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

1. Sales (15,000 games) .......... $300,000 $20
   Less variable expenses .......... 90,000 6
   Contribution margin .......... 210,000 $14
   Less fixed expenses .......... 182,000
   Net operating income .......... $ 28,000

   The degree of operating leverage would be:

   \[
   \text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}}
   \]

   \[
   = \frac{210,000}{28,000} = 7.5
   \]

2. a. Sales of 18,000 games would represent a 20% increase over last year’s sales. Since 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) ......................... 42,000
   Total expected net operating income ............ $70,000
Exercise 6-14 (45 minutes)

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

2. a. Selling price........................ $40 100%

   Less variable expenses........   28 70

   Contribution margin ............ $12 30%

Let $Q = \text{Break-even point in units}.$

Sales = Variable expenses + Fixed expenses + Profits
$40Q = 28Q + 180,000 + 0$

$12Q = 180,000$

$Q = 180,000 \div 12 \text{ per unit}$

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

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

Alternative solution:

Let $X = \text{Break-even point in sales dollars}.$

$X = 0.70X + 180,000 + 0$

$0.30X = 180,000$

$X = 180,000 \div 0.30$

$X = 600,000$

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

b. $40Q = 28Q + 180,000 + 60,000$

$12Q = 240,000$

$Q = 240,000 \div 12 \text{ per unit}$

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

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

Alternative solution:

$X = 0.70X + 180,000 + 60,000$

$0.30X = 240,000$

$X = 240,000 \div 0.30$

$X = 800,000$

In units: $800,000 \div 40 \text{ per unit} = 20,000 \text{ units}$
Exercise 6-14 (continued)

c. The company’s new cost/revenue relationships will be:

<table>
<thead>
<tr>
<th>Selling price</th>
<th>$40</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less variable expenses ($28 - $4)</td>
<td>24</td>
<td>60%</td>
</tr>
<tr>
<td>Contribution margin</td>
<td>$16</td>
<td>40%</td>
</tr>
</tbody>
</table>

\[ 40Q = 24Q + 180,000 + 0 \]
\[ 16Q = 180,000 \]
\[ Q = \frac{180,000}{16} \text{ per unit} \]
\[ Q = 11,250 \text{ units} \]

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

Alternative solution:

\[ X = 0.60X + 180,000 + 0 \]
\[ 0.40X = 180,000 \]
\[ X = \frac{180,000}{0.40} \]
\[ X = 450,000 \]

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

3. a.

Break-even point in unit sales = \( \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \)

\[ = \frac{180,000}{12 \text{ per unit}} = 15,000 \text{ units} \]

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

Alternative solution:

Break-even point in sales dollars = \( \frac{\text{Fixed expenses}}{\text{CM ratio}} \)

\[ = \frac{180,000}{0.30} = 600,000 \]

In units: $600,000 ÷ $40 per unit = 15,000 units.
Exercise 6-14 (continued)

b. Unit sales to attain target profit

\[ \frac{\text{Fixed expenses} + \text{Target profit}}{\text{Unit contribution margin}} = \frac{$180,000 + $60,000}{12 \text{ per unit}} = 20,000 \text{ units} \]

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

Alternative solution:

\[ \frac{\text{Fixed expenses} + \text{Target profit}}{\text{CM ratio}} = \frac{$180,000 + $60,000}{0.30} = $800,000 \]

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

c. Break-even point in unit sales

\[ \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} = \frac{$180,000}{16 \text{ per unit}} = 11,250 \text{ units} \]

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

Alternative solution:

\[ \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{$180,000}{0.40} = $450,000 \]

In units: $450,000 ÷ $40 per unit = 11,250 units
**Exercise 6-16** (45 minutes)

1. \( \text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits} \)
   \[ 30Q = 12Q + 216,000 + 0 \]
   \[ 18Q = 216,000 \]
   \[ Q = 216,000 \div $18 \text{ per unit} \]
   \[ Q = 12,000 \text{ units}, \text{ or at } $30 \text{ per unit}, $360,000 \]

   Alternative solution:
   \[
   \text{Break-even point in unit sales} = \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} = \frac{216,000}{18 \text{ per unit}} = 12,000 \text{ units} \]
   or, at $30 per unit, $360,000

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

3. \( \text{Units sold to attain target profit} = \frac{\text{Fixed expenses} + \text{Target profit}}{\text{Unit contribution margin}} \)
   \[
   = \frac{216,000 + 90,000}{18 \text{ per unit}} = 17,000 \text{ units} \]

