

Cost Accounting, Cdn. Ed., 7e (Horngren)
Chapter 3 Cost-Volume-Profit Analysis

3.1 Identify the essential elements of cost-volume-profit analysis and calculate the break-even point (BEP).

1) The contribution margin is computed by deducting all costs which vary on the basis of an output-related cost driver from revenues.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 3-1

2) To perform cost-volume-profit analysis, a company must be able to separate costs into fixed and variable components.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

3) In CVP analysis, total costs can be separated into a fixed component that does not vary with output and a component that is variable with output level.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

4) Variable operating costs and fixed operating costs constitute total operating costs.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

5) CVP analysis assumes that total costs can be separated into the fixed component and variable component with respect to the level of output.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

6) CVP analysis requires the time value of money to be factored into formula when comparing revenues and costs.

Answer: FALSE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 3-1

7) CVP analysis assumes that the behaviour of total costs is non-linear.

Answer: FALSE

Explanation: Linearity is an assumption of CVP

Diff: 2 Type: TF

Skill: Remember

Objective: LO 3-1

8) In CVP analysis, an assumption is made that the total revenues are linear with respect to output units, but that total costs are non-linear with respect to output units.

Answer: FALSE

Explanation: In CVP analysis, an assumption is made that the total revenues and the total costs are non-linear with respect to output units.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 3-1

9) Total revenues less total fixed costs equal the contribution margin.

Answer: FALSE

Explanation: Total revenues less total variable costs equal the *contribution margin*.

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

10) In the graph method of CVP analysis, the break-even point is the (X-axis) quantity of units sold for which the total revenues line crosses the total costs line.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

11) A profit-volume graph shows the impact on operating income from changes in the output level.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

12) The contribution margin method of CVP analysis uses the equation: break-even units = unit contribution margin/fixed costs.

Answer: FALSE

Explanation: fixed costs/CM

Diff: 2 Type: TF

Skill: Remember

Objective: LO 3-1

13) The contribution margin method can be used to verify a break-even calculation.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

14) The total costs line includes all variable costs and all fixed costs when using the graph method of CVP analysis.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

15) In cost-volume-profit (CVP) analysis relevant costs include variable, fixed, and mixed costs.

Answer: FALSE

Explanation: All costs are classified as either fixed (FC) or variable (VC) with no mixed costs.

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-1

16) In cost-volume-profit analysis (CVP) it is assumed that both the product mix and the volume sold are dynamic variables.

Answer: FALSE

Explanation: Either the product sold or the product mix remains constant, although the volume changes.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 3-1

17) Cost-volume-profit analysis is useful for

A) helping managers to answer "what-if" questions.

B) implementing a differentiation strategy.

C) eliminating uncertainty about external factors, such as interest rates.

D) for long-range planning.

E) assigning costs to products.

Answer: A

Diff: 2 Type: MC

Skill: Remember

Objective: LO 3-1

18) Schuppener Company sells its only product for \$18 per unit; variable production costs are \$6 per unit, and variable selling and administrative costs are \$3 per unit; fixed costs for 10,000 units are \$10,000. The contribution margin is

- A) \$12 per unit.
- B) \$9 per unit.
- C) \$11 per unit.
- D) \$8 per unit.
- E) \$18 per unit.

Answer: B

Explanation: B) $\$18 - \$6 - \$3 = \9

Diff: 1 Type: MC

Skill: Apply

Objective: LO 3-1

19) Which of the following are necessary assumptions when using the contribution margin method of determining the break-even point?

- A) Average unit costs must be known.
- B) There must be an input-related cost driver.
- C) Fixed costs are irrelevant.
- D) Total variable cost must be known.
- E) Unit selling price and unit variable cost must be known.

Answer: E

Diff: 2 Type: MC

Skill: Remember

Objective: LO 3-1

20) At the break-even point of 200 units, variable costs total \$400 and fixed costs total \$600. The 201st unit sold will contribute _____ to profits.

- A) \$1
- B) \$2
- C) \$3
- D) \$5
- E) \$6

Answer: C

Explanation: C) $\$1,000 - \$400 - \$600 = 0$; Sales $(\$1,000/200)$ - Variable costs $(\$400/200) = \3 CM

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-1

21) Sales total \$200,000 when variable costs total \$150,000 and fixed costs total \$30,000. The break-even point in sales dollars is

- A) \$200,000.
- B) \$120,000.
- C) \$40,000.
- D) \$30,000.
- E) \$180,000.

Answer: B

Explanation: B) $(\$200,000 - \$150,000) / \$200,000 = 25\%$ CM%; $\$30,000 / 0.25 = \$120,000$ BE sales

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-1

22) Cost-volume profit is used to analyze

- A) the behaviour of some costs and revenues as changes occur in the output level.
- B) the behaviour of total costs, total revenues, and operating income as changes occur in the output level.
- C) a single revenue driver and multiple cost drivers in special case CVP.
- D) multiple revenue drivers and a single cost driver in special case CVP.
- E) the behaviour of variable costs at all levels of output.

Answer: B

Diff: 2 Type: MC

Skill: Remember

Objective: LO 3-1

23) Which of the following is an assumption of CVP analysis?

- A) Costs must be separated into separate fixed and variable components.
- B) Total revenues and total costs are curvilinear in relation to output units.
- C) Given revenue mixed of products is dynamic.
- D) There will be a change between beginning and ending levels of inventory.
- E) The time value of money must be taken into account.

Answer: A

Diff: 2 Type: MC

Skill: Remember

Objective: LO 3-1

24) Which of the following statements about contribution margin and gross margin in CVP analysis is TRUE?

- A) Contribution margin equals total revenue minus cost of goods sold.
- B) Contribution margin equals total revenue minus non-variable costs.
- C) Gross margin equals total revenue minus cost of goods sold.
- D) Service companies can compute a gross margin but not a contribution margin.
- E) Gross margin equals total revenue minus non-variable costs.

Answer: C

Diff: 2 Type: MC

Skill: Remember

Objective: LO 3-1, 2

25) The contribution income statement highlights

- A) gross margin.
- B) products costs and period costs.
- C) different product lines.
- D) variable and fixed costs.
- E) gross margin and net operating income.

Answer: D

Diff: 1 Type: MC

Skill: Remember

Objective: LO 3-1

Use the information below to answer the following question(s).

Franscioso Company sells several products. Information of average revenue and costs is as follows:

Selling price per unit	\$28.50
Variable costs per unit:	
Direct material	\$5.25
Direct manufacturing labor	\$1.15
Manufacturing overhead	\$0.25
Selling costs	\$1.85
Annual fixed costs	\$110,000

26) The Franscioso Company contribution margin ratio is

- A) 1.102:1.
- B) 1.425:1.
- C) 0.298:1.
- D) 0.637:1.
- E) 0.702:1.

Answer: E

Explanation: E) $(\$28.50 - \$5.25 - \$1.15 - \$0.25 - \$1.85)/\$28.50 = 0.702:1$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-1

27) The Franscioso Company break-even in sales dollars is

- A) \$99,819.
- B) \$77,193.
- C) \$369,128.
- D) \$172,684.
- E) \$156,695.

Answer: E

Explanation: E) $(\$28.50 - \$5.25 - \$1.15 - \$0.25 - \$1.85)/\$28.50 = 0.702:1$
 $\$110,000/0.702 = \$156,695.16$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-1

- 28) The break-even point in CVP analysis is defined as the point
- A) where output units equal input units.
 - B) where total revenue equals fixed costs.
 - C) where revenues less variable costs equal operating income.
 - D) where the unit contribution margin equals the selling price less the unit variable cost.
 - E) where total revenue equals total costs.

Answer: E

Diff: 1 Type: MC

Skill: Remember

Objective: LO 3-1

- 29) If unit sales exceed the break-even point when using the graph method
- A) there is a loss because the total cost line exceeds the total revenue line.
 - B) total sales exceed total costs.
 - C) there is a profit because the total cost line exceeds the total revenue line.
 - D) expenses are extremely high relative to revenues.
 - E) operating income is negative (an operating loss).

Answer: B

Diff: 2 Type: MC

Skill: Understand

Objective: LO 3-1

Use the information below to answer the following question(s).

Jill Bishop makes homemade soap. She sells it for \$100 a case. Her variable costs are \$40 per case. She has fixed costs of \$600.

- 30) What is the break-even point in cases?
- A) 6 cases
 - B) 10 cases
 - C) 15 cases
 - D) 20 cases
 - E) 100 cases

Answer: B

Explanation: B) $Q = \$600 / (\$100 - \$40) = 10$ cases

Diff: 1 Type: MC

Skill: Apply

Objective: LO 3-1

31) What is the contribution margin per case?

- A) \$100.00
- B) \$60.00
- C) \$40.00
- D) \$15.00
- E) \$10.00

Answer: B

Explanation: B) $\$100 - \$40 = \$60$ per case

Diff: 1 Type: MC

Skill: Apply

Objective: LO 3-1

32) Ben's Custom Golf sells special clubs. Ben is able to purchase equipment from a manufacturing company for \$100 each. The equipment is sold for \$150 each.

Required:

- a. What is the break-even in units assuming Ben incurred \$2,500 in selling expenses, and there were no other expenses?
- b. What would be the break-even in units assuming Ben incurred \$2,500 in selling expenses and had \$10,000 in other fixed expenses?

Answer:

- a. N = Break-even units

$$\$150N - \$100N - \$2,500 = 0$$

$$\$50N - \$2,500 = 0$$

$$N = \$2,500 / \$50$$

$$N = 50 \text{ units}$$

- b. N = Break-even units

$$\$150N - \$100N - \$2,500 - \$10,000 = 0$$

$$\$50N - \$12,500 = 0$$

$$N = \$12,500 / \$50$$

$$N = 250 \text{ units}$$

Diff: 1 Type: ES

Skill: Apply

Objective: LO 3-1

33) What is meant by the term break-even point? Why should a manager be concerned about the break-even point?

Answer: The break-even point is the level of production and sales at which total revenues equal total costs. Managers should be concerned about the break-even point because it helps determine when a business venture will be profitable. Break-even point shows a company how far sales can decline before a net loss will be incurred. It helps to assess the risk of loss.

Diff: 2 Type: ES

Skill: Understand

Objective: LO 3-1

34) Explain when a manager would use cost-volume-profit analysis and sensitivity analysis.

Answer: Cost-volume-profit analysis is helpful for evaluating the profit impact of management decisions that affect production and sales volume.

Sensitivity analysis is helpful for identifying those estimates most critical for a decision.

Diff: 2 Type: ES

Skill: Remember

Objective: LO 3-1

35) List the assumptions required to identify relevant information in cost-volume-profit analysis.

Answer: The following assumptions identify relevant information required to complete a CVP analysis:

Changes in the sales volume and production (or purchase) volume are identical (purchase volume would apply to a merchandiser). The ending balances in all inventories are zero. Everything purchased is used in production; everything produced is sold. For a merchandiser, the sales volume of finished goods purchased for resale is identical to the sales volume sold.

All costs are classified as either fixed (FC) or variable (VC) with no mixed costs. The fixed costs include *both* manufacturing *and* non-manufacturing fixed costs. The total variable costs include both manufacturing and non-manufacturing variable costs.

All cost behaviour is linear (a straight line) within the relevant volume range.

The sales price per unit, variable costs per unit, and total fixed costs and sales (or production) volume are known. The MIS provides all of this information.

Either the product sold or the product mix remains constant, although the volume changes.

All revenue and costs can be calculated and compared without considering the timevalue of money.

Diff: 3 Type: ES

Skill: Remember

Objective: LO 3-1

3.2 Apply the CVP model to calculate a target operating profit before interest and tax.

1) How many units would have to be sold to yield a target operating income of \$22,000, assuming variable costs are \$15 per unit, total fixed costs are \$2,000, and the unit selling price is \$20?

A) 4,800 units

B) 4,400 units

C) 4,000 units

D) 3,600 units

E) 1,600 units

Answer: A

Explanation: A) $(\$2,000 + \$22,000)/(\$20 - \$15) = 4,800$ units

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-2

2) What is the break-even point in units for a product line, assuming a unit selling price of \$200, total fixed costs are \$4,000, unit variable costs are \$40, and target operating income is \$16,000,000?

- A) 25 units
- B) 75 units
- C) 100 units
- D) 125 units
- E) 100,000 units

Answer: A

Explanation: A) $Q = \$4000 / (\$200 - \$40) = 25$ units

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-2

3) What is the break-even point in units, assuming a product's selling price is \$100, fixed costs are \$8,000, unit variable costs are \$20, and operating income is \$32,000?

