Chapter 8: Cost-Volume-Profit Analysis

MULTIPLE CHOICE QUESTIONS

1. CVP analysis can be used to study the effect of:
   A. changes in selling prices on a company's profitability.
   B. changes in variable costs on a company's profitability.
   C. changes in fixed costs on a company's profitability.
   D. changes in product sales mix on a company's profitability.
   E. all of the above.

   Answer: E LO: 1 Type: RC

2. The break-even point is that level of activity where:
   A. total revenue equals total cost.
   B. variable cost equals fixed cost.
   C. total contribution margin equals the sum of variable cost plus fixed cost.
   D. sales revenue equals total variable cost.
   E. profit is greater than zero.

   Answer: A LO: 1 Type: RC

3. The unit contribution margin is calculated as the difference between:
   A. selling price and fixed cost per unit.
   B. selling price and variable cost per unit.
   C. selling price and product cost per unit.
   D. fixed cost per unit and variable cost per unit.
   E. fixed cost per unit and product cost per unit.

   Answer: B LO: 1 Type: RC

4. Which of the following would produce the largest increase in the contribution margin per unit?
   A. A 7% increase in selling price.
   B. A 15% decrease in selling price.
   C. A 14% increase in variable cost.
   D. A 17% decrease in fixed cost.
   E. A 23% increase in the number of units sold.

   Answer: A LO: 1 Type: N

5. Which of the following would take place if a company were able to reduce its variable cost per unit?

	Contribution Margin	Break-even Point
A.	Increase	Increase
B.	Increase	Decrease
C.	Decrease	Increase
D.	Decrease	Decrease
E.	Increase	No effect

Answer: B LO: 1 Type: N

6. Which of the following would take place if a company experienced an increase in fixed costs?
   A. Net income would increase.
   B. The break-even point would increase.
   C. The contribution margin would increase.
   D. The contribution margin would decrease.
   E. More than one of the above events would occur.

Answer: B LO: 1 Type: N

7. Assuming no change in sales volume, an increase in a firm's per-unit contribution margin would:
   A. increase net income.
   B. decrease net income.
   C. have no effect on net income.
   D. increase fixed costs.
   E. decrease fixed costs.

Answer: A LO: 1 Type: N

8. A company that desires to lower its break-even point should strive to:
   A. decrease selling prices.
   B. reduce variable costs.
   C. increase fixed costs.
   D. sell more units.
   E. pursue more than one of the above actions.

Answer: B LO: 1 Type: N

9. A company has fixed costs of $900 and a per-unit contribution margin of $3. Which of the following statements is (are) true?
   A. Each unit "contributes" $3 toward covering the fixed costs of $900.
   B. The situation described is not possible and there must be an error.
   C. Once the break-even point is reached, the company will make money at the rate of $3 per unit.
   D. The firm will definitely lose money in this situation.
   E. Statements "A" and "C" are true.

Answer: E LO: 1 Type: N

10. Sanderson sells a single product for $50 that has a variable cost of $30. Fixed costs amount to $5 per unit when anticipated sales targets are met. If the company sells one unit in excess of its break-even volume, the bottom-line profit will be:
    A. $15.
    B. $20.
    C. $50.
    D. an amount that cannot be derived based on the information presented.
    E. an amount other than those in choices "A," "B," and "C" but one that can be derived based on the information presented.

    Answer: B LO: 1 Type: A

11. At a volume of 15,000 units, Boston reported sales revenues of $600,000, variable costs of $225,000, and fixed costs of $120,000. The company's contribution margin per unit is:
    A. $17.
    B. $25.
    C. $47.
    D. $55.
    E. an amount other than those above.

    Answer: B LO: 1 Type: A

12. A recent income statement of Banks Corporation reported the following data:

Sales revenue	$8,000,000
Variable costs	5,000,000
Fixed costs	2,200,000

    If these data are based on the sale of 20,000 units, the contribution margin per unit would be:
    A. $40.
    B. $150.
    C. $290.
    D. $360.
    E. an amount other than those above.

    Answer: B LO: 1 Type: A

13. A recent income statement of Fox Corporation reported the following data:

Sales revenue	$3,600,000
Variable costs	1,600,000
Fixed costs	1,000,000

If these data are based on the sale of 10,000 units, the break-even point would be:
A. 2,000 units.
B. 2,778 units.
C. 3,600 units.
D. 5,000 units.
E. an amount other than those above.

Answer: D LO: 1 Type: A

14. A recent income statement of Yale Corporation reported the following data:

Sales revenue	$2,500,000
Variable costs	1,500,000
Fixed costs	800,000

If these data are based on the sale of 5,000 units, the break-even sales would be:
A. $2,000,000.
B. $2,206,000.
C. $2,500,000.
D. $10,000,000.
E. an amount other than those above.

Answer: A LO: 1 Type: A

15. Lawton, Inc., sells a single product for $12. Variable costs are $8 per unit and fixed costs total $360,000 at a volume level of 60,000 units. Assuming that fixed costs do not change, Lawton's break-even point would be:
A. 30,000 units.
B. 45,000 units.
C. 90,000 units.
D. negative because the company loses $2 on every unit sold.
E. a positive amount other than those given above.

Answer: C LO: 1 Type: A

16. Green, Inc., sells a single product for $20. Variable costs are $8 per unit and fixed costs total $120,000 at a volume level of 5,000 units. Assuming that fixed costs do not change, Green's break-even sales would be:
    A. $160,000.
    B. $200,000.
    C. $300,000.
    D. $480,000.
    E. an amount other than those above.

    Answer: B LO: 1 Type: A

17. Orion recently reported sales revenues of $800,000, a total contribution margin of $300,000, and fixed costs of $180,000. If sales volume amounted to 10,000 units, the company's variable cost per unit must have been:
    A. $12.
    B. $32.
    C. $50.
    D. $92.
    E. an amount other than those above.

    Answer: C LO: 1 Type: A

18. Strand has a break-even point of 120,000 units. If the firm's sole product sells for $40 and fixed costs total $480,000, the variable cost per unit must be:
    A. $4.
    B. $36.
    C. $44.
    D. an amount that cannot be derived based on the information presented.
    E. an amount other than those in choices "A," "B," and "C" but one that can be derived based on the information presented.