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (17,000 units × $30 per unit)</td>
<td>$510,000</td>
<td>$30</td>
</tr>
<tr>
<td>Less variable expenses</td>
<td>$204,000</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>$306,000</td>
<td>$18</td>
</tr>
<tr>
<td>Less fixed expenses</td>
<td>$216,000</td>
<td></td>
</tr>
<tr>
<td>Net operating income</td>
<td>$90,000</td>
<td></td>
</tr>
</tbody>
</table>
Exercise 6-16 (continued)

4. Margin of safety in dollar terms:
   \[ \text{Margin of safety in dollars} = \text{Total sales} - \text{Break-even sales} \]
   \[ = \$450,000 - \$360,000 = \$90,000 \]

   Margin of safety in percentage terms:
   \[ \text{Margin of safety percentage} = \frac{\text{Margin of safety in dollars}}{\text{Total sales}} \]
   \[ = \frac{\$90,000}{\$450,000} = 20\% \]

5. The CM ratio is 60%.

   Expected total contribution margin: \((\$500,000 \times 60\%)\) .... \$300,000
   Present total contribution margin: \((\$450,000 \times 60\%)\) ...... \$270,000
   Increased contribution margin................................. \$30,000

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

   Since in this case the company’s fixed expenses will not change, quarterly net operating income will also increase by \$30,000.
Problem 6-18A (90 minutes)

1. Sales price......................... $20.00 100%
   Less variable expenses ........ 8.00 40
   Contribution margin .......... $12.00 60%

2. Break-even point in total sales dollars = \( \frac{\text{Fixed expenses}}{\text{CM ratio}} \)

   \[ \frac{180,000}{0.60} = 300,000 \]

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

4. a. Degree of operating leverage = \( \frac{\text{Contribution margin}}{\text{Net operating income}} \)

   \[ \frac{240,000}{60,000} = 4 \]

   b. \( 4 \times 20\% = 80\% \) increase in net operating income.

5. | Last Year: | Proposed: |
   | 18,000 units | 24,000 units* |
   | Amount | Per Unit | Amount | Per Unit |
   | Sales......................... | $360,000 | $20.00 | $432,000 | $18.00 ** |
   | Less variable expenses ... | 144,000 | 8.00 | 192,000 | 8.00 |
   | Contribution margin ...... | 216,000 | $12.00 | 240,000 | $10.00 |
   | Less fixed expenses ...... | 180,000 | | 210,000 |
   | Net operating income..... | $36,000 | | $30,000 |

*18,000 units + 6,000 units = 24,000 units
**$20.00 \times 0.9 = $18.00

No, the changes should not be made.
Problem 6-18A (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........................................ 216,000
Incremental contribution margin, and the amount by which advertising can be increased with net operating income remaining unchanged........................................ $ 31,500

   *$20.00 - ($8.00 + $1.00) = $11.00

Problem 6-24A (75 minutes)

1. Sales = Variable expenses + Fixed expenses + Profits
   $40.00Q = $16.00Q + $60,000 + $0
   $24.00Q = $60,000
   Q = $60,000 ÷ $24.00 per pair
   Q = 2,500 pairs

   2,500 pairs × $40.00 per pair = $100,000 in sales

   Alternative solution:
   Break-even point in unit sales = \(\frac{\text{Fixed expenses}}{\text{Unit contribution margin}}\)
   = \(\frac{$60,000}{24.00 \text{ per pair}}\) = 2,500 pairs
   
   Break-even point in dollar sales = \(\frac{\text{Fixed expenses}}{\text{CM ratio}}\)
   = \(\frac{$60,000}{0.600}\) = $100,000

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

3. Sales = Variable expenses + Fixed expenses + Profits
   $40.00Q = $16.00Q + $60,000 + $18,000
   $24.00Q = $78,000
   Q = $78,000 ÷ $24.00 per pair
   Q = 3,250 pairs

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

= \frac{\$60,000 + \$18,000}{\$24.00 \text{ per pair}} = 3,250 \text{ pairs}

4. Incremental contribution margin:
   - $25,000 \times 60\% \text{ CM ratio} = $15,000
   - Incremental fixed salary cost = $8,000
   - Increased net operating income = $7,000

Yes, the position should be converted to a full-time basis.
Problem 6-24A (continued)

5. a. \[ \text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}} = \frac{72,000}{12,000} = 6.00 \]

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: