

# Chapter 2

## Cost Behavior, Activity Analysis, and Cost Estimation

Learning Objectives – coverage by question					
	True / False	Multiple Choice	Exercises	Problems	Essays
<b>LO1</b> – Identify basic patterns of how costs respond to changes in activity cost drivers.	1-4	1-6, 30-41, 59	1-4, 8, 9		
<b>LO2</b> – Determine a linear cost estimating equation.	5-7	7-16, 42-58	5, 6, 10, 12-16		1, 2
<b>LO3</b> – Identify and discuss problems encountered in cost estimation.	8, 9	17-22, 60	6, 11		3, 4
<b>LO4</b> – Describe and develop alternative classifications for activity cost drivers.	10-12	32-29, 61-79	7		5, 6

## Chapter 2: Cost Behavior, Activity Analysis, and Cost Estimation

### True False

#### Topic: Cost Behavior Pattern

##### LO: 1

1. Mixed cost behavior pattern is unrelated to unit activity level.

*Answer:* False

*Rationale:* The variable portion of a mixed cost is related to the unit activity level, because this portion of the mixed cost will increase as activity level increases. The fixed portion of the mixed cost, however, does not vary with the activity level.

#### Topic: Variable Costs

##### LO: 1

2. The wheels on an automobile is classified as a variable cost with respect to the volume of cars produced in an automobile assembly plant.

*Answer:* True

*Rationale:* Wheels represent direct materials in the production of automobiles; therefore, they represent a variable cost.

#### Topic: Committed Fixed Cost

##### LO: 1

3. The depreciation cost for a manufacturing building is an example of a committed fixed cost:

*Answer:* True

*Rationale:* Depreciation on the building for a manufacturing company is a committed fixed cost because it cannot be readily eliminated in the short term, and it does not vary with production.

#### Topic: Cost Estimation

##### LO: 1

4. The number of units sold is a better independent variable than square feet of all manufacturing facilities in estimating the cost function of a headphone manufacturer.

*Answer:* True

*Rationale:* The independent variable in a cost estimation equation should be the variable that relates as closely as possible to the dependent variable (which is total cost). When manufacturing headphones, it is more likely that the number of units produced is more closely related than square footage to total cost.

#### Topic: High-Low Method

##### LO: 2

5. The primary advantage of the high-low method of cost estimation over the least-squares regression method is its Limited data requirements.

*Answer:* True

*Rationale:* The high-low method is used primarily because of the ease of data collection that it requires. It is not as precise mathematically as other methods, and it does not as effective as the scatter diagram method in identifying outliers, but it is very convenient.

**Topic: High-Low Method**

**LO: 2**

6. The high-low method is likely to produce an inaccurate cost estimating equation when the organization has mixed costs.

*Answer:* False

*Rationale:* The purpose of the high-low method is to estimate the variable and fixed cost components of mixed costs.

**Topic: Scatter Diagram**

**LO: 2**

7. Periods of highest and lowest activity in a scatter diagram are always assumed to be representative of all cost observations.

*Answer:* False

*Rationale:* One of the major benefits of the scatter diagram method over the high-low method is that it allows one to readily identify outliers through visual observation. Any significant outliers would be removed from the data set (or ignored) in developing the cost estimation equation.

**Topic: Cost Estimation Difficulties**

**LO: 3**

8. Changes in technology during the period of cost observations should not be a concern in estimating cost.

*Answer:* False

*Rationale:* Unless all cost observations were collected under the same conditions regarding the technology employed, the estimation equation is likely to be inaccurate in estimating future costs. For the best results, all cost observations should be collected under conditions that are as uniform as possible, except for the level of operations.

**Topic: Cost Estimation Difficulties**

**LO: 3**

9. The longer the time period of each observation, the higher the probability of error in matching costs and activity,

*Answer:* False

*Rationale:* Just the opposite is true: The shorter the time period of each observation, the higher the probability of error in matching costs and activity, because most matching problems occur either at the beginning or end of the period. By having a longer period for each cost observation, the impact of mismatches at the beginning and end of the period are diluted.

**Topic: Changes in Cost Structures**

**LO: 4**

10. Over the past century cost structures in the typical company have shifted significantly as a consequence of breakthroughs in technology, resulting in a major downward shift in direct labor as a percentage of total manufacturing costs.

*Answer:* True

*Rationale:* With the increase in automation resulting from new technologies, the percentage of manufacturing costs represented by direct labor has decreased, and the percentage represented by factory overhead has increased.

**Topic: Batch Level Cost**

**LO: 4**

11. Preparing the engineering design and preparing tools to make a new product added to a company's product line would be a good example of a batch level activity.

*Answer:* False

*Rationale:* Preparing the engineering design and tools to make a new product is an example of a product level activity, not a batch level activity. An example of a batch level activity would be moving a batch of units from one location to another in the manufacturing facility.

**Topic: Product Level Cost**

**LO: 4**

12. Advertising a new health beverage is an example of a product-level activity.

*Answer:* True

*Rationale:* The activity of advertising a new product creates costs that are driven by the number of new products, not by the number of units produced or the number of batches of product produced.

