CHAPTER 8 SOLUTIONS

Exercise 8-29 (30 minutes)

1. 

<table>
<thead>
<tr>
<th>Bicycle Type</th>
<th>Sales Price</th>
<th>Unit Variable Cost</th>
<th>Unit Contribution Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-quality</td>
<td>$500</td>
<td>$300 ($275 + $25)</td>
<td>$200</td>
</tr>
<tr>
<td>Medium-quality</td>
<td>300</td>
<td>150 ($135 + $15)</td>
<td>150</td>
</tr>
</tbody>
</table>

2. Sales mix:

   High-quality bicycles ........................................................................................................ 25%
   Medium-quality bicycles ................................................................................................. 75%

3. Weighted-average unit contribution margin = ($200 \times 25\%) + ($150 \times 75\%)
   = $162.50

4. Break-even point (in units) = \frac{\text{fixed expenses}}{\text{weighted-average unit contribution margin}}
   = \frac{65,000}{162.50} = 400 bicycles

<table>
<thead>
<tr>
<th>Bicycle Type</th>
<th>Break-Even Sales Volume</th>
<th>Sales Price</th>
<th>Sales Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-quality</td>
<td>100 (400 \times .25)</td>
<td>$500</td>
<td>$50,000</td>
</tr>
<tr>
<td>Medium-quality</td>
<td>300 (400 \times .75)</td>
<td>300</td>
<td>90,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>$140,000</td>
</tr>
</tbody>
</table>
EXERCISE 8-29 (CONTINUED)

5. Target net income:

Sales volume required to earn target net income of $48,750 = \frac{65,000 + 48,750}{162.50} = 700 \text{ bicycles}

This means that the shop will need to sell the following volume of each type of bicycle to earn the target net income:

- High-quality: \(175 \times 0.25\)
- Medium-quality: \(525 \times 0.75\)

Exercise 8-31 (25 minutes)

1. The following income statement, often called a common-size income statement, provides a convenient way to show the cost structure.

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$500,000</td>
<td>100</td>
</tr>
<tr>
<td>Variable expenses</td>
<td>300,000</td>
<td>60</td>
</tr>
<tr>
<td>Contribution margin</td>
<td>$200,000</td>
<td>40</td>
</tr>
<tr>
<td>Fixed expenses</td>
<td>150,000</td>
<td>30</td>
</tr>
<tr>
<td>Net income</td>
<td>$ 50,000</td>
<td>10</td>
</tr>
</tbody>
</table>

2.

<table>
<thead>
<tr>
<th>Decrease in Revenue</th>
<th>Contribution Margin Percentage</th>
<th>Decrease in Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>$75,000*</td>
<td>(40%)†</td>
<td>$30,000</td>
</tr>
</tbody>
</table>

*\$75,000 = 500,000 \times 15\%
†40\% = \frac{200,000}{500,000}
EXERCISE 8-31 (CONTINUED)

3. Operating leverage factor (at revenue of $500,000) = \frac{\text{contribution margin}}{\text{net income}}
   \[ \frac{200,000}{50,000} = 4 \]

4. Percentage change in net income = \left(\frac{\text{percentage increase in revenue}}{\text{operating leverage factor}}\right)
   \[ = 20\% \times 4 \]
   \[ = 80\% \]

Problem 8-35 (30 minutes)

1. Break-even point in sales dollars, using the contribution-margin ratio:
   \[ \text{Break-even point} = \frac{\text{fixed expenses}}{\text{contribution-margin ratio}} \]
   \[ = \frac{180,000 + 72,000}{20 - 8 - 4} = \frac{252,000}{.4} = 630,000 \]

2. Target net income, using contribution-margin approach:
   \[ \text{Sales units required to earn income of } 180,000 = \frac{\text{fixed expenses + target net income}}{\text{unit contribution margin}} \]
   \[ = \frac{252,000 + 180,000}{20 - 8 - 4} = \frac{432,000}{8} = 54,000 \text{ units} \]
**Problem 8-35 (continued)**

3. New unit variable manufacturing cost = $8 \times 110% = \$8.80

Break-even point in sales dollars:

\[
\text{Break-even point} = \frac{\$252,000}{\$20.00 - \$8.80 - \$4.00} = \frac{\$252,000}{\$20} = \$700,000
\]

4. Let \(P\) denote the selling price that will yield the same contribution-margin ratio:

\[
\frac{\$20.00 - \$8.00 - \$4.00}{\$20.00} = \frac{P - \$8.80 - \$4.00}{P}
\]

\[.4 = \frac{P - \$12.80}{P}\]

\[.4P = P - \$12.80\]

\[\$12.80 = .6P\]

\[P = \frac{\$12.80}{.6}\]

\[P = \$21.33\text{ (rounded)}\]

Check: New contribution-margin ratio is:

\[
\frac{\$21.33 - \$8.80 - \$4.00}{\$21.33} = .4 \text{ (rounded)}
\]

**Problem 8-40 (30 minutes)**

1. Break-even point (in units) = \(\frac{\text{fixed costs}}{\text{unit contribution margin}}\)

\[= \frac{\$468,000}{\$25.00 - \$19.80} = 90,000\text{ units}\]
2. Break-even point (in sales dollars) = \frac{\text{fixed cost}}{\text{contribution-margin ratio}}

= \frac{\$468,000}{\$25.00 - \$19.80} = \$2,250,000

3. Number of sales units required to earn target net profit

= \frac{\text{fixed costs} + \text{target net profit}}{\text{unit contribution margin}}

= \frac{\$468,000 + \$260,000}{\$25.00 - \$19.80} = 140,000 \text{ units}

4. Margin of safety = \text{budgeted sales revenue} - \text{break-even sales revenue}

= (120,000)(\$25) - \$2,250,000 = \$750,000

5. Break-even point if direct-labor costs increase by 8 percent:

\text{New unit contribution margin} = \$25.00 - \$10.50 - (\$5.00)(1.08) - \$3.00 - \$1.30

= \$4.80

\text{Break-even point} = \frac{\text{fixed costs}}{\text{new unit contribution margin}}

= \frac{\$468,000}{\$4.80} = 97,500 \text{ units}
problem 8-40 (continued)

6. Contribution margin ratio = \( \frac{\text{unit contribution margin}}{\text{sales price}} \)

Old contribution-margin ratio = \( \frac{\$25.00 - \$19.80}{\$25.00} = .208 \)

Let \( P \) denote sales price required to maintain a contribution-margin ratio of .208. Then \( P \) is determined as follows:

\[
\frac{P - \$10.50 - (\$5.00)(1.08) - \$3.00 - \$1.30}{P} = .208
\]

\[
P - \$20.20 = .208P
\]

\[
.792P = \$20.20
\]

\[
P = \$25.51 \text{(rounded)}
\]

Check: New contribution-margin ratio = \( \frac{\$25.51 - \$10.50 - (\$5.00)(1.08) - \$3.00 - \$1.30}{\$25.51} = .208 \text{ (rounded)} \)