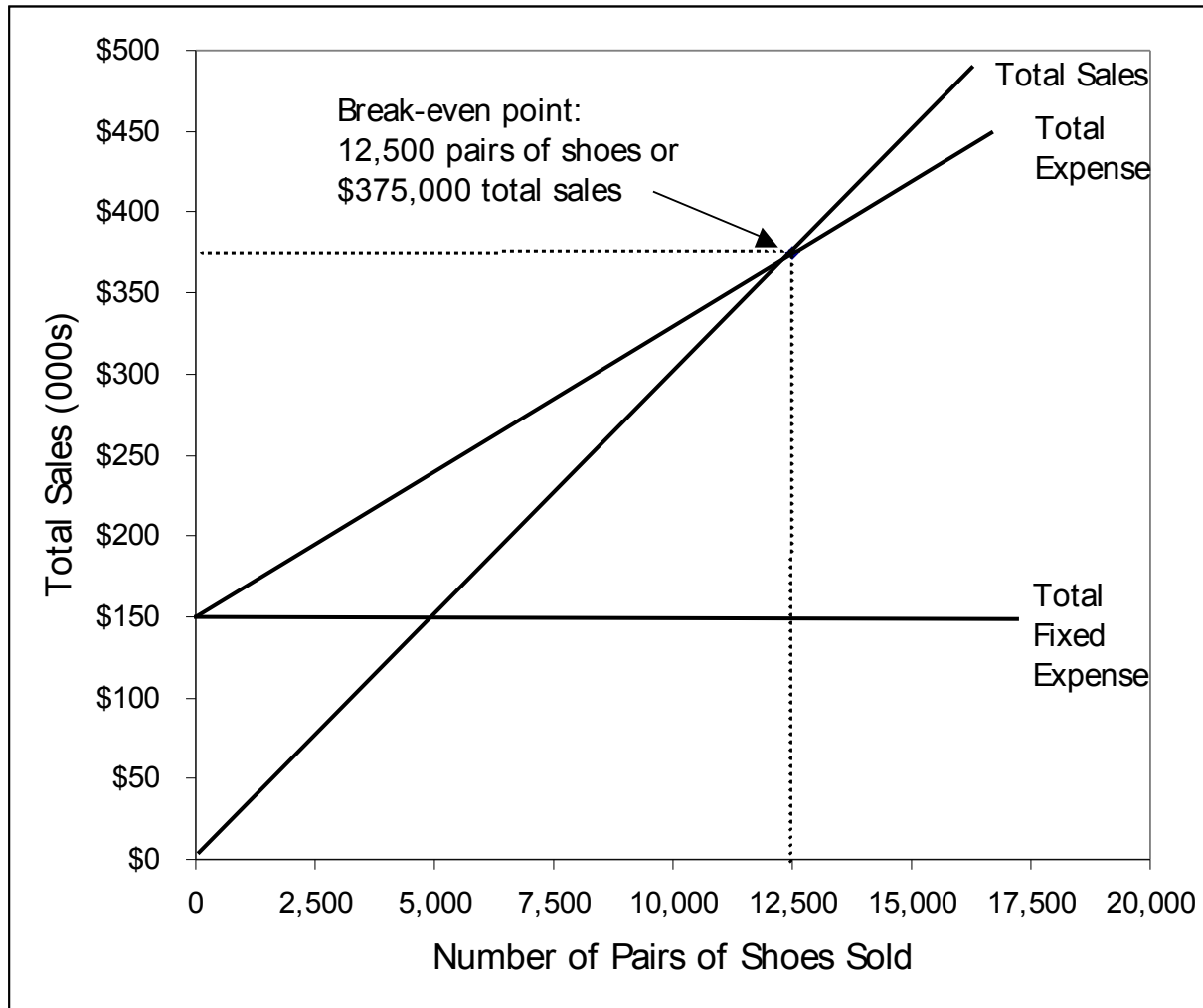
500 pairs × \$12 contribution margin per pair = \$6,000 loss

Alternative solution:

Sales (12,000 pairs × \$30.00 per pair).....	\$360,000
Variable expenses (12,000 pairs × \$18.00 per pair).....	<u>216,000</u>
Contribution margin.....	144,000
Fixed expenses.....	<u>150,000</u>
Net operating loss.....	<u>(\$ 6,000)</u>

**Problem 6-21 (continued)**

**2. Cost-volume-profit graph:**



### Problem 6-21 (continued)

4. The variable expenses will now be \$18.75 (\$18.00 + \$0.75) per pair, and the contribution margin will be \$11.25 (\$30.00 – \$18.75) per pair.

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

$$\$0 = (\$30.00 - \$18.75) \times Q - \$150,000$$

$$\$0 = (\$11.25) \times Q - \$150,000$$

$$\$11.25Q = \$150,000$$

$$Q = \$150,000 \div \$11.25$$

$$Q = 13,333 \text{ pairs (rounded)}$$

$$13,333 \text{ pairs} \times \$30.00 \text{ per pair} = \$400,000 \text{ in sales}$$

Alternative solution:

$$\begin{array}{l} \text{Unit sales to} \\ \text{break even} \end{array} = \frac{\text{Fixed expenses}}{\text{CM per unit}}$$

$$= \frac{\$150,000}{\$11.25} = 13,333 \text{ pairs}$$

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

$$= \frac{\$150,000}{0.375} = \$400,000 \text{ in sales}$$

5. The simplest approach is:

Actual sales.....	15,000 pairs
Break-even sales.....	<u>12,500</u> pairs
Excess over break-even sales.....	<u>2,500</u> pairs

2,500 pairs × \$11.50 per pair\* = \$28,750 profit

\*\$12.00 present contribution margin – \$0.50 commission = \$11.50

Alternative solution:

Sales (15,000 pairs × \$30.00 per pair).....	\$450,000
Variable expenses (12,500 pairs × \$18.00 per pair; 2,500 pairs × \$18.50 per pair).....	<u>271,250</u>
Contribution margin.....	178,750
Fixed expenses.....	<u>150,000</u>
Net operating income.....	<u>\$ 28,750</u>

### Problem 6-21 (continued)

6. The new variable expenses will be \$13.50 per pair.

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

$$\$0 = (\$30.00 - \$13.50) \times Q - \$181,500$$

$$\$0 = (\$16.50) \times Q - \$181,500$$

$$\$16.50Q = \$181,500$$

$$Q = \$181,500 \div \$16.50$$

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

$$11,000 \text{ pairs} \times \$30.00 \text{ per pair} = \$330,000 \text{ in sales}$$

Although the change will lower the break-even point from 12,500 pairs to 11,000 pairs, the company must consider whether this reduction in the break-even point is more than offset by the possible loss in sales arising from having the sales staff on a salaried basis. Under a salary arrangement, the sales staff has less incentive to sell than under the present commission arrangement, resulting in a potential loss of sales and a reduction of profits. Although it is generally desirable to lower the break-even point, management must consider the other effects of a change in the cost structure. The break-even point could be reduced dramatically by doubling the selling price but it does not necessarily follow that this would improve the company's profit.



**Problem 6-23** (45 minutes)

1. a.