## Multiple Choice

### Topic: Fixed Costs

#### LO: 1

1. Which of the following costs is best classified as fixed costs with respect to volume?
  - A) Parts used in manufacturing digital cameras
  - B) Electricity used to heat, light, and cool a hospital
  - C) Depreciation of a copy machine in the Human Resource Department
  - D) Salaries of quality inspectors in a production facility

*Answer: C*

*Rationale:* Typically, depreciation cost on assets (buildings and equipment) in a staff department such as Human Resources remains constant irrespective of the volume of output.

### Topic: Step Costs

#### LO: 1

2. Step costs:
  - A) Are constant within certain ranges of activity but differ outside those ranges of activity
  - B) Are variable within narrowly defined ranges of activity, but constant over wider ranges of activity
  - C) Increase with each additional unit produced
  - D) Have no relation to number of units produced

*Answer: A*

*Rationale:* Step costs behave as fixed costs within a relatively narrow range, but increase to a higher level when that range is exceeded. Typical example of step costs is an inspection cost where each inspector can handle a fixed volume of product.

### Topic: Fixed Costs

#### LO: 1

3. Fixed costs *do not* respond to:
  - A) Capital expenditures made by the company
  - B) Short-term changes in the amount of activity
  - C) Changes in committed expenditures
  - D) Discretionary investments in the company

*Answer: B*

*Rationale:* Over the short term, fixed costs are indifferent to activity level changes. For example the cost of property taxes on a building would not change based on activity volume differences.

### Topic: Relevant Range

#### LO: 1

4. The range of operations that falls within the capacity of the current level of fixed costs is referred to as the:
  - A) Linear average
  - B) Relevant range
  - C) Marginal range
  - D) Operating range

*Answer: B*

*Rationale:* When developing a cost model for a firm or segment of a firm, that model is only relevant within the range of capacity of the fixed costs. For example if the current level of fixed cost of \$10 million represents a capacity of 2 million units of output, that cost model cannot be used to estimate the cost of producing more than 2 million units.

**Topic: Discretionary Fixed Costs**

**LO: 1**

5. Discretionary fixed costs are also known as:
- A) Committed fixed costs
  - B) Capacity costs
  - C) Managed fixed costs
  - D) Mixed costs

*Answer: C*

*Rationale:* Management decides during each budget period how much it will spend on discretionary items such as charitable contributions and training. These costs are not related to the capacity of operations.

**Topic: Discretionary Fixed Costs**

**LO: 1**

6. Which of the following is an example of a discretionary fixed cost?
- A) Depreciation of manufacturing facilities
  - B) Donations to charitable organizations
  - C) Salaries of production supervisors
  - D) Property taxes on manufacturing facilities

*Answer: B*

*Rationale:* Donations are not related to the capacity of operations, but are determined by the discretion of management.

**Topic: Cost Estimation**

**LO: 2**

7. The determination of the mathematical relationship between activity level and cost is known as:
- A) Cost control
  - B) Cost estimation
  - C) Cost prediction
  - D) Regression analysis

*Answer: B*

*Rationale:* A mathematical equation that models the relationship between cost (the dependent variable) and activity level (the independent variable) is used in estimating costs for different levels of activity.

**Topic: Scatter Diagram Method**

**LO: 2**

8. The scatter diagram method of cost estimation:
- A) Is influenced by extreme observations
  - B) Is superior to other methods in its ability to distinguish between discretionary and committed fixed costs
  - C) Requires the use of judgment
  - D) Provides a measure of the goodness of fit

*Answer: C*

*Rationale:* The scatter diagram method depends of visual observation of the data points on a graph to fit the cost curve to the data. The position of the curve on the graph depends on the judgment of the person observing the data points.

**Topic: Cost Estimation Tools**

**LO: 2**

9. Which one of the following tools of analyses is *not* commonly used in cost estimation?
- A) High-low estimation
  - B) Linear programming
  - C) Least-squares regression
  - D) Scatter diagrams

*Answer:* B

*Rationale:* Linear programming is a mathematical model used for determining the best utilization of limited resources; it is not a cost estimation model.

**Topic: High-Low Method**

**LO: 2**

10. Mary French uses gas to heat her home. She has accumulated the following information regarding her monthly gas bill and monthly heating degree-days. The heating degree-days value for a month is found by first subtracting the average temperature for each day from 65 degrees and then summing these daily amounts together for the month.

<u>Month</u>	<u>Heating Degree-Days</u>	<u>Gas Bill</u>
February	1,900	\$195
April	600	\$78

What will be the increase in Mary's monthly gas bill per heating degree-day using the high-low method?

- A) \$ 0.09
- B) \$ 0.39
- C) \$ 46.00
- D) \$117.00

*Answer:* A

*Rationale:*  $(\$195 - \$78) / (1,900 - 600) = \$0.09$

**Topic: Cost Estimation**

**LO: 2**

11. Mary French uses gas to heat her home. She has accumulated the following information regarding her monthly gas bill and monthly heating degree-days. The heating degree-days value for a month is found by first subtracting the average temperature for each day from 65 degrees and then summing these daily amounts together for the month.

