

SOLUTION EXERCISES SECTION 3

- 1 Beacon Corporation manufactures and sells coffee makers. The following unit cost information is based on a production and sales volume of 12,000 units:

Direct materials: \$12

Direct labor: \$8

Variable overhead: \$3

Fixed overhead: \$5

Variable selling and administrative expenses: \$2

Fixed selling and administrative expenses: \$6

Required:

- 1) Determine the budgeted selling price per unit assuming that Beacon Corporation applies a cost-plus pricing strategy with a markup of 60% on the production cost.
- 2) Calculate the company's total fixed costs.
- 3) Calculate the contribution margin per unit based on the selling price determined in Requirement 1.
- 4) Compute the break-even point in units and in dollars, using the selling price determined in Requirement 1.
- 5) Using the unit contribution margin, estimate the company's profit if 16,000 units are sold.

Answers:

- 1) **Budgeted selling price:**
Production cost per unit = \$12 (Direct materials) + \$8 (Direct labor) + \$3 (Variable overhead) + \$5 (Fixed overhead) = **\$28**
Selling price = \$28 + (\$28 × 60%) = **\$44.80**
- 2) **Total fixed costs:**
Fixed costs = 12,000 units × (\$5 [Fixed overhead] + \$6 [Fixed selling and administrative])
Total fixed costs = 12,000 × \$11 = **\$132,000**
- 3) **Contribution margin per unit:**
Variable costs per unit = \$12 (Materials) + \$8 (Labor) + \$3 (Variable overhead) + \$2 (Variable selling and administrative) = **\$25**
Contribution margin per unit = \$44.80 – \$25 = **\$19.80**
- 4) **Break-even point:**
Break-even units = Total fixed costs ÷ Contribution margin per unit = \$132,000 ÷ \$19.80 ≈ **6,667 units**
Break-even sales (in dollars) = 6,667 units × \$44.80 = **\$298,130**
- 5) **Estimated profit for 16,000 units sold:**
Profit = (Units sold – Break-even units) × Contribution margin per unit
Profit = (16,000 – 6,667) × \$19.80 = **\$184,394**

- 2** Carson Corporation expects to sell 18,000 units of its new product at a selling price of \$130 per unit. The unit production cost is \$85. The company's target profit is 35% of sales revenue. Recently, the Vice President of Marketing discovered that a competitor plans to launch a similar product priced at \$118. The Vice President has suggested matching the competitor's price, believing that the lower price would lead to a 25% increase in sales volume.

Required:

- 1) Calculate the company's net income assuming the product is sold at \$130 and the unit cost remains at \$85. Assume no additional costs are incurred.
- 2) Determine the product's target cost if it is sold at a \$130 price point.
- 3) Calculate the company's net income if the target cost computed in Requirement 2 is achieved.
- 4) Calculate the change in income from Requirement 1 if the product is sold for \$118, the cost remains at \$85, and sales volume increases by 25%.

Answers

- 1) **Net income at \$130 selling price and \$85 cost:**
 $\text{Net income} = (\$130 - \$85) \times 18,000 = \mathbf{\$810,000}$
- 2) **Target cost for \$130 selling price:**
 $\text{Target cost} = \$130 - (\$130 \times 35\%) = \$130 - \$45.50 = \mathbf{\$84.50}$
- 3) **Net income assuming \$130 selling price and \$84.50 cost:**
 $\text{Net income} = (\$130 - \$84.50) \times 18,000 = \mathbf{\$819,000}$
- 4) **Change in income if selling at \$118 with 25% volume increase:**
 $\text{New sales volume} = 18,000 \times 1.25 = \mathbf{22,500 \text{ units}}$
 $\text{Net income} = (\$118 - \$85) \times 22,500 = \mathbf{\$742,500}$
 $\text{Change in income} = \$810,000 - \$742,500 = \mathbf{\$67,500 \text{ decrease.}}$

- 3** Benson Corporation manufactures and sells electric scooters at a price of \$450 per unit. The variable costs per unit are \$270 plus a sales commission of 12% of the selling price. Total fixed costs include \$20,000 in fixed manufacturing overhead and \$12,000 in fixed selling and administrative expenses.

Required:

- 1) Calculate the contribution margin per unit.
- 2) Determine the break-even point in units and in dollars.
- 3) Compute the number of units that must be sold to achieve a profit of \$25,000.
- 4) What would be the break-even point in units if the sales commission is reduced to \$30 per unit sold?

Answers

- 1) **Contribution margin per unit:**
 $\text{Contribution margin} = \$450 - [\$270 + 12\% \times \$450]$
 $= \$450 - (\$270 + \$54)$
 $= \$450 - \324
 $= \mathbf{\$126}$

2) **Break-even point:**

Total fixed costs = \$20,000 + \$12,000 = **\$32,000**

Break-even units = \$32,000 ÷ \$126 ≈ **254 units**

Break-even sales (in dollars) = 254 × \$450 = **\$114,300**

3) **Units needed to earn \$25,000 profit:**

Required sales = (\$32,000 + \$25,000) ÷ \$126 ≈ **452 units**

4) **Break-even point with reduced commission:**

New variable cost = \$270 + \$30 = \$300

New contribution margin = \$450 - \$300 = **\$150**

Break-even units = \$32,000 ÷ \$150 ≈ **214 units**

- 4 Monroe Corporation reports sales of \$680,000. The company incurs variable costs equal to 45% of sales and has total fixed costs of \$180,000.

Required:

- 1) Calculate the company's break-even point in sales dollars.
- 2) Compute the company's operating leverage at its current level of sales.
- 3) Determine the percentage change in net income that would result from a 10% increase in sales.
- 4) Calculate the company's net income and operating leverage (rounded to one decimal place) if sales increase by 10%.
- 5) Explain the effect on operating leverage as a company's sales grow and move further beyond the break-even point.

Answers

1) **Break-even point in sales dollars:**

Break-even sales = \$180,000 ÷ (100% - 45%) = \$180,000 ÷ 55% = **\$327,273**

2) **Operating leverage at current sales level:**

Contribution margin = \$680,000 × 55% = **\$374,000**

Net income = \$374,000 - \$180,000 = **\$194,000**

Operating leverage = \$374,000 ÷ \$194,000 ≈ **1.93**

3) **Percentage change in net income with a 10% sales increase:**

Percentage change = 10% × 1.93 = **19.3%**

4) **Net income and operating leverage after a 10% sales increase:**

New sales = \$680,000 + (\$680,000 × 10%) = \$748,000

New contribution margin = \$748,000 × 55% = **\$411,400**

New net income = \$411,400 - \$180,000 = **\$231,400**

Operating leverage = \$411,400 ÷ \$231,400 ≈ **1.78**

5) **Effect on operating leverage as sales increase:**

Operating leverage decreases as a company moves further beyond its break-even point. For example, at a sales level of \$680,000, a 10% increase in sales results in a 19.3% increase in net income. However, at a sales level of \$748,000, a 10% sales increase generates only a 17.8% increase in profit.

- 5 The Campus Store sells merchandise at university events for \$30 each. The merchandise costs \$20 per unit. The store is currently negotiating with university management for permission to operate a booth in the student center. Three rental options are under consideration:

Option 1: Pay a fixed rent of \$2,400.

Option 2: Pay a fixed rent of \$1,500 plus 12% of revenue.

Option 3: Pay the university 30% of revenue with no fixed rent.

The store estimates that it can sell 350 merchandise items during the period.

Required:

- 1) Calculate the break-even point in units for each of the three options.
- 2) Assuming the store meets its sales target, which rental option should be selected?

