

## Chapter 19(4)

### Cost Behavior and Cost-Volume-Profit Analysis

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#### OBJECTIVES

Obj 1	Classify costs by their behavior as variable costs, fixed costs, or mixed costs.
Obj 2	Compute the contribution margin, the contribution margin ratio, and the unit contribution margin, and explain how they may be useful to managers.
Obj 3	Using the unit contribution margin, determine the break-even point and the volume necessary to achieve a target profit.
Obj 4	Using a cost-volume-profit chart and a profit-volume chart, determine the break-even point and the volume necessary to achieve a target profit.
Obj 5	Compute the break-even point for a business selling more than one product, operating leverage, and the margin of safety, and explain how managers use these concepts.

#### TRUE/FALSE

1. Cost behavior refers to the methods used to estimate costs for use in managerial decision making.

**ANS:** F      DIF: Easy      OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement

2. Cost behavior refers to the manner in which a cost changes as the related activity changes.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement

3. The fixed cost per unit varies with changes in the level of activity.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement

4. A production supervisor's salary that does not vary with the number of units produced is an example of a fixed cost.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement

5. Direct materials cost that varies with the number of units produced is an example of a fixed cost of production.

**ANS:** F      DIF: Easy      OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement

6. In order to choose the proper activity base for a cost, managerial accountants must be familiar with the operations of the entity.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement

7. The relevant range is useful for analyzing cost behavior for management decision-making purposes.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement

8. The relevant activity base for a cost depends upon which base is most closely associated with the cost and the decision-making needs of management.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

9. The range of activity over which changes in cost are of interest to management is called the relevant range.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

10. Total fixed costs change as the level of activity changes.

**ANS:** F      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

11. Because variable costs are assumed to change in constant proportion with changes in the activity level, the graph of the variable costs when plotted against the activity level appears as a circle.

**ANS:** F      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

12. Variable costs are costs that remain constant in total dollar amount as the level of activity changes.

**ANS:** F      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

13. Variable costs are costs that remain constant on a per-unit basis as the level of activity changes.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

14. Variable costs are costs that vary in total in direct proportion to changes in the activity level.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

15. Variable costs are costs that vary on a per-unit basis with changes in the activity level.

**ANS:** F      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

16. Direct materials and direct labor costs are examples of variable costs of production.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

17. Total variable costs change as the level of activity changes.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

18. Unit variable cost does not change as the number of units of activity changes.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

19. A mixed cost has characteristics of both a variable and a fixed cost.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

20. Rental charges of \$40,000 per year plus \$3 for each machine hour over 18,000 hours is an example of a fixed cost.

**ANS:** F      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

21. A rental cost of \$20,000 plus \$.70 per machine hour of use is an example of a mixed cost.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

22. For purposes of analysis, mixed costs can generally be separated into their variable and fixed components.

**ANS:** T      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

23. The contribution margin ratio is the same as the profit-volume ratio.

**ANS:** T      DIF: Easy      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

24. Variable costs as a percentage of sales are equal to 100% minus the contribution margin ratio.

**ANS:** T      DIF: Easy      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

25. The dollars available from each unit of sales to cover fixed cost and profit is the unit variable cost.

**ANS:** F      DIF: Easy      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

26. The ratio that indicates the percentage of each sales dollar available to cover the fixed costs and to provide operating income is termed the contribution margin ratio.

**ANS:** T      DIF: Easy      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

27. If sales total \$2,000,000, fixed costs total \$800,000, and variable costs are 60% of sales, the contribution margin ratio is 60%.

**ANS:** F      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

28. If sales total \$2,000,000, fixed costs total \$800,000, and variable costs are 60% of sales, the contribution margin ratio is 40%.

**ANS:** T      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

29. The data required for determining the break-even point for a business are the total estimated fixed costs for a period, stated as a percentage of net sales.

**ANS:** F      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

30. If fixed costs are \$300,000 and variable costs are 70% of break-even sales, profit is zero when sales revenue is \$930,000.

**ANS:** F      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

31. If fixed costs are \$850,000 and the unit contribution margin is \$50, profit is zero when 15,000 units are sold.

**ANS:** F      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

32. The point in operations at which revenues and expired costs are exactly equal is called the break-even point.

**ANS:** T      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

33. Break-even analysis is one type of cost-volume-profit analysis.

**ANS:** T      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

34. If the property tax rates are increased, this change in fixed costs will result in a decrease in the break-even point.

**ANS:** F      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

35. If yearly insurance premiums are increased, this change in fixed costs will result in an increase in the break-even point.

**ANS:** T      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

36. If employees accept a wage contract that increases the unit contribution margin, the break-even point will decrease.

**ANS:** T      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

37. If employees accept a wage contract that decreases the unit contribution margin, the break-even point will decrease.

**ANS:** F      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

38. If direct materials cost per unit increases, the break-even point will decrease.

**ANS:** F      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

39. If direct materials cost per unit increases, the break-even point will increase.

**ANS:** T      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

40. If direct materials cost per unit decreases, the amount of sales necessary to earn a desired amount of profit will decrease.

**ANS:** T      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

41. If fixed costs are \$450,000 and the unit contribution margin is \$50, the sales necessary to earn an operating income of \$50,000 are 10,000 units.

**ANS:** T      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

42. If fixed costs are \$450,000 and the unit contribution margin is \$50, the sales necessary to earn an operating income of \$30,000 are 14,000 units.

**ANS:** F      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

43. Only a single line, which represents the difference between total sales revenues and total costs, is plotted on the profit-volume chart.

**ANS:** T      DIF: Easy      OBJ: 19(4)-04

**NAT:** AACSB Analytic | IMA-Performance Measurement

44. Only a single line, which represents the difference between total sales revenues and total costs, is plotted on the cost-volume-profit chart.

**ANS:** F      DIF: Easy      OBJ: 19(4)-04

**NAT:** AACSB Analytic | IMA-Performance Measurement

45. Cost-volume-profit analysis can be presented in both equation form and graphic form.

**ANS:** T      DIF: Easy      OBJ: 19(4)-04

**NAT:** AACSB Analytic | IMA-Performance Measurement

46. If a business sells two products, it is not possible to estimate the break-even point.

**ANS:** F      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

47. If a business sells four products, it is not possible to estimate the break-even point.

**ANS:** F      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

48. Even if a business sells six products, it is possible to estimate the break-even point.

**ANS:** T      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

49. If the unit selling price is \$40, the volume of sales is \$3,000,000, sales at the break-even point amount to \$2,500,000, and the maximum possible sales are \$3,300,000, the margin of safety is 11,500 units.

**ANS:** F      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

50. If the unit selling price is \$40, the volume of sales is \$3,000,000, sales at the break-even point amount to \$2,500,000, and the maximum possible sales are \$3,300,000, the margin of safety is 12,500 units.

**ANS:** T      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

51. If the volume of sales is \$6,000,000 and sales at the break-even point amount to \$4,800,000, the margin of safety is 25%.

**ANS:** F      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

52. If the volume of sales is \$6,000,000 and sales at the break-even point amount to \$4,800,000, the margin of safety is 20%.

**ANS:** T      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

53. Companies with large amounts of fixed costs will generally have a high operating leverage.

**ANS:** T      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

54. A low operating leverage is normal for highly automated industries.

**ANS:** F      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

55. DeGiaino Co. has an operating leverage of 5. Next year's sales are expected to increase by 10%. The company's operating income will increase by 50%.

**ANS:** T      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

56. The reliability of cost-volume-profit analysis does NOT depend on the assumption that costs can be accurately divided into fixed and variable components.

**ANS:** F      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

## **MULTIPLE CHOICE**

1. Cost behavior refers to the manner in which:
  - a. a cost changes as the related activity changes
  - b. a cost is allocated to products
  - c. a cost is used in setting selling prices
  - d. a cost is estimated

**ANS:** A      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

2. The three most common cost behavior classifications are:
  - a. variable costs, product costs, and sunk costs
  - b. fixed costs, variable costs, and mixed costs
  - c. variable costs, period costs, and differential costs
  - d. variable costs, sunk costs, and opportunity costs

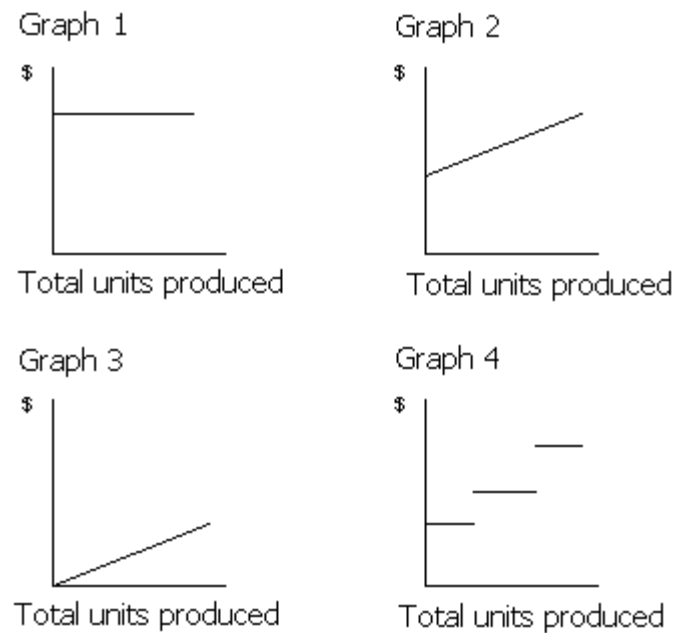
**ANS:** B      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

3. Costs that remain constant in total dollar amount as the level of activity changes are called:
- fixed costs
  - mixed costs
  - opportunity costs
  - variable costs

**ANS:** A      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement



**FIGURE 20.1**

4. Which of the graphs in Figure 20-1 illustrates the behavior of a total fixed cost?
- Graph 2
  - Graph 3
  - Graph 4
  - Graph 1

**ANS:** D      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

5. Which of the graphs in Figure 20-1 illustrates the behavior of a total variable cost?
- Graph 2
  - Graph 3
  - Graph 4
  - Graph 1

**ANS:** B      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

6. Which of the graphs in Figure 20-1 illustrates the nature of a mixed cost?
- Graph 2
  - Graph 3
  - Graph 4
  - Graph 1

**ANS:** A      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

7. Which of the following costs is an example of a cost that remains the same in total as the number of units produced changes?
- Direct labor
  - Salary of a factory supervisor
  - Units of production depreciation on factory equipment
  - Direct materials

**ANS:** B      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

8. Which of the following describes the behavior of the fixed cost per unit?
- Decreases with increasing production
  - Decreases with decreasing production
  - Remains constant with changes in production
  - Increases with increasing production

**ANS:** A      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

9. Which of the following activity bases would be the most appropriate for food costs of a hospital?
- Number of cooks scheduled to work
  - Number of x-rays taken
  - Number of patients who stay in the hospital
  - Number of scheduled surgeries

**ANS:** C      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

10. Which of the following activity bases would be the most appropriate for gasoline costs of a delivery service, such as United Postal Service?
- Number of trucks employed
  - Number of miles driven
  - Number of trucks in service
  - Number of packages delivered

**ANS:** B      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

11. Most operating decisions of management focus on a narrow range of activity called the:
- relevant range of production
  - strategic level of production
  - optimal level of production
  - tactical operating level of production

**ANS:** A      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement



12. Costs that vary in total in direct proportion to changes in an activity level are called:
- fixed costs
  - sunk costs
  - variable costs
  - differential costs

**ANS:** C      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

13. Which of the following is an example of a cost that varies in total as the number of units produced changes?
- Salary of a production supervisor
  - Direct materials cost
  - Property taxes on factory buildings
  - Straight-line depreciation on factory equipment

**ANS:** B      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

14. Which of the following is NOT an example of a cost that varies in total as the number of units produced changes?
- Electricity per KWH to operate factory equipment
  - Direct materials cost
  - Straight-line depreciation on factory equipment
  - Wages of assembly worker

**ANS:** C      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

15. Which of the following is NOT an example of a cost that varies in total as the number of units produced changes?
- Electricity per KWH to operate factory equipment
  - Direct materials cost
  - Insurance premiums on factory building
  - Wages of assembly worker

**ANS:** C      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

16. Which of the following describes the behavior of the variable cost per unit?
- Varies in increasing proportion with changes in the activity level
  - Varies in decreasing proportion with changes in the activity level
  - Remains constant with changes in the activity level
  - Varies in direct proportion with the activity level

**ANS:** C      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

17. The graph of a variable cost when plotted against its related activity base appears as a:
- circle
  - rectangle
  - straight line
  - curved line

**ANS:** C      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

18. A cost that has characteristics of both a variable cost and a fixed cost is called a:
- variable/fixed cost
  - mixed cost
  - discretionary cost
  - sunk cost

**ANS:** B      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

19. Which of the following costs is a mixed cost?
- Salary of a factory supervisor
  - Electricity costs of \$2 per kilowatt-hour
  - Rental costs of \$5,000 per month plus \$.30 per machine hour of use
  - Straight-line depreciation on factory equipment

**ANS:** C      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

20. For purposes of analysis, mixed costs are generally:
- classified as fixed costs
  - classified as variable costs
  - classified as period costs
  - separated into their variable and fixed cost components

**ANS:** D      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

21. Ingram Co. manufactures office furniture. During the most productive month of the year, 3,500 desks were manufactured at a total cost of \$84,400. In its slowest month, the company made 1,100 desks at a cost of \$46,000. Using the high-low method of cost estimation, total fixed costs are:
- \$56,000
  - \$28,400
  - \$17,600
  - cannot be determined from the data given

**ANS:** B      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

22. Given the following cost and activity observations for Wondrous Company's utilities, use the high-low method to calculate Wondrous' variable utilities costs per machine hour.

	Cost	Machine Hours
March	\$3,100	15,000
April	2,700	10,000
May	2,900	12,000
June	3,500	18,000

- \$10.00
- \$.67
- \$.63
- \$.10

**ANS:** D      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

23. Given the following cost and activity observations for Johnson Company's utilities, use the high-low method to calculate Johnson's fixed costs per month.

	Cost	Machine Hours
January	\$52,600	20,000
February	75,100	29,000
March	57,000	22,000
April	64,000	24,500

- a. \$2,600
- b. \$50,000
- c. \$12,500
- d. \$5,000

**ANS:** A      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

24. Given the following cost and activity observations for Sanchez Company's utilities, use the high-low method to calculate Sanchez's variable utilities costs per machine hour.

	Cost	Machine Hours
May	\$8,300	15,000
June	10,400	20,000
July	7,200	12,000
August	9,500	18,000

- a. \$10.00
- b. \$.60
- c. \$.40
- d. \$.52

**ANS:** C      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

25. Lanley Co. manufactures office furniture. During the most productive month of the year, 4,500 desks were manufactured at a total cost of \$86,625. In its slowest month, the company made 1,800 desks at a cost of \$49,500. Using the high-low method of cost estimation, total fixed costs are:

- a. \$61,875
- b. \$33,875
- c. \$24,750
- d. cannot be determined from the data given

**ANS:** C      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

26. Which of the following statements is true regarding fixed and variable costs?

- a. Both costs are constant when considered on a per unit basis.
- b. Both costs are constant when considered on a total basis.
- c. Fixed costs are fixed in total, and variable costs are fixed per unit.
- d. Variable costs are fixed in total, and fixed costs vary in total.

**ANS:** C      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

27. As production increases, what would you expect to happen to fixed cost per unit?
- Increase
  - Decrease
  - Remain the same
  - Either increase or decrease, depending on the variable costs

**ANS:** B      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

28. Knowing how costs behave is useful to management for all the following reasons except for
- predicting customer demand.
  - predicting profits as sales and production volumes change.
  - estimating costs.
  - changing an existing product production.

**ANS:** A      DIF: Easy      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

29. The manufacturing cost of Lancer Industries for three months of the year are provided below:

	Total Cost	Production
April	\$ 61,900	1,200 Units
May	80,920	1,800
June	100,300	2,400

Using the high-low method, the variable cost per unit, and the total fixed costs are:

- \$32.30 per unit and \$77,520 respectively.
- \$32 per unit and \$23,500 respectively.
- \$32 per unit and \$76,800 respectively.
- \$32.30 per unit and \$22,780 respectively.