<u>Month</u>	<u>Heating Degree-Days</u>	<u>Gas Bill</u>
February	1,900	\$195
April	600	\$78

The equation representing the relationship between the gas bill (Y) and heating degree-days (X) is:

- A)  $Y = \$0.09X$
- B)  $Y = \$24 + \$0.09X$
- C)  $Y = \$36 + \$0.09X$
- D)  $Y = \$120 + \$0.09X$

*Answer:* B

*Rationale:*  $(\$195 - \$78) / (1,900 - 600) = \$0.09 =$  variable cost per heating degree day

$\$195 - (1,900 \times \$0.09) = \$24$ ; or,  $\$78 - (600 \times \$0.09) = \$24 =$  fixed costs

Therefore,  $Y = \$24 + \$0.09X$

**Topic: Cost Estimation**

**LO: 2**

12. The Lightning Delivery Service has the following information about its truck fleet miles and operating costs:

<u>Year</u>	<u>Miles</u>	<u>Operating Costs</u>
2008	250,000	\$160,000
2009	300,000	\$175,000
2010	350,000	\$210,000

What is the best estimate of fixed costs for fleet operating expenses in 2011 using the high-low method?

- A) \$100,000
- B) \$ 50,000
- C) \$175,000
- D) \$ 35,000

*Answer: D*

*Rationale:*  $(\$210,000 - \$160,000) / (350,000 - 250,000) = \$0.50$  per mile variable cost  $\$210,000 - (350,000 \times \$0.50) = \$35,000$

**Topic: Cost Estimation**

**LO: 2**

13. The Fairport Machine Shop wants to develop a cost estimating equation for its monthly cost of electricity. It has the following data:

<u>Month</u>	<u>Cost of Electricity (Y)</u>	<u>Direct Labor-Hours (X)</u>
January	\$13,000	1,500
April	\$15,000	1,700
July	\$17,000	2,000
October	\$14,500	1,600

What would be the best equation using the high-low method?

- A)  $Y = \$4,000 + \$7X$
- B)  $Y = \$0 + \$9X$
- C)  $Y = \$1,000 + \$8X$
- D)  $Y = \$4,000 + \$8X$

*Answer: C*

*Rationale:*  $(\$17,000 - \$13,000) / (2,000 - 1,500) = \$8$  variable cost period hour

$\$17,000 - (2,000 \times \$8) = \$1,000$  fixed cost.

Therefore,  $Y = \$1,000 + \$8X$



**Topic: Estimating Fixed Costs**

**LO: 2**

14. The following information pertains to Cutter Company's weekly activity and total costs:

<u>Volume of Activity</u>	<u>Total Cost</u>
110 units	\$1,400
120 units	\$1,500
130 units	\$1,600

What are Cutter's weekly fixed costs?

- A) \$ -0-
- B) \$ 200
- C) \$ 300
- D) \$1,600

*Answer: C*

*Rationale:*  $(\$1,400 - \$1,600) / (130 - 110) = \$10$  variable cost per unit  
 $\$1,600 - (130 \times \$10) = \$300$  fixed costs

**Topic: Least Squares versus High-Low**

**LO: 2**

15. Comparing least-squares regression to high-low estimation:

- A) Least-squares regression is preferred to high-low estimation because with this method, the computer can make all the decisions after data entry
- B) Least-squares regression provides superior estimates to high-low estimation when using unreliable data
- C) Least-squares regression provides a means of estimating how well the data fit the model
- D) All of the above

*Answer: C*

*Rationale:* Least-squares regression is a mathematical model that not only uses the data points to determine the cost curve, but it provides statistics to enable the user to know how well the data fit the cost curve and how reliable the model is in estimating costs.

**Topic: Least Squares versus High-Low**

**LO: 2**

16. Comparing least-squares regression to high-low estimation:

- A) Least-squares regression better predicts costs outside the range of past observations
- B) Least-squares regression makes fuller use of the data
- C) Least-squares regression requires fewer calculations
- D) All of the above

*Answer: B*

*Rationale:* The high-low method only uses two data points in establishing the cost estimation equation; whereas, least squares regression uses all of the available data to provide the best fit of the cost estimation equation to the data.

**Topic: Difficulties in Cost Estimation**

**LO: 3**

17. Which one of the following statements about difficulties in cost estimation is true?

- A) Changes in the company's production technology make estimating the company's production costs easier
- B) The shorter the time period, the higher the probability of inappropriately matching activity and cost
- C) The stronger the economy, the harder it is to accurately match activity and cost
- D) When prices of a company's raw materials or labor are rapidly increasing, cost estimations based on previous periods will overestimate future costs

*Answer: B*

*Rationale:* One of the difficulties in collecting data for time periods is making sure that the cost data and the activity data are related to the same time period. Often there are lags between the end of the time period and the measurement of cost. If the time period is short, any errors related to establishing the year-end cutoff are magnified. For longer periods, the effect of the errors is diluted.

**Topic: Difficulties in Cost Estimation**

**LO: 3**

18. Which one of the following statements about difficulties of cost estimation is true?

- A) Data may not be based on normal operating conditions
- B) Linear relationships between total costs and activity levels may exist
- C) Both A and B
- D) None of the above

*Answer: A*

*Rationale:* When collecting data for cost estimation, it is important that activity and cost data are representative of typical operations. If data are collected for an operating period when conditions were not similar to expected future conditions, estimates of future costs will not be reliable.

**Topic: Difficulties in Cost Estimation**

**LO: 3**

19. This creates difficulties in cost estimations:

- A) Changes in technology or prices
- B) Identifying cost drivers
- C) Matching activity and cost within each observation
- D) All of the above

*Answer: D*

*Rationale:* All of the above were discussed in the text as possible difficulties in cost estimation.

**Topic: Difficulties in Cost Estimation**

**LO: 3**

20. In cost estimation:

- A) Care must be taken to make sure that data used in developing cost estimates are based on currently employed technology
- B) Changes in technology and prices make cost estimation difficult
- C) Only data reflecting a single price level should be used in cost estimation
- D) All of the above

*Answer: D*

*Rationale:* All of the above were discussed in the text as possible difficulties in cost estimation.

**Topic: Difficulties in Cost Estimation**

**LO: 3**

21. In cost estimation:

- A) Old price data of cost elements should be used cautiously, if at all
- B) Only data reflecting historical price levels should be used in cost estimation
- C) The prices of various cost elements are likely to change at the same rates and at the same times
- D) All of the above

*Answer: A*

*Rationale:* It may be necessary to make adjustments to the cost estimation equation for changes in prices levels that have occurred since the time periods of the data used to develop the cost estimation equation.

**Topic: Difficulties in Cost Estimation**

**LO: 3**

22. The development of accurate cost-estimating equations requires the matching of the activity to:

- A) Changes in technology and prices
- B) Production
- C) Related costs within each observation
- D) All of the above

*Answer: C*

*Rationale:* The first requirement in estimating future costs is collecting accurate data regarding past activity. It is crucial that accurate costs for past activity levels are determined; otherwise, the cost estimation equation will not be reliable.

**Topic: Alternate Cost Drivers**

**LO: 4**

23. As a consequence of automation and product diversity, in cost estimation:

- A) A facility level approach to estimating costs is increasingly important
- B) Companies no longer need to pay attention to estimating overhead
- C) Cost estimation is improved with the inclusion of non-unit cost drivers
- D) Direct labor is playing an increasingly important role in cost determination

*Answer: C*

*Rationale:* With modern production methods, many variable costs may be driven by activities not related to units of production, but rather to non-unit activities such as the number of batches produced, or the number of different products supported by the production facility.

**Topic: Facility-Level Activities**

**LO: 4**

24. Facility level activities of an organization would *not* include:

- A) Building maintenance
- B) Machine set up
- C) Property taxes
- D) The production supervisor's salary

*Answer: B*

*Rationale:* Machine set-up is typically a batch-level activity since there is normally not a set up of equipment for each unit, but for batches of units. Building maintenance, property taxes, and supervisors' salaries are typical facility-level costs that exist because of the existence of the facility. They are the same as fixed costs in a unit-level cost estimation model.

**Topic: Batch-Level Activities**

**LO: 4**

25. The following procedure performed at the United States mint is *not* a batch level activity:

- A) Inspecting the first units produced to verify proper set-up
- B) Movement of manufactured coins to finishing stations
- C) Setting up machinery for the stamping process
- D) Stamping each individual coin

*Answer:* D

*Rationale:* Stamping each individual coin is an example of a unit-level activity since it occurs for each coin produced. All of the other items are examples of batch-level activities.

**Topic: Unit-Level Activities**

**LO: 4**

26. The following procedure performed by a dairy is the *best* example of a unit level activity within a manufacturing cost hierarchy:

- A) Delivering dairy products to a grocery store
- B) Filling milk into half-gallon cartons
- C) Homogenizing milk in specially designed tanks
- D) Receiving milk from farms

*Answer:* B

*Rationale:* Filling half-gallon cartons is a unit-level activity; whereas, the other items listed are batch-level activities.

**Topic: Product-Level Activities**

**LO: 4**

27. The following procedure performed by a candy manufacturer is the *best* example of a product level activity within a manufacturing cost hierarchy:

- A) Cleaning the mixing machine for the next production run of candy, a special Halloween candy
- B) Developing an advertising campaign for a special Halloween candy
- C) Inspecting the quality of the candy produced during one of the special Halloween package production runs
- D) Resetting the packaging equipment to wrap a special 36-count Halloween package

*Answer:* B

*Rationale:* A product-level activity is one that occurs as a result of producing a new product, such as product design activities, or developing an advertising campaign for a new product.

**Topic: Customer Cost Hierarchy**

**LO: 4**

28. The following procedure performed by a food wholesaler is the *best* example of a unit level activity within a customer cost hierarchy:

- A) Calling a retail customer to inquire if the customer is satisfied with the wholesaler's service
- B) Driving the delivery truck to the retail customer's store
- C) Sending the retail customer a bill for a recent order
- D) Stacking items on the shelf of a retail customer's store

*Answer:* D

*Rationale:* In a customer cost hierarchy, activities are classified based on units, orders, customers, and facilities. A unit-level activity is one that is performed for each unit sold. Therefore, stacking items on the shelf is unit-level activity. Calling a customer is customer-level, and driving a truck to the customer's store and sending a bill for a recent order are both order-level activities.

**Topic: Customer Cost Hierarchy**

**LO: 4**

29. The following procedure performed by a home oil delivery company is the *best* example of a unit level activity within a customer cost hierarchy:
- A) Opening an account for a new customer
  - B) Processing monthly customer billings
  - C) Pumping home heating oil into a customer's oil tank
  - D) Purchasing a new delivery truck

*Answer: C*

*Rationale:* In a customer cost hierarchy, activities are classified based on units, orders, customers, and facilities. A unit-level activity is one that is performed for each unit sold. Therefore, pumping home heating oil into a customer's oil tank is a unit-level activity. Opening an account for a new customer, and processing customer billings are either customer-level or order-level activities, and purchasing a new truck is a facility level activity.

**Topic: Cost Behavior Patterns**

**LO: 1**

30. Depreciation of a copy machine in the Human Resource Department would best be classified as what type of cost?
- A) Variable Cost
  - B) Fixed cost
  - C) Mixed cost
  - D) Step cost

*Answer: B*

**Topic: Cost Behavior Patterns**

**LO: 1**

31. Parts used in manufacturing digital cameras would best be classified as what type of cost?
- A) Variable cost
  - B) Fixed cost
  - C) Mixed cost
  - D) Step cost

*Answer: A*

**Topic: Cost Behavior Patterns**

**LO: 1**

32. Electricity used to heat, light, and cool a manufacturing facility would best be classified as what type of cost?
- A) Variable cost
  - B) Fixed cost
  - C) Mixed cost
  - D) Step cost

*Answer: C*

**Topic: Cost Behavior Patterns**

**LO: 1**

33. A cost that is constant within a relevant range but differs outside the relevant range of activity is best classified as what type of cost?
- A) Variable cost
  - B) Fixed cost
  - C) Mixed cost
  - D) Step cost

*Answer: D*

**Topic: Cost Behavior Patterns**

**LO: 1**

34. Which of the following mathematical expressions best describes a mixed cost?
- A)  $Y = bX$
  - B)  $Y = a$
  - C)  $Y = a + bX$
  - D)  $Y = a_i$

*Answer: C*

**Topic: Cost Behavior Patterns**

**LO: 1**

35. Over the short term, which type of costs is indifferent to activity level changes?
- A) Variable costs
  - B) Fixed costs
  - C) Mixed costs
  - D) Step costs

*Answer: B*

**Topic: Cost Behavior Patterns**

**LO: 1**

36. In the following equation for total cost,  $Y = a + bX$ , the slope of the total cost line is an approximation of which of the following?
- A) Total Cost
  - B) Fixed Cost
  - C) Variable Cost
  - D) Volume

*Answer: C*

**Topic: Relevant Range**

**LO: 1**

37. When developing a cost model for a firm or segment of a firm, the cost model is only applicable within the \_\_\_\_\_ range of capacity of fixed costs.
- A) Operating
  - B) Average
  - C) Marginal
  - D) Relevant

*Answer: D*

**Topic: Cost Behavior Patterns**

**LO: 1**

38. As volume increases, which of the following statements is *not* correct?
- A) Variable cost per unit will remain the same.
  - B) Total fixed will remain the same.
  - C) Average cost per unit will increase.
  - D) Total variable costs will increase.

*Answer: C*

**Topic: Discretionary Fixed Costs**

**LO: 1**

39. Which of the following would be classified as a discretionary fixed cost?
- A) Depreciation
  - B) Research and Development
  - C) Property Taxes
  - D) Interest on Bonds

*Answer: B*

**Topic: Committed Fixed Costs**

**LO: 1**

40. Committed fixed costs are also known as:
- A) Capacity costs
  - B) Managed fixed costs
  - C) Mixed costs
  - D) Step costs

*Answer: A*

**Topic: Cost Behavior Patterns**

**LO: 1**

41. As volume increases, average cost per unit decreases because:
- A) Total fixed costs increase
  - B) Total variable costs increase
  - C) Total fixed costs stay the same
  - D) Total variable costs stay the same

*Answer: C*

**Topic: Cost Estimation**

**LO: 2**

42. Which of the following methods of cost estimation utilizes all observations and relies on statistical measures to determine the cost estimation model?
- A) High-Low Method
  - B) Scatter Diagram
  - C) Least-Squares Regression
  - D) Linear Programming

*Answer: C*

**Topic: Cost Estimation**

**LO: 2**

43. Which of the following methods of cost estimation utilizes judgment to determine the cost estimation model?
- A) High-Low Method
  - B) Scatter Diagram
  - C) Least-Squares Regression
  - D) Linear Programming

Answer: B

**The following information applies to problems 44-46.**

Speedy Delivery Services has the collected the following information about operating expenditures for its delivery truck fleet for the past five years:

<u>Year</u>	<u>Miles</u>	<u>Operating Costs</u>
2007	110,000	\$390,000
2008	140,000	\$420,000
2009	100,000	\$360,000
2010	130,000	\$410,000
2011	150,000	\$440,000

**Topic: High-Low Cost Estimation**

**LO: 2**

44. Using the high-low method, what is the cost estimate for *variable* costs for 2012?
- A) \$1.25
  - B) \$2.00
  - C) \$1.60
  - D) \$1.50

Answer: C

**Topic: High-Low Cost Estimation**

**LO: 2**

45. Using the high-low method, what is the cost estimate for *fixed* costs for 2012?
- A) \$200,000
  - B) \$140,000
  - C) \$210,000
  - D) \$235,000

Answer: A

**Topic: High-Low Cost Estimation**

**LO: 2**

46. What is the best estimate of *total operating expenses* for 2012 using the high-low method based on total expected miles of 120,000?
- A) \$380,000
  - B) \$390,000
  - C) \$392,000
  - D) \$402,000

Answer: C



**Topic: High-Low Cost Estimation**

**LO: 2**

47. The following information pertains to Campbell Company's monthly activity and total costs:

<u>Volume of Activity</u>	<u>Total Cost</u>
110 units	\$1,400
120 units	\$1,500
130 units	\$1,600

What would be the best equation for predicting total costs using the high-low method?

- A)  $Y = \$10 + \$300X$
- B)  $Y = \$300 + \$20X$
- C)  $Y = \$20 + \$300X$
- D)  $Y = \$300 + 10X$

Answer: D

**The following information relates to problems 48-51:**

Sterling Rentals offers machine rental services for concrete cutting. Consider the following costs of the company over the relevant range of 5,000 to 8,000 hours of operating time for its concrete cutting equipment.

	<u>Hours of Operating Time</u>			
	<u>5,000</u>	<u>6,000</u>	<u>7,000</u>	<u>8,000</u>
Total Costs:				
Variable Costs	\$ 20,000	?	?	?
Fixed Costs	<u>168,000</u>	?	?	?
Total Costs	\$188,000	?	?	?
Cost per hour:				
Variable cost	?	?	?	?
Fixed cost	?	?	?	?
Total cost per hour	?	?	?	?

**Topic: Cost Estimation**

**LO: 2**

48. What are the estimated total costs at a volume of 6,000 hours?

- A) \$188,000
- B) \$192,000
- C) \$196,000
- D) \$200,000

Answer: B

**Topic: Cost Estimation**

**LO: 2**

49. What is the estimated total cost per hour at a volume of 7,000 hours?

- A) \$25.00
- B) \$28.00
- C) \$32.00
- D) \$37.60

Answer: B

**Topic: Cost Estimation**

**LO: 2**

50. What are the estimated total fixed costs at a volume of 8,000 hours?
- A) \$168,000
  - B) \$188,000
  - C) \$196,000
  - D) \$200,000

*Answer: A*

**Topic: Cost Estimation**

**LO: 2**

51. What is the estimated total fixed per hour at a volume 7,000 hours?
- A) \$24.00
  - B) \$28.00
  - C) \$33.60
  - D) \$37.60

*Answer: A*

**Topic: High-Low Cost Estimation**

**LO: 2**

52. The primary advantage of the High-Low method over other cost estimation methods is that:
- A) It utilizes only two data points rather all data points within a relevant range
  - B) It relies on judgment to determine the cost estimation model
  - C) It is a more straightforward approach to determining the variable and fixed elements of fixed costs
  - D) It can only be applied within the relevant range of observations of the independent variable

*Answer: C*

***The following information applies to problems 53-56.***

The following data was input into a spreadsheet program to determine the Intercept, Slope and  $R^2$  (RSQ) for Patient Days and Maintenance Costs for a local hospital:

<u>Month</u>	<u>Patient Days (X)</u>	<u>Maintenance Costs (Y)</u>
January	5,600	\$7,900
February	7,100	\$8,500
March	5,000	\$7,400
April	6,500	\$8,200
May	7,300	\$9,100
June	8,000	\$9,800
July	6,200	\$7,800
Intercept	\$3,431	
Slope	\$0.759	
RSQ	0.9	

**Topic: Least-Squares Regression**

**LO: 2**

53. The estimated *fixed* maintenance cost for the hospital is:

- A) \$3,088
- B) \$3,431
- C) \$0.759
- D) \$0.683

Answer: B

**Topic: Least-Squares Regression**

**LO: 2**

54. The estimated *variable* maintenance cost for the hospital is:

- A) \$3,088
- B) \$3,431
- C) \$0.759
- D) \$0.683

Answer: C

**Topic: Least-Squares Regression**

**LO: 2**

55. The *estimated* total maintenance cost for August based on an estimated 6,000 patient days is:

- A) \$7,642
- B) \$7,186
- C) \$7,985
- D) \$7,529

Answer: C

**Topic: Least-Squares Regression**

**LO: 2**

56. The coefficient of determination for the estimated cost model for maintenance is represented by:

- A) Slope
- B) Intercept
- C) The dependent variable (Y)
- D)  $R^2$

Answer: D

**Topic: Least-Squares Regression**

**LO: 2**

57. The coefficient of determination for estimating packaging costs for a local shipper was determined to be 0.74. Which of the following statement is *not* correct?
- A) The coefficient of determination is a measure of the percent of variation in the independent variable.
  - B) The coefficient of determination is a measure of how well a least-squares equation fits historical data.
  - C) The coefficient of determination can have values between zero and one, with values close to zero suggesting that the equation is not very useful.
  - D) It is possible to have a high coefficient of determination by chance between the independent and dependent variable.

*Answer: C*

**Topic: Cost Estimation**

**LO: 2**

58. An increase in volume within the relevant range will cause:
- A) Unit fixed costs to increase.
  - B) Unit variable costs to decrease.
  - C) Total fixed costs to stay the same.
  - D) Total variable costs to decrease.

*Answer: C*

**Topic: Cost Behavior Patterns**

**LO: 1**

59. The graph of an estimated cost represented by cost equation,  $Y = a + bX$ , would be best described by which of the following descriptions:
- A) A positive slope starting at the point of origin
  - B) A positive slope starting at the y-intercept
  - C) A horizontal line starting at the y-intercept
  - D) A negative slope starting at the y-intercept

*Answer: B*

**Topic: Changes in Technology**

**LO: 3**

60. The introduction of production technology to replace labor in a manufacturing process would likely result in which of the following?
- A) A shift in costs from variable costs to fixed costs.
  - B) A shift in costs from fixed costs to variable costs.
  - C) An increase in total manufacturing costs.
  - D) A decrease in total manufacturing costs.

*Answer: A*

**Topic: Activity Cost Drivers**

**LO: 4**

61. The introduction of production technology in a manufacturing process would likely result in which of the following?
- A) Decreasing the probability of inappropriately matching activity and costs in the short run
  - B) Shifting to production technology makes cost estimation and prediction easier
  - C) Shifting to production technology requires identifying the most appropriate activity that matches costs
  - D) Increasing the probability that the coefficient of determination will likely decrease in the short run

*Answer: C*

**Topic: Composition of Total Manufacturing Costs**

**LO: 4**

62. Over the past decade, the composition of total manufacturing costs has resulted in which of the following?
- A) Manufacturing overhead decreasing as a percent of total manufacturing costs.
  - B) Direct labor decreasing as a percent of total manufacturing costs.
  - C) Direct materials decreasing as a percent of total manufacturing costs.
  - D) Direct labor increasing as a percent of total manufacturing costs.

*Answer: B*

**Topic: Manufacturing Cost Hierarchy**

**LO: 4**

63. The cost of raw materials would best be classified as what type of activity?
- A) A unit-level activity
  - B) A batch-level activity
  - C) A product-level activity
  - D) A facility-level activity

*Answer: A*

**Topic: Manufacturing Cost Hierarchy**

**LO: 4**

64. The cost of issuing and tracking a work order would best be classified as what type of activity?
- A) A unit-level activity
  - B) A batch-level activity
  - C) A product-level activity
  - D) A facility-level activity

*Answer: B*

**Topic: Manufacturing Cost Hierarchy**

**LO: 4**

65. The cost of maintaining general facilities such as buildings and grounds would best be classified as what type of activity?
- A) A unit-level activity
  - B) A batch-level activity
  - C) A product-level activity
  - D) A facility-level activity

*Answer: D*

**Topic: Manufacturing Cost Hierarchy**

**LO: 4**

66. The cost of product marketing such as advertising would best be classified as what type of activity?
- A) A unit-level activity
  - B) A batch-level activity
  - C) A product-level activity
  - D) A facility-level activity

*Answer: C*

***The following information relates to questions 67-70.***

MicroBrew West is a successfully brewery engaged in the development and production of specialty micro brews. It uses manufacturing cost hierarchy to allocate costs to various activities. During the past year, it has incurred \$1,250,000 of product development costs, \$850,000 of materials handling costs, \$2,500,000 of production line labor costs, \$700,000 for production setup costs, \$500,000 in power costs for cooling beer and running equipment and \$1,500,000 for manufacturing facility management.

**Topic: Manufacturing Cost Hierarchy**

**LO: 4**

67. Using the manufacturing cost hierarchy, what is the total cost that would be classified as unit-level activity costs?
- A) \$ 850,000
  - B) \$2,500,000
  - C) \$3,350,000
  - D) \$3,850,000

*Answer: D*

**Topic: Manufacturing Cost Hierarchy**

**LO: 4**

68. Using the manufacturing cost hierarchy, what is the total cost that would be classified as batch-level activity costs?
- A) \$ 500,000
  - B) \$ 700,000
  - C) \$1,200,000
  - D) \$1,250,000

*Answer: B*

**Topic: Manufacturing Cost Hierarchy**

**LO: 4**

69. Using the manufacturing cost hierarchy, what is the total cost that would be classified as product-level activity costs?
- A) \$1,250,000
  - B) \$2,500,000
  - C) \$3,750,000
  - D) \$4,600,000

*Answer: A*

**Topic: Manufacturing Cost Hierarchy**

**LO: 4**

70. Using the manufacturing cost hierarchy, what is the total cost that would be classified as facility-level activity costs?
- A) \$ 500,000
  - B) \$1,250,000
  - C) \$1,500,000
  - D) \$2,000,000