    Answer: B LO: 1 Type: A

19. Ribco Co., makes and sells only one product. The unit contribution margin is $6 and the break-even point in unit sales is 24,000. The company's fixed costs are:
    A. $4,000.
    B. $14,400.
    C. $40,000.
    D. $144,000.
    E. an amount other than those above.

    Answer: D LO: 1 Type: A

20. The contribution-margin ratio is:
    A. the difference between the selling price and the variable cost per unit.
    B. fixed cost per unit divided by variable cost per unit.
    C. variable cost per unit divided by the selling price.
    D. unit contribution margin divided by the selling price.
    E. unit contribution margin divided by fixed cost per unit.

    Answer: D LO: 2 Type: RC

21. At a volume level of 500,000 units, Sullivan reported the following information:

Sales price	$60
Variable cost per unit	20
Fixed cost per unit	4

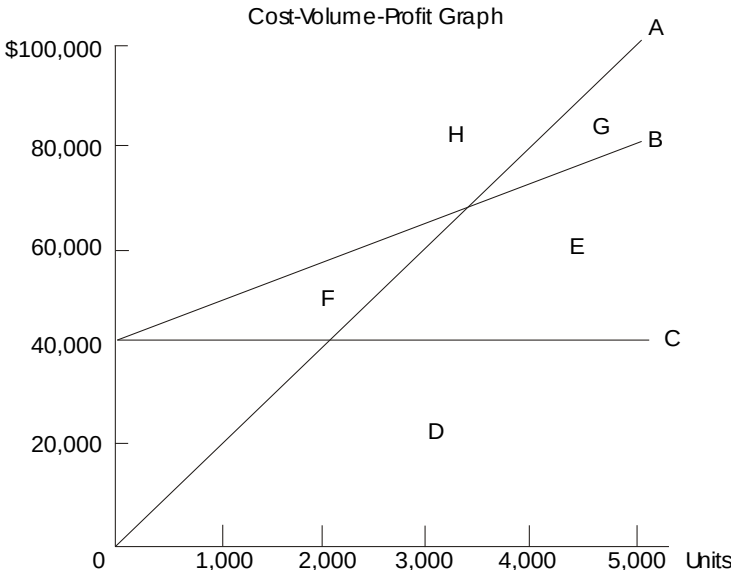
    The company's contribution-margin ratio is:
    A. 0.33.
    B. 0.40.
    C. 0.60.
    D. 0.67.
    E. an amount other than those above.

    Answer: D LO: 2 Type: A

22. Which of the following expressions can be used to calculate the break-even point with the contribution-margin ratio (CMR)?
    A. CMR ÷ fixed costs.
    B. CMR x fixed costs.
    C. Fixed costs ÷ CMR.
    D. (Fixed costs + variable costs) x CMR.
    E. (Sales revenue - variable costs) ÷ CMR.

    Answer: C LO: 2 Type: RC

Use the following to answer questions 23-30:



23. Line A is the:
    A. total revenue line.
    B. fixed cost line.
    C. variable cost line.
    D. total cost line.
    E. profit line.

    Answer: A LO: 3 Type: RC

24. Line C represents the level of:
    A. fixed cost.
    B. variable cost.
    C. semivariable cost.
    D. total cost.
    E. mixed cost.

    Answer: A LO: 3 Type: RC

25. The slope of line A is equal to the:
    A. fixed cost per unit.
    B. selling price per unit.
    C. profit per unit.
    D. semivariable cost per unit.
    E. unit contribution margin.

    Answer: B LO: 3 Type: RC

26. The slope of line B is equal to the:
    A. fixed cost per unit.
    B. selling price per unit.
    C. variable cost per unit.
    D. profit per unit.
    E. unit contribution margin.

    Answer: C LO: 3 Type: RC

27. The vertical distance between the total cost line and the total revenue line represents:
    A. fixed cost.
    B. variable cost.
    C. profit or loss at that volume.
    D. semivariable cost.
    E. the safety margin.

    Answer: C LO: 3 Type: RC

28. Assume that the firm whose cost structure is depicted in the figure expects to produce a loss for the upcoming period. The loss would be shown on the graph:
    A. by the area immediately above the break-even point.
    B. by the area immediately below the total cost line.
    C. by the area diagonally to the right of the break-even point.
    D. by the area diagonally to the left of the break-even point.
    E. in some other area not mentioned above.

    Answer: D LO: 3 Type: RC

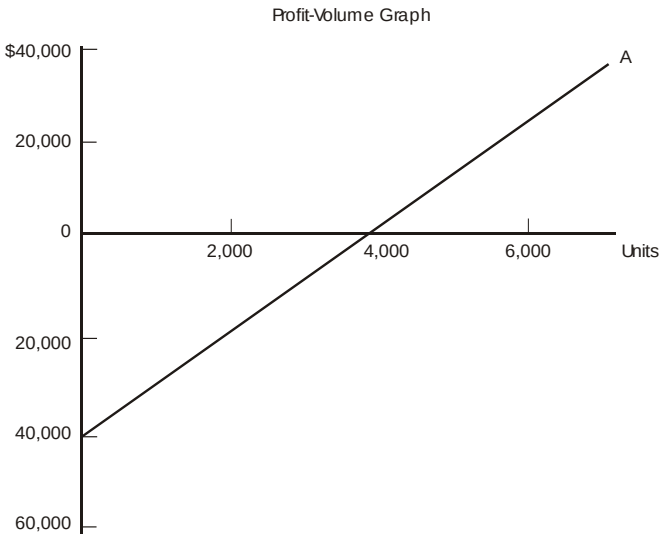
29. At a given sales volume, the vertical distance between the fixed cost line and the total cost line represents:
    A. fixed cost.
    B. variable cost.
    C. profit or loss at that volume.
    D. semivariable cost.
    E. the safety margin.

    Answer: B LO: 3 Type: RC

30. Assume that the firm whose cost structure is depicted in the figure expects to produce a profit for the upcoming accounting period. The profit would be shown on the graph by the letter:
    A. D.
    B. E.
    C. F.
    D. G.
    E. H.

    Answer: D LO: 3 Type: RC

Use the following to answer questions 31-32:



31. Line A is the:
    A. fixed cost line.
    B. variable cost line.
    C. total cost line.
    D. total revenue line.
    E. profit line.

    Answer: E LO: 3 Type: N

32. The triangular area between the horizontal axis and Line A, to the right of 4,000, represents:
    A. fixed cost.
    B. variable cost.
    C. profit.
    D. loss.
    E. sales revenue.

    Answer: C LO: 3 Type: RC

33. A recent income statement of Oslo Corporation reported the following data:

Units sold	8,000
Sales revenue	$7,200,000
Variable costs	4,000,000
Fixed costs	1,600,000

If the company desired to earn a target net profit of $480,000, it would have to sell:
A. 1,200 units.
B. 2,800 units.
C. 4,000 units.
D. 5,200 units.
E. an amount other than those above.

Answer: D LO: 4 Type: A

34. Yellow, Inc., sells a single product for $10. Variable costs are $4 per unit and fixed costs total $120,000 at a volume level of 10,000 units. What dollar sales level would Yellow have to achieve to earn a target net profit of $240,000?
A. $400,000.
B. $500,000.
C. $600,000.
D. $750,000.
E. $900,000.

Answer: C LO: 4 Type: A

Use the following to answer questions 35-37:

Archie sells a single product for $50. Variable costs are 60% of the selling price, and the company has fixed costs that amount to $400,000. Current sales total 16,000 units.

35. Archie:
A. will break-even by selling 8,000 units.
B. will break-even by selling 13,333 units.
C. will break-even by selling 20,000 units.
D. will break-even by selling 1,000,000 units.
E. cannot break-even because it loses money on every unit sold.

Answer: C LO: 1 Type: A

36. Each unit that the company sells will:
A. increase overall profitability by $20.
B. increase overall profitability by $30.
C. increase overall profitability by $50.
D. increase overall profitability by some other amount.
E. decrease overall profitability by $5.

Answer: A LO: 1 Type: A

37. In order to produce a target profit of $22,000, Archie's dollar sales must total:
    A. $8,440.
    B. $21,100.
    C. $1,000,000.
    D. $1,055,000.
    E. an amount other than those above.

    Answer: D LO: 4 Type: A

38. The difference between budgeted sales revenue and break-even sales revenue is the:
    A. contribution margin.
    B. contribution-margin ratio.
    C. safety margin.
    D. target net profit.
    E. operating leverage.

    Answer: C LO: 4 Type: RC

39. Maxie's budget for the upcoming year revealed the following figures:

Sales revenue	$840,000
Contribution margin	504,000
Net income	54,000

    If the company's break-even sales total $750,000, Maxie's safety margin would be:
    A. $(90,000).
    B. $90,000.
    C. $246,000.
    D. $336,000.
    E. $696,000.

    Answer: B LO: 4 Type: A

40. If a company desires to increase its safety margin, it should:
    A. increase fixed costs.
    B. decrease the contribution margin.
    C. decrease selling prices, assuming the price change will have no effect on demand.
    D. stimulate sales volume.
    E. attempt to raise the break-even point.

    Answer: D LO: 4 Type: N

41. Dana sells a single product at $20 per unit. The firm's most recent income statement revealed unit sales of 100,000, variable costs of $800,000, and fixed costs of $400,000. If a $4 drop in selling price will boost unit sales volume by 20%, the company will experience:
    A. no change in profit because a 20% drop in sales price is balanced by a 20% increase in volume.
    B. an $80,000 drop in profitability.
    C. a $240,000 drop in profitability.
    D. a $400,000 drop in profitability.
    E. a change in profitability other than those above.

    Answer: C LO: 4 Type: A

42. Grimes is studying the profitability of a change in operation and has gathered the following information:

	Current Operation	Anticipated Operation
Fixed costs	$38,000	$48,000
Selling price	$16	$22
Variable cost	$10	$12
Sales (units)	9,000	6,000

    Should Grimes make the change?
    A. Yes, the company will be better off by $6,000.
    B. No, because sales will drop by 3,000 units.
    C. No, because the company will be worse off by $4,000.
    D. No, because the company will be worse off by $22,000.
    E. It is impossible to judge because additional information is needed.

    Answer: C LO: 4 Type: A

43. Gleason sells a single product at $14 per unit. The firm's most recent income statement revealed unit sales of 80,000, variable costs of $800,000, and fixed costs of $560,000. Management believes that a $3 drop in selling price will boost unit sales volume by 20%. Which of the following correctly depicts how these two changes will affect the company's break-even point?

	Drop in Sales Price	Increase in Sales Volume
A.	Increase	Increase
B.	Increase	Decrease
C.	Increase	No effect
D.	Decrease	Increase
E.	Decrease	Decrease

    Answer: C LO: 4 Type: A

44. All other things being equal, a company that sells multiple products should attempt to structure its sales mix so the greatest portion of the mix is composed of those products with the highest:
A. selling price.
B. variable cost.
C. contribution margin.
D. fixed cost.
E. gross margin.

Answer: C LO: 5 Type: N

45. O'Dell sells three products: R, S, and T. Budgeted information for the upcoming accounting period follows.

Product	Sales Volume (Units)	Selling Price	Variable Cost
R	16,000	$14	$9
S	12,000	10	6
T	52,000	11	8

The company's weighted-average unit contribution margin is:
A. $3.00.
B. $3.55.
C. $4.00.
D. $19.35.
E. an amount other than those above.

Answer: B LO: 5 Type: A

46. Wells Corporation has the following sales mix for its three products: A, 20%; B, 35%; and C, 45%. Fixed costs total $400,000 and the weighted-average contribution margin is $100. How many units of product A must be sold to break-even?
A. 800.
B. 4,000.
C. 20,000.
D. An amount other than those above.
E. Cannot be determined based on the information presented.

Answer: A LO: 5 Type: A

Use the following to answer questions 47-50:

Lamar & Co., makes and sells two types of shoes, Plain and Fancy. Data concerning these products are as follows:

	Plain	Fancy
Unit selling price	$20.00	$35.00
Variable cost per unit	12.00	24.50

Sixty percent of the unit sales are Plain, and annual fixed expenses are $45,000.

47. The weighted-average unit contribution margin is:
    A. $4.80.
    B. $9.00.
    C. $9.25.
    D. $17.00.
    E. an amount other than those above.

    Answer: B LO: 5 Type: A

48. Assuming that the sales mix remains constant, the total number of units that the company must sell to break even is:
    A. 2,432.
    B. 2,647.
    C. 4,737.
    D. 5,000.
    E. an amount other than those above.