**ANS:** B      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

30. Which of the following statements is correct concerning variable and fixed costs?
- Both costs are constant when considered on a per unit basis.
  - Variable costs vary in total and fixed costs are constant on a per unit basis.
  - Fixed costs are constant in total and variable costs are constant on a per unit basis.
  - Variable costs are constant in total and fixed costs are constant on a per unit basis.

**ANS:** C      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

31. As production increases, what should happen to the fixed costs per unit?
- Stay the same.
  - Increase.
  - Decrease.
  - Either increase or decrease, depending on the variable costs.

**ANS:** C      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

32. As production increases, what should happen to the variable costs per unit?
- Stay the same.
  - Increase.
  - Decrease.
  - Either increase or decrease, depending on the fixed costs.

**ANS:** A      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

33. Sanchez Company manufactures and sells commercial air conditioners. Because of current trends, it expects to increase sales by 15 percent next year. If this expected level of production and sales occurs and plant expansion is not needed, how should this increase affect next year's total amounts for the following costs.

	Variable Costs	Fixed Costs	Mixed Costs
a.	increase	increase	increase
b.	increase	no change	increase
c.	no change	no change	increase
d.	decrease	increase	increase

**ANS:** B      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

34. Given the following costs and activities for Downing Company electrical costs, use the high-low method to calculate Downings's variable electrical costs per machine hour.

	Costs	Machine Hours
April	\$11,700	15,000
May	\$13,200	17,500
June	\$11,400	14,500

- 2.08
- 6.00
- .60
- 1.20

**ANS:** C      DIF: Moderate      OBJ: 19(4)-01

**NAT:** AACSB Analytic | IMA-Performance Measurement

35. The systematic examination of the relationships among selling prices, volume of sales and production, costs, and profits is termed:
- contribution margin analysis
  - cost-volume-profit analysis
  - budgetary analysis
  - gross profit analysis

**ANS:** B      DIF: Easy      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

36. In cost-volume-profit analysis, all costs are classified into the following two categories:
- a. mixed costs and variable costs
  - b. sunk costs and fixed costs
  - c. discretionary costs and sunk costs
  - d. variable costs and fixed costs

**ANS:** D      DIF: Easy      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

37. Contribution margin is:
- a. the excess of sales revenue over variable cost
  - b. another term for volume in the "cost-volume-profit" analysis
  - c. profit
  - d. the same as sales revenue

**ANS:** A      DIF: Easy      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

38. The contribution margin ratio is:
- a. the same as the variable cost ratio
  - b. the same as profit
  - c. the portion of equity contributed by the stockholders
  - d. the same as the profit-volume ratio

**ANS:** D      DIF: Easy      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

39. If sales are \$820,000, variable costs are 62% of sales, and operating income is \$260,000, what is the contribution margin ratio?
- a. 53.1%
  - b. 38%
  - c. 62%
  - d. 32%

**ANS:** B      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

40. What ratio indicates the percentage of each sales dollar that is available to cover fixed costs and to provide a profit?
- a. Margin of safety ratio
  - b. Contribution margin ratio
  - c. Costs and expenses ratio
  - d. Profit ratio

**ANS:** B      DIF: Easy      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

41. A firm operated at 80% of capacity for the past year, during which fixed costs were \$210,000, variable costs were 65% of sales, and sales were \$1,000,000. Operating profit was:
- a. \$140,000
  - b. \$150,000
  - c. \$310,000
  - d. \$200,000

**ANS:** A      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

42. If sales are \$425,000, variable costs are 63% of sales, and operating income is \$50,000, what is the contribution margin ratio?
- a. 37%
  - b. 26.8%
  - c. 11.8%
  - d. 63%

**ANS:** A      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

43. Variable costs as a percentage of sales for Leamon Inc. are 75%, current sales are \$600,000, and fixed costs are \$110,000. How much will operating income change if sales increase by \$40,000?
- a. \$10,000 increase
  - b. \$10,000 decrease
  - c. \$30,000 decrease
  - d. \$30,000 increase

**ANS:** A      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

44. Salter Inc.'s unit selling price is \$50, the unit variable costs are \$35, fixed costs are \$125,000, and current sales are 10,000 units. How much will operating income change if sales increase by 5,000 units?
- a. \$150,000 decrease
  - b. \$175,000 increase
  - c. \$75,000 increase
  - d. \$150,000 increase

**ANS:** C      DIF: Difficult      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

45. If sales are \$820,000, variable costs are \$524,800, and operating income is \$260,000, what is the contribution margin ratio?
- a. 53.1%
  - b. 33%
  - c. 64%
  - d. 36%

**ANS:** D      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

46. A firm operated at 80% of capacity for the past year, during which fixed costs were \$220,000, variable costs were 66% of sales, and sales were \$1,000,000. Operating profit was:
- a. \$140,000
  - b. \$120,000
  - c. \$340,000
  - d. \$220,000

**ANS:** B      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

47. If sales are \$525,000, variable costs are 64% of sales, and operating income is \$50,000, what is the contribution margin ratio?
- a. 36%
  - b. 26.5%
  - c. 9.5%
  - d. 64%

**ANS:** A      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

48. Halter Inc.'s unit selling price is \$70, the unit variable costs are \$45, fixed costs are \$150,000, and current sales are 10,000 units. How much will operating income change if sales increase by 5,000 units?
- a. \$125,000 decrease
  - b. \$175,000 increase
  - c. \$75,000 increase
  - d. \$125,000 increase

**ANS:** D      DIF: Difficult      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

49. Bailey Company sells 25,000 units at \$15 per unit. Variable costs are \$8 per unit, and fixed costs are \$35,000. The contribution margin ratio and the unit contribution margin, (rounding to two decimal points) are:
- a. 47% and \$7 per unit
  - b. 53% and \$7 per unit
  - c. 47% and \$8 per unit
  - d. 53% and \$8 per unit

**ANS:** A      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

50. If the contribution margin ratio for Lyndon Company is 37%, sales were \$425,000. and fixed costs were \$100,000, what was the income from operations?
- a. \$167,750
  - b. \$57,250
  - c. \$54,730
  - d. \$125,310

**ANS:** B      DIF: Moderate      OBJ: 19(4)-02

**NAT:** AACSB Analytic | IMA-Performance Measurement

51. If fixed costs are \$250,000, the unit selling price is \$105, and the unit variable costs are \$65, what is the break-even sales (units)?
- a. 3,846 units
  - b. 2,381 units
  - c. 10,000 units
  - d. 6,250 units

**ANS:** D      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement



52. If fixed costs are \$750,000 and variable costs are 70% of sales, what is the break-even point (dollars)?

- a. \$1,071,429
- b. \$525,000
- c. \$2,500,000
- d. \$1,275,000

**ANS:** C      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

53. If fixed costs are \$1,400,000, the unit selling price is \$220, and the unit variable costs are \$120, what is the amount of sales required to realize an operating income of \$200,000?

- a. 14,000 units
- b. 12,000 units
- c. 16,000 units
- d. 13,333 units

**ANS:** C      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

54. If fixed costs are \$300,000, the unit selling price is \$25, and the unit variable costs are \$20, what is the break-even sales (units) if fixed costs are reduced by \$40,000?

- a. 60,000 units
- b. 52,000 units
- c. 62,000 units
- d. 64,000 units

**ANS:** B      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

55. If fixed costs are \$300,000, the unit selling price is \$25, and the unit variable costs are \$20, what is the break-even sales (units) if fixed costs are increased by \$40,000?

- a. 52,000 units
- b. 60,000 units
- c. 68,000 units
- d. 62,000 units

**ANS:** C      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

56. If fixed costs are \$300,000, the unit selling price is \$25, and the unit variable costs are \$20, what is the break-even sales (units) if the variable costs are decreased by \$2?

- a. 42,857 units
- b. 17,143 units
- c. 60,000 units
- d. 100,000 units

**ANS:** A      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

57. If fixed costs are \$450,000, the unit selling price is \$75, and the unit variable costs are \$50, what are the old and new break-even sales (units) if the unit selling price increases by \$5?
- a. 6,000 units and 5,250 units
  - b. 18,000 units and 6,000 units
  - c. 18,000 units and 15,000 units
  - d. 9,000 units and 15,000 units

**ANS:** C      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

58. Morino Corporation sells product W for \$125 per unit, the variable cost per unit is \$90, the fixed costs are \$450,000, and Morino is in the 30% corporate tax bracket. What are the sales (dollars) required to earn a net income (after tax) of \$25,000?
- a. \$1,249,020
  - b. \$674,625
  - c. \$1,734,693
  - d. \$1,904,750

**ANS:** C      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

59. Scher Corporation sells product G for \$150 per unit, the variable cost per unit is \$105, the fixed costs are \$720,000, and Scher is in the 25% corporate tax bracket. What are the sales (dollars) required to earn a net income (after tax) of \$40,000?
- a. \$2,533,350
  - b. \$2,577,777
  - c. \$2,933,400
  - d. \$2,400,000

**ANS:** B      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

60. If fixed costs are \$200,000 and the unit contribution margin is \$20, what amount of units must be sold in order to have a zero profit?
- a. 25,000
  - b. 20,000
  - c. 200,000
  - d. 10,000

**ANS:** D      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

61. If fixed costs are \$500,000 and the unit contribution margin is \$12, what amount of units must be sold in order to realize an operating income of \$100,000?
- a. 5,000
  - b. 41,667
  - c. 50,000
  - d. 58,333

**ANS:** C      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

62. If fixed costs are \$500,000 and the unit contribution margin is \$20, what is the break-even point in units if fixed costs are reduced by \$80,000?
- a. 25,000
  - b. 29,000
  - c. 4,000
  - d. 21,000

**ANS:** D      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

63. If fixed costs are \$500,000 and the unit contribution margin is \$40, what is the break-even point if fixed costs are increased by \$80,000?
- a. 14,500
  - b. 12,500
  - c. 8,333
  - d. 9,667

**ANS:** A      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

64. If fixed costs are \$561,000 and the unit contribution margin is \$8.00, what is the break-even point in units if variable costs are decreased by \$.50 a unit?
- a. 66,000
  - b. 70,125
  - c. 74,800
  - d. 60,000

**ANS:** A      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

65. If variable costs per unit increased because of an increase in hourly wage rates, the break-even point would:
- a. decrease
  - b. increase
  - c. remain the same
  - d. increase or decrease, depending upon the percentage increase in wage rates

**ANS:** B      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

66. If variable costs per unit decreased because of a decrease in utility rates, the break-even point would:
- a. decrease
  - b. increase
  - c. remain the same
  - d. increase or decrease, depending upon the percentage increase in utility rates

**ANS:** A      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

67. If fixed costs increased and variable costs per unit decreased, the break-even point would:
- increase
  - decrease
  - remain the same
  - increase, decrease, or remain the same, depending upon the amounts of increase in fixed cost and decrease in variable cost

**ANS:** D      DIF: Difficult      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

68. Which of the following conditions would cause the break-even point to decrease?
- Total fixed costs increase
  - Unit selling price decreases
  - Unit variable cost decreases
  - Unit variable cost increases

**ANS:** C      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

69. Which of the following conditions would cause the break-even point to increase?
- Total fixed costs decrease
  - Unit selling price increases
  - Unit variable cost decreases
  - Unit variable cost increases

**ANS:** D      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

70. Which of the following conditions would cause the break-even point to increase?
- Total fixed costs increase
  - Unit selling price increases
  - Unit variable cost decreases
  - Total fixed costs decrease

**ANS:** A      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

71. Cialini Co. has budgeted salary increases to factory supervisors totaling 10%. If selling prices and all other cost relationships are held constant, next year's break-even point will:
- decrease by 10%
  - increase by 10%
  - not be determined from the data given
  - increase at a rate greater than 10%

**ANS:** C      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

72. Flynn Co. has the following operating data for its manufacturing operations:

Unit selling price	\$ 250
Unit variable cost	100
Total fixed costs	\$840,000

The company has decided to increase the wages of hourly workers which will increase the unit variable cost by 10%. Increases in the salaries of factory supervisors and property taxes for the factory will increase fixed costs by 4%. If sales prices are held constant, the next break-even point for Flynn Co. will be:

- a. increased by 640 units
- b. increased by 400 units
- c. decreased by 640 units
- d. increased by 800 units

**ANS:** A      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

73. If fixed costs are \$750,000 and variable costs are 60% of sales, what is the break-even point (dollars)?

- a. \$1,875,000
- b. \$300,000
- c. \$2,500,000
- d. \$1,250,000

**ANS:** A      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

74. If fixed costs are \$240,000, the unit selling price is \$36, and the unit variable costs are \$20, what is the break-even sales (units)?

- a. 12,000 units
- b. 27,000 units
- c. 15,000 units
- d. 6,667 units

**ANS:** C      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

75. If fixed costs are \$1,500,000, the unit selling price is \$250, and the unit variable costs are \$130, what is the amount of sales required to realize an operating income of \$200,000?

- a. 14,166 units
- b. 12,500 units
- c. 16,000 units
- d. 11,538 units

**ANS:** A      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

76. If fixed costs are \$490,000, the unit selling price is \$35, and the unit variable costs are \$20, what is the break-even sales (units) if fixed costs are reduced by \$40,000?
- a. 32,667 units
  - b. 14,000 units
  - c. 30,000 units
  - d. 24,500 units

**ANS:** C      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

77. If fixed costs are \$400,000, the unit selling price is \$25, and the unit variable costs are \$15, what is the break-even sales (units) if the variable costs are increased by \$2?
- a. 50,000 units
  - b. 30,770 units
  - c. 40,000 units
  - d. 26,667 units

**ANS:** A      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

78. If fixed costs are \$240,000, the unit selling price is \$32, and the unit variable costs are \$20, what are the old and new break-even sales (units) if the unit selling price increases by \$4?
- a. 7,500 units and 6,667 units
  - b. 20,000 units and 30,000 units
  - c. 20,000 units and 15,000 units
  - d. 12,000 units and 15,000 units

**ANS:** C      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

79. When the fixed costs are \$80,000 and the contribution margin is \$20, the break-even point is
- a. 16,000 units
  - b. 8,000 units
  - c. 7,998 units
  - d. 4,000 units

**ANS:** D      DIF: Easy      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

80. If fixed costs are \$39,600, the unit selling price is \$42, and the variable costs are \$24, what is the break-even sales (units)?
- a. 2,500
  - b. 943
  - c. 1,650
  - d. 2,200

**ANS:** D      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

81. If fixed costs are \$39,600, the unit selling price is \$42, and the variable costs are \$24, what is the break-even sales (dollars)?
- a. \$52,800
  - b. \$92,400
  - c. \$132,000
  - d. \$124,000

**ANS:** B      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

82. If fixed costs are \$39,600, the unit selling price is \$42, and the variable costs are \$24, what is the break-even sales (unit ) if the variable costs are decreased by \$2?
- a. 1,650
  - b. 990
  - c. 1,980
  - d. 1,350

**ANS:** C      DIF: Moderate      OBJ: 19(4)-03

**NAT:** AACSB Analytic | IMA-Performance Measurement

83. The point where the sales line and the total costs line intersect on the cost-volume-profit chart represents:
- a. the maximum possible operating loss
  - b. the maximum possible operating income
  - c. the total fixed costs
  - d. the break-even point

**ANS:** D      DIF: Easy      OBJ: 19(4)-04

**NAT:** AACSB Analytic | IMA-Performance Measurement

84. The point where the total costs line intersects the left-hand vertical axis on the cost-volume-profit chart represents:
- a. the minimum possible operating loss
  - b. the maximum possible operating income
  - c. the total fixed costs
  - d. the break-even point

**ANS:** C      DIF: Moderate      OBJ: 19(4)-04

**NAT:** AACSB Analytic | IMA-Performance Measurement

85. The point where the profit line intersects the horizontal axis on the profit-volume chart represents:
- a. the maximum possible operating loss
  - b. the maximum possible operating income
  - c. the total fixed costs
  - d. the break-even point

**ANS:** D      DIF: Moderate      OBJ: 19(4)-04

**NAT:** AACSB Analytic | IMA-Performance Measurement

86. The point where the profit line intersects the left vertical axis on the profit-volume chart represents:
- a. the maximum possible operating loss
  - b. the maximum possible operating income
  - c. the total fixed costs
  - d. the break-even point

**ANS:** A      DIF: Moderate      OBJ: 19(4)-04

**NAT:** AACSB Analytic | IMA-Performance Measurement

87. With the aid of computer software, managers can vary assumptions regarding selling prices, costs, and volume and can immediately see the effects of each change on the break-even point and profit. Such an analysis is called:
- a. "What if" or sensitivity analysis
  - b. vary the data analysis
  - c. computer aided analysis
  - d. data gathering

**ANS:** A      DIF: Easy      OBJ: 19(4)-04

**NAT:** AACSB Analytic | IMA-Performance Measurement

88. In a cost-volume-Profit chart, the
- a. total cost line begins at zero.
  - b. slope of the total cost line is dependent on the fixed cost per unit.
  - c. total cost line begins at the total fixed cost value on the vertical axis.
  - d. total cost line normally begins at zero.

