CHAPTER 2
INTRODUCTION TO COST BEHAVIOR AND COST-VOLUME RELATIONSHIPS

LEARNING OBJECTIVES:

1. **Explain how cost drivers affect cost behavior.**
2. **Show how changes in cost-driver activity levels affect variable and fixed costs.**
3. **Calculate break-even sales volume in total dollars and total units.**
4. **Create a cost-volume-profit graph and understand the assumptions behind it.**
5. **Calculate sales volume in total dollars and total units to reach a target profit.**
6. **Differentiate between contribution margin and gross margin.**
7. **Explain the effects of sales mix on profits (Appendix 2A).**
8. **Compute cost-volume-profit relationships on an after-tax basis (Appendix 2B).**

TRUE/FALSE:

LEARNING OBJECTIVE 1

1. On a day-to-day basis, managers must manage the activities required to make products and services.
True

2. Cost drivers are output measures of both resources and activities.
True

3. Cost behavior pertains to how costs affect the activities of an organization.
False

4. A key factor in controlling costs is associating costs with activities.
True

5. A good example of a cost driver for production labor wages is the number of machine hours.
False

6. A good example of a cost driver for production supervisor salaries is the number of people supervised.
True

LEARNING OBJECTIVE 2

7. A fixed cost changes in direct proportion to changes in a cost driver.
False

8. When analyzing costs, two rules of thumb are useful: (1) think of fixed costs on a per-unit basis; and (2) think of variable costs as a total.
False

9. The relevant range is the limit of cost-driver activity within which a specific relationship between costs and the cost driver is valid.
True

10. Costs may behave in a linear and nonlinear way.
True

11. Only one cost driver may affect a cost at any given time.
False

12. With very short time spans, costs become more fixed and less variable.
True

LEARNING OBJECTIVE 3

13. The break-even point is the level of sales at which revenue equals fixed costs.
False

14. Gross profit margin is the sales price minus the variable cost per unit.
False

15. The income statement can be expressed as:
Sales - Variable Expenses - Fixed Expenses = Net Income
True

16. The margin of safety is the difference between planned unit sales and break-even sales.
True

17. Only managers of profit-seeking organizations find that the cost-volume-profit analysis is useful.
False

18. A major simplifying assumption of cost-volume-profit analysis is that costs can be classified as either variable or fixed with respect to a single measure of the volume of output activity.
True

19. At the break-even point, net income may be positive.
False

20. After a certain point, a unit sold does not generate marginal income.
False

21. The break-even point is when enough units are sold that total contribution margin equals total variable costs.
False

22. Total contribution margin / total sales = 100% - variable cost percentage.
True

23. Break-even volume in units = fixed costs / unit contribution margin.
True

24. Break-even volume in dollars = variable costs / contribution-margin ratio.
False

LEARNING OBJECTIVE 4

25. The break-even point is located at the intersection of the total revenue line and the total expenses line on a cost-volume-profit graph.
True

26. The CVP graph shows profit and loss at any rate of activity.
True

27. The CVP graph shows how costs behave over multiple relevant ranges.
False

28. The CVP graph uses the assumption that costs are linear over the relevant range.
True

29. The horizontal axis on the CVP graph is the dollars of cost and revenue.
False

30. On the CVP graph, the horizontal difference between the sales line and the total expenses line measures the net income or net loss.
False

31. An assumption of the CVP analysis is that changes in efficiency or productivity are expected.
False

32. An assumption of the CVP analysis is that the difference in inventory level at the beginning and at the end of a period is insignificant.
True

33. The sales mix is the relative proportions or combinations of quantities of products that constitute total sales.
True

34. An assumption of the CVP analysis is that the sales mix can fluctuate.
False

35. The break-even point may be reduced by reducing total fixed costs and holding everything else constant.
True

36. The break-even point may be reduced by increasing the per unit variable cost.
False

LEARNING OBJECTIVE 5

37. The incremental approach means that a manager focuses on the effects of changes from the current condition.
True

38. An increase in sales price would cause a decrease in the break-even point.
True

39. Target sales volume in units = (variable expenses + target net income) / unit contribution margin.
False

40. Target sales – variable expenses – fixed expenses = target net income.
True

41. The reliability of computer models used in CVP analysis depends on the accuracy of their underlying assumptions about how revenues and costs may actually be affected.
True

42. The benefits of increased accuracy of using a computer model in CVP analysis always exceed the costs.
False

43. Generally, companies that spend heavily for advertising are willing to do so because they have low contribution-margin percentages.
False

44. An industry that has a high contribution-margin percentage is the airlines.
True

45. Manufacturers of industrial equipment have high contribution-margin percentages.
False

46. Small increases in profits occur for high contribution-margin ratio companies when sales grow.
False

47. Operating leverage is the ratio of fixed costs to variable costs.
True

48. Highly leveraged companies have low fixed costs and high variable costs.
False

49. In highly leveraged companies, small changes in sales volume result in large changes in net income.
True

50. Highly leveraged companies are less risky than companies with low leverage.
False

51. The margin of safety shows how far sales can fall below the planned level of sales before losses occur.
True

52. A small margin of safety may indicate a risky situation.
True

53. Margin of safety = actual unit sales – planned unit sales.
False

LEARNING OBJECTIVE 6

54. Gross margin is the same as contribution margin.
False

55. Gross margin focuses on sales in relation to variable cost.
False

56. Sales mix concept is relevant for all companies, regardless of the number of units produced.
False

57. Gross margin = sales price – cost of goods sold.
True

58. Contribution margin = sales price – all variable expenses.
True

59. Cost of goods sold is the cost of the merchandise that a company acquires or produces and then sells.
True

60. Selling expenses are found in the cost of goods sold.
False

LEARNING OBJECTIVE 7

61. When changes occur in the sales mix, there is no effect on the cost-volume-profit relationships.
False

62. Due to limited resources, sales of every type of product cannot be maximized.
True

63. Sales volume of a given product helps guide executives who must decide to emphasize or deemphasize particular products.
False

LEARNING OBJECTIVE 8

64. A change in the tax rate will not affect the break-even point.
True

65. Income before income taxes = net income / marginal tax rate.
False

MULTIPLE CHOICE:

LEARNING OBJECTIVE 1

66. Managers should focus their efforts on managing _____.

a. activities required to make products or deliver services
b. products and services
c. revenues
d. none of these answers is correct

67. Which value chain function would include the cost of computer-aided design equipment and cost to develop the prototype of a product?

a. The distribution function would include these costs.
b. The design of product, services, and processes function would include these costs.
c. The production function would include these costs.
d. The marketing function would include these costs.

68. Which value chain function would include depreciation of plant and machinery?

a. The distribution function would include depreciation of plant and machinery.
b. The customer service function would include depreciation of plant and machinery.
c. The production function would include depreciation of plant and machinery.
d. The marketing function would include depreciation of plant and machinery.

69. Which value chain function would include advertising costs?

a. The distribution function would include advertising costs.
b. The customer service function would include advertising costs.
c. The production function would include advertising costs.
d. The marketing function would include advertising costs.

70. Which value chain function would include depreciation on transportation cost?

a. The distribution function would include depreciation on transportation cost.
b. The customer service function would include depreciation on transportation cost.
c. The production function would include depreciation on transportation cost.
d. The marketing function would include depreciation on transportation cost.

71. Which of the following is not a cost driver of customer services costs?

a. Hours spent servicing products are not a cost driver of customer services costs.
b. Travel costs are not a cost driver of customer services costs.
c. Number of service calls is not a cost driver of customer services costs.
d. All of these answers are correct.

72. Which of the following would be a good cost driver for salaries of product and supervisory salaries?

a. Number of hours worked is a good cost driver for salaries of product and supervisory salaries.
b. Number of people supervised is a good cost driver for salaries of product and supervisory salaries.
c. Number of department transactions is a good cost driver for salaries of product and supervisory salaries.
d. Number of customers served is a good cost driver for salaries of product and supervisory salaries.

73. Number of engineering hours is a likely cost driver for which value chain function?

a. The research and development function has number of engineering hours as a likely cost driver.
b. The design function has number of engineering hours as a likely cost driver.
c. The marketing function has number of engineering hours as a likely cost driver.
d. The production function has number of engineering hours as a likely cost driver.

74. Output measures of both resources and activities are _____.

a. cost drivers
b. stages of production
c. fixed activities
d. variable activities

75. _____ is how the activities of an organization affect its costs.

a. Cost behavior
b. Cost driver
c. Volume-related cost drivers
d. None of these answers is correct

LEARNING OBJECTIVE 2

76. As the cost-driver activity level increases within the relevant range _____.

a. total fixed costs remain unchanged
b. fixed costs per unit increases
c. total variable costs decrease
d. variable costs per unit increases

77. As the cost-driver activity level increases within the relevant range _____.

a. total fixed costs increase
b. fixed costs per unit decrease
c. total variable costs decrease
d. variable costs per unit decrease

78. As the cost driver activity level decreases within the relevant range _____.

a. total fixed costs increase
b. fixed costs per unit decrease
c. total variable costs decrease
d. variable costs per unit decrease

79. As the level of activity decreases within the relevant range _____.

a. total fixed costs increase
b. fixed costs per unit decrease
c. total variable costs increase
d. variable costs per unit remain unchanged

80. An accountant may have difficulty classifying costs as fixed or variable because _____.

a. costs may behave in a nonlinear way
b. costs may be affected by more than one cost driver
c. the decision situation may cause the costs to be fixed in the short term
d. all of these answers are correct

81. When analyzing cost, think of _____.

a. variable costs as a total
b. variable costs on a per-unit basis
c. fixed costs on a per-unit basis
d. variable costs as a total and fixed costs on a per-unit basis

82. An increase in fixed costs usually indicates _____.

a. cost driver activity is decreasing
b. cost driver activity is increasing
c. relevant range is increasing
d. relevant range is decreasing

83. An increase in total variable cost usually indicates _____.

a. the cost-driver activity level is decreasing
b. the cost-driver activity level is increasing
c. variable costs per unit is decreasing
d. variable costs per unit is increasing

84. Fixed costs _____.

a. are fixed on a per-unit basis, but vary in total
b. vary on a per-unit basis, but are fixed in total
c. are fixed on a per-unit basis, and fixed in total
d. vary on a per-unit basis, and vary in total

85. Variable costs _____.

a. vary per unit
b. are fixed in total
c. decrease in total as the cost-driver activity level increases
d. are fixed per unit and vary in total

86. Relevant range applies to _____.

a. the variable costs
b. fixed costs
c. both fixed and variable costs
d. cost driver activity levels

LEARNING OBJECTIVE 3

87. The level of sales at which revenues equal expenses and net income is zero is called the _____.

a. margin of safety
b. contribution margin
c. break-even point
d. marginal income point

88. The margin of safety _____.

a. equals planned unit sales less break-even unit sales
b. shows how actual sales differ from planned sales
c. is the sales price minus all the fixed expenses
d. is the same as contribution margin

89. Mercy Hospital has total variable costs of 80% of total revenues and fixed costs of $20 million per year. There are 70,000 patient-days estimated for next year. What is the break-even point expressed in total revenue?

a. $100 million is the break-even point.
b. $10 million is the break-even point.
c. $12.5 million is the break-even point.
d. None of these answers is correct.

$20 million / (1 - 0.80) = $100 million

90. General Hospital has total variable costs of 90% of total revenues and fixed costs of $50 million per year. There are 50,000 patient-days estimated for next year. What is the average daily revenue per patient necessary to breakeven?

a. $1,000 is the average daily revenue per patient necessary to breakeven.
b. $4,000 is the average daily revenue per patient necessary to breakeven.
c. $250 is the average daily revenue per patient necessary to breakeven.
d. $10,000 is the average daily revenue per patient necessary to breakeven.

$50,000,000 / (1 - .90) = $500,000,000;
$500,000,000 / 50,000 = $10,000

91. Suppose a Holiday Inn Hotel has annual fixed costs applicable to its rooms of $1.2 million for its 300-room hotel, average daily room rents of $50, and average variable costs of $10 for each room rented. It operates 365 days per year. The amount of net income on rooms that will be generated if the hotel is completely full throughout the entire year is _____.
a. $(1,188,000)
b. $4,275,000
c. $3,180,000
d. $5,475,000

[300 x 365 x ($50 - $10)] - $1,200,000 = $3,180,000

92. Suppose a Holiday Inn Hotel has annual fixed costs applicable to its rooms of $1.2 million for its 300-room hotel, average daily room rents of $50, and average variable costs of $10 for each room rented. It operates 365 days per year. The amount of net income on rooms that will be generated if the hotel is half full throughout the entire year is _____.

a. $(1,192,500)
b. $1,590,000
c. $2,737,500
d. $990,000

[.5 x 300 x 365 x ($50 - $10)] - $1,200,000 = $990,000

93. Suppose a Holiday Inn Hotel has annual fixed costs applicable to its rooms of $1.2 million for its 300-room hotel, average daily room rents of $50, and average variable costs of $10 for each room rented. It operates 365 days per year. The break-even point in number of rooms rented is _____.

a. 30,000 rooms
b. 24,000 rooms
c. 120,000 rooms
d. none of these answers is correct

$1,200,000 / ($50 - $10) = 30,000 rooms

94. Suppose the Holiday Inn Hotel has annual fixed costs applicable to its rooms of $1.2 million for its 300-room hotel, average daily room rents of $50, and average variable costs of $10 for each room rented. It operates 365 days per year. The percent of occupancy for the year needed to breakeven is _____.

a. 3.65%
b. 27.4%
c. 25%
d. 100%

$1,200,000 / ($50 - $10) = 30,000 rooms;
30,000 / (300 x 365) = 27.4 percent

95. Deadwood Hospital has overall variable costs of 50% of total revenues and fixed costs of $40 million per year. There are 40,000 patient-days estimated for next year. The break-even point expressed in total revenue is _____.

a. $80 million
b. $40 million
c. $10 million
d. none of these answers is correct

$40 million / (1 - 0.50) = $80 million

96. Medina County Hospital has overall variable costs of 75% of total revenues and fixed costs of $40 million per year. There are 40,000 patient-days estimated for next year. The average daily revenue per patient necessary to breakeven is _____.

a. $1,000
b. $4,000
c. $250
d. $20,000

$40 million / (1 - .75);
$160 million / 40,000 = $4,000

97. If the sales price per unit is $30, the unit contribution margin is $8, and total fixed costs are $32,000, the break-even point in units is _____.

a. 4,000
b. 1,200
c. 857
d. 2,000

$32,000 / $8 = 4,000 units

98. If the sales price per unit is $34, the unit variable cost is $19, and the break-even point is 12,000 units, then the total fixed costs are _____.

a. $340,000
b. $190,000
c. $180,000
d. $530,000

X / ($34 - $19) = 10,000
X = 12,000 x $15 = $180,000

99. If the sales price per unit is $100, the unit variable cost is $75, and total fixed costs are $150,000, then the break-even volume in dollar sales rounded to the nearest whole dollar is _____.

a. $600,000
b. $150,000
c. $200,000
d. $1,500

$150,000 / ($100 - $75) = 6,000 units
6,000 units x $100 = $600,000

100. If the sales price per unit is $100, the total fixed costs are $75,000, and the break-even volume in dollar sales is $250,000, then the variable cost per unit is _____.

a. $70
b. $100
c. $75,000
d. $30

$75,000 / [($100 - X) / $100] = $250,000
$75,000 / $250,000 = ($100 - X) / $100
.3 = ($100 – X) / $100
$30 = ($100 – X)
$70 = X

101. Walnut Corporation sells desks at $480 per desk. The costs associated with each desk are as follows:

Direct materials	$195
Direct labor	126
Variable factory overhead	51

Total fixed costs for the period are $456,840. The contribution margin per desk is _____.

a. $195
b. $108
c. $51
d. $126

$480 - $195 - $126 - $51 = $108

102. Cherry Wood Company sells desks at $480 per desk. The costs associated with each desk are as follows:

Direct materials	$195
Direct labor	126
Variable factory overhead	51

Total fixed costs for the period are $456,840. The contribution-margin ratio is _____.

a. 22.5%
b. 29.0%
c. 40.6%
d. 77.5%

$480 - $195 - $126 - $51 = $108;
$108 / $480 = 22.5%

103. Oak Corporation sells desks at $480 per desk. The costs associated with each desk are as follows:

Direct materials	$195
Direct labor	126
Variable factory overhead	51

Total fixed costs for the period are $456,840. The break-even point in desks is _____.

a. 952 desks
b. 1,228 desks
c. 4,230 desks
d. 5,458 desks

$480 - $195 - $126 - $51 = $108;
$456,840 / $108 = 4,230 desks

104. Knothole Company sells desks at $480 per desk. The costs associated with each desk are as follows:

Direct materials	$195
Direct labor	126
Variable factory overhead	51

Total fixed costs for the period are $456,840. The break-even volume in dollars is _____.

a. $456,840
b. $1,573,560
c. $2,030,400
d. none of these answers is correct

$480 - $195 - $126 - $51 = $108;
$456,840 / $108 = 4,230 desks;
4,230 x $480 = $2,030,400

105. Hug Me Company produces dolls. Each doll sells for $20.00. Variable costs per unit total $14.00, of which $6.25 is for direct materials and $5.25 is for direct labor. If total fixed costs are $435,000, then the break-even point is _____.

a. 21,750 dolls
b. 31,071 dolls
c. 51,176 dolls
d. 72,500 dolls

$435,000 / ($20 - $14) = 72,500 dolls

106. Hug Me Company produces dolls. Each doll sells for $20.00. Variable costs per unit total $14.00, of which $6.25 is for direct materials and $5.25 is for direct labor. If total fixed costs are $435,000, then the break-even volume in dollars is _____.

a. $1,450,000
b. $1,023,529
c. $621,429
d. $435,000

$435,000 / ($20 - $14) = 72,500 dolls;
72,500 x $20 = $1,450,000

107. Hug Me Company produces dolls. Each doll sells for $20.00. Variable costs per unit total $14.00, of which $6.25 is for direct materials and $5.25 is for direct labor. If the break-even volume in dollars is $1,446,000, then the total fixed costs for the period must be _____.

a. $433,800
b. $361,500
c. $516,425
d. $1,446,000

[X / ($20 - $14)] x $20 = $1,446,000
$20X = $1,446,000 x ($20 - $14)
X = $433,800

108. Zachary Company wishes to earn after-tax net income of $18,000. Total fixed costs are $84,000, and the contribution margin per unit is $6.00. Zachary's tax rate is 40%. The number of units that must be sold to breakeven is _____.

a. 14,000 units
b. 17,000 units
c. 19,000 units
d. 21,500 units

$84,000 / $6.00 = 14,000 units

109. Strongsville Company wishes to earn after-tax net income of $18,000. Total fixed costs are $84,000, and the contribution margin per unit is $6.00. Strongsville's tax rate is 40%. The number of units that must be sold to earn the targeted net income is _____.

a. 14,000 units
b. 17,000 units
c. 19,000 units
d. 21,500 units

[$84,000 + ($18,000 / .60)] / $6.00 = 19,000 units

110. Berea Company currently sells 19,000 units. Total fixed costs are $84,000, and the contribution margin per unit is $6.00. Berea's tax rate is 40%. The margin of safety in units is _____.

a. 3,000 units
b. 5,000 units
c. 7,500 units
d. 14,000 units

[$84,000 + ($18,000 / .60)] / $6.00 = 19,000 units;
19,000 units – ($84,000 / $6.00) = 5,000 units

111. Hot Company, a producer of salsa, has the following information:

Income tax rate	30%
Selling price per unit	$8.00
Variable cost per unit	$3.00
Total fixed costs	$90,000.00

The contribution margin per unit is _____.

a. $2.00
b. $3.00
c. $5.00
d. $8.00

$8.00 - $3.00 = $5.00

112. On Fire Company, a producer of salsa, has the following information:

Income tax rate	30%
Selling price per unit	$5.00
Variable cost per unit	$3.00
Total fixed costs	$90,000.00

The contribution-margin ratio is _____.

a. 30%
b. 40%
c. 60%
d. 100%

$5.00 - $3.00 = $2.00;
$2.00 / $5.00 = 40%

113. Sizzling Company, a producer of salsa, has the following information:

Income tax rate	30%
Selling price per unit	$5.00
Variable cost per unit	$3.00
Total fixed costs	$90,000.00

The break-even point in dollars is _____.

a. $150,000
b. $180,000
c. $225,000
d. $270,000

$90,000 / ($5.00 - $3.00) = 45,000 units;
45,000 units x $5.00 = $225,000

LEARNING OBJECTIVE 4

114. The horizontal axis on the cost-volume-profit graph is the _____.

a. dollars of cost
b. sales volume in units
c. dollars of revenue
d. net income

115. _____ is not shown in the cost-volume-profit graph.

a. The break-even point
b. The profit or loss at any rate of activity
c. The fixed cost per unit
d. Sales volume in units

116. _____ is not an underlying assumption of the cost-volume-profit graph.

a. Expenses are categorized into variable and fixed costs
b. Sales mix will be constant
c. Revenues and expenses are nonlinear over the relevant range
d. Efficiency and productivity will be unchanged

117. _____ will decrease a company's break-even point.

a. Reducing its total fixed costs
b. Decreasing contribution margin per unit
c. Increasing variable cost per unit
d. Decreasing the selling price per unit

LEARNING OBJECTIVE 5

118. If fixed expenses were the same and contribution margin per unit was cut in half, then the break-even point would _____.

a. be cut in half
b. double
c. be the same
d. be undeterminable

119. The following information is for Kinsner Corporation:

Total fixed costs	$313,500
Variable costs per unit	$99
Selling price per unit	$154

If management has a targeted net income of $46,200 (ignore income taxes), then the number of units that must be sold is _____.

a. 2,036 units
b. 2,336 units
c. 5,700 units
d. 6,540 units

($313,500 + $46,200) / ($154 - $99) = 6,540 units

120. The following information is for Kinsner Corporation:

Total fixed costs	$313,500
Variable costs per unit	$99
Selling price per unit	$154

If management has a targeted net income of $59,400 (ignore income taxes), then sales revenue should be _____.

a. $580,067
b. $1,044,120
c. $239,721
d. $671,220

($313,500 + $59,400) / [($154 - $99) / $154] = $1,044,120

121. The following information is for Brook Park Corporation:

Total fixed costs	$313,500
Variable costs per unit	$101
Selling price per unit	$163

The contribution-margin ratio is _____.

a. 35.7%
b. 38.0%
c. 55.6%
d. 64.3%

($163 - $101) / $163 = 38.04 percent

122. The following information is for Donald Corporation:

Total fixed costs	$333,500
Variable costs per unit	$99
Selling price per unit	$154

If total fixed costs increased to $394,850, then break-even volume in dollars would increase by _____.

a. 10.0%
b. 12.3%
c. 18.4%
d. 34.3%

($394,850 - $333,500) / $333,500 = 18.40%

123. Assume the following cost information for Marie Company:

Selling price per unit	$144
Variable costs per unit	$80
Total fixed costs	$80,000
Tax rate	40%

_____ of sales dollars is required to earn an after-tax net income of $24,000.

a. $216,000
b. $252,000
c. $270,000
d. $315,000

[$80,000 + ($24,000 / 0.6] / ($144 - $80) = 1,875 units
1,875 x $144 = $270,000

124. Assume the following cost information for Andrew Company:

Selling price per unit	$144
Variable costs per unit	$80
Total fixed costs	$80,000
Tax rate	40%

_____ must be sold to earn an after-tax net income of $40,800.

a. 3,700 units
b. 2,313 units
c. 1,594 units
d. 1,063 units

[$80,000 + ($40,800 / 0.6)] / ($144 - $80) = 2,312.5 or 2,313 units

125. Assume the following cost information for Katherine Company:

Selling price per unit	$144
Variable costs per unit	$95
Total fixed costs	$80,000
Tax rate	40%

The break-even point in units is _____.

a. 500 units
b. 556 units
c. 1,000 units
d. 1,633 units

$80,000 / ($144 - $95) = 1,633 units

126. Assume the following cost information for Janice Company:

Selling price per unit	$144
Variable costs per unit	$80
Total fixed costs	$80,000
Tax rate	40%

If fixed costs increased by 10% and management wanted to maintain the original break-even point, then the selling price per unit would have to be increased to _____.

a. $158.40
b. $208.00
c. $150.40
d. $155.20

$80,000 / ($144 - $80) = 1,250 units at original break-even point;
($80,000 x 1.10) / X = 1,250
$88,000 / X = 1,250
X = $88,000 / 1,250 = $70.40
Price = $70.40 + $80.00 = $150.40

127. The _____ is the change in total results under a new condition, in comparison with some given or known condition.

a. incremental effect
b. detrimental effect
c. conditional effect
d. comparability effect

128. Given a break-even point of 88,000 units and a contribution margin per unit of $9.60, the total number of units that must be sold to reach a net pre-tax profit of $18,096 is _____.

a. 89,885 units
b. 88,000 units
c. 1,885 units
d. indeterminable

88,000 + ($18,096 / $9.60) = 89,885 units

129. As sales exceed the break-even point, a high contribution-margin percentage _____.

a. increases profits faster than does a low contribution-margin percentage
b. increases profits at the same rate as a low contribution-margin percentage
c. decreases profits at the same rate as a low contribution-margin percentage
d. increases profits slower than does a low contribution-margin percentage

130. _____ is the ratio of fixed costs to variable costs.

a. Contribution margin
b. Break-even point
c. Operating leverage
d. The margin of safety

131. Which of the following statements about highly leveraged companies is true?

a. Fixed costs are high and variable costs are low.
b. Large changes in sales volume result in larger changes in net income.
c. There is a higher possibility of net income or net loss and, therefore, more risk than in a highly leveraged firm.
d. All of these answers are correct.

132. If the sales price per unit is $180, variable cost per unit is $100, targeted net income is $52,800, and total fixed costs are $39,600, the number of units that must be sold is _____.

a. 513
b. 629
c. 963
d. 1,155

($52,800 + $39,600) / ($180 - $100) = 1,115 units

133. If the contribution-margin ratio is 0.30, targeted net income is $76,800, and targeted sales volume in dollars is $480,000, then total fixed costs are _____.

a. $23,000
b. $44,160
c. $67,200
d. $144,000

(X + $76,800) / .30 = $480,000 and X = $67,200

134. If targeted sales volume in units is 62,300, total fixed costs are $31,200, and contribution margin per unit is $1.20, then the targeted net income is _____.

a. $31,200
b. $43,560
c. $37,440
d. $74,760

($31,200 + X) / $1.20 = 62,300 and X = $43,560

LEARNING OBJECTIVE 6

135. _____ is all variable costs divided by sales.

a. Gross margin
b. Contribution-margin ratio
c. Variable-cost ratio
d. The sales mix

136. _____ is the excess of sales over the cost of goods sold.

a. Gross margin
b. Contribution-margin ratio
c. Variable-cost ratio
d. The sales mix

LEARNING OBJECTIVE 7

137. _____ is the relative proportions or combinations of quantities of products that comprise total sales.

a. Sales mix
b. Gross margin
c. Contribution-margin ratio
d. Variable-cost ratio

138. If the proportions in a sales mix change, the _____.

a. contribution margin per unit increases
b. break-even point will remain the same
c. cost-volume-profit relationship also changes
d. net income will not be altered

139. Assuming a constant mix of 3 units of Zip for every 1 unit of Zap, a selling price of $21.60 for Zip and $28.80 for Zap, variable costs per unit of $14.40 for Zip and $16.80 for Zap, and total fixed costs of $53,760, the break-even point in units would be _____.

a. 4,800 units of Zip and 1,600 units of Zap
b. 1,200 units of Zip and 400 units of Zap
c. 1,600 units of Zip and 4,800 units of Zap
d. 40,320 units of Zip and 13,440 units of Zap

	Zip	Zap
Sales	**$21.60**	**$28.80**
Variable costs	**14.40**	**16.80**
Contribution margin	**$7.20**	**$12.00**
Sales mix	**x 3**	**x 1**
Contribution margin per mix	**$21.60**	**$12.00**

Total contribution margin per mix = $21.60 + $12.00 = $33.60

Break-even point in composite units = $53,760 / $33.60 = 1,600

Zip: 1,600 x 3 = 4,800 units
Zap: 1,600 x 1 = 1,600 units

LEARNING OBJECTIVE 8

140. If total fixed costs are $84,000, contribution margin per unit is $6.20, and targeted after-tax net income is $18,000 with a 40% tax rate, then the number of units that must be sold is _____.

a. 14,223 units
b. 17,853 units
c. 18,387 units
d. 21,504 units

[$84,000 + ($18,000 / 0.6)] / $6.20 = 18,387 units

141. If targeted after-tax net income is $67,500 with a 40% tax rate, contribution margin per unit is $2.00, and total fixed costs are $370,000, then the number of units that must be sold is _____.

a. 160,833 units
b. 167,250 units
c. 218,750 units
d. 241,250 units

[$370,000 + ($67,500 / 0.6)] / $2 = 241,250 units

142. If total fixed costs are $350,000, contribution margin per unit is $7.50, the tax rate is 30%, and the number of units to be sold is 100,000, then the after-tax net income will be _____.

a. $280,000
b. $350,000
c. $400,000
d. $877,500

[$350,000 + (X / 0.7) / $7.50 = 100,000
$350,000 + (X / 0.7) = $750,000
X / 0.7 = $400,000
X = $280,000

143. Hell Fire Company, a producer of salsa, has the following information:

Income tax rate	30%
Selling price per unit	$5.00
Variable cost per unit	$3.50
Total fixed costs	$90,000.00

_____ must be sold to obtain a targeted income before taxes of $30,000.

a. 10,000 units
b. 27,000 units
c. 45,000 units
d. 80,000 units

($90,000 + $30,000) / ($5.00 - $3.50) = 80,000 units

144. Muy Mal Company, a producer of salsa, has the following information:

Income tax rate	30%
Selling price per unit	$5.00
Variable cost per unit	$3.00
Total fixed costs	$90,000.00

_____ must be sold to obtain a targeted after-tax income of $14,000.

a. 45,000 units
b. 52,000 units
c. 55,000 units
d. 60,000 units

[$90,000 + ($14,000 / 0.7)] / ($5.00 - $3.00) = 55,000 units

145. Adele Company has the following information:

Income tax rate	40%
Selling price per unit	$7.50
Variable cost per unit	$2.50
Total fixed costs	$100,000

If the tax rate decreases to 30%, _____ fewer units can be sold to retain the same net income of $42,000.

a. 32,000 units
b. 34,000 units
c. 1,000 units
d. 2,000 units

[$100,000 + ($42,000 / 0.6)] / ($7.50 - $2.50) = 34,000 units @ 40% tax rate;
[$100,000 + ($42,000 / 0.7)] / ($7.50 - $2.50) = 32,000 units @ 30% tax rate;
2,000 units is the difference.

SHORT ANSWER:

LEARNING OBJECTIVE 1

146. The relationship between an organization's activities and its costs

Cost behavior

147. Cause the consumption of costly resources

Cost drivers

148. The cost of advertisements is part of this value-chain function

Marketing

149. A good cost driver for maintenance wages

Number of mechanic hours

LEARNING OBJECTIVE 2

150. A cost that changes in direct proportion to changes in the cost driver

Variable cost

151. A cost that is not immediately affected by changes in the cost driver

Fixed cost

152. The range of activity over which the relationship between cost and activity is valid

Relevant range

153. A cost that does not change in total as the volume increases, assuming the volume is within the relevant range

Fixed cost

154. The assumed relationship between the cost and its cost driver

Linear

LEARNING OBJECTIVE 3

155. The study of the effects of output volume on sales, costs, and profit

Cost-volume-profit analysis

156. The level of sales at which the contribution margin equals the fixed cost

Break-even point

157. The relationship between sales and variable costs

Contribution margin

158. The difference between planned sales and break-even sales

Margin of safety

159. A firm's ratio of fixed and variable costs

Operating leverage

160. All variable costs divided by sales

Variable-cost ratio

161. Total contribution margin / total sales

Contribution-margin percentage

162. Total fixed expenses / unit contribution margin

Break-even volume in units

163. Total fixed expenses / contribution-margin ratio

Break-even volume in dollars

LEARNING OBJECTIVE 4

164. The horizontal axis of the CVP graph

Sales volume

165. The vertical axis of the CVP graph

Dollars of cost and revenue

166. On the CVP graph, where the total expenses line crosses the sales line

Break-even point

167. The behavior of revenues and expenses on the CVP graph

Linear

168. At any given volume, this distance on the CVP graph measures the net income or net loss

Vertical distance between the sales line and the total expenses line

169. The relative proportion or combinations of quantities of products that constitute total sales

Sales mix

LEARNING OBJECTIVE 5

170. The change in total results (such as revenue, expenses, or income) under a new condition in comparison with some given or known condition

Incremental effect

171. (fixed expenses + target net income) / unit contribution margin

Target sales volume in units

172. Companies with high contribution-margin percentages

Airlines, cigarette, and cosmetic companies

173. A firm's ratio of fixed to variable costs

Operating leverage

174. Shows how far sales can fall below the planned level of sales before losses occur

Margin of safety

LEARNING OBJECTIVE 6

175. The sales price minus the cost of goods sold

Gross profit

176. The cost of the merchandise that a company acquires or produces and then sells

Cost of goods sold

177. Another name for gross profit

Gross margin

LEARNING OBJECTIVE 7

178. The relative proportions or combinations of quantities of products that comprise total sales

Sales mix

LEARNING OBJECTIVE 8

179. The planned or desired net income

Target profit

180. (change in volume in units) x (contribution margin per unit) x (1 – tax rate)

Change in net income

181. Net income / (1 – tax rate)

Income before income taxes

PROBLEMS:

LEARNING OBJECTIVE 3

182. Frances Company produces only product A. The following information is available:

Selling price per unit	$95
Variable costs per unit	$65
Total fixed costs	$130,000

Required:

a. Compute break-even point in units.

b. Compute break-even volume in dollars.

c. Compute the margin of safety assuming planned unit sales of 7,000.

Answer:

a. $130,000 / ($95 - $65) = 4,333 units

b. 4,333 units x $95/unit = $411,635

c. 7,000 units – 4,333 units = 2,667 units

183. The following information is for Wildwood Corporation:

Total fixed costs	$500,000
Unit variable costs	$50.95
Unit selling price	$68.50

Required:

a. Compute the contribution margin per unit.

b. Compute the contribution-margin ratio.

c. Compute the break-even point in units.

d. Compute the break-even volume in dollars.

Answer:

a. $68.50 - $50.95 = $17.55 per unit

b. $17.55 / $68.50 = .2562

c. $500,000 / $17.55 = 28,490 units

d. 28,490 units x $68.50 = $1,951,565

184. Southwest Hospital has variable costs of $100 million per year. These costs represent approximately 80% of the total revenues. There are 50,000 patient-days estimated for next year.

Required:

a. What is the break-even point expressed in total revenue?

b. What is the average daily revenue per patient necessary to break even?

Answer:

a. $100 million / (1 - 0.80) = $500 million

b. $500 million / 50,000 = $10,000

185. Explosion Company produces fireworks and has provided the following information:

Total fixed costs	$100,000
Unit variable costs	$6
Planned unit sales	30,000

The break-even point is 25,000 units.

Required:

a. Compute the selling price per unit.

b. Compute the contribution-margin ratio.

c. Compute the break-even volume in dollars.

d. Compute the margin of safety.

Answer:

a. $100,000 / 25,000 = $4 + $6 = $10

b. $4 / $10 = 0.40

c. 25,000 units x $10 = $250,000

d. 30,000 - 25,000 = 5,000 fireworks

LEARNING OBJECTIVES 3 and 5

186. The Eastman Family Restaurant is open 24 hours per day serving breakfast, lunch, and dinner. Fixed costs are $24,000 per month. Variable costs are estimated at $9.60 per meal. The average total bill (excluding tax and tip) is $12 per customer.

Required:

a. Compute the number of meals that must be served if the Eastman Family Restaurant wishes to earn a profit before taxes of $6,000.

b. Compute the break-even point in meals.

c. Compute the break-even volume in dollars.

d. Assume that fixed costs increase to $30,000. How many additional meals must be served if the Eastman Family Restaurant wishes to earn the same before-tax profit?

Answer:

a. ($24,000 + $6,000) / ($12.00 - $9.60) = 12,500 meals

b. $24,000 / ($12.00 - $9.60) = 10,000 meals

c. 10,000 meals x $12 per meal = $120,000

d. ($30,000 - $24,000) / ($12.00 - $9.60) = 2,500 meals

187. Sole Company manufactures running shoes. The selling price per pair of shoes (one unit) averages $80 and variable costs per pair are $47.50. The sales volume of $776,000 produces $100,750 of net income before taxes.

Required:

a. Compute total fixed costs.

b. Compute total variable costs.

c. Compute the break-even point in units.

d. Compute the quantity of units above breakeven to reach targeted net income before taxes.

Answer:

a. $776,000 / $80 = 9,700 units
9,700 x ($80.00 - $47.50) = $315,250
$315,250 - $100,750 = $214,500

b. 9,700 units x $47.50 = $460,750

c. $214,500 / $32.50 = 6,600 units

d. 9,700 - 6,600 = 3,100 units

LEARNING OBJECTIVES 3 and 6

188. Brunswick Manufacturing Inc.'s most recent income statement is presented below:

Sales	$450,000
Cost of goods sold	200,000
Gross margin	250,000
Other operating expenses	196,000
Operating income	$54,000

Brunswick Manufacturing Inc. has determined that $50,000 of cost of goods sold and $166,000 of operating expenses is fixed.

Required:

a. Compute the contribution margin.

b. Compute the contribution-margin percentage.

c. Compute the break-even volume in sales dollars.

d. Compute the current margin of safety.

Answer:

a. Fixed costs = $50,000 + $166,000 = $216,000
Variable costs + $150,000 + $30,000 = $180,000

$450,000 - $180,000 = $270,000

b. $270,000 / $450,000 = 60%

c. $216,000 / 60% = $360,000

d. $450,000 - $360,000 = $90,000

LEARNING OBJECTIVES 3 and 7

189. Lakers Company produces two products, X and Y. The following information is presented for both products:

	X	Y
Selling price per unit	$46	$36
Variable cost per unit	$38	$24

Total fixed costs are $234,000. Lakers Company plans to sell 21,000 units of product X and 7,000 units of product Y.

Compute:

a. Contribution margin for each product

b. Current net income

c. Break-even point in units of both X and Y if the sales mix is 3 units of X for every unit of Y

d. Break-even volume in total dollars if the sales mix is 2 units of X for every 3 units of Y

Answer:

a. X: $46 - $38 = $8
Y: $36 - $24 = $12

b. (21,000 x $8) + (7,000 x $12) - $234,000 = $18,000

c. 21,000:7,000 = 3:1
(3 x $8) + (1 x $12) = $36
$234,000 / $36 = 6,500 units
X: 6,500 x 3 = 19,500 units
Y: 6,500 x 1 = 6,500 units

d. (2 x $8) + (3 x $12) = $52
$234,000 / $52 = 4,500 units
X: 4,500 x 2 = 9,000 x $46 = $414,000
Y: 4,500 x 3 = 13,500 x $36 = $486,000
Total dollar sales = $900,000

LEARNING OBJECTIVES 3 and 8

190. The Love Company, a producer of specialty cards, has asked you to complete several calculations based upon the following information:

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

Required:

a. Compute the break-even point in units.

b. Compute the sales volume necessary to produce an after-tax net income of $13,028.40.

c. Compute the total units sold to earn an after-tax net income of $18,480.

Answer:

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

b. $13,028.40 / 0.70 = $18,612
$18,612 + $46,200 = $64,812
$64,812 / $1.32 = 49,100 units
49,100 units x $6.60 = $324,060

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

191. Young Corporation gathered the following information:

Variable costs	$945,000
Income tax rate	40%
Contribution-margin ratio	35%

Required:

a. Compute total fixed costs assuming a break-even volume in dollars of $1,500,000.

b. Compute sales volume in dollars to produce an after-tax net income of $250,000.

Answer:

a. $1,500,000 x 0.35 = $525,000

b. $250,000 / (1 - .40) = $416,667
($525,000 + $416,667) / 0.35 = $2,690,477

LEARNING OBJECTIVE 4

192. What are the assumptions used for CVP analysis?

Answer:

Expenses can be classified as variable or fixed. Total variable expenses vary directly with activity level. Total fixed expenses do not change with activity level.

The behavior of revenues and expenses is linear over the relevant range.

No change in efficiency or productivity is expected.

Sales mix remains constant.

The difference in inventory level at the beginning and at the end of a period is insignificant.

CRITICAL THINKING:

LEARNING OBJECTIVE 1

193. A classmate is having difficulty understanding two sets of accounting terms, variable and fixed costs, as opposed to period and product costs. He understands that variable costs change during an accounting period while fixed costs do not. However, he explains that a period cost implies that it is for a period of time and is, therefore, also fixed. Does his assumption imply that all product costs are variable?

Required:

Assist your classmate in being able to distinguish between these terms.

Answer:

First, you should explain that all costs should be first classified as either variable or fixed. This concept deals with cost behavior and not with what the costs are associated in the organization. Many decisions are made about costs because of the type of behavior they exhibit.

Second, a cost can be assigned to "why you are in business" activities (product costs) of the organization or to "support" activities (period costs) of the organization. For a manufacturing firm, period costs are all costs that have no direct relationship to the manufacturing process.

Using accounting terminology, you might explain that period costs are always expenses during the accounting period while product costs are included in inventory because they can be assigned to the products being produced.

LEARNING OBJECTIVE 2

194. Bonnie and Clyde started the BC Restaurant in 20X0. They rented a building, bought equipment, and hired two employees to work full time at a fixed monthly salary. Utilities and other operating charges remain fairly constant during each month.

During the past two years, the business has grown with average sales increasing 1% a month. This situation pleases both Bonnie and Clyde, but they do not understand how sales can grow by one percent a month while profits are increasing at an even faster pace. They are afraid that one day they will wake up to increasing sales but decreasing profits.

Required:

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

Answer:

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

LEARNING OBJECTIVE 4

195. Renew Tires has been in the tire business for five years. It rents a building but owns its equipment. All employees are paid a fixed salary except during the busy season (April – June), when temporary help is hired by the hour. Utilities and other operating charges remain fairly constant each month except during those in the busy season.

Selling prices per tire average $50 except during the busy season. Because a large number of customers buy tires prior to winter, discounts run above average during the busy season. A 15% discount is given when two tires are purchased at one time. During the busy months, selling prices per tire average $40.

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

Required:

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

Answer:

a. The accounting system includes some assumptions about the CVP model that do not hold for Renew Tires. The CVP model requires cost and revenue to be linear. During the busy months, the company has cost and revenue that behave differently than during the other months of the year. The revenue line turns down (less slope) with the average selling price per tire decreasing from $50 to $40. The variable costs line probably turns upward (increasing slope) with the additional hourly workers being added to the work force.

b. The accountant may want to present two sets of information regarding the revenue and cost behaviors of the company: one for the busy season and one for the other months of the year. It would show that while the break-even point actually increases during the busy months (a negative), the marginal income increases because of increased sales (a positive).