- A) 100 units
- B) 300 units
- C) 400 units
- D) 500 units
- E) 600 units

Answer: A

Explanation: A) $\$100N - \$20N - \$8,000 = 0$; $\$80N = \$8,000$; $N = 100$ units

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-2

4) What would target operating income be when fixed costs equal \$6,000, unit contribution margin equals \$40.00, and the number of units equals 400?

- A) \$6,000
- B) \$10,000
- C) \$16,000
- D) \$20,000
- E) \$60,000

Answer: B

Explanation: B) $400 = (\$6000 + \text{TOI}) / \40 ; $\text{TOI} = \$10,000$

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-2

5) How many units would have to be sold to yield a target income of \$11,000 assuming variable costs are \$30 per unit, total fixed costs are \$1,000, and the unit selling price is \$40?

- A) 1,200 units
- B) 1,100 units
- C) 1,000 units
- D) 900 units
- E) 300 units

Answer: A

Explanation: A) $Q = (\$1000 + \$11,000)/(\$40 - \$30) = 1,200$ units

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-2

6) Which of the following statements about using the equation method to determine the break-even point is TRUE?

- A) Operating income in the equation is set equal to the target income for the year.
- B) Operating income in the equation assumes that fixed costs are nil.
- C) Revenue in the equation includes only operating revenues plus fixed costs.
- D) The number of units required to reach the break-even point tends to be higher (as it incorporates total costs) using this method than when using the contribution margin method.
- E) Operating income in the equation is set equal to nil.

Answer: E

Diff: 1 Type: MC

Skill: Remember

Objective: LO 3-2

7) Which of the following formulae is correct when using the contribution margin method to determine the break-even point?

- A) Revenues less operating income equal variable costs plus fixed costs.
- B) Unit contribution margin times unit variable cost equals the break-even number of units.
- C) Unit contribution margin times the break-even number of units equals total variable costs.
- D) Selling price less unit contribution margin equals unit fixed cost for all values below or at the break-even number of units.
- E) Unit contribution margin times the break-even number of units equals fixed costs.

Answer: E

Diff: 2 Type: MC

Skill: Remember

Objective: LO 3-2

Answer the following question(s) using the information below.

Kaiser's Kraft Korner sells a single product. 7,000 units were sold resulting in \$70,000 of sales revenue, \$28,000 of variable costs, and \$12,000 of fixed costs.

8) Contribution margin per unit is

- A) \$4.00
- B) \$4.29
- C) \$6.00
- D) \$10.00
- E) \$5.71

Answer: C

Explanation: C) $(\$70,000 - \$28,000) / 7,000 \text{ units} = \6 per unit

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-1, 2

9) Break-even point in units is

- A) 2,000 units.
- B) 3,000 units.
- C) 5,000 units.
- D) 7,000 units.
- E) 2,797 units.

Answer: A

Explanation: A) $\$10X - \$4X - \$12,000 = 0$; $X = 2,000 \text{ units}$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-1, 2

10) The number of units that must be sold to achieve \$60,000 of operating income is

- A) 10,000 units.
- B) 11,666 units.
- C) 15,000 units.
- D) 18,000 units.
- E) 12,000 units.

Answer: E

Explanation: E) $10X - 4X - 12,000 = 60,000$; $X = 12,000 \text{ units}$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-2

11) If sales increase by \$25,000, operating income will increase by

A) \$10,000.

B) \$15,000.

C) \$22,200.

D) \$12,500.

E) \$8,000.

Answer: B

Explanation: B) $[(\$70,000 - \$28,000)/\$70,000] \times \$25,000 = \$15,000$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-2

12) Following is the Becker Company Ltd. partial income statement for the most recent year:

Becker Company Ltd.
Partial Income Statement
Most Recent Year

Sales		\$ 1,190,000
Cost of goods sold		<u>476,000</u>
Gross margin		\$ 714,000
Less operating expenses:		
Fixed	\$39,000	
Variable	<u>357,000</u>	<u>396,000</u>
Operating income		<u>\$ 318,000</u>

What would the Becker Company sales have to be in order for the company to have an operating income of \$500,000?

A) \$1,796,667

B) \$2,001,988

C) \$1,372,000

D) \$1,411,000

E) \$1,567,824

Answer: A

Explanation: A) $CM\% = (\$1,190,000 - \$476,000 - \$357,000)/\$1,190,000 = 30\%$

$(\$39,000 + \$500,000)/0.3 = \$1,796,667$

Diff: 3 Type: MC

Skill: Analyze

Objective: LO 3-2

13) Berhannan's Cellular sells phones for \$100. The unit variable cost per phone is \$50 plus a selling commission of 10%. Fixed manufacturing costs total \$1,250 per month, while fixed selling and administrative costs total \$2,500.

Required:

- a. What is the contribution margin per phone?
- b. What is the break-even point in phones?
- c. How many phones must be sold to earn pre-tax income of \$7,500?

Answer:

- a. CM per phone = $\$100 - \$50 - 0.1(\$100) = \40
- b. N = Break-even in phones
 $\$100N - \$50N - \$10N - \$1,250 - \$2,500 = 0$
 $\$40N - \$3,750 = 0$
 $N = \$3,750/\$40 = 93.75$ phones
Break-even is 94 phones
- c. N = Phones to be sold
 $\$100N - \$50N - \$10N - \$1,250 - \$2,500 = \$7,500$
 $\$40N = \$11,250$
 $N = \$11,250/\$40 = 281.25$ phones
282 phones must be sold

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-2

14) Gilley Inc., sells a single product. The company's most recent income statement is given below.

Sales (4,000 units)	\$120,000
Less variable expenses	<u>(68,000)</u>
Contribution margin	52,000
Less fixed expenses	<u>(40,000)</u>
Net income	<u>\$12,000</u>

Required:

- Contribution margin per unit is \$ _____
- If sales are doubled to \$240,000,
total variable costs will equal \$ _____
- If sales are doubled to \$240,000,
total fixed costs will equal \$ _____
- If 10 more units are sold, profits will increase by \$ _____
- Compute how many units must be sold to break-even. # _____
- Compute how many units must be sold
to achieve profits of \$20,000. # _____

Answer:

- Contribution margin per unit is $\$30 - \$17 = \$13$
- $\$68,000 \times 2 = \$136,000$
- $\$40,000$
- Contribution margin of $\$13 \times 10 \text{ units} = \130
- Fixed costs of $\$40,000 / \text{Contribution margin per unit } \$13 = 3,077 \text{ units}$
- $(\text{Fixed costs of } \$40,000 + \text{Profits } \$20,000) / \text{CM per unit } \$13 = 4,616 \text{ units}$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-1, 2

15) Blankinship, Inc., sells a single product. The company's most recent income statement is given below.

Sales	\$200,000
Less variable expenses	<u>(120,000)</u>
Contribution margin	80,000
Less fixed expenses	<u>(50,000)</u>
Net income	<u>\$30,000</u>

Required:

- a. Contribution margin ratio is _____ %
- b. Break-even point in total sales dollars is \$ _____
- c. To achieve \$40,000 in operating income, sales must total \$ _____
- d. If sales increase by \$50,000, net income will increase by \$ _____

Answer:

- a. Contribution margin ratio is $\$80,000/\$200,000 = 40\%$
- b. Fixed costs $\$50,000/0.40 \text{ CM}\% = \$125,000$ in sales
- c. $[\text{Fixed costs } \$50,000 + \text{Operating income } \$40,000]/0.40 \text{ CM}\% = \$225,000$ in sales
- d. $\$50,000 \times 0.40 \text{ CM}\% = \$20,000$ increase in net income

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-1, 2

16) Black Pearl, Inc., sells a single product. The company's most recent income statement is given below.

Sales	\$50,000
Less variable expenses	<u>(30,000)</u>
Contribution margin	20,000
Less fixed expenses	<u>(12,500)</u>
Net income	<u>\$ 7,500</u>

Required:

- a. Contribution margin ratio is _____ %
- b. Breakeven point in total sales dollars is \$ _____
- c. To achieve \$40,000 in net income, sales must total \$ _____
- d. If sales increase by \$50,000, net income will increase by \$ _____

Answer:

- a. Contribution margin ratio is $\$20,000/\$50,000 = 40\%$
- b. Fixed costs $\$12,500/0.40 \text{ CM}\% = \$31,250$ in sales
- c. $[\text{Fixed costs } \$12,500 + \text{Net income } \$40,000]/0.40 \text{ CM}\% = \$131,250$ in sales
- d. $\$50,000 \times 0.40 \text{ CM}\% = \$20,000$ increase in net income

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-1, 2

17) Symbol Manufacturing Inc. makes component parts for automobile navigation systems. For component A14 direct materials cost \$47, and the assembly technicians are paid \$42 per hour. A technician can produce two components per hour. Fixed manufacturing costs for A14 are \$70,000 per unit based on current production of 12,000 units. Non-manufacturing costs are fixed at \$120,000 per period. Each A14 component sells for \$195.

Required:

- Prepare an income statement in gross margin format.
- Calculate the dollar sales required to generate an operating profit of \$1,500,000 and prepare an income statement in contribution margin format.
- What actions could Symbol Manufacturing Inc. management take to lower the required number of units sold necessary to generate the desired operating profit?

Answer:

a.	Revenue (12,000 × \$195)	\$ 2,340,000
	Cost of goods sold:	
	Materials (12,000 × \$47)	\$564,000
	Direct labour (12,000 × (\$42/2))	252,000
	Fixed manufacturing costs	<u>840,000</u>
	Cost of goods sold	<u>1,656,000</u>
	Gross margin	\$ 684,000
	Fixed non-manufacturing costs	<u>120,000</u>
	Net operating profit	<u>\$ 564,000</u>

- $$\text{CM ratio} = (\$2,340,000 - \$564,000 - \$252,000) / \$2,340,000 = 65.13\%$$

$$(\$840,000 + \$120,000 + \$1,500,000) / 0.6513 = \$3,777,061.26$$

$$\# \text{ of units required} = \$3,777,061.26 / \$195 \text{ per unit} = 19,370 \text{ units (rounded up)}$$

	Revenue (19,370 × \$195)	\$ 3,777,150
	Variable costs:	
	Materials (19,370 × \$47)	\$910,390
	Direct labour (19,370 × (\$42/2))	<u>406,770</u>
	Contribution margin	<u>1,317,160</u>
		\$ 2,459,990
	Fixed costs:	
	Fixed manufacturing costs	840,000
	Fixed non-manufacturing costs	<u>120,000</u>
	Net operating profit	<u>960,000</u>
		<u>\$ 1,499,990</u>

- The management could evaluate a number of options based on increasing the per unit revenue and decreasing costs both variable and fixed.

Diff: 3 Type: ES

Skill: Analyze

Objective: LO 2-3 and 3-2

3.3 Distinguish among contribution, gross, operating, and net income margins, and apply the CVP model to calculate target net income.

1) An increase in the tax rate will increase the break-even point.

Answer: FALSE

Explanation: A change in the tax rate will not change the break-even point.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 3-3

2) When making net income evaluations, CVP calculations for target income must be stated in terms of target operating income instead of target net income.

Answer: FALSE

Explanation: Target net income must be used as income taxes will reduce the operating income.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 3-3

3) If planned net income is \$21,000 and the tax rate is 30%, then planned operating income would be \$27,300.

Answer: FALSE

Explanation: If planned net income is \$21,000 and the tax rate is 30%, then planned operating income would be \$30,000 [$\$21,000 / (1.0 - .3) = \$30,000$].

Diff: 2 Type: TF

Skill: Apply

Objective: LO 3-3

4) Target net income is computed by multiplying operating income by one minus the entity's tax rate, or by multiplying operating income by the tax rate, and subtracting that amount from operating income.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 3-3

5) Operating margin is the same as gross margin in CVP analysis.

Answer: FALSE

Explanation: Operating margin has the same meaning as operating income. It is the result of deducting all business function costs from revenue. Neither interest nor tax expense is considered a business function cost.

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-3

6) Operating income is equal to net income plus income taxes.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 3-3

7) Revenues less all costs that vary with respect to an output level is the gross margin.

Answer: FALSE

Explanation: Operating margin has the same meaning as operating income. It is the result of deducting all business function costs from revenue. Neither interest nor tax expense is considered a business function cost.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 3-3

8) The gross margin is revenue minus all variable manufacturing costs.