    Answer: D LO: 5 Type: A

49. Assuming that the sales mix remains constant, the number of units of Plain that the company must sell to break even is:
    A. 2,000.
    B. 3,000.
    C. 3,375.
    D. 5,000.
    E. 5,625.

    Answer: B LO: 5 Type: A

50. Assuming that the sales mix remains constant, the number of units of Fancy that the company must sell to break even is:
    A. 2,000.
    B. 3,000.
    C. 3,375.
    D. 5,000.
    E. 5,625.

    Answer: A LO: 5 Type: A

51. Which of the following underlying assumptions form(s) the basis for cost-volume-profit analysis?
    A. Revenues and costs behave in a linear manner.
    B. Costs can be categorized as variable, fixed, or semivariable.
    C. Worker efficiency and productivity remain constant.
    D. In multiproduct organizations, the sales mix remains constant.
    E. All of the above are assumptions that underlie cost-volume-profit analysis.

    Answer: E LO: 6 Type: RC

52. Cost-volume-profit analysis is based on certain general assumptions. Which of the following is not one of these assumptions?
    A. Product prices will remain constant as volume varies within the relevant range.
    B. Costs can be categorized as fixed, variable, or semivariable.
    C. The efficiency and productivity of the production process and workers will change to reflect manufacturing advances.
    D. Total fixed costs remain constant as activity changes.
    E. Unit variable cost remains constant as activity changes.

    Answer: C LO: 6 Type: RC

53. The assumptions on which cost-volume-profit analysis is based appear to be most valid for businesses:
    A. over the short run.
    B. over the long run.
    C. over both the short run and the long run.
    D. in periods of sustained profits.
    E. in periods of increasing sales.

    Answer: A LO: 6 Type: N

54. The contribution income statement differs from the traditional income statement in which of the following ways?
    A. The traditional income statement separates costs into fixed and variable components.
    B. The traditional income statement subtracts all variable costs from sales to obtain the contribution margin.
    C. Cost-volume-profit relationships can be analyzed more easily from the contribution income statement.
    D. The effect of sales volume changes on profit is readily apparent on the traditional income statement.
    E. The contribution income statement separates costs into product and period categories.

    Answer: C LO: 7 Type: RC

55. Which of the following does not typically appear on a contribution income statement?
    A. Net income.
    B. Gross margin.
    C. Contribution margin.
    D. Total variable costs.
    E. Total fixed costs.

    Answer: B LO: 7 Type: RC

56. Which of the following does not typically appear on an income statement prepared by using a traditional format?
    A. Cost of goods sold.
    B. Contribution margin.
    C. Gross margin.
    D. Selling expenses.
    E. Administrative expenses.

    Answer: B LO: 7 Type: RC

57. The extent to which an organization uses fixed costs in its cost structure is measured by:
    A. financial leverage.
    B. operating leverage.
    C. fixed cost leverage.
    D. contribution leverage.
    E. efficiency leverage.

    Answer: B LO: 8 Type: RC

58. A manager who wants to determine the percentage impact on net income of a given percentage change in sales would multiply the percentage increase/decrease in sales revenue by the:
    A. contribution margin.
    B. gross margin.
    C. operating leverage factor.
    D. safety margin.
    E. contribution-margin ratio.

    Answer: C LO: 8 Type: RC

59. Which of the following calculations can be used to measure a company's degree of operating leverage?
    A. Contribution margin ÷ sales.
    B. Contribution margin ÷ net income.
    C. Sales ÷ contribution margin.
    D. Sales ÷ net income.
    E. Sales ÷ fixed costs.

    Answer: B LO: 8 Type: RC

60. You are analyzing Becker Corporation and Newton Corporation and have concluded that Becker has a higher operating leverage factor than Newton. Which one of the following choices correctly depicts (1) the relative use of fixed costs (as opposed to variable costs) for the two companies and (2) the percentage change in income caused by a change in sales?

	Relative Use of Fixed Costs as Opposed to Variable Costs	Percentage Change in Income Caused by a Change in Sales
A.	Greater for Becker	Greater for Becker
B.	Greater for Becker	Lower for Becker
C.	Greater for Becker	Equal for both
D.	Lower for Becker	Greater for Becker
E.	Lower for Becker	Lower for Becker

Answer: A LO: 8 Type: RC

61. The following information relates to Day Company:

Sales revenue	$12,000,000
Contribution margin	4,800,000
Net income	800,000

Day's operating leverage factor is:
A. 0.067.
B. 0.167.
C. 0.400.
D. 2.500.
E. 6.000.

Answer: E LO: 8 Type: A

62. The following information relates to Paterno Company:

Sales revenue	$10,000,000
Contribution margin	4,000,000
Net income	1,000,000

If a manager at Paterno desired to determine the percentage impact on net income of a given percentage change in sales, the manager would multiply the percentage increase/decrease in sales revenue by:
A. 0.25.
B. 0.40.
C. 2.50.
D. 4.00.
E. 10.00.

Answer: D LO: 8 Type: A, N

Use the following to answer questions 63-64:

Edco Company produced and sold 45,000 units of a single product last year, with the following results:

Sales revenue	$1,350,000
Manufacturing costs:	
Variable	585,000
Fixed	270,000
Selling costs:	
Variable	40,500
Fixed	54,000
Administrative costs:	
Variable	184,500
Fixed	108,000

63. Edco's operating leverage factor was:
    A. 4.
    B. 5.
    C. 6.
    D. 7.
    E. 8.

    Answer: B LO: 8 Type: A

64. If Edco's sales revenues increase 15%, what will be the percentage increase in income before income taxes?
    A. 15%.
    B. 45%.
    C. 60%.
    D. 75%.
    E. An amount other than those above.

    Answer: D LO: 8 Type: A

65. When advanced manufacturing systems are installed, what effect does such installation usually have on fixed costs and the break-even point?

	Fixed Costs	Break-even Point
A.	Increase	Increase
B.	Increase	Decrease
C.	Decrease	Increase
D.	Decrease	Decrease
E.	Do not change	Does not change

    Answer: A LO: 8 Type: RC

66. Which of the following statements is (are) true regarding a company that has implemented flexible manufacturing systems and activity-based costing?