**ANS:** C      DIF: Moderate      OBJ: 19(4)-04

**NAT:** AACSB Analytic | IMA-Performance Measurement

89. The relative distribution of sales among the various products sold by a business is termed the:
- a. business's basket of goods
  - b. contribution margin mix
  - c. sales mix
  - d. product portfolio

**ANS:** C      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

90. When a business sells more than one product at varying selling prices, the business's break-even point can be determined as long as the number of products does not exceed:
- a. two
  - b. three
  - c. fifteen
  - d. there is no limit

**ANS:** D      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement



91. Assume that Crowley Co. sold 8,000 units of Product A and 2,000 units of Product B during the past year. The unit contribution margins for Products A and B are \$20 and \$45 respectively. Crowley has fixed costs of \$350,000. The break-even point in units is:

- a. 14,000 units
- b. 25,278 units
- c. 8,000 units
- d. 10,769 units

**ANS:** A      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

Phipps Co. sells two products, Arks and Bins. Last year Phipps sold 12,000 units of Arks and 28,000 units of Bins. Related data are:

Product	Unit Selling Price	Unit Variable Cost	Unit Contribution Margin
Arks	\$120	\$80	\$40
Bins	80	60	20

92. What was Phipps Co.'s sales mix last year?

- a. 30% Arks, 70% Bins
- b. 12% Arks, 28% Bins
- c. 70% Arks, 30% Bins
- d. 40% Arks, 20% Bins

**ANS:** A      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

93. What was Phipps Co.'s total unit selling price?

- a. \$200
- b. \$100
- c. \$ 80
- d. \$ 92

**ANS:** D      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

94. What was Phipps Co.'s overall unit variable cost?

- a. \$140
- b. \$ 70
- c. \$ 66
- d. \$ 60

**ANS:** C      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

95. What was Phipps Co.'s overall unit contribution margin?

- a. \$26
- b. \$60
- c. \$92
- d. \$20

**ANS:** A      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

96. Assuming that last year's fixed costs totaled \$910,000, what was Phipps Co.'s break-even point in units?
- a. 40,000 units
  - b. 12,000 units
  - c. 35,000 units
  - d. 28,000 units

**ANS:** C      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

97. If a business had a capacity of \$10,000,000 of sales, actual sales of \$6,000,000, break-even sales of \$4,500,000, fixed costs of \$1,800,000, and variable costs of 60% of sales, what is the margin of safety expressed as a percentage of sales?
- a. 25%
  - b. 18%
  - c. 33.3%
  - d. 15%

**ANS:** A      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

98. If a business had sales of \$4,000,000, fixed costs of \$1,200,000, a margin of safety of 25%, and a contribution margin ratio of 40%, what was the break-even point?
- a. \$3,000,000
  - b. \$2,800,000
  - c. \$4,800,000
  - d. \$1,000,000

**ANS:** A      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

99. If a business had sales of \$4,000,000 and a margin of safety of 20%, what was the break-even point?
- a. \$5,000,000
  - b. \$3,200,000
  - c. \$12,000,000
  - d. \$1,000,000

**ANS:** B      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

100. Forde Co. has an operating leverage of 4. Sales are expected to increase by 8% next year. Operating income is:
- a. unaffected
  - b. expected to increase by 2%
  - c. expected to increase by 32%
  - d. expected to increase by 4 times

**ANS:** C      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

101. If sales are \$300,000, variable costs are 75% of sales, and operating income is \$40,000, what is the operating leverage?

- a. 0
- b. 7.500
- c. 1.875
- d. 1.333

**ANS:** C      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

102. If a business had a margin of safety ratio of 20%, variable costs of 75% of sales, fixed costs of \$240,000, a break-even point of \$960,000, and operating income of \$60,000 for the current year, what are the current year's sales?

- a. \$1,200,000
- b. \$1,040,000
- c. \$1,260,000
- d. \$1,020,000

**ANS:** A      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

103. The difference between the current sales revenue and the sales at the break-even point is called the:

- a. contribution margin
- b. margin of safety
- c. price factor
- d. operating leverage

**ANS:** B      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

104. Cost-volume-profit analysis cannot be used if which of the following occurs?

- a. Costs cannot be properly classified into fixed and variable costs
- b. The total fixed costs change
- c. The per unit variable costs change
- d. Per unit sales prices change

**ANS:** A      DIF: Difficult      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

105. Assume that Growley Co. sold 8,000 units of Product A and 2,000 units of Product B during the past year. The unit contribution margins for Products A and B are \$30 and \$60 respectively. Growley has fixed costs of \$378,000. The break-even point in units is:

- a. 8,000 units
- b. 6,300 units
- c. 12,600 units
- d. 10,500 units

**ANS:** D      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

Shipley Co. sells two products, Orks and Zins. Last year Shipley sold 14,000 units of Orks and 21,000 units of Zins. Related data are:

Product	Unit Selling Price	Unit Variable Cost	Unit Contribution Margin
Orks	\$120	\$80	\$40
Zins	80	60	20

106. What was Shipley's Co.'s sales mix last year?

- a. 60% Orks, 40% Zins
- b. 30% Orks, 70% Zins
- c. 70% Orks, 30% Zins
- d. 40% Orks, 60% Zins

**ANS:** D      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

107. What was Shipley's Co.'s unit selling price?

- a. \$200
- b. \$96
- c. \$120
- d. \$80

**ANS:** B      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

108. What was Shipley's Co.'s overall unit contribution margin?

- a. \$20
- b. \$40
- c. \$28
- d. \$24

**ANS:** C      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

109. Assuming that last years fixed costs totaled \$159,992, what was Shipley's Co.'s breakeven point in units?

- a. 5,714 units
- b. 4,000 units
- c. 8,000 units
- d. 2,667 units

**ANS:** A      DIF: Easy      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

110. If a business had a capacity of \$8,000,000 of sales, actual sales of \$5,000,000, break-even sales of \$3,500,000, fixed costs of \$1,400,000, and variable costs of 60% of sales, what is the margin of safety expressed as a percentage of sales?

- a. 25%
- b. 18%
- c. 28%
- d. 30%

**ANS:** D      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

111. If sales are \$400,000, variable costs are 75% of sales, and operating income is \$50,000, what is the operating leverage?

- a. 0
- b. 1.25
- c. 2.2
- d. 2

**ANS:** D      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

112. The Zucker Company reports the following data.

Sales	\$600,000
Variable costs	\$300,000
Fixed costs	\$100,000

Zucker Company's operating leverage is:

- a. 3.0
- b. 2.0
- c. 1.0
- d. 1.5

**ANS:** D      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

Knotley Co. sells two products, X and Y. Last year Knotley sold 14,000 units of X's and 21,000 units of Y's. Related data are:

Product	Unit Selling Price Price	Unit Variable Cost	Unit contribution Margin
X	\$110	\$70	\$40
Y	70	50	\$20

113. What was Knotley Co.'s sales mix last year?

- a. 58% X's, 42% Y's
- b. 60% X's, 40% Y's
- c. 30% X's, 70% Y's
- d. 40% X's, 60% Y's

**ANS:** D      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

114. What was Knotley Co.'s overall unit selling price?

- a. \$180
- b. \$86
- c. \$100
- d. \$110

**ANS:** B      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

115. What was Knotley Co.'s overall unit variable cost?

- a. \$58
- b. \$48
- c. \$70
- d. \$50

**ANS:** A      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

116. What was Knotley Co.'s unit contribution margin?

- a. \$30
- b. \$20
- c. \$40
- d. \$28

**ANS:** D      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

117. Assuming that last year's fixed costs totaled \$588,000. What was Knotley Co.'s break-even point in units?

- a. 35,000 units
- b. 30,100 units
- c. 21,000 units
- d. 14,000 units

**ANS:** C      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

118. If sales are \$400,000, variable costs are 75% of sales, and operating income is \$50,000, what is the operating leverage?

- a. 2.500
- b. 7.500
- c. 2.000
- d. 0

**ANS:** C      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

119. Which of the following is *not* an assumption underlying cost-volume-profit analysis?

- a. The break-even point will be passed during the period.
- b. Total sales and total costs can be represented by straight lines.
- c. Costs can be accurately divided into fixed and variable components.
- d. The sales mix is constant.

**ANS:** A      DIF: Moderate      OBJ: 19(4)-05

**NAT:** AACSB Analytic | IMA-Performance Measurement

**EXERCISE/OTHER**

1. The manufacturing cost of Lancer Industries for three months of the year are provided below:

	Total Cost	Production
April	\$ 63,100	1,200 Units
May	80,920	1,800
June	100,300	2,400

Using the high-low method, determine the (a) variable cost per unit, and (b) the total fixed costs.

**ANS:**

(a) \$31 per unit =  $(\$100,300 - \$61,900) / (2,400 - 1,200)$

(b) \$25,900 =  $\$100,300 - (\$31 \times 2,400)$

DIF: Moderate OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-1

2. The manufacturing cost of Spencer Industries for the first three months of the year are provided below:

	Total Cost	Production
January	\$ 93,300	2,300 Units
February	115,500	3,100
March	81,900	1,900

Using the high-low method, determine the (a) variable cost per unit, and (b) the total fixed cost.

**ANS:**

(a) \$28 per unit =  $(\$115,500 - \$81,900) / (3,100 - 1,900)$

(b) \$28,700 =  $\$115,500 - (\$28 \times 3,100)$

DIF: Moderate OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-1

3. Halley Company sells 30,000 units at \$15 per unit. Variable costs are \$9 per unit, and fixed costs are \$42,000. Determine the (a) contribution margin ratio, (b) unit contribution margin, and (c) income from operations.

**ANS:**

(a) 40% =  $(\$450,000 - \$270,000) / \$450,000$

(b) \$6 per unit =  $\$15 - \$9$

(c)

Sales	\$450,000	(30,000 units × \$15)
Variable costs	<u>270,000</u>	(30,000 units × \$9)
Contribution margin	180,000	[30,000 units × (\$15 - \$9)]
Fixed costs	<u>42,000</u>	
Income from operations	\$138,000	

DIF: Moderate OBJ: 19(4)-02

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-2

4. Halley Company sells 25,000 units at \$15 per unit. Variable costs are \$9 per unit, and fixed costs are \$32,000. Determine the (a) contribution margin ratio, (b) unit contribution margin, and (c) income from operations.

**ANS:**

(a)  $40\% = (\$375,000 - \$225,000) / \$375,000$

(b) \$6 per unit = \$15 - \$9

(c)

Sales	\$375,000	(25,000 units × \$15)
Variable costs	<u>225,000</u>	(25,000 units × \$9)
Contribution margin	150,000	[25,000 units × (15 - \$9)]
Fixed costs	<u>32,000</u>	
Income from operations	\$118,000	

DIF: Moderate OBJ: 19(4)-02

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-2

5. Madstorm Enterprises sells a product for \$50 per unit. The variable cost is \$30 per unit, while fixed costs are \$80,000. Determine the (a) break-even point in sales units, and (b) break-even point if the selling price was increased to \$55 per unit.

**ANS:**

(a)  $4,000 \text{ units} = \$80,000 / (\$50 - \$30)$

(b)  $3,200 \text{ units} = \$80,000 / (\$55 - \$30)$

DIF: Moderate OBJ: 19(4)-03

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-3

6. Maddy Enterprises sells a product for \$80 per unit. The variable cost is \$40 per unit, while fixed costs are \$70,000. Determine the (a) break-even point in sales units, and (b) break-even point if the selling price was increased to \$90 per unit.

**ANS:**

(a)  $1,750 \text{ units} = \$70,000 / (\$80 - \$40)$

(b)  $1,400 \text{ units} = \$70,000 / (\$90 - \$40)$

DIF: Moderate OBJ: 19(4)-03

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-3

7. The Jamestown Company sells a product for \$150 per unit. The variable cost is \$60 per unit, and fixed costs are \$270,000. Determine the (a) break-even point in sales units, and (b) break-even points in sales units if the company desires a target profit of \$36,000.

**ANS:**

(a)  $3,000 \text{ units} = \$270,000 / (\$150 - \$60)$

(b)  $3,400 \text{ units} = (\$270,000 + \$36,000) / (\$150 - \$60)$

DIF: Moderate OBJ: 19(4)-03

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-4



8. The Jamestown Company sells a product for \$120 per unit. The variable cost is \$40 per unit, and fixed costs are \$270,000. Determine the (a) break-even point in sales units, and (b) break-even points in sales units if the company desires a target profit of \$36,000.

**ANS:**

(a)  $3,375 \text{ units} = \$270,000 / (\$120 - \$40)$

(b)  $3,825 \text{ units} = (\$270,000 + \$36,000) / (\$120 - \$40)$

DIF: Moderate OBJ: 19(4)-03

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-4

9. James Company has fixed costs of \$160,000. The unit selling price, variable cost per unit, and contribution margin per unit for the company's two products are provided below.

Product	Selling Price	Variable Cost per unit	Contribution Margin per unit
X	\$180	\$100	\$80
Y	\$100	\$60	\$40

The sales mix for product X and Y is 60% and 40% respectively. Determine the break-even point in units of X and Y.

**ANS:**

Unit selling price of sales mix = \$148 =  $(\$180 \times .60) + (\$100 \times .40)$

Unit variable cost of sales mix = \$84 =  $(\$100 \times .60) + (\$60 \times .40)$

Unit contribution margin of sales mix = \$64 =  $(\$80 \times .60) + (\$40 \times .40)$

Break-even sales (units) = 2,500 =  $\$160,000 / \$64$

DIF: Moderate OBJ: 19(4)-05

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-5

10. Jonus Company has fixed costs of \$160,000. The unit selling price, variable cost per unit, and contribution margin per unit for the company's two products are provided below.

Product	Selling Price	Variable Cost per unit	Contribution Margin per unit
X	\$180	\$80	\$100
Y	\$100	\$50	\$50

The sales mix for product X and Y is 60% and 40% respectively. Determine the break-even point in units of X and Y.

**ANS:**

Unit selling price of sales mix = \$148 =  $(\$180 \times .60) + (\$100 \times .40)$

Unit variable cost of sales mix = \$68 =  $(\$80 \times .60) + (\$50 \times .40)$

Unit contribution margin of sales mix = \$80 =  $(\$100 \times .60) + (\$50 \times .40)$

Break-even sales (units) = 2,000 =  $\$160,000 / \$80$

DIF: Moderate OBJ: 19(4)-05

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-5

11. The Zucker Company reports the following data.

Sales	\$800,000
Variable costs	\$500,000
Fixed costs	\$250,000

Determine Zucker Company's operating leverage.

**ANS:**

$$6.0 = (\$800,000 - \$500,000) / (\$800,000 - \$500,000 - \$250,000)$$

DIF: Easy OBJ: 19(4)-05

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-6

12. The Zucker Company reports the following data.

Sales	\$600,000
Variable costs	\$400,000
Fixed costs	\$100,000

Determine Zucker Company's operating leverage.

**ANS:**

$$2.0 = (\$600,000 - \$400,000) / (\$600,000 - \$400,000 - \$100,000)$$

DIF: Easy OBJ: 19(4)-05

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-6

13. The Nachez Company has sales of \$500,000, and the break-even point in sales dollars of \$300,000.

Determine the company's margin of safety.

**ANS:**

$$40\% = (\$500,000 - \$300,000) / \$500,000$$

DIF: Easy OBJ: 19(4)-05

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-7

14. The Sanchez Company has sales of sales of \$300,000, and the break-even point in sales dollars if \$210,000. Determine the company's margin of safety.

**ANS:**

$$30\% = (\$300,000 - \$210,000) / \$300,000$$

DIF: Easy OBJ: 19(4)-05

NAT: AACSB Analytic | IMA-Performance Measurement TOP: Example Exercise 19(4)-7

**PROBLEM**

1. The following is a list of various costs of producing sweatshirts. Classify each cost as either a variable, fixed, or mixed cost for units produced and sold.
- (a) Lubricants used to oil machinery.
  - (b) Warehouse rent of \$6,000 per month plus \$.50 per square foot of storage used.
  - (c) Thread.
  - (d) Electricity costs of \$.025 per kilowatt-hour.
  - (e) Janitorial costs of \$2,000 per month.
  - (f) Advertising costs of \$10,000 per month.
  - (g) Sales salaries.
  - (h) Color dyes for producing different colors of sweatshirts.
  - (i) Salary of the production supervisor.
  - (j) Straight-line depreciation on sewing machines.
  - (k) Patterns for different designs. Patterns typically last many years before being replaced.
  - (l) Hourly wages of sewing machine operators.
  - (m) Property taxes on factory, building, and equipment.
  - (n) Cotton and polyester cloth.
  - (o) Maintenance costs with sewing machine company. The cost is \$2,000 per year plus \$.001 for each machine hour of use.

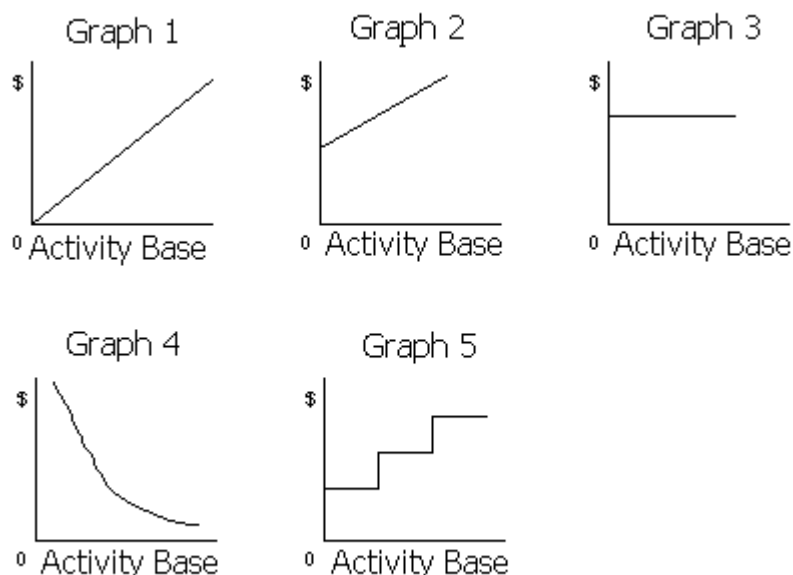
**ANS:**

- |              |              |
|--------------|--------------|
| (a) variable | (i) fixed    |
| (b) mixed    | (j) fixed    |
| (c) variable | (k) fixed    |
| (d) variable | (l) variable |
| (e) fixed    | (m) fixed    |
| (f) fixed    | (n) variable |
| (g) fixed    | (o) mixed    |
| (h) variable |              |

DIF: Moderate      OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement

2. The cost graphs in the illustration below shows various types of cost behaviors.



**FIGURE 20.2**

For each of the following costs, identify the cost graph that best describes its cost behavior as the number of units produced and sold increases:

- Sales commissions of \$5,000 plus \$.05 for each item sold.
- Rent on warehouse of \$10,000 per month.
- Insurance costs of \$2,500 per month.
- Per-unit cost of direct labor.
- Total salaries of quality control supervisors. One supervisor must be added for each additional work shift.
- Total employer pension costs of \$.30 per direct labor hour.
- Per-unit straight-line depreciation costs.
- Per-unit cost of direct materials.
- Total direct materials cost.
- Electricity costs of \$5,000 per month plus \$.0004 per kilowatt-hour.
- Per-unit cost of plant superintendent's salary.
- Per-unit cost of direct labor.
- Repairs and maintenance costs of \$3,000 for each 2,000 hours of factory machine usage.
- Total direct labor cost.
- Straight-line depreciation on factory equipment.

**ANS:**

	<u>Graph</u>		<u>Graph</u>
(a)	2	(i)	1
(b)	3	(j)	2
(c)	3	(k)	4
(d)	3	(l)	3
(e)	5	(m)	5
(f)	1	(n)	1
(g)	4	(o)	3
(h)	3		

DIF: Difficult OBJ: 19(4)-01

NAT: AACSB Analytic | IMA-Performance Measurement

3. Barrack Inc. manufactures laser printers within a relevant range of production of 50,000 to 70,000 printers per year. The following partially completed manufacturing cost schedule has been prepared:

	Number of Printers Produced		
	<u>70,000</u>	<u>90,000</u>	<u>100,000</u>
Total costs:			
Total variable costs	\$350,000	(d)	(j)
Total fixed costs	<u>630,000</u>	(e)	(k)
Total costs	<u>\$980,000</u>	(f)	(l)
Cost per unit:			
Variable cost per unit	(a)	(g)	(m)
Fixed cost per unit	(b)	(h)	(n)
Total cost per unit	(c)	(i)	(o)

Complete the preceding cost schedule, identifying each cost by the appropriate letter (a) through (o).

**ANS:**

- (a) \$5.00 (\$350,000/70,000 printers)
- (b) \$9.00 (\$630,000/70,000 printers)
- (c) \$14.00 (\$980,000/70,000 printers)
- (d) \$450,000 (\$5.00 × 90,000 printers)
- (e) \$630,000
- (f) \$1,080,000 (\$450,000 + \$630,000)
- (g) \$5.00
- (h) \$7.00 (\$630,000/90,000 printers)
- (i) \$12.00 (\$1,080,000/90,000 printers)
- (j) \$500,000 (\$5.00 × 100,000 printers)
- (k) \$630,000
- (l) \$1,130,000 (\$500,000 + \$630,000)
- (m) \$5.00
- (n) \$6.30 (\$630,000/100,000 units)
- (o) \$11.30 (\$1,130,000/100,000 units)

DIF: Easy OBJ: 19(4)-02

NAT: AACSB Analytic | IMA-Performance Measurement

4.

- (a) If Bart Company's budgeted sales are \$800,000, fixed costs are \$350,000, and variable costs are \$640,000, what is the budgeted contribution margin ratio?
- (b) If the contribution margin ratio is 30% for Gray Company, sales are \$900,000, and fixed costs are \$180,000, what is the operating profit?

**ANS:**

- (a)  $\$160,000/\$800,000 = 20\%$
- (b)  $\$900,000 - (70\% \text{ of } \$900,000) \text{ variable costs} - \$180,000 \text{ fixed costs} = \$90,000$  or  $(\$900,000 \times 30\%) - \$180,000 = \$90,000$

DIF: Easy OBJ: 19(4)-02

NAT: AACSB Analytic | IMA-Performance Measurement

5. For the current year ending April 30, Phillip Company expects fixed costs of \$70,000, a unit variable cost of \$60, and a unit selling price of \$95.
- (a) Compute the anticipated break-even sales (units).
  - (b) Compute the sales (units) required to realize an operating profit of \$8,000.

**ANS:**

- (a)  $\$70,000/\$35 = 2,000$
- (b)  $\$78,000/\$35 = 2,229$  (rounded)

DIF: Easy OBJ: 19(4)-03

NAT: AACSB Analytic | IMA-Performance Measurement

6. For the current year ending January 31, Bell Company expects fixed costs of \$178,500 and a unit variable cost of \$41.50. For the coming year, a new wage contract will increase the unit variable cost to \$45. The selling price of \$50 per unit is expected to remain the same.
- (a) Compute the break-even sales (units) for the current year.
  - (b) Compute the anticipated break-even sales (units) for the coming year, assuming the new wage contract is signed.

**ANS:**

- (a)  $\$178,500/\$8.50 = 21,000$  units
- (b)  $\$178,500/\$5 = 35,700$  units

DIF: Easy OBJ: 19(4)-03

NAT: AACSB Analytic | IMA-Performance Measurement

7. Currently, the unit selling price is \$30, the variable cost, \$14, and the total fixed costs, \$96,000. A proposal is being evaluated to increase the selling price to \$34.
- (a) Compute the current break-even sales (units).
  - (b) Compute the anticipated break-even sales (units), assuming that the unit selling price is increased and all costs remain constant.

**ANS:**

- (a)  $\$96,000/\$16 = 6,000$  units
- (b)  $\$96,000/\$20 = 4,800$  units

DIF: Easy OBJ: 19(4)-03

NAT: AACSB Analytic | IMA-Performance Measurement

8. For the coming year, Swain Company estimates fixed costs at \$90,000, the unit variable cost at \$20, and the unit selling price at \$80. Determine (a) the break-even point in units of sales, (b) the unit sales required to realize operating income of \$150,000, and (c) the probable operating income if sales total \$500,000.

**ANS:**

- (a)  $S = \$90,000 / \$60 = 1,500$  units
- (b)  $S = (\$90,000 + \$150,000) / \$60 = 4,000$  units
- (c)  $\$500,000 - \$90,000 - (25\% \times \$500,000) = \$285,000$

DIF: Moderate      OBJ: 19(4)-03  
NAT: AACSB Analytic | IMA-Performance Measurement

9. For the past year, Chandler Company had fixed costs of \$70,000, unit variable costs of \$32, and a unit selling price of \$40. For the coming year, no changes are expected in revenues and costs, except that property taxes are expected to increase by \$10,000. Determine the break-even sales (units) for (a) the past year and (b) the coming year.

**ANS:**

- (a)  $S = \$70,000 / \$8 = 8,750$  units
- (b)  $S = \$80,000 / \$8 = 10,000$  units

DIF: Moderate      OBJ: 19(4)-03  
NAT: AACSB Analytic | IMA-Performance Measurement

10. For the past year, Holcomb Company had fixed costs of \$6,552,000, a unit variable cost of \$444, and a unit selling price of \$600. For the coming year, no changes are expected in revenues and costs, except that a new wage contract will increase variable costs by \$6 per unit. Determine the break-even sales (units) for (a) the past year and (b) the coming year.

**ANS:**

- (a)  $S = \$6,552,000 / \$156 = 42,000$  units
- (b)  $S = \$6,552,000 / \$150 = 43,680$  units

DIF: Moderate      OBJ: 19(4)-03  
NAT: AACSB Analytic | IMA-Performance Measurement

11. Mega Stampers makes and sells aftermarket hub caps. The variable cost for each hub cap is \$4.75 and the hub cap sells for \$9.95. Mega Stampers has fixed costs per month of \$2,750.00. Compute the contribution margin per unit and break-even sales in units and in dollars for the month.

**ANS:**

Contribution margin is \$9.95 selling price less \$4.75 variable cost = \$5.20  
Break even sales in units is \$2,750.00 fixed costs / \$5.20 contribution margin = 529 units.  
Break even sales in dollars is \$9.95 selling price  $\times$  529 units = \$5,263.55

**Note:** You would not expect to sell part of a hub cap so round the partial unit up regardless of its partial value.

DIF: Moderate      OBJ: 19(4)-03  
NAT: AACSB Analytic | IMA-Performance Measurement

12. Mega Stampers has collected new data over the last three months for evaluation of their budgeting and cost computations. Their average production labor cost is \$5,500.00 per month, the average raw materials consumed per month is \$1,475.00, the average utilities expense is \$500.00, which is all production, depreciation, other overhead items, and indirect items are averaging \$1,950.00 per month. Stampers has been producing an average of 1,925 hub caps per month which it sells at \$9.95 each. Compute the unit variable cost and the contribution margin per unit. If fixed costs are \$2,750.00 per month, what is the break-even point in units?

**ANS:**

Total variable costs are:

Production labor cost is	\$5,500.00	per month
Raw materials consumed per month is	1,475.00	
Utilities expense is	500.00	
Depreciation and other items	<u>1,950.00</u>	per month
Total variable costs (average per month)	<u>\$9,425.00</u>	

Unit variable costs = Total (average) production costs \$9,425.00 / 1,925 hub caps = \$4.8961 per hub cap.

Contribution Margin= Selling price per unit- variable unit costs = \$9.95-\$4.90= \$5.05

Break-even point in units is \$2,750.00 per month / (\$9.95 - \$4.90) = 545 units

DIF: Difficult OBJ: 19(4)-03

NAT: AACSB Analytic | IMA-Performance Measurement

13. A company with a break-even point at \$900,000 in sales revenue and had fixed costs of \$225,000. When actual sales were \$1,000,000 variable costs were \$750,000. Determine (a) the margin of safety expressed in dollars, (b) the margin of safety expressed as a percentage of sales, (c) the contribution margin ratio, and (d) the operating income.

**ANS:**

(a)  $\$1,000,000 - \$900,000 = \$100,000$

(b)  $\$100,000 / \$1,000,000 = 10\%$

(c) Contribution margin ratio =  $\frac{\$1,000,000 - \$750,000}{\$1,000,000} = 25.0\%$

(d)  $\$1,000,000 - \$225,000 - \$750,000 = \$25,000$   
or  
 $\$100,000 \times 25.0\% = \$25,000$

DIF: Moderate OBJ: 19(4)-03 | 19(4)-05

NAT: AACSB Analytic | IMA-Performance Measurement

14. A company has a margin of safety of 25%, a contribution margin ratio of 30%, and sales of \$1,000,000.

- What was the break-even point?
- What was the operating income?
- If neither the relationship between variable costs and sales nor the amount of fixed costs is expected to change in the next year, how much additional operating income can be earned by increasing sales by \$110,000?



**ANS:**

(a)  $\text{Margin of safety} = \$1,000,000 \times 25\% = \$250,000$   
 $\text{Break-even point} = \$1,000,000 - \$250,000 = \$750,000$

(b)  $\$250,000 (\text{margin of safety}) \times 30\% (\text{contribution margin ratio}) = \$75,000$

Alternate computation:

Sales		\$1,000,000
Less fixed costs*	\$225,000	
Variable costs (\$1,000,000 × 70% **)	<u>700,000</u>	<u>925,000</u>
Operating income		<u>\$ 75,000</u>
*Break-even point (a)	\$750,000	
Less variable costs (\$750,000 × 70% **)	<u>525,000</u>	
Fixed costs	<u>\$225,000</u>	
**100% - 30% (contribution margin ratio) = 70% (variable costs)		

(c)  $\$110,000 \times 30\% = \$33,000$

DIF: Moderate OBJ: 19(4)-03 | 19(4)-05

NAT: AACSB Analytic | IMA-Performance Measurement

15. Hitch Company sells Products S and T and has made the following estimates for the coming year:

<u>Product</u>	<u>Unit Selling Price</u>	<u>Unit Variable Cost</u>	<u>Sales Mix</u>
S	\$30	\$24	60%
T	70	56	40

Fixed costs are estimated at \$202,400. Determine (a) the estimated sales in units of the overall product necessary to reach the break-even point for the coming year, (b) the estimated number of units of each product necessary to be sold to reach the break-even point for the coming year, and (c) the estimated sales in units of the overall product necessary to realize an operating income of \$119,600 for the coming year.

**ANS:**

Unit selling price of E\* =  $(\$30 \times 60\%) + (\$70 \times 40\%) = \$46.00$

Unit variable cost of E =  $(\$24 \times 60\%) + (\$56 \times 40\%) = \$36.80$

Unit contribution margin =  $\$46 - \$36.80 = \$9.20$

Sales =  $\$202,400 / \$9.20 = 22,000$  units

\*Overall product

S:  $13,200$  units ( $22,000$  units  $\times$  60%)

T:  $8,800$  units ( $22,000$  units  $\times$  40%)

Sales =  $(\$202,400 + \$119,600) / \$9.20 = 35,000$  units

DIF: Difficult OBJ: 19(4)-05

NAT: AACSB Analytic | IMA-Performance Measurement