	<i>Hawaiian Fantasy</i>		<i>Tahitian Joy</i>		<i>Total</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales.....	\$300,000	100%	\$500,000	100%	\$800,000	100%
Variable expenses.....	<u>180,000</u>	<u>60%</u>	<u>100,000</u>	<u>20%</u>	<u>280,000</u>	<u>35%</u>
Contribution margin.....	<u>\$120,000</u>	<u>40%</u>	<u>\$400,000</u>	<u>80%</u>	<u>520,000</u>	<u>65%</u>
Fixed expenses.....					<u>475,800</u>	
Net operating income..					<u>\$ 44,200</u>	

$$\text{b. Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$475,800}{0.65} = \$732,000$$

$$\begin{aligned} \text{Margin of safety} &= \text{Actual sales} - \text{Break-even sales} \\ &= \$800,000 - \$732,000 = \$68,000 \end{aligned}$$

$$\begin{aligned} \text{Margin of safety percentage} &= \frac{\text{Margin of safety in dollars}}{\text{Actual sales}} \\ &= \frac{\$68,000}{\$800,000} = 8.5\% \end{aligned}$$

**Problem 6-23** (continued)

2. a.	<i>Hawaiian Fantasy</i>		<i>Tahitian Joy</i>		<i>Samoan Delight</i>		<i>Total</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales.....	\$300,000	100%	\$500,000	100%	\$450,000	100%	\$1,250,000	100.0%
Variable expenses.....	<u>180,000</u>	<u>60%</u>	<u>100,000</u>	<u>20%</u>	<u>360,000</u>	<u>80%</u>	<u>640,000</u>	<u>51.2%</u>
Contribution margin.....	<u>\$120,000</u>	<u>40%</u>	<u>\$400,000</u>	<u>80%</u>	<u>\$ 90,000</u>	<u>20%</u>	610,000	<u>48.8%</u>
Fixed expenses..							<u>475,800</u>	
Net operating income.....							<u>\$ 134,200</u>	

**Problem 6-23 (continued)**

$$\text{b. Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$475,800}{0.488} = \$975,000$$

$$\begin{aligned}\text{Margin of safety} &= \text{Actual sales} - \text{Break-even sales} \\ &= \$1,250,000 - \$975,000 = \$275,000\end{aligned}$$

$$\begin{aligned}\text{Margin of safety percentage} &= \frac{\text{Margin of safety in dollars}}{\text{Actual sales}} \\ &= \frac{\$275,000}{\$1,250,000} = 22\%\end{aligned}$$

3. The reason for the increase in the break-even point can be traced to the decrease in the company's overall contribution margin ratio when the third product is added. Note from the income statements above that this ratio drops from 65% to 48.8% with the addition of the third product. This product (the Samoan Delight) has a CM ratio of only 20%, which causes the average contribution margin per dollar of sales to shift downward.

This problem shows the somewhat tenuous nature of break-even analysis when the company has more than one product. The analyst must be very careful of his or her assumptions regarding sales mix, including the addition (or deletion) of new products.

It should be pointed out to the president that even though the break-even point is higher with the addition of the third product, the company's margin of safety is also greater. Notice that the margin of safety increases from \$68,000 to \$275,000 or from 8.5% to 22%. Thus, the addition of the new product shifts the company much further from its break-even point, even though the break-even point is higher.

**Problem 6-24** (30 minutes)

1.
  - (1) Dollars
  - (2) Volume of output, expressed in units, % of capacity, sales, or some other measure
  - (3) Total expense line
  - (4) Variable expense area
  - (5) Fixed expense area
  - (6) Break-even point
  - (7) Loss area
  - (8) Profit area
  - (9) Sales line

### Problem 6-24 (continued)

2. a. Line 3: Remain unchanged.  
Line 9: Have a steeper slope.  
Break-even point: Decrease.
- b. Line 3: Have a flatter slope.  
Line 9: Remain unchanged.  
Break-even point: Decrease.
- c. Line 3: Shift upward.  
Line 9: Remain unchanged.  
Break-even point: Increase.
- d. Line 3: Remain unchanged.  
Line 9: Remain unchanged.  
Break-even point: Remain unchanged.
- e. Line 3: Shift downward and have a steeper slope.  
Line 9: Remain unchanged.  
Break-even point: Probably change, but the direction is uncertain.
- f. Line 3: Have a steeper slope.  
Line 9: Have a steeper slope.  
Break-even point: Remain unchanged in terms of units; increase in terms of total dollars of sales.
- g. Line 3: Shift upward.  
Line 9: Remain unchanged.  
Break-even point: Increase.
- h. Line 3: Shift upward and have a flatter slope.  
Line 9: Remain unchanged.  
Break-even point: Probably change, but the direction is uncertain.

**Problem 6-25** (60 minutes)

1.

Carbex, Inc.  
Income Statement For April

	<i>Standard</i>		<i>Deluxe</i>		<i>Total</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales.....	<u>\$240,000</u>	<u>100</u>	<u>\$150,000</u>	<u>100</u>	<u>\$390,000</u>	<u>100.0</u>
Variable expenses:						
Production.....	60,000	25	60,000	40	120,000	30.8
Sales commission.....	<u>36,000</u>	<u>15</u>	<u>22,500</u>	<u>15</u>	<u>58,500</u>	<u>15.0</u>
Total variable expenses	<u>96,000</u>	<u>40</u>	<u>82,500</u>	<u>55</u>	<u>178,500</u>	<u>45.8</u>
Contribution margin.....	<u>\$144,000</u>	<u>60</u>	<u>\$ 67,500</u>	<u>45</u>	<u>\$211,500</u>	<u>54.2</u>
Fixed expenses:						
Advertising.....					105,000	
Depreciation.....					21,700	
Administrative.....					<u>63,000</u>	
Total fixed expenses.....					<u>189,700</u>	
Net operating income....					<u>\$ 21,800</u>	

Carbex, Inc.  
Income Statement For May

	<i>Standard</i>		<i>Deluxe</i>		<i>Total</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales.....	<u>\$60,000</u>	<u>100</u>	<u>\$375,000</u>	<u>100</u>	<u>\$435,000</u>	<u>100.0</u>
Variable expenses:						
Production.....	15,000	25	150,000	40	165,000	37.9
Sales commission.....	<u>9,000</u>	<u>15</u>	<u>56,250</u>	<u>15</u>	<u>65,250</u>	<u>15.0</u>
Total variable expenses....	<u>24,000</u>	<u>40</u>	<u>206,250</u>	<u>55</u>	<u>230,250</u>	<u>52.9</u>
Contribution margin.....	<u>\$36,000</u>	<u>60</u>	<u>\$168,750</u>	<u>45</u>	<u>204,750</u>	<u>47.1</u>
Fixed expenses:						
Advertising.....					105,000	
Depreciation.....					21,700	
Administrative.....					<u>63,000</u>	
Total fixed expenses.....					<u>189,700</u>	
Net operating income.....					<u>\$ 15,050</u>	

### Problem 6-25 (continued)

2. The sales mix has shifted over the last year from Standard sets to Deluxe sets. This shift has caused a decrease in the company's overall CM ratio from 54.2% in April to 47.1% in May. For this reason, even though total sales (in dollars) are greater, net operating income is lower.
3. Sales commissions could be based on contribution margin rather than on sales price. A flat rate on total contribution margin, as the text suggests, might encourage the salespersons to emphasize the product with the greatest contribution to the profits of the firm.
4. a. The break-even in dollar sales can be computed as follows:

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$189,700}{0.542} = \$350,000$$

- b. The break-even point is higher with May's sales mix than with April's. This is because the company's overall CM ratio has gone down, i.e., the sales mix has shifted from the more profitable to the less profitable units.