I. The company has erred, as these two practices used in conjunction with one another will severely limit the firm's ability to analyze costs over the relevant range.
II. Costs formerly viewed as fixed under traditional-costing systems may now be considered variable with respect to changes in cost drivers such as number of setups, number of material moves, and so forth.
III. As compared with the results obtained under a traditional-costing system, the concept of break-even analysis loses meaning.

A. I only.
B. II only.
C. III only.
D. I and II.
E. II and III.

Answer: B LO: 10 Type: N

67. A company, subject to a 40% tax rate, desires to earn $500,000 of after-tax income. How much should the firm add to fixed costs when figuring the sales revenues necessary to produce this income level?
A. $200,000.
B. $300,000.
C. $500,000.
D. $833,333.
E. $1,250,000.

Answer: D LO: 11 Type: A

68. Barney, Inc., is subject to a 40% income tax rate. The following data pertain to the period just ended when the company produced and sold 45,000 units:

Sales revenue	$1,350,000
Variable costs	810,000
Fixed costs	432,000

How many units must Barney sell to earn an after-tax profit of $180,000?
A. 42,000.
B. 45,000.
C. 51,000.
D. 61,000.
E. An amount other than those above.

Answer: D LO: 11 Type: A

EXERCISES

Basic CVP Relationships

69. Vince's Pizza delivers pizzas to dormitories and apartments near a major state university. The company's annual fixed costs are $48,000. The sales price averages $9, and it costs the company $3 to make and deliver each pizza.

Required:

A. How many pizzas must Vince's sell to break even?
B. How many pizzas must the company sell to earn a target net profit of $54,000?
C. If budgeted sales total 9,900 pizzas, how much is the company's safety margin?
D. Vince's assistant manager, an accounting major, has suggested that the firm should try to increase the contribution margin per pizza. Explain the meaning of "contribution margin" in layman's terms.

LO: 1, 4 Type: RC, A

Answer:

A.

Selling price per pizza	$9
Less: Variable cost per pizza	3
Unit contribution margin	$6

Break-even pizzas: $48,000 ÷ $6 = 8,000

B. Pizzas to earn $54,000: ($48,000 + $54,000) ÷ $6 = 17,000

C. Safety margin: (9,900 x $9) - (8,000 x $9) = $17,100

D. The contribution margin is the amount that each unit (pizza) contributes toward covering fixed cost and producing a profit. Once a company's fixed costs are covered, operating income will increase by the amount of the contribution margin. Mathematically, it is computed as the difference between selling price and the variable cost per unit.

Basic CVP Relationships

70. Seventh Heaven takes tourists on helicopter tours of Hawaii. Each tourist buys a $150 ticket; the variable costs average $60 per person. Seventh Heaven has annual fixed costs of $702,000.

    Required:
    A. How many tours must the company conduct in a month to break even?
    B. Compute the sales revenue needed to produce a target net profit of $36,000 per month.
    C. Calculate the contribution margin ratio.
    D. Determine whether the actions that follow will increase, decrease, or not affect the company's break-even point.
        1. A decrease in tour prices.
        2. The termination of a salaried clerk (no replacement is planned).
        3. A decrease in the number of tours sold.

    LO: 1, 2, 4 Type: A, N

    Answer:

    A.

Selling price per tour	$150
Less: Variable cost per tour	60
Unit contribution margin	$ 90

    Break-even tours: ($702,000 ÷ 12 months) ÷ $90 = 650

    B. Tours to earn $36,000: [($702,000 ÷ 12 months) + $36,000] ÷ $90 = 1,050

    C. Contribution margin ratio: $90 ÷ $150 = 0.6

    D. 1. Increase
        2. Decrease
        3. No effect

CVP: Analysis of Operations

71. Thompson Company is considering the development of two products: no. 65 or no. 66. Manufacturing cost information follows.

	No. 65	No. 66
Annual fixed costs	$220,000	$340,000
Variable cost per unit	33	25

Regardless of which product is introduced, the anticipated selling price will be $50 and the company will pay a 10% sales commission on gross dollar sales. Thompson will not carry an inventory of these items.

Required:

A. What is the break-even sales volume (in dollars) on product no. 66?
B. Which of the two products will be more profitable at a sales level of 25,000 units?
C. At what unit-volume level will the profit/loss on product no. 65 equal the profit/loss on product no. 66?

LO: 1, 4 Type: A

Answer:

A.

Selling price	$50
Less: Variable cost [$25 + ($50 x 10%)]	30
Unit contribution margin	$20

Break-even units: $340,000 ÷ $20 = 17,000
Break-even sales: 17,000 x $50 = $850,000

B.

	No. 65	No. 66
Sales*	$1,250,000	$1,250,000
Less: Variable costs**	950,000	750,000
Contribution margin	$ 300,000	$ 500,000
Less: Fixed costs	220,000	340,000
Operating income	$ 80,000	$ 160,000

*25,000 x $50
**No. 65: 25,000 x [$33 + ($50 x 10%)]; No. 66: 25,000 x [$25 + ($50 x 10%)]

Product no. 66 is more profitable: $160,000 vs. $80,000

C. X = Number of units
($50 - $38)X - $220,000 = ($50 - $30)X - $340,000
$12X - $220,000 = $20X - $340,000
$8X = $120,000
X = 15,000 units

Break-Even Analysis, Decision Making

72. The Bruggs & Strutton Company manufactures an engine for carpet cleaners called the "Snooper." Budgeted cost and revenue data for the "Snooper" are given below, based on sales of 40,000 units.

Sales	$1,600,000
Less: Cost of goods sold	1,120,000
Gross margin	$ 480,000
Less: Operating expenses	100,000
Net income	$ 380,000

Cost of goods sold consists of $800,000 of variable costs and $320,000 of fixed costs. Operating expenses consist of $40,000 of variable costs and $60,000 of fixed costs.

Required:
A. Calculate the break-even point in units and sales dollars.
B. Calculate the safety margin.
C. Bruggs & Strutton received an order for 6,000 units at a price of $25.00. There will be no increase in fixed costs, but variable costs will be reduced by $0.54 per unit because of cheaper packaging. Determine the projected increase or decrease in profit from the order.

LO: 4 Type: A

Answer:

A.