Answers

1. Break-even points:

Option 1:

$$(\$30X - \$20X) - \$2,400 = \$0$$

$$\$10X = \$2,400$$

$$X = \mathbf{240 \text{ units}}$$

Option 2:

$$\$30X - \$20X - (12\% \times \$30X) - \$1,500 = \$0$$

$$\$6.40X - \$1,500 = \$0$$

$$\$6.40X = \$1,500$$

$$X = \mathbf{234.38 \text{ units} \approx 235 \text{ units}}$$

Option 3:

Since there are no fixed costs, the Campus Store will earn a profit at any positive sales volume.

2. Profit comparison at 350 units sold:

Option 1 profit:

$$(\$10 \times 350) - \$2,400 = \$3,500 - \$2,400 = \mathbf{\$1,100}$$

Option 2 profit:

$$(\$6.40 \times 350) - \$1,500 = \$2,240 - \$1,500 = \mathbf{\$740}$$

Option 3 profit:

$$(\$10 \times 350) - 30\%(\$30 \times 350) = \$3,500 - \$3,150 = \mathbf{\$350}$$

Thus, **Option 1** is the most profitable choice.

- 6 Green Garden, Inc. manufactures and sells electric hedge trimmers for \$140 each. The variable costs per unit amount to \$90, while total monthly fixed costs are \$7,500. Current monthly sales revenue is \$56,000. The company is evaluating a proposal that would reduce the selling price by 12%, increase monthly fixed costs by 40%, and raise unit sales to 500 units per month.

Required:

- 1) Calculate the company's current break-even point in units and in dollars.
- 2) Determine the company's current margin of safety in units, dollars, and as a percentage.
- 3) Compute the company's margin of safety in units if the proposal is accepted.
- 4) Calculate the increase or decrease in profit if the proposal is accepted.

Answers

1. **Current break-even point:**

$$\text{Break-even units} = \$7,500 \div (\$140 - \$90) = \$7,500 \div \$50 = \mathbf{150 \text{ units}}$$

$$\text{Break-even sales (in dollars)} = 150 \times \$140 = \mathbf{\$21,000}$$

2. **Current margin of safety:**

$$\text{Units sold} = \$56,000 \div \$140 = \mathbf{400 \text{ units}}$$

$$\text{Margin of safety in units} = 400 - 150 = \mathbf{250 \text{ units}}$$

$$\text{Margin of safety in dollars} = \$56,000 - \$21,000 = \mathbf{\$35,000}$$

$$\text{Margin of safety ratio} = \$35,000 \div \$56,000 \approx \mathbf{62.5\%}$$

3. **Margin of safety with proposal:**

$$\text{New selling price} = \$140 - (12\% \times \$140) = \$140 - \$16.80 = \mathbf{\$123.20}$$

$$\text{New fixed costs} = \$7,500 + (40\% \times \$7,500) = \$7,500 + \$3,000 = \mathbf{\$10,500}$$

$$\text{New contribution margin per unit} = \$123.20 - \$90 = \mathbf{\$33.20}$$

$$\text{New break-even point} = \$10,500 \div \$33.20 \approx \mathbf{316 \text{ units}}$$

$$\text{Margin of safety} = 500 - 316 = \mathbf{184 \text{ units}}$$

4. **Profit impact of proposal:**

$$\text{Current profit} = [(\$140 - \$90) \times 400] - \$7,500 = (\$50 \times 400) - \$7,500 = \$20,000 - \$7,500 = \mathbf{\$12,500}$$

$$\text{New profit} = (\$33.20 \times 500) - \$10,500 = \$16,600 - \$10,500 = \mathbf{\$6,100}$$

$$\text{Change in profit} = \$6,100 - \$12,500 = \mathbf{\text{decrease of } \$6,400}.$$

- 7 Summit Company manufactures and sells garden furniture. Its current sales revenue is \$600,000. The company's accountant provided the following cost information:

Manufacturing costs: \$120,000 + 35% of sales

Selling costs: \$40,000 + 8% of sales

Administrative costs: \$50,000 + 12% of sales

Required:

- 1) Calculate the product's contribution margin ratio.
- 2) Compute the company's current net income.
- 3) Determine the product's break-even point in dollars.
- 4) Calculate the amount of revenue necessary to achieve a profit of \$75,000.
- 5) Compute the company's current margin of safety ratio.
- 6) Should the company accept a proposal that would increase sales by 15% and total fixed costs by 20%?

Answers:

1. **Contribution margin ratio:**

Total variable costs:

Manufacturing variable = $35\% \times \$600,000 = \$210,000$

Selling variable = $8\% \times \$600,000 = \$48,000$

Administrative variable = $12\% \times \$600,000 = \$72,000$

Total variable costs = $\$210,000 + \$48,000 + \$72,000 = \$330,000$

Total contribution margin = $\$600,000 - \$330,000 = \$270,000$

Contribution margin ratio = $\$270,000 \div \$600,000 = 45\%$

2. **Current net income:**

Total fixed costs = $\$120,000 + \$40,000 + \$50,000 = \$210,000$

Net income = $(\$600,000 \times 45\%) - \$210,000 = \$270,000 - \$210,000 = \$60,000$

3. **Break-even point in dollars:**

Break-even sales = $\$210,000 \div 45\% \approx \$466,667$

4. **Sales required for \$75,000 profit:**

Required sales = $(\$210,000 + \$75,000) \div 45\% = \$285,000 \div 45\% \approx \$633,333$

5. **Margin of safety ratio:**

Margin of safety = $(\$600,000 - \$466,667) \div \$600,000 \approx 22.2\%$

6. **Evaluation of the proposal:**

Sales increase = $15\% \times \$600,000 = \$90,000$

Additional contribution margin = $45\% \times \$90,000 = \$40,500$

Increase in fixed costs = $20\% \times \$210,000 = \$42,000$

Since the additional contribution margin (\$40,500) is less than the increase in fixed costs (\$42,000), **the company should not accept the proposal** because net income would decrease by **\$1,500**.

- 8 Lopez Company manufactures and sells a product with variable costs of \$60 and a selling price of \$100. Current monthly sales total \$320,000. Fixed manufacturing costs are \$50,000 per month and fixed selling and administrative costs are \$40,000 per month. The company is evaluating a proposal to increase the selling price by 8%, raise fixed manufacturing costs by 12%, and increase fixed selling and administrative costs by \$2,000.

Required:

- 1) Compute the company's current break-even point in units.
- 2) Compute the company's current net income and margin of safety in dollars.
- 3) Compute the break-even point in units assuming the proposal is accepted.
- 4) Compute the company's net income assuming the proposal is accepted and sales total 3,400 units. Should the proposal be accepted?

Answers

1. **Current break-even point in units:**

Total fixed costs = $\$50,000 + \$40,000 = \$90,000$

Contribution margin per unit = $\$100 - \$60 = \$40$

Break-even point = $\$90,000 \div \$40 = 2,250$ units

2. **Current net income and margin of safety:**

Units sold = $\$320,000 \div \$100 = 3,200$ units

Net income = $(3,200 \times \$40) - \$90,000 = \$128,000 - \$90,000 = \$38,000$

Margin of safety = $\$320,000 - (2,250 \times \$100) = \$320,000 - \$225,000 = \$95,000$

3. **New break-even point under the proposal:**

New selling price = $\$100 \times 1.08 = \108

New fixed manufacturing costs = $\$50,000 \times 1.12 = \$56,000$

New fixed selling and administrative costs = $\$40,000 + \$2,000 = \$42,000$

New total fixed costs = $\$56,000 + \$42,000 = \$98,000$

New contribution margin per unit = $\$108 - \$60 = \$48$

Break-even point = $\$98,000 \div \$48 \approx 2,042$ units

4. **Net income under the proposal:**

Net income = $(3,400 \times \$48) - \$98,000 = \$163,200 - \$98,000 = \$65,200$

Since net income would increase from **\$38,000** to **\$65,200**, the proposal should be accepted.

- 9 Denver Company incurs annual fixed costs of \$90,000. Variable costs are \$4.00 per unit, and the selling price is \$12 per unit. Denver aims to achieve an annual profit of \$75,000.

Required:

Use the contribution margin ratio approach to determine the required sales volume in both dollars and units to earn the desired profit.

Answers

Contribution margin ratio = $(\$12 - \$4) \div \$12 = 66.67\%$

Required sales in dollars = $(\$90,000 + \$75,000) \div 66.67\% = \$165,000 \div 0.6667 \approx \$247,505$

Required sales in units = $\$247,505 \div \$12 \approx 20,625$ units

- 10 Broadway Fashion Company manufactures and sells two lines of business jackets: the *Urban* and the *Executive*. The following monthly data are provided:

	Urban	Executive
Estimated unit sales per month	600 units	900 units
Selling price	\$220	\$190
Variable manufacturing costs	\$120	\$110
Variable selling and administrative costs	\$15	\$12

Budgeted net income is **\$55,000** per month.

Required:

- 1) Calculate the company's total fixed costs, the weighted-average contribution margin, and the break-even point in units and dollars for each product.

- 2) Determine the margin of safety in dollars.
- 3) Calculate the company's total contribution margin and budgeted net income if monthly sales are 800 Urban units and 800 Executive units.
- 4) Evaluate the effect on net income if 300 additional Urban jackets are sold instead of 300 Executive jackets.

Answers

1. **Total fixed costs, weighted-average contribution margin, and break-even point:**

Contribution margin per unit:

Urban = $\$220 - (\$120 + \$15) = \mathbf{\$85}$

Executive = $\$190 - (\$110 + \$12) = \mathbf{\$68}$

Total contribution margin:

$(600 \times \$85) + (900 \times \$68) = \$51,000 + \$61,200 = \mathbf{\$112,200}$

Total fixed costs:

Total contribution margin – Budgeted net income = $\$112,200 - \$55,000 = \mathbf{\$57,200}$

Sales mix: 600 Urban : 900 Executive = 2 : 3 parts → total 5 parts.

Weighted-average contribution margin:

$= [(2 \times \$85) + (3 \times \$68)] \div 5$

$= (\$170 + \$204) \div 5 = \$374 \div 5 = \mathbf{\$74.80}$

Break-even point in units:

$= \$57,200 \div \$74.80 \approx \mathbf{765 \text{ units}}$

Units by product:

Urban = $765 \times 2/5 \approx 306 \text{ units}$

Executive = $765 \times 3/5 \approx 459 \text{ units}$

Break-even sales in dollars:

Urban = $306 \times \$220 = \mathbf{\$67,320}$

Executive = $459 \times \$190 = \mathbf{\$87,210}$

2. **Margin of safety:**

Budgeted sales revenue = $(600 \times \$220) + (900 \times \$190)$

$= \$132,000 + \$171,000 = \mathbf{\$303,000}$

Break-even sales revenue = $\$67,320 + \$87,210 = \mathbf{\$154,530}$

Margin of safety = $\$303,000 - \$154,530 = \mathbf{\$148,470}$

3. **New contribution margin and net income (800 units each):**

Total contribution margin:

$(800 \times \$85) + (800 \times \$68) = \$68,000 + \$54,400 = \mathbf{\$122,400}$

Net income:

$= \$122,400 - \$57,200 = \mathbf{\$65,200}$

4. **Impact of selling 300 more Urban jackets instead of Executive:**

Additional Urban contribution margin: $300 \times \$85 = \mathbf{\$25,500}$

Lost Executive contribution margin: $300 \times \$68 = \mathbf{\$20,400}$

Net increase in income: $\$25,500 - \$20,400 = \mathbf{\$5,100}$

Thus, **net income would increase by \$5,100.**