**Problem 6-26** (45 minutes)

1. Sales (15,000 units × \$70 per unit).....	\$1,050,000
Variable expenses (15,000 units × \$40 per unit).....	<u>600,000</u>
Contribution margin.....	450,000
Fixed expenses.....	<u>540,000</u>
Net operating loss.....	<u>(\$ 90,000)</u>

$$\begin{aligned} 2. \text{ Break-even point} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ \text{in unit sales} &= \frac{\$540,000}{\$30 \text{ per unit}} = 18,000 \text{ units} \end{aligned}$$

18,000 units × \$70 per unit = \$1,260,000 to break even

3. See the next page.

4. At a selling price of \$58 per unit, the contribution margin is \$18 per unit.  
Therefore:

$$\begin{aligned} \text{Unit sales to} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ \text{break even} &= \frac{\$540,000}{\$18} = 30,000 \text{ units} \end{aligned}$$

30,000 units × \$58 per unit = \$1,740,000 to break even

This break-even point is different from the break-even point in part (2) because of the change in selling price. With the change in selling price the unit contribution margin drops from \$30 to \$18, resulting in an increase in the break-even point.



**Problem 6-26** (continued)

3.

<i>Unit Selling Price</i>	<i>Unit Variable Expense</i>	<i>Unit Contribution Margin</i>	<i>Volume (Units)</i>	<i>Total Contribution Margin</i>	<i>Fixed Expenses</i>	<i>Net operating income</i>
\$70	\$40	\$30	15,000	\$450,000	\$540,000	(\$90,000)
\$68	\$40	\$28	20,000	\$560,000	\$540,000	\$20,000
\$66	\$40	\$26	25,000	\$650,000	\$540,000	\$110,000
\$64	\$40	\$24	30,000	\$720,000	\$540,000	\$180,000
\$62	\$40	\$22	35,000	\$770,000	\$540,000	\$230,000
\$60	\$40	\$20	40,000	\$800,000	\$540,000	\$260,000
\$58	\$40	\$18	45,000	\$810,000	\$540,000	\$270,000
\$56	\$40	\$16	50,000	\$800,000	\$540,000	\$260,000

The maximum profit is \$270,000. This level of profit can be earned by selling 45,000 units at a price of \$58 each.

**Problem 6-27 (75 minutes)**

1. a. Selling price.....	\$25	100%
Variable expenses.....	<u>15</u>	<u>60%</u>
Contribution margin.....	<u>\$10</u>	<u>40%</u>

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

$$\$0 = \$10 \times Q - \$210,000$$

$$\$10Q = \$210,000$$

$$Q = \$210,000 \div \$10$$

$$Q = 21,000 \text{ balls}$$

Alternative solution:

$$\begin{aligned}\text{Unit sales to break even} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$210,000}{\$10} = 21,000 \text{ balls}\end{aligned}$$

b. The degree of operating leverage is:

$$\begin{aligned}\text{Degree of operating leverage} &= \frac{\text{Contribution margin}}{\text{Net operating income}} \\ &= \frac{\$300,000}{\$90,000} = 3.33 \text{ (rounded)}\end{aligned}$$

2. The new CM ratio will be:

Selling price.....	\$25	100%
Variable expenses.....	<u>18</u>	<u>72%</u>
Contribution margin.....	<u>\$ 7</u>	<u>28%</u>

The new break-even point will be:

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

$$\$0 = \$7 \times Q - \$210,000$$

$$\$7Q = \$210,000$$

$$Q = \$210,000 \div \$7$$

$$Q = 30,000 \text{ balls}$$

### Problem 6-27 (continued)

Alternative solution:

$$\begin{aligned}\text{Unit sales to break even} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$210,000}{\$7} = 30,000 \text{ balls}\end{aligned}$$

3. Profit = Unit CM × Q – Fixed expenses  
\$90,000 = \$7 × Q – \$210,000  
\$7Q = \$90,000 + \$210,000  
Q = \$300,000 ÷ \$7  
Q = 42,857 balls (rounded)

Alternative solution:

$$\begin{aligned}\text{Unit sales to attain target profit} &= \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$90,000 + \$210,000}{\$7} = 42,857 \text{ balls}\end{aligned}$$

Thus, sales will have to increase by 12,857 balls (42,857 balls, less 30,000 balls currently being sold) to earn the same amount of net operating income as last year. The computations above and in part (2) show the dramatic effect that increases in variable costs can have on an organization. The effects on Northwood Company are summarized below:

	<i>Present</i>	<i>Expected</i>
Combination margin ratio.....	40%	28%
Break-even point (in balls).....	21,000	30,000
Sales (in balls) needed to earn a \$90,000 profit...	30,000	42,857

Note that if variable costs do increase next year, then the company will just break even if it sells the same number of balls (30,000) as it did last year.

**Problem 6-27 (continued)**

4. The contribution margin ratio last year was 40%. If we let P equal the new selling price, then:

$$\begin{aligned}P &= \$18 + 0.40P \\0.60P &= \$18 \\P &= \$18 \div 0.60 \\P &= \$30\end{aligned}$$

To verify:

Selling price.....	\$30	100%
Variable expenses.....	<u>18</u>	<u>60%</u>
Contribution margin.....	<u>\$12</u>	<u>40%</u>

Therefore, to maintain a 40% CM ratio, a \$3 increase in variable costs would require a \$5 increase in the selling price.

5. The new CM ratio would be:

Selling price.....	\$25	100%
Variable expenses.....	<u>9*</u>	<u>36%</u>
Contribution margin.....	<u>\$16</u>	<u>64%</u>

$$*\$15 - (\$15 \times 40\%) = \$9$$

The new break-even point would be:

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses} \\ \$0 &= \$16 \times Q - \$420,000 \\ \$16Q &= \$420,000 \\ Q &= \$420,000 \div \$16 \\ Q &= 26,250 \text{ balls}\end{aligned}$$

Alternative solution:

$$\begin{aligned}\text{Unit sales to} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ \text{break even} &= \frac{\$420,000}{\$16} = 26,250 \text{ balls}\end{aligned}$$

Although this new break-even is greater than the company's present break-even of 21,000 balls [see Part (1) above], it is less than the break-even point will be if the company does not automate and variable labor costs rise next year [see Part (2) above].

**Problem 6-27 (continued)**

6. a. Profit = Unit CM × Q – Fixed expenses

$$\$90,000 = \$16 \times Q - \$420,000$$

$$\$16Q = \$90,000 + \$420,000$$

$$Q = \$510,000 \div \$16$$

$$Q = 31,875 \text{ balls}$$

Alternative solution:

$$\begin{aligned} \text{Unit sales to attain} &= \frac{\text{Target profit} + \text{Fixed expenses}}{\text{target profit} \quad \text{Unit contribution margin}} \\ &= \frac{\$90,000 + \$420,000}{\$16} = 31,875 \text{ balls} \end{aligned}$$

Thus, the company will have to sell 1,875 more balls (31,875 – 30,000 = 1,875) than now being sold to earn a profit of \$90,000 per year. However, this is still less than the 42,857 balls that would have to be sold to earn a \$90,000 profit if the plant is not automated and variable labor costs rise next year [see Part (3) above].