Sales	$1,600,000
Less: Variable costs ($800,000 + $40,000)	840,000
Contribution margin	$ 760,000

Unit contribution margin: $760,000 ÷ 40,000 units = $19
Break-even point in units: ($320,000 + $60,000) ÷ $19 = 20,000 units
Unit selling price: $1,600,000 ÷ 40,000 units = $40
Break-even point in dollars: 20,000 units x $40 = $800,000

B. Safety margin: $1,600,000 - $800,000 = $800,000

C.

Sales (6,000 x $25)	$ 150,000
Less: Variable costs at $20.46*	122,760
Increase in profit	$ 27,240

*($800,000 + $40,000) ÷ 40,000 units = $21.00; $21.00 - $0.54 = $20.46

Impact of Operating Changes

73. Oakmark recently sold 70,000 units, generating sales revenue of $4,900,000. The company's variable cost per unit and total fixed cost amounted to $20 and $2,800,000, respectively. Management is in the process of studying the dollar impact of various transactions and events, and desires answers to the following independent cases:

    Case no. 1: Management wants to lower the firm's break-even point to 52,000 units. All other things being equal, what must happen to fixed costs to achieve this objective?

    Case no. 2: The company anticipates a $2 hike in the variable cost per unit. All other things being equal, if management desires to keep the firm's current break-even point, what must happen to Oakmark's selling price? If selling price remains constant, what must happen to the firm's total fixed costs?

    Required:
    A. Answer the two cases raised by management.
    B. Determine the impact (increase, decrease, or no effect) of the following operating changes on the items cited:
        1. An increase in variable selling costs on net income.
        2. A decrease in direct material cost on the unit contribution margin.
        3. A decrease in the number of units sold on the break-even point.

    LO: 1, 4 Type: A

    Answer:
    A. Case no. 1:
        Selling price per unit: $4,900,000 ÷ 70,000 units = $70
        Unit contribution margin: $70 - $20 = $50
        Current break-even point: $2,800,000 ÷ $50 = 56,000 units
        New level of fixed cost: X ÷ $50 = 52,000 units; X = $2,600,000

        Fixed costs must decrease by $200,000 ($2,800,000 - $2,600,000).

        Case no. 2:
        To keep the same break-even point, the contribution margin must remain at $50. Thus, the selling price must increase to $72 to offset the $2 hike in variable cost.

        Break-even: Fixed cost ÷ $48 = 56,000 units; fixed cost = $2,688,000

        Fixed costs must fall by $112,000 ($2,800,000 - $2,688,000) if the selling price remains constant.

    B. 1. Decrease
        2. Increase
        3. No effect

Impact of Operating Changes

74. Wilcox Company is studying the impact of the following:

    1. An increase in sales price.
    2. An increase in the variable cost per unit.
    3. An increase in the number of units sold (note: each unit produces a $6 contribution margin).
    4. A decrease in fixed costs.
    5. A proposed change in the method of compensation for salespeople, away from commissions based on gross sales dollars and toward higher monthly salaries.

    Required:
    Determine the impact of each of these operating changes on Wilcox's per-unit contribution margin and break-even point by completing the chart that follows. Your responses should be Increase (INC), Decrease (DEC), No Effect (NE), or Insufficient Information to Judge (II).

	Per-Unit Contribution Margin	Break-Even Point
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____

    LO: 1, 4 Type: N

    Answer:

	Per-Unit Contribution Margin	Break-Even Point
1.	INC	DEC
2.	DEC	INC
3.	NE	NE
4.	NE	DEC
5.	INC	II

Impact of Operating Changes

75. Gladstone Company is studying the impact of the following:

    1. An increase in sales price on the break-even point.
    2. A decrease in fixed costs on the contribution margin.
    3. An increase in the contribution margin on the break-even point.
    4. A decrease in the variable cost per unit on the sales volume needed to achieve Gladstone's $68,000 target net profit.
    5. An increase in sales commissions on the break-even point and the contribution margin.
    6. A decrease in anticipated advertising outlays on fixed cost and the break-even point.

    Required:
    Determine the impact of these operating changes (increase, decrease, no effect) on the item(s) noted.

    LO: 1, 4 Type: N

    Answer:

    1. Decrease
    2. No effect
    3. Decrease
    4. Decrease
    5. Increase, decrease
    6. Decrease, decrease

Cost-Volume-Profit Analysis, Multiple Products

76. Boise Company manufactures and sells three products: Good, Better, and Best. Annual fixed costs are $3,315,000, and data about the three products follow.

	Good	Better	Best
Sales mix in units	30%	50%	20%
Selling price	$250	$350	$500
Variable cost	100	150	250

Required:

A. Determine the weighted-average unit contribution margin.
B. Determine the break-even volume in units for each product.
C. Determine the total number of units that must be sold to obtain a profit for the company of $234,000.
D. Assume that the sales mix for Good, Better, and Best is changed to 50%, 30%, and 20%, respectively. Will the number of units required to break-even increase or decrease? Explain. Hint: Detailed calculations are not needed to obtain the proper solution.

LO: 5 Type: A, N

Answer:

A.

	Good	Better	Best
Selling price	$250	$350	$500
Less: Variable cost	100	150	250
Contribution margin	$150	$200	$250

Good: $150 x 30%	$ 45
Better: $200 x 50%	100
Best: $250 x 20%	50
Weighted-average CM	$195

B. Break-even volume: $3,315,000 ÷ $195 = 17,000 units
Good: 17,000 x 30% = 5,100 units
Better: 17,000 x 50% = 8,500 units
Best: 17,000 x 20% = 3,400 units

C. Volume to earn $234,000: ($3,315,000 + $234,000) ÷ $195 = 18,200 units

D. The number of units required would increase since a greater proportion of lower-contribution-margin units (specifically, Good) would be sold.

Cost-Volume-Profit Analysis, Multiple Products

77. Alphabet Corporation sells three products: J, K, and L. The following information was taken from a recent budget:

	J	K	L
Unit sales	40,000	130,000	30,000
Selling price	$60	$80	$75
Variable cost	40	65	50

Total fixed costs are anticipated to be $2,450,000.

Required:
A. Determine Alphabet's sales mix.
B. Determine the weighted-average contribution margin.
C. Calculate the number of units of J, K, and L that must be sold to break even.
D. If Alphabet desires to increase company profitability, should it attempt to increase or decrease the sales of product K relative to those of J and L? Briefly explain.

LO: 5 Type: A, N

Answer:

A. Sales mix: 40,000 + 130,000 + 30,000 = 200,000 units
J: 40,000 ÷ 200,000 = 20%
K: 130,000 ÷ 200,000 = 65%
L: 30,000 ÷ 200,000 = 15%

B. Unit contribution margins:

	J	K	L
Selling price	$60	$80	$75
Less: Variable cost	40	65	50
Contribution margin	$20	$15	$25

J: $20 x 20%	$ 4.00
K: $15 x 65%	9.75
L: $25 x 15%	3.75
Weighted-average CM	$17.50

C. Break-even volume: $2,450,000 ÷ $17.50 = 140,000 units
J: 140,000 x 20% = 28,000 units
K: 140,000 x 65% = 91,000 units
L: 140,000 x 15% = 21,000 units

D. As measured in units, K has 65% of the company's sales mix. Unfortunately, though, K is Alphabet's least profitable product ($15 contribution margin vs. $20 and $25). To increase overall profitability, the firm should strive to decrease sales of K relative to those of J and L.

Traditional and Contribution Income Statements

78. Price Publications, Inc., produces and sells business books. The results of the company's operations for the year ended December 31, 20x1, are given below.

Sales revenue	$400,000
Manufacturing costs:	
Fixed	100,000
Variable	200,000
Selling costs:	
Fixed	10,000
Variable	20,000
Administrative costs:	
Fixed	24,000
Variable	6,000

Required:

A. Prepare a traditional income statement for the company.
B. Prepare a contribution income statement for the company.
C. Which income statement (traditional or contribution) would an operating manager most likely use to study changes in operating income that are caused by changes in sales? Why?

LO: 7 Type: A, N

Answer:

A.

Sales		$400,000
Less: Cost of goods sold		300,000
Gross margin		$100,000
Less operating expenses:		
Selling	$30,000	
Administrative	30,000	60,000
Net income		$ 40,000

B.

Sales		$400,000
Less variable expenses:		
Manufacturing	$200,000	
Selling	20,000	
Administrative	6,000	226,000
Contribution margin		$174,000
Less fixed expenses:		
Manufacturing	$100,000	
Selling	10,000	
Administrative	24,000	134,000
Net income		$ 40,000

C. The contribution statement would be used because the fixed and variable costs must be separated in order to measure the effect of a volume change on total costs. Unfortunately, a traditional income statement does not provide the necessary information.

Traditional and Contribution Income Computations

79. High Point Corporation reported sales revenues of $1,850,000 for the period just ended. Cost of goods sold, selling expenses, and administrative expenses totaled $1,200,000, $280,000, and $170,000, respectively. A detailed analysis of the latter three amounts revealed respective fixed cost components of $780,000, $60,000, and $130,000.

Required:

A. Determine the amounts that High Point would report on a traditional income statement for (1) gross margin, (2) contribution margin, and (3) net income.
B. Determine the amounts that High Point would report on a contribution income statement for (1) gross margin, (2) contribution margin, and (3) net income.
C. Which of the two income statements (traditional or contribution) is more useful for studying a company's cost-volume-profit relationships.

LO: 7 Type: A, N

Answer:

A. 1. Sales ($1,850,000) - cost of goods sold ($1,200,000) = gross margin ($650,000)

2. $0. The contribution margin is not disclosed on a traditional income statement.

3. Gross margin ($650,000) - selling expenses ($280,000) - administrative expenses ($170,000) = net income ($200,000)

B. 1. $0. Gross margin is not disclosed on a contribution income statement.

2. Variable expenses = total expenses - fixed expenses:

Cost of goods sold: $1,200,000 - $780,000	$420,000
Selling expenses: $280,000 - $60,000	220,000
Administrative expenses: $170,000 - $130,000	40,000
Total variable expenses	$680,000

Sales ($1,850,000) - variable expenses ($680,000) = contribution margin ($1,170,000)

3. Contribution margin ($1,170,000) - fixed expenses ($780,000 + $60,000 + $130,000 = $970,000) = net income ($200,000)

C. Contribution income statement

Cost Structure, Operating Leverage

80. Once upon a time, two brothers (Barry and Larry) dreamt about owning and operating companies in the same line of business. Barry believed in maintaining a very large, highly efficient manual labor force; Larry, on the other hand, favored automated-production processes. One business was located in Madison and the other was located in Austin. Recent data follow.

	Madison	Austin
Sales	$2,000,000	$2,000,000
Contribution margin	1,700,000	400,000
Net income	150,000	150,000

Required:

A. Which of the two businesses, Madison or Austin, has the highest level of (1) variable cost and (2) highest level of fixed cost? Explain how you determined your answer.
B. Determine the probable owner of the firm located in (1) Madison and (2) Austin. Briefly explain your logic.
C. Compute the operating leverage factor for Madison and Austin.
D. Suppose that both Madison and Austin had the opportunity to increase sales by 10%. Which of the two locations would experience a larger percentage change in net income? Why?

LO: 8 Type: A, N

Answer:

A. Given that both locations have identical sales, Austin has a higher level of variable cost ($1,600,000 vs. $300,000) as indicated by a smaller contribution margin. Madison, in contrast, has a higher amount of fixed cost ($1,550,000 vs. $250,000) because of the larger contribution margin and a net income equal to that of Austin.

B. Operations with sizable labor forces have high variable costs; conversely, automated facilities give rise to high fixed costs (e.g., depreciation, lease payments, maintenance). Thus, Barry's philosophy is most closely associated with the Austin facility, and Larry's seems consistent with the cost structure in Madison.

C. Madison: $1,700,000 ÷ $150,000 = 11.33
Austin: $400,000 ÷ $150,000 = 2.67

D. Madison would experience a larger percentage change in net income because it is more highly leveraged than Austin. Mathematically, the percentage change in income can be computed by multiplying the operating leverage factor by the percentage change in sales revenue.

Operating Leverage

81. Metropolitan Enterprises is studying the addition of a new product that would have an expected selling price of $160 and expected variable cost of $100. Anticipated demand is 8,000 units.

A new salesperson must be hired because the company's current sales force is working at capacity. Two compensation plans are under consideration:

Plan 1: An annual salary of $32,000 plus 10% commission based on gross sales dollars
Plan 2: An annual salary of $140,000 and no commission

Required:

A. What is meant by the term "operating leverage"?
B. Calculate the contribution margin and net income of the two plans at 8,000 units.
C. Compute the operating leverage factor of the two plans at 8,000 units. Which of the two plans is more highly leveraged? Why?
D. Assume that a general economic downturn occurred during year no. 2, with product demand falling from 8,000 to 6,400 units. By using the operating leverage factors, determine and show which plan would produce a larger percentage decrease in net income.