Answer: FALSE

Explanation: The gross margin is revenue minus cost of goods sold, which includes both fixed and variable manufacturing costs.

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-3

Use the information below to answer the following question(s).

Brian O'Neil intends to sell his customers a special round-trip airline ticket package. He is able to purchase the package from the airline carrier for \$400 each. The airline intends to reimburse Brian for any unsold ticket packages. The round-trip tickets will be sold for \$500 each. Brian has a tax rate of 30% on his business income.

9) How many units will he need to sell in order to break-even assuming Brian incurred \$10,000 in expenses to advertise the sale, and there are no other expenses?

A) 20 packages

B) 25 packages

C) 75 packages

D) 100 packages

E) 125 packages

Answer: D

Explanation: D) $Q = \$10,000 / (\$500 - \$400) = 100$ packages

Diff: 1 Type: MC

Skill: Apply

Objective: LO 3-1, 3

10) What would his break-even point be assuming Brian incurred \$31,200 in fixed expenses?

- A) 312 packages
- B) 232 packages
- C) 125 packages
- D) 110 packages
- E) 100 packages

Answer: A

Explanation: A) $Q = \$31,200 / (\$500 - \$400) = 312$ packages

Diff: 1 Type: MC

Skill: Apply

Objective: LO 3-1, 3

11) What is the dollar amount of sales required for Brian to earn an after-tax profit of \$7,000 if fixed costs are \$10,000?

- A) \$17,000
- B) \$50,000
- C) \$70,588
- D) \$85,000
- E) \$100,000

Answer: E

Explanation: E) Pre-tax profit = $\$7,000 / (1 - 0.30) = \$10,000$

$(\$10,000 + \$10,000) / (\$500 - \$400) = 200$ packages

$\$200 \text{ packages} \times \$500 \text{ per package} = \$100,000$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-3

Answer the following question(s) using the information below.

Stephanie's Bridal Shoppe sells wedding dresses. The average selling price of each dress is \$1,000, variable costs are \$400, and fixed costs are \$90,000.

12) What is the Bridal Shoppe's operating income when 200 dresses are sold?

- A) \$120,000
- B) \$80,000
- C) \$200,000
- D) \$100,000
- E) \$30,000

Answer: E

Explanation: E) $200(\$1,000) - 200(\$400) - \$90,000 = \$30,000$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-3

13) How many dresses are sold when operating income is zero?

- A) 225 dresses
- B) 150 dresses
- C) 100 dresses
- D) 90 dresses
- E) 60 dresses

Answer: B

Explanation: B) $\$1,000N - \$400N - \$90,000 = 0$; $\$600N = \$90,000$; $N = 150$ dresses

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-3

14) How many dresses must the Bridal Shoppe sell to yield after-tax net income of \$18,000, assuming the tax rate is 40%?

- A) 180 dresses
- B) 170 dresses
- C) 150 dresses
- D) 200 dresses
- E) 270 dresses

Answer: D

Explanation: D) $\$1,000N - \$400N - \$90,000 = \$18,000 / (1 - 0.4)$; $\$600N - \$90,000 = \$30,000$; $N = 200$ units

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-3

15) To determine the effect of income tax on a CVP calculation, managers should consider

- A) target operating income.
- B) contribution margin.
- C) tax as a variable expense in determining contribution margin.
- D) selling price.
- E) target net income.

Answer: E

Diff: 1 Type: MC

Skill: Understand

Objective: LO 3-3

16) If the tax rate is t , it is possible to calculate planned operating income by

- A) dividing net operating income by t .
- B) dividing net operating income by $1 - t$.
- C) multiplying net operating income by t .
- D) multiplying net operating income by $1 - t$.
- E) dividing net operating income by $t - 1$.

Answer: B

Diff: 2 Type: MC

Skill: Remember

Objective: LO 3-3

17) Information Inc., sells accounting software. Each unit's cost may be separated as follows: selling price of \$100 and variable costs of \$30. Fixed costs are \$10,000.

What is Information Inc.'s operating income assuming 1,000 units are sold?

- A) \$100,000
- B) \$90,000
- C) \$60,000
- D) \$40,000
- E) \$20,000

Answer: C

Explanation: C) $1,000 (\$100 - \$30) - \$10,000 = \$60,000$

Diff: 1 Type: MC

Skill: Apply

Objective: LO 3-3

18) Operating costs include

- A) interest costs.
- B) income taxes.
- C) only cost of goods sold.
- D) all fixed and variable costs.
- E) operating expenses and cost of goods sold.

Answer: E

Diff: 2 Type: MC

Skill: Remember

Objective: LO 3-3

19) Comparing contribution margin [CM] to gross margin [GM], which of the following is TRUE?

- A) If Cost of goods sold includes fixed costs, then CM will exceed GM.
- B) If Cost of goods sold does not include any fixed costs, then CM will equal GM.
- C) In the merchandising sector, CM and GM are equivalent terms.
- D) If CM and GM remain constant from one period to the next, operating income has to remain constant as well.
- E) CM is computed after all variable costs are deducted, but GM is computed by deducting only cost of goods sold from revenues.

Answer: E

Diff: 2 Type: MC

Skill: Understand

Objective: LO 3-3

20) Which of the following statements about net income (NI) is TRUE?

- A) $NI = \text{operating income} - \text{income taxes}$
- B) $NI = \text{operating income} + \text{operating costs}$
- C) $NI = \text{operating income} + \text{non-operating revenues less non-operating costs}$
- D) $NI = \text{operating income less Cost of Goods Sold}$
- E) $NI = \text{operating revenue less Cost of Goods Sold}$

Answer: A

Diff: 1 Type: MC

Skill: Remember

Objective: LO 3-3

- 21) Gross margin in a merchandising organization is considered to be
- A) the same as the contribution margin.
 - B) all revenues less costs which do not change with respect to an output-related driver.
 - C) all revenues less cost of goods sold.
 - D) all revenues plus costs which change with respect to an output-related driver.
 - E) all revenues.

Answer: C

Diff: 1 Type: MC

Skill: Remember

Objective: LO 3-3

22) Gates Rubber Company sells cases of hydraulic hoses for \$80. The unit variable costs per case are \$40 plus a selling commission of 10 percent of sales. Fixed manufacturing costs total \$1,000 per month, while fixed selling and administrative costs total \$2,000. The company has a tax rate of 40%.

Required:

- a. What is the contribution margin per case?
- b. What is the break-even point in cases?
- c. How many cases must be sold to earn pre-tax profit of \$6,000?
- d. How many cases must be sold to earn an after-tax income of \$6,000?

Answer:

a. $CM \text{ per case} = \$80 - \$40 - 0.1(\$80) = \32

- b. $N = \text{Break-even in cases}$

$$\$80N - \$40N - \$8N - \$1,000 - \$2,000 = 0$$

$$\$32N - \$3,000 = 0$$

$$N = \$3,000/\$32$$

$$N = 93.75 \text{ cases}$$

- c. $N = \text{Cases to be sold}$

$$\$80N - \$40N - \$8N - \$1,000 - \$2,000 - \$6,000 = 0$$

$$\$32N - \$9,000 = 0$$

$$N = \$9,000/\$32$$

$$N = 281.25 \text{ cases}$$

- d. $N = \text{Cases to be sold}$

$$\$80N - \$40N - \$8N - \$1,000 - \$2,000 - [\$6,000/(1-0.40)] = 0$$

$$\$32N - \$13,000 = 0$$

$$N = \$13,000/\$32$$

$$N = 406.25 \text{ cases}$$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-1, 2, 3

23) Widget Company sells widgets for \$20.00 each. The manufacturing costs, all variable, are \$6 each. The company is planning on renting an exhibition booth, for both display and selling purposes, at the annual candy convention. The company's sales manager will earn a vacation bonus if she can earn a target net income of \$150,000, for the sales operation at the convention. The convention organizers provide the advertising and guarantee a certain level of traffic, in exchange for 15% of the net income. The 15% surcharge operates like a tax on net income. The company absorbs all of the fixed costs of production for the sales made at the convention.

How many widgets does the sales manager have to sell to earn the vacation bonus?

Answer: $\$20Q - \$6Q - 0 = [\$150,000 \div (1 - 0.15)]$

$\$14Q = \$176,470.59$

$Q = 12,605$ units

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-3

24) The Holiday Card Company, a producer of specialty cards, has asked you to complete several calculations based upon the following information:

Income tax rate	30%
Selling price per unit	\$6.60
Variable cost per unit	\$5.28
Total fixed costs	\$46,200.00

Required:

- What is the break-even point in cards?
- What sales volume is needed to earn an after-tax net income of \$13,028.40?
- How many cards must be sold to earn an after-tax net income of \$18,480?

Answer:

a. $\$46,200 / (\$6.60 - \$5.28) = 35,000$ units

b. $\$13,028.40 / 0.70 = \$18,612$
 $\$18,612 + \$46,200 = \$64,812$
 $\$64,812 / \$1.32 = 49,100$ units
 $49,100 \text{ units} \times \$6.60 = \$324,060$

c. $\$18,480 / 0.70 = \$26,400$
 $\$26,400 + \$46,200 = \$72,600$
 $\$72,600 / \$1.32 = 55,000$ units

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-3

25) Heady Company sells headbands to retailers for \$5. The variable cost of goods sold per headband is \$1, with a selling commission of 10 percent of sales. Fixed manufacturing costs total \$25,000 per month, while fixed selling and administrative costs total \$10,500. The income tax rate for Heady Company is 30 percent.

Required:

- What is the break-even point in headbands?
- What are target sales in headbands to generate a before-tax income of \$3,000?
- What are target sales in headbands to generate an after-tax income of \$3,080?
- What is net income assuming Heady sells total 15,000 headbands?

Answer:

- N = Break-even

$$\$5N - \$1N - \$5(0.10)N - \$25,000 - \$10,500 = 0$$

$$\$3.50N - \$35,500 = 0$$

$$N = \$35,500 / \$3.50$$

$$N = 10,143 \text{ headbands}$$

- N = Target units

$$\$5N - \$1N - \$5(0.10)N - \$25,000 - \$10,500 - \$3,000 = 0$$

$$\$3.50 - \$38,500 = 0$$

$$N = \$38,500 / \$3.50$$

$$N = 11,000 \text{ headbands}$$

- N = Target units

$$\$5N - \$1N - \$5(0.1)N - \$25,000 - \$10,500 - \$3,080 / 0.7 = 0$$

$$\$3.50N - \$35,500 - \$4,400 = 0$$

$$N = \$39,900 / \$3.50$$

$$N = 11,400 \text{ headbands}$$

-

Sales (5 × 15,000)		\$75,000
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Variable costs:

Manufacturing (1 × 15,000)	\$15,000	
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Selling (5 × 15,000 × 0.10)	<u>7,500</u>	<u>22,500</u>
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Contribution margin		\$52,500
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Fixed:

Manufacturing	\$25,000	
---------------	----------	--

Selling and administrative	<u>10,500</u>	<u>35,500</u>
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Operating income		\$17,000
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Income taxes (17,000 × 0.30)		<u>5,100</u>
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Net income		<u>\$11,900</u>
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Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-3

26) Stephanie's Stuffed Animals reported the following:

Revenues	\$1,000
Variable manufacturing costs	\$200
Variable nonmanufacturing costs	\$230
Fixed manufacturing costs	\$150
Fixed nonmanufacturing costs	\$140

Required:

- Compute contribution margin.
- Compute gross margin.
- Compute operating income.

Answer:

- Contribution margin $\$1,000 - \$200 - \$230 = \570
- Gross margin $\$1,000 - \$200 - \$150 = \650
- Operating income $\$1,000 - \$200 - \$230 - \$150 - \$140 = \280

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-3

27) Arthur's Plumbing reported the following:

Revenues	\$4,500
Variable manufacturing costs	\$900
Variable nonmanufacturing costs	\$810
Fixed manufacturing costs	\$630
Fixed nonmanufacturing costs	\$545

Required:

- Compute contribution margin.
- Compute contribution margin percentage.
- Compute gross margin.
- Compute gross margin percentage.
- Compute operating income.

Answer:

- Contribution margin $\$4,500 - \$900 - \$810 = \$2,790$
- Contribution margin percentage $= (\$2,790 / \$4,500) \times 100 = 62\%$
- Gross margin $\$4,500 - \$900 - \$630 = \$2,970$
- Gross margin percentage $= (\$2,970 / \$4,500) \times 100 = 66\%$
- Operating income $\$4,500 - \$900 - \$810 - \$630 - \$545 = \$1,615$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-3

28) Big Ben Golf Accessories makes novelty electronic equipment for golf enthusiasts. One of their most popular accessories is the "Putting Magician." This electronic device analyses puts and provides instruction on the direction and pace of a put. Although not allowed under the rules amateur golfers have purchased or received as a gift 17,300 of these last year from a total production of 18,000 units. The recommended retail price is \$139 and the wholesale price received by Big Ben Golf Accessories is \$90.

The company's variable production costs are \$62 per unit. Per unit fixed manufacturing costs are \$7. Other fixed costs are \$65,000 for rent; \$290,000 in salaries; \$75,000 for a product endorsement. The tax rate is 25%.

Required:

- a. How many units must be sold to breakeven?
- b. What is the amount of sales in dollars required to earn an after-tax profit of \$300,000?

Answer:

- a. Breakeven in units

$$CM = \$90 - \$62 = \$28$$

$$BE \text{ in units} = [(18,000 \text{ units} \times \$7) + \$65,000 + \$290,000 + \$75,000] / \$28 \text{ per unit} = 19,857 \text{ units}$$

- b. Sales \$ required for after-tax profit of \$250,000

$$\text{Pre-tax income} = \$300,000 / (1 - 0.25) = \$400,000$$

$$CM \text{ ratio} = \$28 / \$90 = 0.31111$$

$$\begin{aligned} \text{Sales required} &= [(18,000 \text{ units} \times \$7) + \$65,000 + \$290,000 + \$75,000 + \$400,000] / 0.3111 \\ &= \$3,072,967 \end{aligned}$$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-1, 3

29) The parent group of the local university football team organizes an end of training camp bar-b-que dinner each year. The 110 player roster and 12 coaches eat for free, and ticket sales are used along with a fixed amount subsidy to fund the event. Last season 250 meals were produced and served. The following financial statement was prepared by one of the team parents:

Revenue:	
Ticket sales	\$ 1,280
Subsidy	3,000
Expenditures:	
Food	3,750
Supplies	300
Fuel	125
Bar-b-que rental	<u>500</u>
Surplus/(deficit)*	<u>\$ (395)</u>

* The deficit was covered by a one-time donation from a parent whose son graduated and is consequently no longer on this years team.

Required:

Calculate the price per ticket that must be charged to breakeven based on the following assumptions:

-the number of players and coaches meals remain the same, but the number of meals sold increases by 20

-the fixed costs are the same as last year

-the variable costs per unit are the same as last year

-the subsidy will remain at \$3,000

Answer: Number of paid meals = $(250 + 20) - (110 + 12) = 148$

Variable unit cost last year = $(\$3,750 + \$300 + \$125)/250 = \16.70 per meal

Price per ticket = X:

$0 = 148X - (-\$3,000 + (270 \times \$16.70) + \$500)$

$X = \$13.57$ per meal

Diff: 3 Type: ES

Skill: Analyze

Objective: LO 3-3

30) Better Battery has been in the battery renewal business for four years. It rents a building but owns all of its equipment. All employees are paid a fixed salary except for the busy season (April - June), when temporary help is hired by the hour. Utilities and other operating charges remain fairly constant during each month, except those in the busy season.

Selling prices per battery average \$100, except during the busy season. Because a large number of customers buy batteries prior to winter, discounts run above average during the busy season. A 15 percent discount is given when two batteries are purchased at one time. During the busy months selling prices per battery average \$90.

The president of Better Battery is somewhat displeased with the company's management accounting system because the cost behaviour pattern displayed by the monthly break-even charts are inconsistent; the busy month's charts are different from the other months of the year. The president is never sure if the company has a satisfactory margin of safety or if it is just above the break-even point.

Required:

- a. What is wrong with the accountant's computations?
- b. How can the information be presented in a better format for the president?

Answer:

- a. The accounting system includes some assumptions about the CVP model that don't hold for Better Battery. The CVP model requires cost and revenue to be linear. During the busy months the company has cost and revenue which behave differently than during the other months of the year. The revenue line turns down (less slope) with the average selling price per battery decreasing from \$100 to \$90. The variable costs line probably turns upward (increasing slope) with the additional hourly workers being added to the work force.
- b. The accountant may want to present two sets of information regarding the revenue and cost behaviour of the company; one for the busy season and one for the other months of the year. It would show that while the break-even point actually increases during the busy months (a negative), the marginal income increases because of increased sales (a positive).

Diff: 2 Type: ES

Skill: Understand

Objective: LO 3-1, 3

3.4 Apply the CVP model in decision making and explain how sensitivity analysis can help managers both identify and manage risk.

1) Sensitivity analysis may be used to determine how a result will change if the original data are changed or if the original results are not achieved.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-4

2) Margin of safety measures the difference between budgeted or actual revenues, and break-even revenues.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-4

3) Sensitivity analysis is a "what-if" technique that managers use to examine how a result will change if the originally predicted data are not achieved or if an underlying assumption changes.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-4

4) Companies with a greater proportion of fixed costs have a greater risk of loss from changes in demand than companies with a greater proportion of variable costs.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 3-4

5) The degree of operating leverage at a specific level of sales helps the managers calculate the effect that potential changes in sales will have on operating income.

Answer: TRUE

Diff: 1 Type: TF

Skill: Understand

Objective: LO 3-4

6) Capital intensive companies have less risk because their relatively lower operating leverage suggests that they have already made large investments in capital assets.

Answer: FALSE

Explanation: High fixed cost simultaneously increases the risk of losses if demand is weak, and magnifies profit if demand is strong.

Diff: 2 Type: TF

Skill: Understand

Objective: LO 3-4

7) Which of the following statements about sensitivity analysis is TRUE?

A) It is a technique which is used to examine past results.

B) It can be used in CVP to show changes in operating income if variable costs per unit change.

C) It examines the relationship between production and service departments.

D) It shows the impact of a manager's behaviour.

E) It is relevant for isolating conversion costs.

Answer: B

Diff: 2 Type: MC

Skill: Understand

Objective: LO 3-4

8) Chris Muss is going to sell Ad-hoc compact disks for \$40 a box; one box is considered to be one unit. The disks cost Chris \$10 a unit. She is planning to rent a booth at the up-coming Area Computer Show. She has three options for attending the show:

1. paying a fixed fee of \$3,000;
2. paying a \$1,000 fee plus 10% of her revenue made at the convention, or;
3. paying 25% of her revenue made at the convention.

Which of the following statements is TRUE?

- A) CVP analysis can show that the risks are identical in each case.
- B) The break-even point is the identical in each case.
- C) Fixed costs are inherent in all of the options.
- D) One of the options will allow Chris Muss to break-even, even if she doesn't sell any disks, assuming she can return any unsold disks for a full refund.
- E) Operating income per unit is the same in each case, as both selling price and costs are the same.

Answer: D

Diff: 2 Type: MC

Skill: Understand

Objective: LO 3-4

9) Which of the following statements is TRUE concerning operating leverage?

- A) It summarizes the risk-return tradeoff across alternate revenue possibilities.
- B) It measures the change in operating income when costs change proportionately with the change in the number of units sold.
- C) The degree of operating leverage increases inversely to the number of units sold.
- D) The degree of operating leverage remains constant (in the relevant range) when there is a change in the number of units sold.
- E) The degree of operating leverage equals contribution margin divided by operating income, at any specific sales level.

Answer: E

Diff: 1 Type: MC

Skill: Remember

Objective: LO 3-4

10) In a company with low operating leverage

- A) fixed costs are high and variable costs are low.
- B) small increases in sales lead to large increases in operating income.
- C) there is a higher possibility of net loss than a higher-leveraged firm.
- D) less risk is assumed than in a highly leveraged firm.
- E) companies follow the strategy of replacing variable costs with fixed costs.

Answer: D

Diff: 2 Type: MC

Skill: Understand

Objective: LO 3-4

11) Which of the following factors would be relevant in classifying costs as fixed or variable in a specific decision situation?

- A) if the time horizon is short or long
- B) the relevant range of the next best alternative situation
- C) the mix of revenues
- D) the sales mix
- E) if the time horizon is shorter in another alternative

Answer: A

Diff: 2 Type: MC

Skill: Understand

Objective: LO 3-4

Use the information below to answer the following question(s).

Big Sports University is planning to hold a fund raising banquet at one of the local country clubs. It has two options for the banquet:

1. Foothills Country Club
 - a. Fixed rental cost of \$600
 - b. plus \$15.00 per person for food.
2. Downhill Country Club
 - a. Fixed rental cost of \$1,080
 - b. It will have to hire a caterer who charges \$12.00 per person for food.

Big Sports has budgeted \$900 for administrative and marketing expenses. It plans to hire a band, which will cost another \$400. Tickets are expected to be \$40 per person. Any other items required for the event will be donated by its local business supporters.

12) What is the break-even point in tickets sold of option one?

- A) 85 tickets
- B) 80 tickets
- C) 76 tickets
- D) 60 tickets
- E) 24 tickets

Answer: C

Explanation: C) Option 1

Rental Cost	\$600
Adm. & Mkt.	900
Band Expense	<u>400</u>

Fixed Cost	<u>\$1,900</u>
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\$ per ticket	\$40.00
Catering	<u>15.00</u>

Cont. Margin	<u>\$25.00</u>
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Break-even point = total fixed cost/contribution margin

Opt. 1 : $\$1,900/\$25 = 76$ tickets

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

13) The break-even point in tickets sold of option two?

- A) 85 tickets
- B) 80 tickets
- C) 76 tickets
- D) 39 tickets
- E) 71 tickets

Answer: A

Explanation: A) Option 2

Rental Cost \$1,080

Adm. & Mkt. 900

Band Expense 400

Fixed Cost \$2,380

\$ per ticket \$40.00

Catering 12.00

Cont. Margin \$28.00

Break-even point = total fixed cost/contribution margin

Opt. 2 : $\$2,380 / \$28 = 85$ tickets

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

14) What is the "operating income" assuming 250 people attend and option one is chosen?

- A) \$4,400
- B) \$4,350
- C) \$4,000
- D) \$6,250
- E) \$4,750

Answer: B

Explanation: B) $\$40X - \$15X - \$1,900 = \text{OI}$

$X = 250$

$\$40(250) - \$15(250) - \$1,900 = \text{OI}$

$\$10,000 - \$3,750 - \$1,900 = \$4,350$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

15) What is the "operating income" assuming 250 people attend and option two is chosen?

- A) \$7,000
- B) \$2,900
- C) \$2,750
- D) \$4,620
- E) \$5,080

Answer: D

Explanation: D) $\$40X - \$12X - \$2,380 = \text{OI}$

$\$40(250) - \$12(250) - \$2,380 = \text{OI}$

$\$10,000 - \$3,000 - \$2,380 = \$4,620$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

16) How many people must purchase tickets assuming option two is chosen, and Big Sports expects to raise \$4,820 for the athletic fund? Assume no one pays more than the cost of his/her ticket.

- A) 258 people
- B) 173 people
- C) 243 people
- D) 276 people
- E) 310 people

Answer: A

Explanation: A) $\$40X - \$12X - \$2,380 = \$4,820$

$\$28X = \$2,380 + \$4,820$

$\$28X = \$7,200$

$X = 257.14$ or 258 people

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-4

Use the information below to answer the following question(s).

Dr. Mickey Finn performs a certain procedure for \$400.00. The fixed costs are \$8,000 and variable costs are \$200.00 per procedure.

17) What is the budgeted revenue assuming the procedure is performed 200 times?

- A) \$40,000
- B) \$80,000
- C) \$120,000
- D) \$160,000
- E) \$320,000

Answer: B

Explanation: B) $200 \times \$400 = \$80,000$

Diff: 1 Type: MC

Skill: Apply

Objective: LO 3-4

18) What is the budgeted contribution margin assuming the procedure is performed 200 times?

A) \$20,000

B) \$30,000

C) \$8,000

D) \$80,000

E) \$40,000

Answer: E

Explanation: E) $200 \times \$200 = \$40,000$

Diff: 1 Type: MC

Skill: Apply

Objective: LO 3-4

19) What is the margin of safety assuming the procedure is performed 200 times?

A) \$80,000

B) \$64,000

C) \$40,000

D) \$32,000

E) \$16,000

Answer: B

Explanation: B) $[\$8,000 \div \$200] = 40$ units.

$[\$80,000 - (40 \times \$400)] = \$64,000$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

20) What is the margin of safety in units assuming the procedure is performed 200 times?

A) 200 units

B) 130 units

C) 140 units

D) 160 units

E) 20 units

Answer: D

Explanation: D) $[\$8,000 \div \$200] = 40$ units.

$[\$80,000 - (40 \times \$400)] = \$64,000$

$\$64,000 \div \$400 = 160$ units

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

21) What is the margin of safety assuming 100 procedures are performed?

- A) \$16,000 or 40 times
- B) \$20,000 or 50 times
- C) \$24,000 or 60 times
- D) \$40,000 or 100 times
- E) \$50,000 or 110 times

Answer: C

Explanation: C) Break even in number of procedures = $\$8,000 / (\$400 - \$200) = 40$ units

Actual sales 100 units \times \$400 = \$40,000

Break-even sales 40 units \times \$200 = \$16,000

Margin of safety 60 units \$24,000

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

Answer the following question(s) using the information below.

Southwestern College is planning to hold a fund raising banquet at one of the local country clubs. It has two options for the banquet:

OPTION 1: *Crestview Country Club*

- a. Fixed rental cost of \$1,000
- b. \$12 per person for food

OPTION 2: *Tallgrass Country Club*

- a. Fixed rental cost of \$3,000
- b. A caterer who charges \$8.00 per person for food

Southwestern College has budgeted \$1,800 for administrative and marketing expenses. It plans to hire a band which will cost another \$800. Tickets are expected to be \$30 per person. Local business supporters will donate any other items required for the event.

22) Which option provides the least amount of risk?

- A) Option one
- B) Option two
- C) Both options provide the same amount of risk.
- D) Neither option has risks.
- E) Without probability assignments it is not possible to determine the riskier option.

Answer: A

Explanation: A) Option 1 has the higher operating leverage.

Diff: 1 Type: MC

Skill: Apply

Objective: LO 3-4

23) What is the break-even point in units for each option?

- A) 96 units and 114 units respectively
- B) 120 units and 187 units respectively
- C) 56 units and 137 units respectively
- D) 200 units and 255 units respectively
- E) 156 units and 219 units respectively

Answer: D

Explanation: D) Option 1: $(\$1,000 + \$1,800 + \$800)/(\$30 - \$12) = 200$ units

Option 2: $(\$3,000 + \$1,800 + \$800)/(\$30 - \$8) = 255$ units

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

24) What is the operating income for each option if 600 people attend?

- A) \$14,400 and \$12,400 respectively
- B) \$9,800 and \$10,200 respectively
- C) \$8,000 and \$8,400 respectively
- D) \$7,900 and \$8,000 respectively
- E) \$7,200 and \$7,600 respectively

Answer: E

Explanation: E) Option 1: $(600 \times \$18) - \$3,600 = \$7,200$

Option 2: $(600 \times \$22) - \$5,600 = \$7,600$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

25) What is the degree of operating leverage for both options if 600 people attend?

- A) 1.37 and 1.75 times respectively
- B) 1.5 times and 1.74 times respectively
- C) 1.10 and 1.29 times respectively
- D) 0.75 and 1.07 times respectively
- E) Operating leverage is indeterminable.

Answer: B

Explanation: B) Option 1: $\$18 \times 600/\$7,200 = 1.50$; Option 2: $\$22 \times 600/\$7,600 = 1.74$

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-4

26) Mrs. Tisdale is going to sell Christmas tree lights for \$40 a box. The lights cost Mrs. Tisdale \$10 a box and any unsold lights can be returned for a full refund. She is planning to rent a booth at the upcoming Happy Holidays Convention, which offers three options:

1. paying a fixed fee of \$3,000, or
2. paying a \$1,000 fee plus 10% of revenues made at the convention, or
3. paying 25% of revenues made at the convention.

Which of the following statements is FALSE?

- A) Her decision will determine the risk she faces.
- B) Contribution margin will vary depending upon the option chosen.
- C) One of the options will allow Mrs. Tisdale to break even, even if she doesn't sell any lights.
- D) Operating income will always be the greatest for Option 3.
- E) Option 3 has the lowest operating leverage.

Answer: D

Diff: 3 Type: MC

Skill: Understand

Objective: LO 3-4

27) You have just been hired as the new management accountant for a pool chemical wholesaler. The company sells packages of pool chemicals to retail stores, consisting of all of the chemicals a typical pool would need for a week, for a price of \$25, and a variable cost of \$8. The company has fixed costs of \$125,000. The previous accountant was promoted to an associated company but has left you her working papers for a project she was working on. The project involves advising management whether to accept an advertising arrangement with an industry publication. The arrangement being offered is a contract calling for a set payment per month (amount to be negotiated) for 6 months. The industry is cyclical and has no sales for 4 months [16 weeks] of the year. The previous accountant notes show her projection that this would result in an increase of 50 units per week, above the normal 1,000 units per week that the company sells currently. The increased demand would arise from more customers to existing outlets, and from new outlets as well. The advertiser is suggesting a monthly fee of \$1,800.

What is your advice, based on the previous accountant's notes and your own analysis?

Answer: While one would expect the fee to be negotiable below the asking price, even at \$1,800 per month, the company should agree to the contract, assuming the previous accountant's estimated sale increase is realistic. Students should identify the extra cost as a fixed cost.

	No Extra <u>Advert.</u>	Extra <u>Advert.</u>	<u>Difference</u>
Contrib margin (1,000 × 17 × 36)	\$612,000		
Contrib margin (1,050 × 17 × 36)		642,600	30,600
Fixed costs	<u>125,000</u>	<u>135,800</u>	<u>10,800</u>
Operating income	\$487,000	\$506,800	\$19,800

Diff: 3 Type: ES

Skill: Analyze

Objective: LO 3-4

28) Seamless Gutter sells 10 metre sections of eaves trough for \$12. The unit variable costs per section are \$8.80. Fixed costs total \$4,800.

Required:

- a. What is the contribution margin per section?
- b. What is the break-even point in sections? . . . in dollars?
- c. How many sections must be sold to earn a pre-tax income of \$4,000?
- d. What is the margin of safety assuming 1,800 sections are sold?

Answer:

a. Contribution margin per section = $\$12.00 - \$8.80 = \$3.20$

b. N = Break-even point in sections

$$\$12.00N - \$8.80N - \$4,800 = 0$$

$$\$3.20N - \$4,800 = 0$$

$$N = \$4,800 / \$3.20$$

$$N = 1,500 \text{ sections}$$

$$\text{Break-even dollars} = 1,500 \times \$12 = \$18,000$$

c. N = Target sales in sections

$$\$12.00N - \$8.80N - \$4,800 - \$4,000 = 0$$

$$\$3.20N - \$8,800 = 0$$

$$N = \$8,800 / \$3.20$$

$$N = 2,750 \text{ sections}$$

d. Margin of safety = Sales - Break-even sales

$$= (\$12.00 \times 1,800) - \$18,000$$

$$= \$21,600 - \$18,000$$

$$= \$3,600$$

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-3, 4

29) Auto Tires Inc. sells tires to service stations for an average of \$45 each. The variable costs of each tire are \$30 and monthly fixed manufacturing costs total \$15,000. Other monthly fixed costs of the company total \$12,000.

Required:

- a. What is the break-even level in tires?
- b. What is the margin of safety assuming sales total \$90,000?
- c. What is the break-even level in tires assuming variable costs increase by 20 percent?
- d. What is the break-even level in tires assuming the selling price goes up by 10 percent, fixed manufacturing costs decline by 10 percent and other fixed costs decline by \$150?

Answer:

- a. N = Break-even units
$$\$45N - \$30N - \$15,000 - \$12,000 = 0$$
$$\$15N - \$27,000 = 0$$
$$N = \$27,000/\$15$$
$$N = 1,800 \text{ tires}$$
- b. Margin of safety = $\$90,000 - (\$45 \times 1,800) = \$9,000$
- c. N = Break-even units
$$\$45N - \$36N - \$15,000 - \$12,000 = 0$$
$$\$9N - \$27,000 = 0$$
$$N = \$27,000/\$9$$
$$N = 3,000 \text{ tires}$$
- d. N = Break-even units
$$\$49.50N - \$30N - \$13,500 - \$11,850 = 0$$
$$\$19.50N - \$25,350 = 0$$
$$N = \$25,350/\$19.50$$
$$N = 1,300 \text{ tires}$$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-4

30) Query Company sells pillows for \$25.00 each. The manufacturing cost, all variable, is \$10 per pillow. The company is planning on renting an exhibition booth at the annual crafts and art convention. The convention coordinator allows three options for each participating company. They are:

1. paying a fixed booth fee of \$5,010, or;
2. paying an \$4,000 fee plus 10% of revenue made at the convention, or;
3. paying 20% of revenue made at the convention.

Required:

- a. Compute the break-even sales in pillows of each option.
- b. Which option should Query Company choose, assuming sales are expected to be 800 pillows?
- c. Calculate the margin of safety for Option 1 if sales are expected to be 300 pillows.

Answer:

- a. **Option 1** N = Break-even in pillows

$$\$25N - \$10N - \$5,010 = 0$$

$$\$15N - \$5,010 = 0$$

$$N = \$5,010 / \$15 = 334 \text{ pillows}$$

- Option 2** N = Break-even in pillows

$$\$25N - \$10N - 0.10(\$25N) - \$4,000 = 0$$

$$\$12.5N - \$4,000 = 0$$

$$N = \$4,000 / \$12.5 = 320 \text{ pillows}$$

- Option 3** N = Break-even in pillows

$$\$25N - \$10N - 0.20(\$25N) = 0$$

$$\$10N - \$0 = 0$$

$$N = \$0 / \$10 = 0 \text{ pillows}$$

- b. Option 1 profit for 800 pillows = $\$15 \times 800 - \$5,010 = \$6,990$
 Option 2 profit for 800 pillows = $\$12.5 \times 800 - 4,000 = \$6,000$
 Option 3 profit for 800 pillows = $\$10 \times 800 = \$8,000$
 Option 3 is the best choice.

- c. There is no margin of safety as expected sales are less than break-even sales.

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-4

31) Karen Hefner, a florist, operates retail stores in several shopping malls. The average selling price of an arrangement is \$30 and the average cost of each sale is \$18. A new mall is opening where Karen wants to locate a store, but the location manager is not sure about the rent method to accept. The mall operator offers the following three options for its retail store rentals:

1. paying a fixed rent of \$15,000 a month, or
2. paying a base rent of \$9,000 plus 10% of revenue received, or
3. paying a base rent of \$4,800 plus 20% of revenue received up to a maximum rent of \$25,000.

Required:

- a. For each option, compute the break-even sales and the monthly rent paid at break-even.
- b. Beginning at zero sales, show the sales levels at which each option is preferable up to 5,000 units.

Answer:

- a. **Option 1** N = Break-even units

$$\$30N - \$18N - \$15,000 = 0$$

$$\$12N - \$15,000 = 0$$

$$N = \$15,000 / \$12 = 1,250 \text{ units}$$

$$\text{rent at break-even} = \$15,000$$

- Option 2** N = Break-even units

$$\$30N - \$18N - 0.10(\$30N) - \$9,000 = 0$$

$$\$9N - \$9,000 = 0$$

$$N = \$9,000 / \$9 = 1,000 \text{ units}$$

$$\text{Rent at break-even} = \$9,000 + (0.10 \times \$30 \times 1,000) = \$12,000$$

- Option 3** N = Break-even units

$$\$30N - \$18N - 0.20(\$30N) - \$4,800 = 0$$

$$\$6N - \$4,800 = 0$$

$$N = \$4,800 / \$6 = 800 \text{ units}$$

$$\text{Rent at break-even} = \$4,800 + (0.20 \times \$30 \times 800) = \$9,600$$

- b. Option 3 from 0 to 1,400 units for \$4,800 plus \$6 per unit.
 Option 2 from 1,401 to 2,000 for \$9,000 plus \$3 per unit.
 Option 1 above 2,000 for \$15,000.

The preferable option at zero will be Option 3 as it has the lowest fixed cost. The incremental contribution margin between Option 3 and Option 2 is (20% - 10% of revenue; \$3/unit). The difference in fixed cost is (\$9,000 - \$4,800 = \$4,200). Therefore, Option 3 will be preferable until the benefit of the lower fixed cost is eliminated by the cost of the lower contribution margin (\$4,200/\$3 per unit = 1,400 units). Similar calculation for determining the level at which Option 1 is preferable over Option 2: (\$15,000 - \$9,000)/\$3 per unit = 2,000 units.

Diff: 3 Type: ES

Skill: Analyze

Objective: LO 3-4

32) Snowmobile Inc. manufactures two colours of snowmobiles: White and Black. Marketing believes that it can sell between 12,000 and 18,000 of either product during the upcoming year. Due to the overall economic slowdown, the company is preparing to produce only one model for next year. The following information has been provided by the accounting department:

	<u>White</u>	<u>Black</u>
Selling price	\$2,250	\$2,550
Variable costs	1,350	1,350

For next year, fixed costs will total \$9,450,000 if White is produced and \$11,640,000 if Black is produced. Plant capacity allows up to 107,800 direct manufacturing hours. White takes 9.8 hours to produce and Black requires 11 hours. The company is subject to a 30 percent income tax rate.

Required:

Which model should Snowmobile Inc. produce, assuming the marketing manager believes annual demand of either model will exceed production capacity? Why?

Answer: Although Black has the highest contribution margin, it also has the highest fixed costs. A break-even analysis could be undertaken to determine if both products are above break-even at plant capacity.

Break-even units White
 $= \$2,250N - \$1,350N - \$9,450,000$
 $= \$900N - \$9,450,000$
 $= \$9,450,000 / \900
 $= 10,500$ snowmobiles

Break-even units Black
 $= \$2,550N - \$1,350N - \$11,640,000$
 $= \$1,200N - \$11,640,000$
 $= \$11,640,000 / \$1,200$
 $= 9,700$ snowmobiles

Plant capacity of White
 $= 107,800 \text{ hrs.} / 9.8$
 $= 11,000$ snowmobiles

Plant capacity of Black
 $= 107,800 \text{ hrs.} / 11$
 $= 9,800$ snowmobiles

Both snowmobiles have break-even points below their plant capacity, so the decision process can continue.

Management may decide that the further away from the break-even point a product can be sold, the safer the operation. Therefore, the margin of safety may be determined for each snowmobile. Remember that Black is limited to 9,800 units.

	<u>White</u>	<u>Black</u>
Sales at maximum level	\$24,750,000	\$24,990,000
Break-even sales	<u>23,625,000</u>	<u>24,735,000</u>
Margin of safety	<u>\$1,125,000</u>	<u>\$255,000</u>

Lastly, a review of the contribution margin and income statement may be necessary.

	<u>White</u>	<u>Black</u>
Sales	\$24,750,000	\$24,990,000
Variable costs	<u>14,850,000</u>	<u>13,230,000</u>
Contribution margin	\$9,900,000	\$11,760,000
Fixed costs	<u>9,450,000</u>	<u>11,640,000</u>
Operating income	<u>\$450,000</u>	<u>\$120,000</u>

Tax computations are not necessary for this decision.

Therefore, one can conclude that the White is the best product to produce, even though its contribution margin is less than that of Black.

Diff: 3 Type: ES

Skill: Analyze

Objective: LO 3-4

33) Alex Miller, Inc., sells car batteries to service stations for an average of \$30 each. The variable cost of each battery is \$20 and monthly fixed manufacturing costs total \$10,000. Other monthly fixed costs of the company total \$8,000.

Required:

- a. What is the breakeven point in batteries?
- b. What is the margin of safety, assuming sales total \$60,000?
- c. What is the breakeven level in batteries, assuming variable costs increase by 20%?
- d. What is the breakeven level in batteries, assuming the selling price goes up by 10%, fixed manufacturing costs decline by 10%, and other fixed costs decline by \$100?

Answer:

- a. N = Breakeven units

$$\$30N - \$20N - \$10,000 - \$8,000 = 0$$

$$\$10N - \$18,000 = 0$$

$$N = \$18,000/\$10 = 1,800 \text{ batteries}$$

- b. Margin of safety = \$60,000 - (\$30 × 1,800) = \$6,000

- c. N = Breakeven units

$$\$30N - \$24N - \$10,000 - \$8,000 = 0$$

$$\$6N - \$18,000 = 0$$

$$N = \$18,000/\$6 = 3,000 \text{ batteries}$$

- d. N = Breakeven units

$$\$33N - \$20N - \$9,000 - \$7,900 = 0$$

$$\$13N - \$16,900 = 0 \quad N = \$16,900/\$13 = 1,300 \text{ batteries}$$

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-3, 4

34) Samuel Linkletter is an importer of clay gardening pots. He has a six-month agreement with a local gardening store, West City Gardening, to set up a display to sell his product. Samuel can return any unsold items at no cost. The average selling price for the pots is \$18 and on average, they cost Samuel \$7 each. The owner of West City Gardening has proposed two options:

1. A fixed payment of \$375 per month
2. A fixed payment of \$125 per month; and, 20% of sales revenues earned during the term of the agreement

Required:

- a. Calculate the degree of operating leverage for both options at sales of 540 units
- b. Explain the results from part a. in terms of risk
- c. What number of units must be sold to generate the same operating income for both options? Which option is favourable below this point, and which option is favourable above this point?

Answer:

- a. Degree of operating leverage = CM/operating income

Option 1:

$$\text{CM} = (\$18 - \$7) \times 540 \text{ units} = \$5,940$$

$$\text{Operating income} = \$5,940 - (\$375 \times 6 \text{ months}) = \$3,690$$

$$\text{Operating leverage} = \$5,940 / \$3,690 = 1.61$$

Option 2:

$$\text{CM} = (\$18 - \$7 - \$3.60) \times 540 \text{ units} = \$3,996$$

$$\text{Operating income} = \$3,996 - (\$125 \times 6 \text{ months}) = \$3,246$$

$$\text{Operating leverage} = \$3,996 / \$3,246 = 1.23$$

- b. Option 1 has more risk due to the larger fixed cost.

- c. $\$11X - (6 \times \$375) = \$7.40X - (6 \times \$125)$
 $\$3.60X - \$2,250 = -\$750$
 $X = (\$2,250 - \$750) / \$3.60$
 $X = 416.67 \text{ or } 417 \text{ rounded}$

Option 2 is favourable below this point; Option 1 is favourable above this point.

Diff: 3 Type: ES

Skill: Analyze

Objective: LO 3-4

35) Suppose a company decided to automate a production line. Explain what effects this would have on a company's cost structure using CVP terminology. Could these changes have any possible negative effect on the firm?

Answer: An automated production line would increase fixed costs through extra amortization on the new machinery and also decrease variable costs due to the elimination of direct labour as a result of automation. This would increase the break-even point. This could possibly have a negative effect on the firm if demand for the product produced by this production line is expected to decline in the future. With high fixed costs and low demand, a decline in profits might be more severe due to the presence of unchanging fixed costs as volume.

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-4

36) Bonnie and Clyde started the BC Restaurant a few years ago. They rented a building, bought equipment, and hired two employees to work full time at a fixed monthly salary. Utilities and other operating charges remain fairly constant during each month.

During the past two years the business has grown with average sales increasing one percent a month. This situation pleases both Bonnie and Clyde, but they do not understand how sales can grow by one percent a month while profits are increasing at an even faster pace. They are afraid that one day they will wake up to increasing sales but decreasing profits.

Required:

Explain why the profits have increased at a faster rate than sales.

Answer: The fixed costs per meal served are decreasing with increased volumes, while the contribution margin per meal served remains constant. Apparently, most of the restaurant's expenses are fixed. Therefore, as sales pass the break-even point the profit will increase even faster because the fixed expenses have already been covered. This allows sales to cover only variable expenses before contributing to the profit margin, thereby causing it to increase at a faster rate.

Diff: 2 Type: ES

Skill: Apply

Objective: LO 3-4

37) Freddie's company has mostly fixed costs and Valerie's company has mostly variable costs. Which company has the greatest risk of a net loss? Explain why.

Answer: Freddie's company has the greatest risk of net loss because more units are required to reach breakeven point than for Valerie.

Diff: 2 Type: ES

Skill: Understand

Objective: LO 3-4

3.5 Analyze the implications of uncertainty on decision models.

1) A probability distribution describes the likelihood of each of the mutually exclusive and collectively exhaustive set of events.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-4

2) An expected value is the weighted-average of the outcomes based on the percentage combinations of the incomes.

Answer: FALSE

Explanation: Expected value is the sum of the risk-weighted average of the outcomes of each choice.

Diff: 2 Type: TF

Skill: Remember

Objective: LO 3-4

3) *Risk neutral* means the decision maker will feel as much pain at losing a dollar as joy at gaining a dollar.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-5

4) "Uncertainty" may be defined as

- A) the possibility that an actual amount will be the same as an expected amount.
- B) the possibility that an actual amount will be either higher or lower than the expected amount.
- C) the possibility that a budgeted amount will be the same as an estimated amount.
- D) the possibility that the budgeted amount will be lower than the estimated amount.
- E) the possibility that the budgeted amount will be either higher or lower than the expected amount.

Answer: B

Diff: 1 Type: MC

Skill: Remember

Objective: LO 3-4

5) An expected value decision model is used for

- A) determining if a budgeted amount will deviate from an actual amount.
- B) determining if a budgeted amount will be the same as an actual amount.
- C) enabling managers to deal with events using a qualitative analysis method.
- D) enabling managers to deal with uncertainty using quantitative analyses.
- E) identifying factors that distinguish an action from an event.

Answer: D

Diff: 1 Type: MC

Skill: Understand

Objective: LO 3-4

6) Expected monetary value may be defined as

- A) the weighted average of all possible outcomes.
- B) the probability that each outcome will not occur.
- C) the weighted average of the financial outcomes with the probability of each outcome serving as the weight.
- D) the average of all possible outcomes.
- E) the weighted average of all mutually exclusive outcomes.

Answer: C

Diff: 1 Type: MC

Skill: Understand

Objective: LO 3-4

7) What would be the expected monetary value for the following data using the probability method?

Probability	Cash Inflows
0.15	\$200,000
0.25	\$175,000
0.30	\$160,000
0.40	\$0

- A) \$535,000
- B) \$250,000
- C) \$121,750
- D) \$200,000
- E) \$30,000

Answer: C

Explanation: C) $0.15(\$200,000) + 0.25(\$175,000) + 0.3(\$160,000) = \$121,750$.

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

8) Joan Perry has three booth rental options at the bridal fair where she plans to sell her new product. The booth rental options are:

Option 1: \$4,000 fixed fee

Option 2: \$3,000 fixed fee + 5% of all revenues generated at the fair

Option 3: 20% of all revenues generated at the fair.

The product sells for \$150 per unit. She is able to purchase the units for \$50.00 each.

Which option should Joan choose in order to maximize income assuming there is a 40% probability that 70 units will be sold and a 60% probability that 40 units will be sold?

- A) Option 1 with expected operating income of \$1,200
- B) Option 2 with expected operating income of \$1,810
- C) Option 3 with expected operating income of \$3,640
- D) Option 3 with expected operating income of \$4,160
- E) Option 2 with expected operating income of \$4,060

Answer: C

Explanation: C) Expected revenues = $.4(70 \times \$150) + .6(40 \times \$150) = \$7,800$

Expected CM before options = $0.4(70 \times \$100) + 0.6(40 \times \$100) = \$5,200$

Option 1: $\$5,200 - \$4,000 = \$1,200$

Option 2: $\$5,200 - \$3,000 - .05(\$7,800) = \$1,810$

Option 3: $\$5,200 - 0.2(\$7,800) = \$3,640^*$

* = maximization of income

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-4

9) Lobster Liquidators will make \$500,000 if the fishing season weather is good, \$200,000 if the weather is fair, and would actually lose \$50,000 if the weather is poor during the season. If the weather service gives a 40% probability of good weather, a 25% probability of fair weather, and a 35% probability of poor weather, what is the expected monetary value for Lobster Liquidators?

- A) \$500,000
- B) \$750,000
- C) \$267,500
- D) \$200,000
- E) \$232,500

Answer: E

Explanation: E) $0.40(\$500,000) + 0.25(\$200,000) + 0.35(-\$50,000) = \$232,500$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-4

10) ABC Grocery needs to know the kilograms of bananas to have on hand each day. Each kilogram of bananas costs \$0.25 and can be sold for \$0.40. Unsold bananas are worthless at the end of the day. The following demands were found after studying the last six month's sales:

200 kilograms of bananas one-fourth of the time

300 kilograms of bananas one-half of the time

400 kilograms of bananas one-fourth of the time

Required:

Determine whether ABC Grocery should order 200, 300, or 400 kilograms of bananas.

Answer:

Quantity Ordered	Demand Probability			Expected Value
	<u>200</u>	<u>300</u>	<u>400</u>	
200	\$30	\$30	\$30	\$30.00
300	5	45	45	\$35.00
400	(20)	20	60	\$20.00
p	.25	.50	.25	

Demand example: 300 units ordered; but demand is 200 units:

$$(\$0.15 \times 200) - (\$0.25 \times 100) = \$5$$

Expected value example:

$$\text{Order 400: } (\$(20) \times 0.25) + (20 \times 0.50) + (\$60 \times 0.25) = 20.00$$

300 kilograms of bananas should be ordered in order to maximize profit.

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-4

11) Produce Company needs to know the pounds of apples to have on hand each day. Each pound of apples costs \$0.50 and can be sold for \$0.80. Unsold apples are worthless at the end of the day. The following demands were found after studying the last six month's sales:

200 pounds of apples 30% of the time
 300 pounds of apples 40% of the time
 400 pounds of apples 30% of the time

Required:

Determine whether Produce Company should order 200, 300, or 400 pounds of apples.

Answer:

<u>Quantity Ordered</u>	<u>Demand Probability</u>			<u>Expected Value</u>
	<u>200</u>	<u>300</u>	<u>400</u>	
200	\$60	\$60	\$60	\$60.00
300	10	90	90	\$6600
400	(40)	40	120	\$40.00
p	.30	.40	.30	

Demand example: 300 units ordered; but demand is 200 units:

$$(\$0.30 \times 200) - (\$0.50 \times 100) = \$10$$

Expected value example:

$$\text{Order 400: } (\$(40) \times 0.30) + (\$40 \times 0.40) + (\$120 \times 0.30) = \$40$$

Should order 300 pounds of apples to maximize profit.

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-4

3.6 Interpret the results of CVP analysis in complex strategic, multi-product, and multiple cost driver situations.

1) The relative combination of quantities of products or services that constitute total revenues are called the sales target.

Answer: FALSE

Explanation: Sales mix is the quantities of various products (or services) that in sum are the total sales volume of a company.

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-6

2) The key to applying CVP analysis in non-profit and service organizations is to measure their output.

Answer: TRUE

Diff: 1 Type: TF

Skill: Remember

Objective: LO 3-6

3) Changes in product quality could be considered an example of a revenue driver.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 3-6

4) There is no unique break-even point when there are multiple cost drivers.

Answer: TRUE

Diff: 2 Type: TF

Skill: Understand

Objective: LO 3-6

5) In multi-product situations when sales mix shifts toward the product with the highest contribution margin, operating income will be higher.

Answer: TRUE

Diff: 1 Type: TF

Skill: Understand

Objective: LO 3-6

6) To calculate the break-even point in a multi-product situation, one must assume that the sales mix of the various products remains constant.

Answer: TRUE

Diff: 2 Type: TF

Skill: Remember

Objective: LO 3-6

Use the information below to answer the following question(s).

The following information is for Winnie Company:

Product A: Revenue	\$4.00
Variable Cost	\$1.00
Product B: Revenue	\$6.00
Variable Cost	\$2.00
Total fixed costs are	40,000

7) What is the break-even point assuming the sales mix consists of two units of Product A and one unit of Product B?

- A) 2,000 units of B and 4,000 units of A
- B) 2,025 units of B and 4,050 units of A
- C) 4,025 units of B and 8,050 units of A
- D) 4,000 units of B and 4,000 units of A
- E) 4,000 units of B and 8,000 units of A

Answer: E

Explanation: E) Q = units of product B; and $2Q$ = units of product A;

$$(\$4 - \$1)2Q + (\$6 - \$2)Q - \$40,000 = 0$$

$$\$6Q + \$4Q = \$40,000$$

$$\$10Q = \$40,000$$

$$Q = 4,000 \text{ units}$$

Product B = 4,000 units; Product A = 8,000 units

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-6

8) What is the operating income assuming actual sales are 300,000 units, and the sales mix is one unit of Product A and two units of Product B?

- A) \$100,000
- B) \$1,040,000
- C) \$1,060,000
- D) \$1,100,000
- E) \$1,100,100

Answer: C

Explanation: C)	<u>Product A</u>	<u>Product B</u>	<u>Total</u>
Sales units	<u>100,000</u>	<u>200,000</u>	<u>300,000</u>
Revenue	\$400,000	\$1,200,000	\$1,600,000
Variable costs	100,000	400,000	500,000
Cont. Mar.	<u>\$300,000</u>	<u>\$800,000</u>	<u>\$1,100,000</u>
Fixed costs			<u>40,000</u>
			<u>\$1,060,000</u>

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-6

9) A hospital receives \$1,000,000 monthly in funding from various sources. Annual fixed costs are projected to be \$5,000,000 and the variable cost per patient, across all departments is projected to be \$534.80. Last year they treated 11,500 patients. The hospital expects a 5% increase in patients this year. A governing bylaw requires that the hospital be run as a non-profit organization.

What is the maximum number of patients the hospital can expect to be able to treat assuming the operating income is zero?

- A) 11,500
- B) 12,079
- C) 13,000
- D) more than 13,000
- E) CVP analysis is not relevant for non-profit organizations.

Answer: D

Explanation: B) $(\$1,000,000 \times 12) - \$5,000,000 = \$7,000,000$

$\$7,000,000 \div \$534.80 = 13,089$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-6

10) A social agency receives a budget appropriation of \$11,000 monthly from the municipality. Annual fixed costs are projected to be \$20,000 and the variable cost per client was \$238.50 last year. Although the agency projects its case load to increase by the usual 15% this year (as it has done historically), the municipality appropriated funds based on last year's case load. Which of the following strategies would be ineffective in dealing with the expected shortfall in budget appropriation for the agency?

- A) reducing the number of clients served
- B) reducing the variable cost of serving a client
- C) reducing the total fixed costs
- D) increasing funding from other sources
- E) changing the measure of output used to calculate service

Answer: E

Diff: 1 Type: MC

Skill: Understand

Objective: LO 3-6

11) The agency supervisor of a non-profit organization wants to know how many individuals may receive financial assistance during the year. The organization has fixed costs of \$600,000. They aid the unemployed by supplementing their incomes by \$8,000 annually, while they seek new employment skills. The budgeted appropriation for the year is \$2,000,000. Based on this financial data, how many individuals can receive financial assistance?

- A) 175 people
- B) 130 people
- C) 100 people
- D) 75 people
- E) 50 people

Answer: A

Explanation: A) $\$2,000,000 - \$8,000Q - \$600,000 = 0$;

$\$1,400,000 = \$8,000Q$;

$Q = 175$ people

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-6

12) Fan Inc. is a nonprofit organization that supplies fans during the summer for individuals in need. Fixed costs are \$500,000. The fans cost \$40.00 each. The organization has a budgeted appropriation of \$1,200,000. How many people can receive a fan during the summer?

- A) 15,000 people
- B) 17,500 people
- C) 30,000 people
- D) 42,500 people
- E) 80,000 people

Answer: B

Explanation: B) $\$1,200,000 - \$40Q - \$500,000 = 0$;

$\$700,000 = \$40Q$;

$Q = 17,500$ people

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-6

13) A revenue driver is defined as

A) any factor that affects costs and revenues.

B) any factor which could cause a change in revenue.

C) any factor which could cause a change in the costs of a related revenue object.

D) any factor which does not affect costs associated with a revenue.

E) any factor that changes when revenue changes.

Answer: B

Diff: 1 Type: MC

Skill: Remember

Objective: LO 3-6

14) Mount Carmel Company sells only two products, Product A and Product B.

	Product A	Product B	Total
Selling price	\$40	\$50	
Variable cost per unit	\$24	\$40	
Total fixed costs			\$840,000

Mount Carmel sells two units of Product A for each unit it sells of Product B. Mount Carmel faces a tax rate of 30%. Mount Carmel desires a net after-tax income of \$73,500. The number of units needed to be sold to achieve the desired after-tax profit would be

A) 21,750 units of Product A and 43,500 units of Product B.

B) 22,500 units of Product A and 22,500 units of product B.

C) 43,500 units of Product A and 21,750 units of Product B.

D) 45,000 units of Product A and 22,500 units of Product B.

E) 64,616 units of Product A and 32,308 units of Product B.

Answer: D

Explanation: D) Desired pre-tax net income $\$73,500 / (1.0 - .3) = \$105,000$

Weighted contribution margin $[2 \times (\$40 - \$24)] + [1 \times (\$50 - \$40)] = \$42$

Break-even point in composite units is $(\$105,000 + \$840,000) / \$42 = 22,500$

22,500 composite units is $(2 \times 22,500) = 45,000$ units of A and

$(1 \times 22,500) = 22,500$ units of B

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-6

15) Determine the breakeven point in units based on the following information:

	<u>Small</u>	<u>Large</u>
Sales	\$20	\$30
VC	14	18

Assume a constant mix of 3 units of Small for every 1 unit of Large.

Total fixed costs: \$48,000

A) 4,800 units of Small and 1,600 units of Large.

B) 1,200 units of Small and 400 units of Large.

C) 1,600 units of Small and 4,800 units of Large.

D) 8,000 units of Small and 2,667 units of Large.

E) 1,600 units of Small and 1,600 units of Large.

Answer: A

Explanation: A)	<u>Small</u>	<u>Large</u>
Sales	\$20	\$30
Variable costs	<u>14</u>	<u>18</u>
Contribution margin	\$6	\$12
Sales mix	<u>× 3</u>	<u>× 1</u>
Contribution margin per mix	<u>\$18</u>	<u>\$12</u>

Total contribution margin per mix = \$18 + \$12 = \$30

Break-even point in composite units = \$48,000/\$30 = 1,600

Small: $1,600 \times 3 = 4,800$ units

Large: $1,600 \times 1 = 1,600$ units

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-6

Answer the following question(s) using the information below.

The following information is for the Jeffries Corporation:

Product A:	
Revenue	\$16.00
Variable Cost	\$12.00
Product B:	
Revenue	\$24.00
Variable Cost	\$16.00
Total fixed costs	\$75,000

16) What is the break-even point, assuming the sales mix consists of three units of Product A and one unit of Product B?

- A) 10,000 units of A and 5,000 units of B
- B) 3,750 units of A and 3,750 units of B
- C) 12,000 units of A and 4,000 units of B
- D) 18,750 units of A and 6,250 units of B
- E) 11,250 units of A and 3,750 units of B

Answer: E

Explanation: E) N = units of product B; and $3N$ = units of product A;

$$(\$16.00 - \$12.00)3N + (\$24.00 - \$16.00) N - \$75,000 = 0$$

$$\$12N + \$8N = \$75,000$$

$$\$20N = \$75,000$$

$$N = 3,750 \text{ units}$$

Product A = 11,250 units; Product B = 3,750 units

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-6

17) What is the operating income, assuming actual sales total 25,000 units, and the sales mix is three units of Product A and one unit of Product B?

- A) \$300,000
- B) \$60,000
- C) \$225,000
- D) \$50,000
- E) \$75,000

Answer: D

	<u>Product A</u>	<u>Product B</u>	<u>Total</u>
Sales units	<u>18,750</u>	<u>6,250</u>	<u>25,000</u>
Revenue	\$300,000	\$150,000	\$450,000
Var. costs	<u>225,000</u>	<u>100,000</u>	<u>325,000</u>
CM	<u>\$75,000</u>	<u>\$50,000</u>	\$125,000
Fixed costs			<u>75,000</u>
			<u>\$50,000</u>

Diff: 3 Type: MC

Skill: Apply

Objective: LO 3-6

18) If the sales mix shifts to four units of Product A and one unit of Product B, then the weighted-average contribution margin will be

- A) \$30
- B) \$16
- C) \$20
- D) \$12
- E) \$24

Answer: E

Explanation: E) $(4 \times \$4) + (1 \times \$8) = \$24$

Diff: 2 Type: MC

Skill: Apply

Objective: LO 3-6

19) If the sales mix shifts to four units of Product A and one unit of Product B, then the break-even point will

- A) increase.
- B) stay the same.
- C) decrease.
- D) decrease then increase.
- E) increase then decrease.