- b. The contribution income statement would be:

Sales (30,000 balls × \$25 per ball).....	\$750,000
Variable expenses (30,000 balls × \$9 per ball).....	<u>270,000</u>
Contribution margin.....	480,000
Fixed expenses.....	<u>420,000</u>
Net operating income.....	<u>\$ 60,000</u>

$$\begin{aligned} \text{Degree of} &= \frac{\text{Contribution margin}}{\text{operating leverage} \quad \text{Net operating income}} \\ &= \frac{\$480,000}{\$60,000} = 8 \end{aligned}$$

**Problem 6-27 (continued)**

- c. This problem illustrates the difficulty faced by some companies. When variable labor costs increase, it is often difficult to pass these cost increases along to customers in the form of higher prices. Thus, companies are forced to automate resulting in higher operating leverage, often a higher break-even point, and greater risk for the company.

There is no clear answer as to whether one should have been in favor of constructing the new plant.

**Problem 6-28** (60 minutes)

1. Profit = Unit CM  $\times$  Q – Fixed expenses  
 $\$0 = (\$40 - \$16) \times Q - \$60,000$   
 $\$0 = (\$24) \times Q - \$60,000$   
 $\$24Q = \$60,000$   
 $Q = \$60,000 \div \$24$   
 $Q = 2,500$  pairs, or at \$40 per pair, \$100,000 in sales

Alternative solution:

$$\text{Unit sales to break even} = \frac{\text{Fixed expenses}}{\text{CM per unit}} = \frac{\$60,000}{\$24.00} = 2,500 \text{ pairs}$$

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$60,000}{0.600} = \$100,000$$

2. See the graphs at the end of this solution.

3. Profit = Unit CM  $\times$  Q – Fixed expenses  
 $\$18,000 = \$24 \times Q - \$60,000$   
 $\$24Q = \$18,000 + \$60,000$   
 $Q = \$78,000 \div \$24$   
 $Q = 3,250$  pairs

Alternative solution:

$$\begin{aligned} \text{Unit sales to attain target profit} &= \frac{\text{Target profit} + \text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$18,000 + \$60,000}{\$24.00} = 3,250 \text{ pairs} \end{aligned}$$

4. Incremental contribution margin:
- |   |                 |
|---|-----------------|
| \$25,000 increased sales $\times$ 60% CM ratio..... | \$15,000        |
| Incremental fixed salary cost.....                  | <u>8,000</u>    |
| Increased net income.....                           | <u>\$ 7,000</u> |

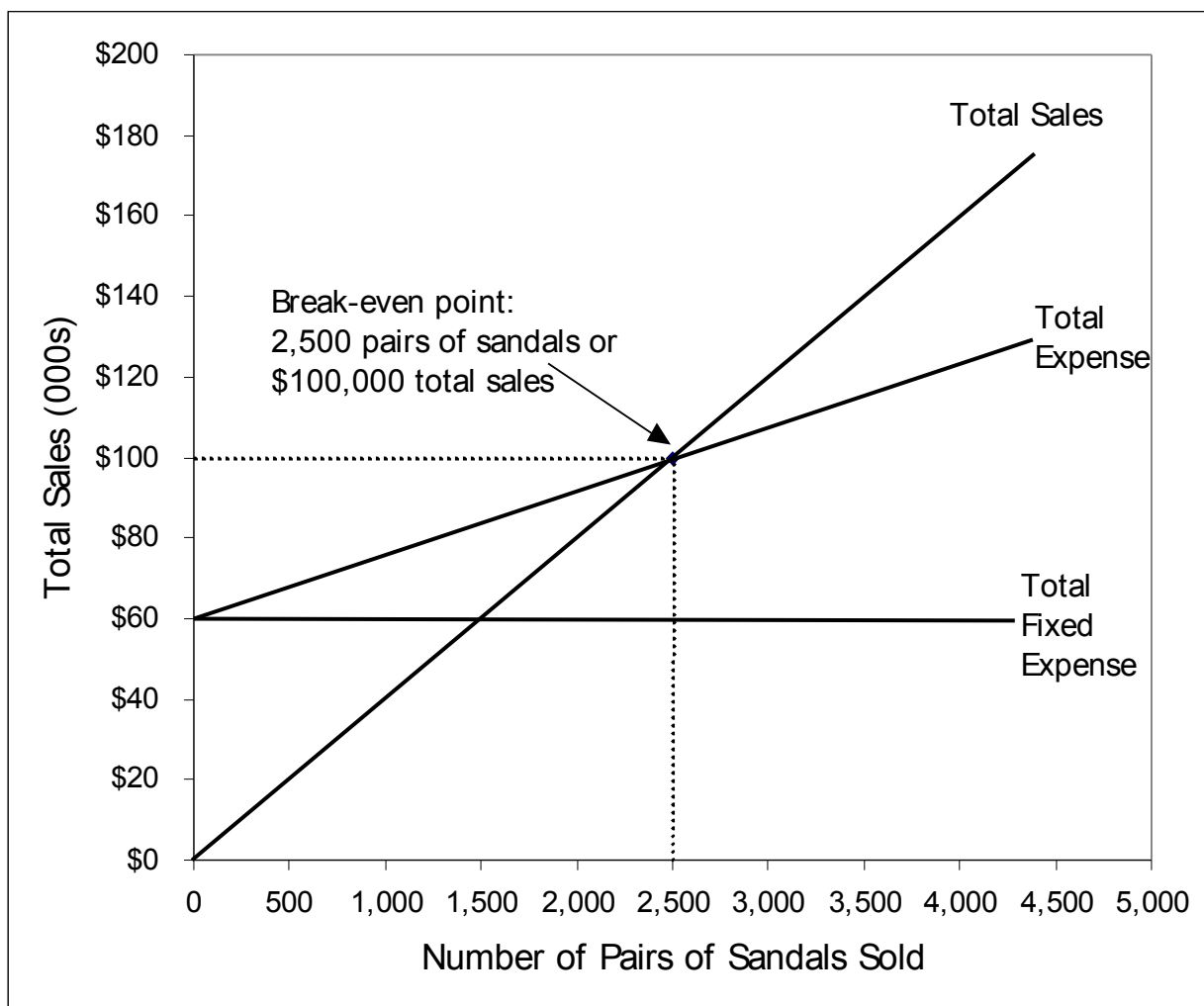
Yes, the position should be converted to a full-time basis.

### Problem 6-28 (continued)

5. a. 
$$\text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}} = \frac{\$72,000}{\$12,000} = 6$$

- b.  $6.00 \times 50\% \text{ sales increase} = 300\% \text{ increase}$  in net operating income.  
Thus, net operating income next year would be:  $\$12,000 + (\$12,000 \times 300\%) = \$48,000$ .