LO: 8 Type: A, N

Answer:

A. Operating leverage refers to the use of fixed costs in an organization's overall cost structure. An organization that has a relatively high proportion of fixed costs and low proportion of variable costs has a high degree of operating leverage.

B.

	Plan 1	Plan 2
Sales revenue: 8,000 units x $160	$1,280,000	$1,280,000
Less variable costs:		
Product cost: 8,000 units x $100	$ 800,000	$ 800,000
Sales commissions: $1,280,000 x 10%	128,000	0
Total variable cost	$ 928,000	$ 800,000
Contribution margin	$ 352,000	$ 480,000
Fixed costs	32,000	140,000
Net income	$ 320,000	$ 340,000

C. Plan 1: $352,000 ÷ $320,000 = 1.1
Plan 2: $480,000 ÷ $340,000 = 1.41
Plan 2 has the higher degree of operating leverage because it has the higher operating leverage factor.

D. Metropolitan would experience a larger percentage decrease in income if it adopts Plan 2. This situation arises because Plan 2 has a higher degree of operating leverage.

The percentage decreases in profitability can be figured by multiplying the percentage decrease in sales revenue by the operating leverage factor. Sales dropped from 8,000 units to 6,400 units, or 20%. Thus:

Plan 1: 20% x 1.1 = 22.0%
Plan 2: 20% x 1.41 = 28.2%

DISCUSSION QUESTIONS

Cost-Volume-Profit Analysis

82. The BoSan Corporation makes major household appliances such as refrigerators, stoves, and dishwashers. Sales are heavily dependent on the number of housing starts and the level of disposable income. Next year, the number of housing starts in the Central region is expected to be the same as this year's; however, about two-thirds of these starts will be for rental apartments as compared to an historical average of one-third. The remaining housing starts will be for single-family homes and upscale condominiums.

    BoSan generally makes two models of each product: Economy (fully functional, but with few special features) and Prestige (with the most popular special features). BoSan assumes a product mix of 40% Economy and 60% Prestige.

    Required:
    A. Explain how a cost-volume-profit (CVP) analysis may be used by management.
    B. One of the assumptions that underlies CVP analysis is a constant sales mix over the relevant range of activity. What are three other assumptions of CVP analysis?
    C. Describe how the percentage change in rental units could create a problem with BoSan's CVP analysis.

    LO: 1, 5, 6 Type: RC, N

    Answer:
    A. CVP analysis may be used to perform "what if" analyses that allow management to study the effects of various operating changes on firm profitability. For example, the effects of changes in selling price, variable costs, fixed costs, and volume may be explored by manipulating the CVP model with different values for these items.

    B. Three additional assumptions for the CVP model are:
        - The per-unit selling price is constant.
        - Cost behavior is linear over the relevant range—that is, variable cost per unit is constant and fixed costs in total are constant.
        - The number of units manufactured and sold is the same.

    C. The shift toward more apartments and fewer single-family homes and upscale condominiums may mean that demand for the Economy models will increase relative to the demand for Prestige models. The rental apartment generally will be used for households with lower income.

        The shift in buying habits could create a problem since the CVP model assumes a constant sales mix. The mix change could invalidate previous CVP studies.

Contribution Margin

83. Maddox Corporation's product no. H647 has a negative contribution margin. How can such a situation arise? Should the company continue to stock and sell product no. H647? Explain.

LO: 1 Type: RC, N

Answer:
A negative contribution arises because selling price is less than variable cost. Several reasons may create this situation: (1) inefficient operations and, thus, higher costs; (2) a very competitive marketplace, which has forced the firm to lower its price; and (3) a loss leader whereby Maddox is purposely taking a loss on product no. H647 with the intent of stimulating customer demand for other, more profitable products.

Each unit sold will lower overall profitability so, technically, Maddox should not continue to sell product no. H647. However, for reasons (2) and (3) above, the firm might decide otherwise and stick with this "loser."

Cost Structure and Operating Leverage

84. Operating leverage is an important concept for many companies.

Required:
A. Define operating leverage.
B. Assume that a firm pays no income taxes and is planning to increase its selling price. If sales volume in units does not change, what will be the effect on the operating leverage factor? Explain.
C. Assume that another firm that pays no income taxes is planning to increase fixed manufacturing costs and decrease variable manufacturing costs per unit. At the present volume of production, the <u>total</u> manufacturing costs will be unchanged. What will this change do to the operating leverage factor? Explain.

LO: 8 Type: RC, N

Answer:
A. Mathematically, operating leverage is contribution margin divided by net income. The degree of operating leverage indicates a company's ability to operate with a given amount of fixed cost relative to variable cost.

B. The increase in selling price with no change in units sold will increase both contribution margin and net income by the same dollar amount. The percentage change in net income will be greater than the percentage change in contribution margin and, thus, the operating leverage factor will decrease.

C. The decrease in variable costs will increase the contribution margin, but net income will not change because total costs remain the same. The operating leverage factor will therefore increase.

Advanced Manufacturing Effects on Cost-Volume-Profit Relationships

85. Many firms are moving toward flexible manufacturing systems and adopting the just-in-time (JIT) philosophy.

    Required:
    A. How is cost behavior altered in the typical flexible manufacturing environment as compared to a traditional manufacturing system? What is the impact on the break-even point? Explain.
    B. One of the assumptions underlying cost-volume profit analysis is that sales volume and production volume are equal. Stated another way, inventories are assumed to remain constant. Is this assumption likely to be violated under an ongoing JIT philosophy? Explain.

    LO: 10 Type: RC, N

    Answer:
    A. Variable manufacturing costs typically decrease in a flexible manufacturing environment and total fixed costs increase. Automation (along with accompanying depreciation, lease, and maintenance costs) and fewer people normally account for this change. The break-even point, as a result, often increases.

    B. When a company first changes to JIT, there is likely to be a drop-off in inventories. However, the assumption of no significant change in inventories will probably not be violated for an ongoing JIT user. Any accompanying level changes are not likely to be significant relative to the volume of production and sales.