Answer: A

Diff: 2 Type: MC

Skill: Understand

Objective: LO 3-6

20) Karen's Klothes sells blouses for women and girls. The average selling price and variable cost for each product are as follows:

Women: Selling Price \$18.00 Girls: Selling Price \$15.00

Women: Variable Cost \$12.75 Girls: Variable Cost \$10.50

Fixed costs are \$30,000 and cannot be separated evenly between the two products.

Required:

a. What is the break-even point in units for each type of blouse assuming the sales mix is 2:1 in favour of women's blouses? Total sales cannot exceed 7,000 units due to space constraints.

b. What is the operating income assuming the sales mix is 2:1 in favour of women's blouses, and sales total 9,900 blouses?

Answer:

a.

$N = \text{Break-even in girls' blouses}$ $2N = \text{break-even in women's blouses}$

$$15N + \$18(2N) - \$10.5N - \$12.75(2N) - \$30,000 = 0$$

$$51N - \$36N - \$30,000 = 0$$

$$15N - \$30,000 = 0$$

$$N = \$30,000 / \$15$$

$$N = 2,000 \text{ blouses}$$

Therefore, to break-even, 2,000 girls' blouses and 4,000 women's blouses need to be sold.

b.

	<u>Girls</u>	<u>Women</u>	<u>Total</u>
Sales in units	<u>3,300</u>	<u>6,600</u>	<u>9,900</u>
Revenue	\$49,500	\$118,800	\$168,300
Variable costs	<u>34,650</u>	<u>84,150</u>	<u>118,800</u>
Cont. Mar.	<u>\$14,850</u>	<u>\$34,650</u>	\$49,500
Fixed costs			<u>30,000</u>
Operating income			<u>\$19,500</u>

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-6

21) Popcorn Inc. currently sells plain popcorn at the ballpark. During a typical month the stand reports a profit of \$18,000 with sales of \$100,000 and fixed costs of \$42,000 and variable costs of \$0.64 per box. Next year the company plans to start selling candy-coated popcorn for \$3 a box. The candy-coated popcorn will have a variable cost of \$0.72. The new equipment and personnel to handle the popcorn will increase monthly fixed costs by \$17,616. Two boxes of candy-coated popcorn are expected to sell for every box of plain popcorn.

Required:

- Determine the monthly break-even sales in units before adding the candy-coated popcorn product.
- Determine the monthly break-even sales in units of each product during the first year of candy-coated popcorn sales assuming a constant sales mix.

Answer:

a.

$$\begin{aligned}\text{Contribution margin} &= \text{Fixed costs} + \text{Profit} \\ &= \$42,000 + \$18,000 \\ &= \$60,000\end{aligned}$$

$$\begin{aligned}\text{Variable costs} &= \text{Sales} - \text{Contribution margin} \\ &= \$100,000 - \$60,000 \\ &= \$40,000\end{aligned}$$

$$\begin{aligned}\text{Units sold} &= \$40,000 / \$0.64 & \text{Selling price} &= \$100,000 / 62,500 \\ &= 62,500 \text{ boxes} & &= \$1.60 \text{ per box}\end{aligned}$$

N = Break-even units

$$\$1.60 - \$0.64N - \$42,000 = 0$$

$$\$0.96N - \$42,000 = 0$$

$$N = \$42,000 / \$0.96$$

$$N = 43,750 \text{ boxes}$$

b.

Ratio equal to 1 plain popcorn boxes to 2 candy-coated popcorn boxes.

N = Break-even in plain popcorn boxes

2N = Break-even in candy-coated popcorn boxes

$$\$3(2N) + \$1.60N - \$0.72(2N) - \$0.64N - \$59,616 = 0$$

$$\$7.60N - \$2.08N - \$59,616 = 0$$

$$N = \$5.52N - \$59,616$$

$$N = \$59,616 / \$5.52$$

$$N = 10,800 \text{ boxes}$$

Therefore, 10,800 boxes of plain popcorn and 21,600 boxes of candy-coated popcorn need to be sold to break-even.

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-6

22) Yurus Manufacturing Company produces two products, X and Y. The following information is presented for both products:

	<u>X</u>	<u>Y</u>
Selling price per unit	\$36	\$24
Variable cost per unit	28	12

Total fixed costs are \$234,000.

Required:

- Calculate the contribution margin for each product.
- Calculate break-even point in units of both X and Y if the sales mix is 3 units of X for every unit of Y.
- Calculate break-even volume in total dollars if the sales mix is 2 units of X for every 3 units of Y.

Answer:

- $X: \$36 - \$28 = \$8$
 $Y: \$24 - \$12 = \$12$
- $(3 \times \$8) + (1 \times \$12) = \$36$
 $\$234,000 / \$36 = 6,500 \text{ units}$
 $X: 6,500 \times 3 = 19,500 \text{ units}$
 $Y: 6,500 \times 1 = 6,500 \text{ units}$
- $(2 \times \$8) + (3 \times \$12) = \$52$
 $\$234,000 / \$52 = 4,500 \text{ units}$
 $X: 4,500 \times 2 = 9,000 \times \$36 = \$324,000$
 $Y: 4,500 \times 3 = 13,500 \times \$24 = \$324,000$
Total dollar sales = \$648,000

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-6

23) Atlanta Radio Supply sells only two products, Product X and Product Y.

	Product X	Product Y	Total
Selling price	\$25	\$45	
Variable cost per unit	\$20	\$35	
Total fixed costs			\$350,000

Atlanta Radio Supply sells three units of Product X for each two units it sells of Product Y; the tax rate is 25%.

Required:

- What is the break-even point in units for each product, assuming the sales mix is 3 units of Product X for each two units of Product Y?
- How many units of each product would be sold if Atlanta Radio Supply desired an after-tax net income of \$210,000, using its tax rate of 25%?

Answer:

- $3N$ = break-even in product X $2N$ = break-even in product Y

$$(\$25 - \$20) \times 3N + (\$45 - \$35) \times 2N - \$350,000 = 0$$

$$\$15N + \$20N - \$350,000 = 0$$

$$\$35N - \$350,000 = 0$$

$$N = \$350,000 / \$35 = 10,000$$

Therefore, to break even, 30,000 ($10,000 \times 3$) units of Product X and 20,000 ($10,000 \times 2$) units of Product Y need to be sold.

- $3N$ = number of units of product X $2N$ = number of units of product Y

$$(\$25 - \$20) \times 3N + (\$45 - \$35) \times 2N - \$350,000 = \$210,000 / (1 - .25)$$

$$\$15N + \$20N - \$350,000 = \$280,000$$

$$\$35N - \$350,000 = \$280,000$$

$$\$35N - \$630,000 = 0$$

$$N = \$630,000 / \$35 = 18,000$$

Therefore, to meet the profit goal, $3 \times N = 54,000$ units of Product X and $2 \times N = 36,000$ units of Product Y need to be sold.

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-6

24) Mount Carmel Company sells only two products, Product A and Product B.

	Product A	Product B	Total
Selling price	\$40	\$50	
Variable cost per unit	\$24	\$40	
Total fixed costs			\$840,000

Mount Carmel sells two units of Product A for each unit it sells of Product B. Mount Carmel faces a tax rate of 30%.

Required:

- What is the breakeven point in units for each product assuming the sales mix is 2 units of Product A for each unit of Product B?
- What is the breakeven point if Mount Carmel's tax rate is reduced to 25%, assuming the sales mix is 2 units of Product A for each unit of Product B?
- How many units of each product would be sold if Mount Carmel desired an after-tax net income of \$73,500, facing a tax rate of 30%?

Answer:

- $N = \text{breakeven in product B}$ $2N = \text{breakeven in product A}$

$$(\$40 \times 2N) + (\$50 \times N) - (\$24 \times 2N) - (\$40 \times N) - \$840,000 = 0$$

$$(\$130 \times N) - (\$88 \times N) - \$840,000 = 0$$

$$\$42N - \$840,000 = 0$$

$$N = \$840,000 / \$42 = 20,000$$

Therefore, to break even, 40,000 units of Product A and 20,000 units of Product B need to be sold.

- The breakeven point would be the same. At the breakeven point there is no pre-tax income, so the tax rate change is irrelevant in this situation.

- $N = \text{number of units of product B}$ $2N = \text{number of units of product A}$

$$(\$40 \times 2N) + (\$50 \times N) - (\$24 \times 2N) - (\$40 \times N) - \$840,000 =$$

$$\$73,500 / (1 - .3)$$

$$(\$130 \times N) - (\$88 \times N) - \$840,000 = \$105,000$$

$$\$42N - \$945,000 = 0$$

$$N = \$945,000 / \$42 = 22,500$$

Therefore, to meet the profit goal, $2 \times N = 45,000$ units of Product A and $N = 22,500$ units of Product B need to be sold.

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-6

25) Ballpark Concessions currently sells hot dogs. During a typical month, the stand reports a profit of \$9,000 with sales of \$50,000, fixed costs of \$21,000, and variable costs of \$0.64 per hot dog.

Next year, the company plans to start selling nachos for \$3 per unit. Nachos will have a variable cost of \$0.72 and new equipment and personnel to produce nachos will increase monthly fixed costs by \$8,808. Initial sales of nachos should total 5,000 units. Most of the nacho sales are anticipated to come from current hot dog purchasers, therefore, monthly sales of hot dogs are expected to decline to \$20,000.

After the first year of nacho sales, the company president believes that hot dog sales will increase to \$33,750 a month and nacho sales will increase to 7,500 units a month.

Required:

- a. Determine the monthly break-even sales in dollars before adding nachos.
- b. Determine the monthly break-even sales during the first year of nachos sales, assuming a constant sales mix of 1 hotdog and 2 units of nachos.
- c. What is the expected monthly operating income for the second year that nachos are sold?

Answer:

a. Contribution margin = Fixed costs + Profit
= \$21,000 + \$9,000 = \$30,000

Variable costs = Sales - Contribution margin
= \$50,000 - \$30,000
= \$20,000

Units sold = \$20,000/\$0.64 = 31,250 units

Selling price = \$50,000/31,250 = \$1.60 per unit

Unit Variable costs = \$20,000/31,250 = \$0.64

N = Break-even units

$\$1.60N - \$0.64N - \$21,000 = 0$

$\$0.96N - \$21,000 = 0$

$N = \$21,000/\$0.96 = 21,875$ units

b. Ratio equal to 1 hot dog to 2 units of nachos.

N = Break-even number of units of hot dogs

2N = Break-even number of units of nachos

$\$3(2)N + \$1.60N - \$0.72(2N) - \$0.64N - \$29,808 = 0$

$\$7.60N - \$2.08N - \$29,808 = 0$

$N = \$29,808/\$5.52 = 5,400$ hot dogs

Therefore, 5,400 hot dogs and 10,800 units of nachos need to be sold to break even.

c.		Hot Dogs	Nachos	Total
	Sales	\$33,750	\$22,500	\$56,250
	Variable costs	<u>(13,500)</u>	<u>(5,400)</u>	<u>(18,900)</u>
	Contribution margin	\$20,250	\$17,100	\$37,350
	Fixed costs			<u>(29,808)</u>
	Operating income			\$7,542

Diff: 3 Type: ES

Skill: Apply

Objective: LO 3-6

26) Pennsylvania Valve Company makes three types of valves: Speedy Flow, Sure Flow, and Fine Flow. Each of the three products has a different contribution margin, and the proportions of the three products sold have remained steady over the years. How could Pennsylvania valve compute a break-even point given this situation?

Answer: Pennsylvania Valve could consider that it makes a single composite product that represents all three products given the constant sales mix. For example, if the ratio is 3 Speedy, 2 Sure Flow, and 1 Fine Flow, Pennsylvania Valve could calculate a weighted average contribution margin for the composite product based on the contribution margins of the individual products using the relative sales mix as weights. Pennsylvania Valve could then divide the fixed costs by this composite contribution margin to determine how many composite units would be needed to be sold to cover the fixed costs. Then the sales mix could be used to determine how many units of each real product is in each composite units. Thus, if 10,000 composite units were required to break-even and the sales mix is 3 Speedy, 2 Sure Flow, and 1 Fine Flow, Pennsylvania Valve would need to sell 30,000 units of Speedy, 20,000 units of Sure Flow and 10,000 units of Fine Flow to break-even.

Diff: 3 Type: ES

Skill: Understand

Objective: LO 3-6