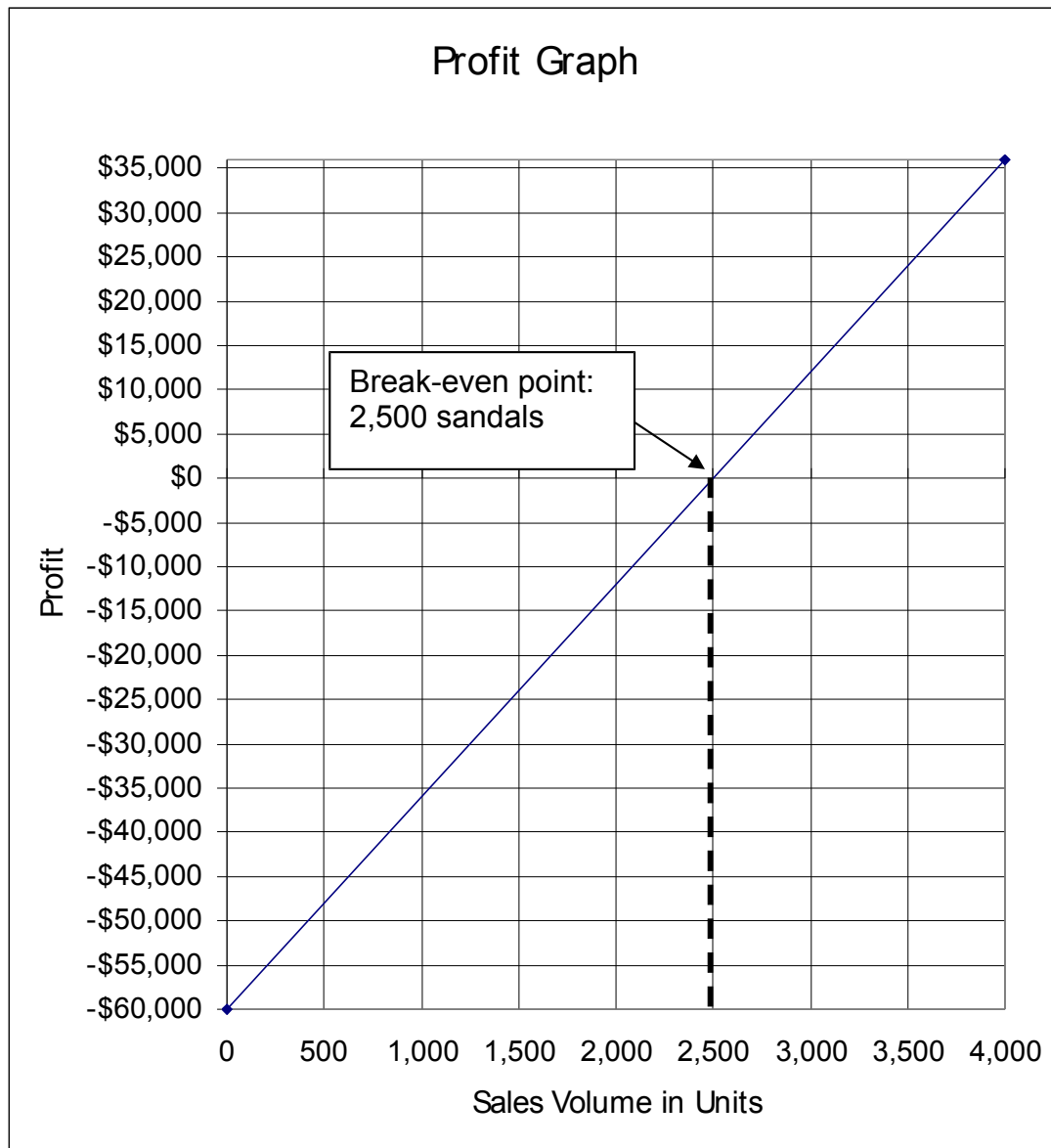
### 2. Cost-volume-profit graph:





### Problem 6-28 (continued)

Profit graph:



**Problem 6-29** (60 minutes)

1. The income statements would be:

<i>Present</i>			
	<i>Amount</i>	<i>Per Unit</i>	<i>%</i>
Sales.....	\$450,000	\$30	100%
Variable expenses.....	<u>315,000</u>	<u>21</u>	<u>70%</u>
Contribution margin.....	135,000	<u>\$ 9</u>	<u>30%</u>
Fixed expenses.....	<u>90,000</u>		
Net operating income..	<u>\$ 45,000</u>		

<i>Proposed</i>			
	<i>Amount</i>	<i>Per Unit</i>	<i>%</i>
Sales.....	\$450,000	\$30	100%
Variable expenses*.....	<u>180,000</u>	<u>12</u>	<u>40%</u>
Contribution margin.....	270,000	<u>\$18</u>	<u>60%</u>
Fixed expenses.....	<u>225,000</u>		
Net operating income..	<u>\$ 45,000</u>		

\*\$21 – \$9 = \$12

2. a. Degree of operating leverage:

Present:

$$\begin{aligned} \text{Degree of operating leverage} &= \frac{\text{Contribution margin}}{\text{Net operating income}} \\ &= \frac{\$135,000}{\$45,000} = 3 \end{aligned}$$

Proposed:

$$\begin{aligned} \text{Degree of operating leverage} &= \frac{\text{Contribution margin}}{\text{Net operating income}} \\ &= \frac{\$270,000}{\$45,000} = 6 \end{aligned}$$

**Problem 6-29** (continued)

b. Dollar sales to break even:

Present:

$$\begin{aligned}\text{Dollar sales to break even} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$90,000}{0.30} = \$300,000\end{aligned}$$

Proposed:

$$\begin{aligned}\text{Dollar sales to break even} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$225,000}{0.60} = \$375,000\end{aligned}$$

c. Margin of safety:

Present:

$$\begin{aligned}\text{Margin of safety} &= \text{Actual sales} - \text{Break-even sales} \\ &= \$450,000 - \$300,000 = \$150,000\end{aligned}$$

$$\begin{aligned}\text{Margin of safety percentage} &= \frac{\text{Margin of safety in dollars}}{\text{Actual sales}} \\ &= \frac{\$150,000}{\$450,000} = 33 \frac{1}{3}\%\end{aligned}$$

Proposed:

$$\begin{aligned}\text{Margin of safety} &= \text{Actual sales} - \text{Break-even sales} \\ &= \$450,000 - \$375,000 = \$75,000\end{aligned}$$

$$\begin{aligned}\text{Margin of safety percentage} &= \frac{\text{Margin of safety in dollars}}{\text{Actual sales}} \\ &= \frac{\$75,000}{\$450,000} = 16 \frac{2}{3}\%\end{aligned}$$

### Problem 6-29 (continued)

3. The major factor would be the sensitivity of the company's operations to cyclical movements in the economy. Because the new equipment will increase the CM ratio, in years of strong economic activity, the company will be better off with the new equipment. However, in economic recession, the company will be worse off with the new equipment. The fixed costs of the new equipment will cause losses to be deeper and sustained more quickly than at present. Thus, management must decide whether the potential for greater profits in good years is worth the risk of deeper losses in bad years.
4. No information is given in the problem concerning the new variable expenses or the new contribution margin ratio. Both of these items must be determined before the new break-even point can be computed. The computations are:

New variable expenses:

$$\begin{aligned}\text{Profit} &= (\text{Sales} - \text{Variable expenses}) - \text{Fixed expenses} \\ \$54,000^{**} &= (\$585,000^* - \text{Variable expenses}) - \$180,000 \\ \text{Variable expenses} &= \$585,000 - \$180,000 - \$54,000 \\ &= \$351,000\end{aligned}$$

\*New level of sales:  $\$450,000 \times 1.30 = \$585,000$

\*\*New level of net operating income:  $\$45,000 \times 1.2 = \$54,000$

New CM ratio:

Sales.....	\$585,000	100%
Variable expenses.....	<u>351,000</u>	<u>60%</u>
Contribution margin.....	<u>\$234,000</u>	<u>40%</u>

With the above data, the new break-even point can be computed:

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$180,000}{0.40} = \$450,000$$

### Problem 6-29 (continued)

The greatest risk is that the increases in sales and net operating income predicted by the marketing manager will not happen and that sales will remain at their present level. Note that the present level of sales is \$450,000, which is equal to the break-even level of sales under the new marketing method. Thus, if the new marketing strategy is adopted and sales remain unchanged, profits will drop from the current level of \$45,000 per month to zero.

