

EXERCISE 3-9 (25 minutes)

1.

		Contribution Income Statement			
Alpha		Beta		Total	
Amount %		Amount %		Amount %	
Unit price	\$25	\$20			
Units sold	8,000 40	12,000 60		20,000 100.0	
Sales	\$200,000 100	\$240,000 100		\$ 440,000 100.0	
Variable costs	110,000 55	120,000 50		230,000 52.3	
C M	<u>90,000 45</u>	<u>120,000 50</u>		<u>210,000 47.7</u>	
Fixed costs				<u>130,000</u>	
Operating income				<u>\$80,000</u>	

2. Break-even point using the company's average CM ratio:

Average CM ratio = 47.7%

$$\text{B E point in sales dollars} = \frac{\text{Fixed costs}}{\text{CM ratio}}$$

$$= \frac{\$130,000}{0.477} = \$272,537$$

EXERCISE 3-9 (Continued)

3. Break-even point using the weighted average CM:

$$\text{CM per unit of Alpha} = \$25 \times 45\% = \$11.25$$

$$\text{CM per unit of Beta} = \$20 \times 50\% = \$10$$

$$\begin{aligned}\text{Weighted average CM} &= \text{Sum of (CM per unit} \times \text{Product mix \%)} \\ &= (\$11.25 \times 40\%) + (\$10 \times 60\%) \\ &= \$4.50 + \$6 = \$10.50\end{aligned}$$

$$\begin{aligned}\text{B E point in units} &= \frac{\text{Fixed costs}}{\text{Weighted average CM}} \\ &= \frac{\$130,000}{\$10.50} = 12,381 \text{ units}\end{aligned}$$

$$\text{Units of Alpha} = 12,381 \times 40\% = 4,952$$

$$\text{Units of Beta} = 12,381 \times 60\% = 7,429$$

PROBLEM 3-18 (45 minutes)

1. a.

$$\begin{aligned}\text{B E point in units} &= \frac{\text{Fixed costs}}{\text{Contribution margin per unit}} \\ &= \frac{\$150,000}{\$45 - \$18} = \frac{\$150,000}{\$27} = 5,556 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{B E point in sales dollars} &= \frac{\text{Fixed costs}}{\text{Contribution margin ratio}} \\ &= \frac{\$150,000}{\text{CM} \div \text{Selling Price}} = \frac{\$150,000}{\$27 \div \$45} = \frac{150,000}{0.6} \\ &= \$250,000\end{aligned}$$

$$\begin{aligned}\text{b. MS in dollars} &= \text{Total sales} - \text{BE point in dollars} \\ &= \$360,000 - \$250,000 \\ &= \$110,000\end{aligned}$$

$$\begin{aligned}
 \text{MS in percentage} &= \text{MS in dollars} \div \text{Total sales} \\
 &= \$110,000 \div \$360,000 \\
 &= 30.56\%
 \end{aligned}$$

c.

$$\begin{aligned}
 \text{Degree of operating leverage} &= \frac{\text{Total CM}}{\text{Operating income}} \\
 &= \frac{\$216,000}{\$66,000} = 3.2727
 \end{aligned}$$

PROBLEM 3-18 (Continued)

2.

$$\begin{array}{rcl} \text{Target sales} & & \text{Fixed costs + Target income} \\ \text{in units} & = & \text{Contribution margin per unit} \end{array}$$

- b. To earn \$4,000 more than last year, the company will need an operating income of \$66,000 + \$4,000, or \$70,000.

$$\begin{aligned} \text{Target sales} &= \frac{\text{Fixed costs} + \text{Target income}}{\text{Contribution margin per unit}} \\ \text{in units} &= \frac{\$150,000 + \$70,000}{\$25} = 8,800 \text{ units} \end{aligned}$$

PROBLEM 3-18 (Continued)

- c. Only selling price and/or variable costs affect the CM ratio.

$$\text{CM ratio} = \frac{\text{Unit CM (or total CM)}}{\text{Unit selling price (or total sales)}}$$

Variable costs will increase \$2 per unit, from \$18 to \$20. Last year's CM ratio was 0.6. Let X = New selling price.

$$\begin{aligned} X &= \text{Variable costs} + \text{CM} \\ X &= \$20 + 0.6X \\ X - 0.6X &= \$20 \\ 0.4X &= \$20 \\ X &= \$20 \div 0.4 = \$50 \end{aligned}$$

Proof:	New selling price	\$ 50	100%
	Variable costs	<u>20</u>	<u>40%</u>
	CM	<u>\$ 30</u>	<u>60%</u>

4. a. There will be no difference, since only selling price and/or variable costs affect CM ratio. The changes are assumed to be only in fixed costs and sales volume in units.
- b. Next year's break-even point in units and in sales dollars will be higher than last year's. This

is because the numerator (fixed costs) in the BE point calculation formula will increase, and the denominator (unit CM and CM ratio) will remain unchanged.

- c. Yes, the degree of operating leverage will change next year from last year. Variable costs affect CM (numerator) and fixed costs influence operating income (denominator) in the formula. A change in fixed costs is assumed.

5. % Increase in operating income
 = % Increase in sales x Degree of operating leverage
 = 60% x 3.2727 = 196%
New operating income
 = \$66,000 x (1 + 1.96) = \$66,000 x 2.96 = \$195,360

PROBLEM 3-20 (35 minutes)

1. Let X = Break-even point in dollars (\$000). Then,
 X = Variable cost of goods sold + current fixed costs
 + fixed cost of hiring + commissions
 $X = 0.45X + \$6,120 + \$1,890 + 0.10X$
 + $0.05(X - 8 \times \$2,000)$
 $X = 0.60X + \$6,120 + \$1,890 - \$800$
 $0.40X = \$7,210$
 $X = \$18,025$

Supporting calculations:

Variable cost of goods sold rate = \$11,700 (\$26,000 = 45%

Current fixed costs (\$000):

Fixed cost of goods sold	\$2,870
Fixed advertising cost.....	750
Fixed administrative cost	1,850
Fixed interest expense	<u>650</u>
Total	<u>\$6,120</u>

Fixed cost of hiring (\$ 000):

Sales people (8 x \$80)	\$ 640
Travel and entertainment	600
Manager/secretary	150
Additional advertising	<u>500</u>
Total	<u>\$1,890</u>

2. Breakeven formula set equal to net income (\$000):

Net income = Pretax income x (1 - tax rate)

Net income = (Sales - Variable cost of goods sold
- Fixed costs - Commissions)(1 - 0.40)

Let X = Sales. Then:

$$(X - 0.45X - \$6,120 - 0.23X) \times 0.6 = \$ 2,100$$
$$0.192X - \$3,672 = \$ 2,100$$

$$0.192X = \$ 5,772$$
$$X = \$30,062$$

3. The general assumptions underlying break-even analysis that limit its usefulness include the following:
- a. All costs can be divided into fixed and variable elements.
 - b. Variable costs vary proportionally to volume.
 - c. Selling prices remain unchanged.

(CMA Unofficial Answer)

\$100,010