It would be a good idea to compare the new marketing strategy to the current situation more directly. What level of sales would be needed under the new method to generate at least the \$45,000 in profits the company is currently earning each month? The computations are:

$$\begin{aligned}\text{Dollar sales to} &= \frac{\text{Target profit} + \text{Fixed expenses}}{\text{CM ratio}} \\ \text{attain target profit} &= \frac{\$45,000 + \$180,000}{0.40} \\ &= \$562,500 \text{ in sales each month}\end{aligned}$$

Thus, sales would have to increase by at least 25% (\$562,500 is 25% higher than \$450,000) in order to make the company better off with the new marketing strategy than with the current situation. This appears to be extremely risky.

**Problem 6-30** (30 minutes)

1. The contribution margin per sweatshirt would be:

Selling price.....		\$13.50
Variable expenses:		
Purchase cost of the sweatshirts.....	\$8.00	
Commission to the student salespersons.	<u>1.50</u>	<u>9.50</u>
Contribution margin.....		<u>\$ 4.00</u>

Since there are no fixed costs, the number of unit sales needed to yield the desired \$1,200 in profits can be obtained by dividing the target \$1,200 profit by the unit contribution margin:

$$\frac{\text{Target profit}}{\text{Unit contribution margin}} = \frac{\$1,200}{\$4.00} = 300 \text{ sweatshirts}$$

$$300 \text{ sweatshirts} \times \$13.50 \text{ per sweatshirt} = \$4,050 \text{ in total sales}$$

2. Since an order has been placed, there is now a “fixed” cost associated with the purchase price of the sweatshirts (i.e., the sweatshirts can’t be returned). For example, an order of 75 sweatshirts requires a “fixed” cost (investment) of \$600 (=75 sweatshirts × \$8.00 per sweatshirt). The variable cost drops to only \$1.50 per sweatshirt, and the new contribution margin per sweatshirt becomes:

Selling price.....	\$13.50
Variable expenses (commissions only)...	<u>1.50</u>
Contribution margin.....	<u>\$12.00</u>

Since the “fixed” cost of \$600 must be recovered before Mr. Hooper shows any profit, the break-even computation would be:

$$\begin{aligned} \text{Unit sales to} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ \text{break even} &= \frac{\$600}{\$12.00} = 50 \text{ sweatshirts} \end{aligned}$$

$$50 \text{ sweatshirts} \times \$13.50 \text{ per sweatshirt} = \$675 \text{ in total sales}$$

If a quantity other than 75 sweatshirts were ordered, the answer would change accordingly.

**Problem 6-31** (45 minutes)

1. The contribution margin per unit on the first 16,000 units is:

	<i>Per Unit</i>
Sales price.....	\$3.00
Variable expenses.....	<u>1.25</u>
Contribution margin.....	<u>\$1.75</u>

The contribution margin per unit on anything over 16,000 units is:

	<i>Per Unit</i>
Sales price.....	\$3.00
Variable expenses.....	<u>1.40</u>
Contribution margin.....	<u>\$1.60</u>

Thus, for the first 16,000 units sold, the total amount of contribution margin generated would be:

$$16,000 \text{ units} \times \$1.75 \text{ per unit} = \$28,000$$

Since the fixed costs on the first 16,000 units total \$35,000, the \$28,000 contribution margin above is not enough to permit the company to break even. Therefore, in order to break even, more than 16,000 units would have to be sold. The fixed costs that will have to be covered by the additional sales are:

Fixed costs on the first 16,000 units.....	\$35,000
Less contribution margin from the first 16,000 units. .	<u>28,000</u>
Remaining unrecovered fixed costs.....	7,000
Add monthly rental cost of the additional space needed to produce more than 16,000 units.....	<u>1,000</u>
Total fixed costs to be covered by remaining sales....	<u>\$ 8,000</u>

### Problem 6-31 (continued)

The additional sales of units required to cover these fixed costs would be:

$$\frac{\text{Total remaining fixed costs}}{\text{Unit contribution margin on added units}} = \frac{\$8,000}{\$1.60} = 5,000 \text{ units}$$

Therefore, a total of 21,000 units (16,000 + 5,000) must be sold in order for the company to break even. This number of units would equal total sales of:

$$21,000 \text{ units} \times \$3.00 \text{ per unit} = \$63,000 \text{ in total sales}$$

2. 
$$\frac{\text{Target profit}}{\text{Unit contribution margin}} = \frac{\$12,000}{\$1.60} = 7,500 \text{ units}$$

Thus, the company must sell 7,500 units above the break-even point to earn a profit of \$12,000 each month. These units, added to the 21,000 units required to break even, equal total sales of 28,500 units each month to reach the target profit.

3. If a bonus of \$0.10 per unit is paid for each unit sold in excess of the break-even point, then the contribution margin on these units would drop from \$1.60 to \$1.50 per unit.

The desired monthly profit would be:

$$25\% \times (\$35,000 + \$1,000) = \$9,000$$

Thus,

$$\frac{\text{Target profit}}{\text{Unit contribution margin}} = \frac{\$9,000}{\$1.50} = 6,000 \text{ units}$$

Therefore, the company must sell 6,000 units above the break-even point to earn a profit of \$9,000 each month. These units, added to the 21,000 units required to break even, would equal total sales of 27,000 units each month.



**Case 6-32** (60 minutes)

Note: This is a problem that will challenge the very best students' conceptual and analytical skills. However, working through this case will yield substantial dividends in terms of a much deeper understanding of critical management accounting concepts.

1. The overall break-even sales can be determined using the CM ratio.

	<i>Velcro</i>	<i>Metal</i>	<i>Nylon</i>	<i>Total</i>
Sales.....	\$165,000	\$300,000	\$340,000	\$805,000
Variable expenses.....	<u>125,000</u>	<u>140,000</u>	<u>100,000</u>	<u>365,000</u>
Contribution margin.....	<u>\$ 40,000</u>	<u>\$160,000</u>	<u>\$240,000</u>	440,000
Fixed expenses.....				<u>400,000</u>
Net operating income.....				<u>\$ 40,000</u>

$$\text{CM ratio} = \frac{\text{Contribution margin}}{\text{Sales}} = \frac{\$440,000}{\$805,000} = 0.5466$$

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$400,000}{0.5466} = \$732,000 \text{ (rounded)}$$

2. The issue is what to do with the common fixed cost when computing the break-evens for the individual products. The correct approach is to ignore the common fixed costs. If the common fixed costs are included in the computations, the break-even points will be overstated for individual products and managers may drop products that in fact are profitable.

- a. The break-even points for each product can be computed using the contribution margin approach as follows:

	<i>Velcro</i>	<i>Metal</i>	<i>Nylon</i>
Unit selling price.....	\$1.65	\$1.50	\$0.85
Variable cost per unit.....	<u>1.25</u>	<u>0.70</u>	<u>0.25</u>
Unit contribution margin (a).....	<u>\$0.40</u>	<u>\$0.80</u>	<u>\$0.60</u>
Product fixed expenses (b).....	\$20,000	\$80,000	\$60,000
Unit sales to break even (b) ÷ (a).....	50,000	100,000	100,000

**Case 6-32** (continued)

- b. If the company were to sell exactly the break-even quantities computed above, the company would lose \$240,000—the amount of the common fixed cost. This can be verified as follows:

	<i>Velcro</i>	<i>Metal</i>	<i>Nylon</i>	<i>Total</i>
Unit sales.....	<u>50,000</u>	<u>100,000</u>	<u>100,000</u>	
Sales.....	\$82,500	\$150,000	\$85,000	\$317,500
Variable expenses.....	<u>62,500</u>	<u>70,000</u>	<u>25,000</u>	<u>157,500</u>
Contribution margin....	<u>\$20,000</u>	<u>\$ 80,000</u>	<u>\$60,000</u>	160,000
Fixed expenses.....				<u>400,000</u>
Net operating income.				<u>(\$240,000)</u>

At this point, many students conclude that something is wrong with their answer to part (a) because a result in which the company loses money operating at the break-evens for the individual products does not seem to make sense. They also worry that managers may be lulled into a false sense of security if they are given the break-evens computed in part (a). Total sales at the individual product break-evens is only \$317,500 whereas the total sales at the overall break-even computed in part (1) is \$732,000.

Many students (and managers, for that matter) attempt to resolve this apparent paradox by allocating the common fixed costs among the products prior to computing the break-evens for individual products. Any of a number of allocation bases could be used for this purpose—sales, variable expenses, product-specific fixed expenses, contribution margins, etc. (We usually take a tally of how many students allocated the common fixed costs using each possible allocation base before proceeding.) For example, the common fixed costs are allocated on the next page based on sales.

**Case 6-32** (continued)

Allocation of common fixed expenses on the basis of sales revenue:

	<i>Velcro</i>	<i>Metal</i>	<i>Nylon</i>	<i>Total</i>
Sales.....	\$165,000	\$300,000	\$340,000	\$805,000
Percentage of total sales.....	20.497%	37.267%	42.236%	100.0%
Allocated common fixed expense*.....	\$49,193	\$ 89,441	\$101,366	\$240,000
Product fixed expenses.....	<u>20,000</u>	<u>80,000</u>	<u>60,000</u>	<u>160,000</u>
Allocated common and product fixed expenses (a).	\$69,193	\$169,441	\$161,366	\$400,000
Unit contribution margin (b). .	\$0.40	\$0.80	\$0.60	
“Break-even” point in units sold (a) ÷ (b).....	172,983	211,801	268,943	

\*Total common fixed expense × percentage of total sales

If the company sells 172,983 units of the Velcro product, 211,801 units of the Metal product, and 268,943 units of the Nylon product, the company will indeed break even overall. However, the apparent break-evens for two of the products are higher than their normal annual sales.

	<i>Velcro</i>	<i>Metal</i>	<i>Nylon</i>
Normal annual sales volume.....	100,000	200,000	400,000
“Break-even” annual sales.....	172,983	211,801	268,943
“Strategic” decision.....	drop	drop	retain

It would be natural for managers to interpret a break-even for a product as the level of sales below which the company would be financially better off dropping the product. Therefore, we should not be surprised if managers, based on the above erroneous break-even calculation, would decide to drop the Velcro and Metal products and concentrate on the company’s “core competency,” which appears to be the Nylon product.

**Case 6-32** (continued)

If the managers drop the Velcro and Metal products, the company would face a loss of \$60,000 computed as follows:

	<i>Velcro</i>	<i>Metal</i>	<i>Nylon</i>	<i>Total</i>
Sales.....	dropped	dropped	\$340,000	\$340,000
Variable expenses.....			<u>100,000</u>	<u>100,000</u>
Contribution margin.....			<u>\$240,000</u>	<u>240,000</u>
Fixed expenses*.....				<u>300,000</u>
Net operating income.....				<u>(\$ 60,000)</u>

\* By dropping the two products, the company reduces its fixed expenses by only \$100,000 (= \$20,000 + \$80,000). Therefore, the total fixed expenses are \$300,000 rather than \$400,000.

By dropping the two products, the company would go from making a profit of \$40,000 to suffering a loss of \$60,000. The reason is that the two dropped products were contributing \$100,000 toward covering common fixed expenses and toward profits. This can be verified by looking at a segmented income statement like the one that will be introduced in a later chapter.

	<i>Velcro</i>	<i>Metal</i>	<i>Nylon</i>	<i>Total</i>
Sales.....	\$165,000	\$300,000	\$340,000	\$805,000
Variable expenses.....	<u>125,000</u>	<u>140,000</u>	<u>100,000</u>	<u>365,000</u>
Contribution margin.....	40,000	160,000	240,000	440,000
Product fixed expenses.....	<u>20,000</u>	<u>80,000</u>	<u>60,000</u>	<u>160,000</u>
Product segment margin.....	<u>\$ 20,000</u>	<u>\$ 80,000</u>	<u>\$180,000</u>	<u>280,000</u>
Common fixed expenses.....				<u>240,000</u>
Net operating income.....				<u>\$ 40,000</u>

\$100,000

**Case 6-33** (75 minutes)

Before proceeding with the solution, it is helpful first to restructure the data into contribution format for each of the three alternatives. (The data in the statements below are in thousands.)

	<i>15% Commission</i>		<i>20% Commission</i>		<i>Own Sales Force</i>	
Sales.....	\$16,000	100%	\$16,000	100%	\$16,000.0	100.0%
Variable expenses:						
Manufacturing.....	7,200		7,200		7,200.0	
Commissions (15%, 20% 7.5%).	<u>2,400</u>		<u>3,200</u>		<u>1,200.0</u>	
Total variable expenses.....	<u>9,600</u>	<u>60%</u>	<u>10,400</u>	<u>65%</u>	<u>8,400.0</u>	<u>52.5%</u>
Contribution margin.....	<u>6,400</u>	<u>40%</u>	<u>5,600</u>	<u>35%</u>	<u>7,600.0</u>	<u>47.5%</u>
Fixed expenses:						
Manufacturing overhead.....	2,340		2,340		2,340.0	
Marketing.....	120		120		2,520.0 *	
Administrative.....	1,800		1,800		1,725.0 **	
Interest.....	<u>540</u>		<u>540</u>		<u>540.0</u>	
Total fixed expenses.....	<u>4,800</u>		<u>4,800</u>		<u>7,125.0</u>	
Income before income taxes.....	1,600		800		475.0	
Income taxes (30%).....	<u>480</u>		<u>240</u>		<u>142.5</u>	
Net income.....	<u>\$ 1,120</u>		<u>\$ 560</u>		<u>\$ 332.5</u>	

\*\$120,000 + \$2,400,000 = \$2,520,000

\*\*\$1,800,000 – \$75,000 = \$1,725,000

### Case 6-33 (continued)

1. When the income before taxes is zero, income taxes will also be zero and net income will be zero. Therefore, the break-even calculations can be based on the income before taxes.

- a. Break-even point in dollar sales if the commission remains 15%:

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$4,800,000}{0.40} = \$12,000,000$$

- b. Break-even point in dollar sales if the commission increases to 20%:

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$4,800,000}{0.35} = \$13,714,286$$

- c. Break-even point in dollar sales if the company employs its own sales force:

$$\text{Dollar sales to break even} = \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$7,125,000}{0.475} = \$15,000,000$$

2. In order to generate a \$1,120,000 net income, the company must generate \$1,600,000 in income before taxes. Therefore,

$$\begin{aligned}\text{Dollar sales to attain target} &= \frac{\text{Target income before taxes} + \text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$1,600,000 + \$4,800,000}{0.35} \\ &= \frac{\$6,400,000}{0.35} = \$18,285,714\end{aligned}$$

3. To determine the volume of sales at which net income would be equal under either the 20% commission plan or the company sales force plan, we find the volume of sales where costs before income taxes under the two plans are equal. See the next page for the solution.

**Case 6-33** (continued)

$$\begin{aligned} X &= \text{Total sales revenue} \\ 0.65X + \$4,800,000 &= 0.525X + \$7,125,000 \\ 0.125X &= \$2,325,000 \\ X &= \$2,325,000 \div 0.125 \\ X &= \$18,600,000 \end{aligned}$$

Thus, at a sales level of \$18,600,000 either plan would yield the same income before taxes and net income. Below this sales level, the commission plan would yield the largest net income; above this sales level, the sales force plan would yield the largest net income.

4. a., b., and c.

	15%	20%	
	<i>Commission</i>	<i>Commission</i>	<i>Own Sales Force</i>
Contribution margin (Part 1) (x)...	\$6,400,000	\$5,600,000	\$7,600,000
Income before taxes (Part 1) (y)...	\$1,600,000	\$800,000	\$475,000
Degree of operating leverage:			
(x) ÷ (y).....	4	7	16

5. We would continue to use the sales agents for at least one more year, and possibly for two more years. The reasons are as follows:

**First**, use of the sales agents would have a less dramatic effect on net income.

**Second**, use of the sales agents for at least one more year would give the company more time to hire competent people and get the sales group organized.

**Third**, the sales force plan doesn't become more desirable than the use of sales agents until the company reaches sales of \$18,600,000 a year. This level probably won't be reached for at least one more year, and possibly two years.

**Fourth**, the sales force plan will be highly leveraged since it will increase fixed costs (and decrease variable costs). One or two years from now, when sales have reached the \$18,600,000 level, the company can benefit greatly from this leverage. For the moment, profits will be greater and risks will be less by staying with the agents, even at the higher 20% commission rate.

## Research and Application 6-34

1. The income statement on page 50 is prepared using an absorption format. The income statement on page 33 is prepared using a contribution format. The annual report says that the contribution format income statement shown on page 33 is used for internal reporting purposes; nonetheless, Benetton has chosen to include it in the annual report. The contribution format income statement treats all cost of sales as variable costs. The selling, general and administrative expenses shown on the absorption income statement have been broken down into variable and fixed components in the contribution format income statement.

It appears the Distribution and Transport expenses and the Sales Commissions have been reclassified as variable selling costs on the contribution format income statement. The sum of these two expenses according to the absorption income statement on page 50 is €103,561 and €114,309 in 2004 and 2003, respectively. If these numbers are rounded to the nearest thousand, they agree with the variable selling costs shown in the contribution format income statements on page 33.

2. The cost of sales is included in the computation of contribution margin because the Benetton Group primarily designs, markets, and sells apparel. The manufacturing of the products is outsourced to various suppliers. While Benetton's cost of sales may include some fixed expenses, the overwhelming majority of the expenses are variable, as one would expect for a merchandising company, thus the cost of sales is included in the calculation of contribution margin.
3. The break-even computations are as follows (see page 33 of annual report):

(in millions; figures are rounded)	2003	2004
Total fixed expenses.....	€464	€436
Contribution margin ratio.....	$\div 0.374$	$\div 0.387$
Breakeven.....	€1,241	€1,127

The break-even point in 2004 is lower than in 2003 because Benetton's fixed expenses in 2004 are lower than in 2003 and its contribution margin ratio in 2004 is higher than in 2003.



## Research and Application 6-34 (continued)

4. The target profit calculation is as follows:

(in millions; figures are rounded)	2004
Target profit + Fixed expenses.....	€736
Contribution margin ratio.....	$\div 0.387$
Sales needed to achieve target profit.....	€1,902

5. The margin of safety calculations are as follows:

(in millions; figures are rounded)	2003	2004
Actual sales.....	€1,859	€1,686
Break-even sales.....	<u>1,241</u>	<u>1,127</u>
Margin of safety.....	<u>€ 618</u>	<u>€ 559</u>

The margin of safety has declined because the drop in sales from 2003 to 2004 (€173) exceeds the decrease in breakeven sales from 2003 to 2004 (€114).

6. The degree of operating leverage is calculated as follows:

(in millions; figures are rounded)	2004
Contribution margin.....	€653
Income from operations.....	$\div$ €217
Degree of operating leverage (rounded).....	3

A 6% increase in sales would result in income from operations of:

(in millions; figures are rounded)	2004
Revised sales (€1,686 $\times$ 1.06).....	€1,787
Contribution margin ratio.....	<u>0.387</u>
Contribution margin.....	692
Fixed general and administrative expenses.....	<u>436</u>
Income from operations.....	<u>€256</u>

The degree of operating leverage can be used to quickly determine that a 6% increase in sales translates into an 18% increase in income from operations ( $6\% \times 3 = 18\%$ ). Rather than preparing a revised contribution format income statement to ascertain the new income from operations, the computation could be performed as follows:

## Research and Application 6-34 (continued)

(in millions; figures are rounded)	2004
Actual sales.....	€217
Percentage increase in income from operations.....	<u>1.18</u>
Projected income from operations.....	€256

7. The income from operations in the first scenario would be computed as follows:

(in millions; figures are rounded)	2004
Sales ( $1,686 \times 1.03$ ).....	€1,737
Contribution margin ratio.....	<u>0.387</u>
Contribution margin.....	672
Fixed general and administrative expenses.....	<u>446</u>
Income from operations.....	<u>€226</u>

The second scenario is more complicated because students need to break the variable selling costs into its two components—Distribution and Transport and Sales Commissions. Using the absorption income statement on page 50, students can determine that Sales Commissions are about 4.4% of sales ( $€73,573 \div €1,686,351$ ). If Sales Commissions are raised to 6%, this is a 1.6% increase in the rate. This 1.6% should be deducted from the contribution margin ratio as shown below:

(in millions; figures are rounded)	2004
Sales ( $1,686 \times 1.05$ ).....	€1,770
Contribution margin ratio ( $0.387 - 0.016$ ).....	<u>0.371</u>
Contribution margin.....	657
Fixed general and administrative expenses.....	<u>446</u>
Income from operations.....	<u>€211</u>

The first scenario is preferable because it increases income from operations by €9 million ( $€226 - €217$ ), whereas the second scenario decreases income from operations by €6 million ( $€217 - €211$ ).

### Research and Application 6-34 (continued)

8. The income from operations using the revised product mix is calculated as follows (the contribution margin ratios for each sector are given on pages 36 and 37 of the annual report):

(in millions)	<i>Casual</i>	<i>Sportswear &amp; Equipment</i>	<i>Manufacturing &amp; Other</i>	<i>Total</i>
Sales.....	€1,554	€45	€87	€1,686.
CM ratio.....	<u>0.418</u>	<u>0.208</u>	<u>0.089</u>	<u>*0.395</u>
CM.....	<u>€649.6</u>	<u>€9.4</u>	<u>€7.7</u>	<u>666.7</u>
Fixed expenses.....				<u>436.0</u>
Income from operations...				<u>€230.7</u>

\*39.5% is the weighted average contribution margin ratio. Notice, it is higher than the 38.7% shown on page 33 of the annual report.

The income from operations is higher under this scenario because the product mix has shifted towards the sector with the highest contribution margin ratio—the Casual sector.

Uploaded By Qasim Mughal  
<http://world-best-free.blogspot.com/>