*Answer: C*

**Topic: Cost Drivers**

**LO: 4**

71. *Number of employees* is most appropriate as a cost driver for which of the following types of activity costs?
- A) Machining
  - B) Purchasing
  - C) Assembly
  - D) Payroll

*Answer: D*

**Topic: Cost Drivers**

**LO: 4**

72. *Number of parts per unit* is most appropriate as a cost driver for which of the following types of activity costs?
- A) Machining
  - B) Purchasing
  - C) Assembly
  - D) Payroll

*Answer: C*

**Topic: Cost Drivers**

**LO: 4**

73. *Number of invoices* is most appropriate as a cost driver for which of the following types of activity costs?
- A) Machining
  - B) Purchasing
  - C) Assembly
  - D) Payroll

*Answer: B*

**Topic: Cost Drivers**

**LO: 4**

74. *Number of machine hours* is most appropriate as a cost driver for which of the following types of activity costs?

- A) Machining
- B) Purchasing
- C) Assembly
- D) Payroll

*Answer: A*

***The following information relates to questions 75-79.***

Phillips Company uses an activity-based costing system. It has the following manufacturing activity areas, related cost drivers and cost allocation rates:

<u>Activity</u>	<u>Cost Driver</u>	<u>Cost Allocation Rate</u>
Machine setup	Number of setups	\$25.00
Materials handling	Number of parts	0.25
Machining	Machine hours	13.00
Assembly	Direct labor hours	22.00
Inspection	Number of finished units	6.00

During the month, 100 units were produced, with no defects, requiring two setups. Each unit consisted of 15 parts, 2 direct labor hours and 2.5 machine hours. Direct materials cost \$50 per finished unit.

**Topic: Cost Drivers**

**LO: 4**

75. What is the total manufacturing cost for machine setups?

- A) \$ 25
- B) \$ 50
- C) \$2,500
- D) \$5,000

*Answer: B*

**Topic: Cost Drivers**

**LO: 4**

76. What is the total manufacturing cost for materials handling?

- A) \$ 3.75
- B) \$ 25.00
- C) \$250.00
- D) \$375.00

*Answer: D*



**Topic: Cost Drivers**

**LO: 4**

77. What is the total manufacturing cost for inspections?

- A) \$ -0-
- B) \$ 6
- C) \$ 90
- D) \$600

*Answer: D*

**Topic: Cost Drivers**

**LO: 4**

78. What is the total manufacturing cost for the period?

- A) \$ 8,675
- B) \$11,625
- C) \$13,675
- D) \$16,125

*Answer: C*

**Topic: Cost Drivers**

**LO: 4**

79. What is the per unit manufacturing cost for the period?

- A) \$ 6.75
- B) \$116.25
- C) \$136.75
- D) \$161.25

*Answer: C*

## Exercises

### Topic: Classifying Cost Behavior

#### LO: 1

1. Classify the total costs of each of the following as variable, fixed, mixed, or step. Sales volume is the cost driver.

- \_\_\_\_\_ a. Salary of machine operator who is paid based on number of units produced on the machine
- \_\_\_\_\_ b. Keyboards purchased from a subcontract supplier in a computer assembly plant
- \_\_\_\_\_ c. Property taxes
- \_\_\_\_\_ d. Salaries of quality inspectors when each inspector can evaluate a maximum of 500 units per day
- \_\_\_\_\_ e. Annual salary for the vice president of manufacturing
- \_\_\_\_\_ f. Electric power in a factory
- \_\_\_\_\_ g. Raw materials used in production
- \_\_\_\_\_ h. Water consumed by the plant, which is based on a flat fee plus actual consumption
- \_\_\_\_\_ i. Overhead costs in the factory for incidental components such as small screws and rivets.
- \_\_\_\_\_ j. Fire insurance on factory building

#### Answer:

- Variable a. Salary of machine operator who is paid based on number of units produced on the machine
- Variable b. Keyboards purchased from a subcontract supplier in a computer assembly plant
- Fixed c. Property taxes
- Step d. Salaries of quality inspectors when each inspector can evaluate a maximum of 500 units per day
- Fixed e. Annual salary for the vice president of manufacturing
- Mixed f. Electric power in a factory
- Variable g. Raw materials used in production
- Mixed h. Water consumed by the plant, which is based on a flat fee plus actual consumption
- Variable i. Overhead costs in the factory for incidental components such as small screws and rivets.
- Fixed j. Fire insurance on factory building

**Topic: Cost Behavior Patterns**

**LO: 1**

2. Ames Company had the following costs for the past three years in which it produced 20,000, 24,000, and 30,000 units, respectively. Identify which of the costs were variable, fixed, and mixed.

	<u>Year1</u>	<u>Year 2</u>	<u>Year 3</u>
Direct Materials	\$40,000	\$48,000	\$60,000
Utilities Expense	22,000	26,000	32,000
Property Taxes	6,000	6,000	6,000
Travel Expense	3,000	3,000	3,000
Direct Labor	30,000	36,000	45,000
Maintenance Expense	11,000	13,000	16,000

*Answer:*

Direct Materials:	Variable
Utilities Expense:	Mixed
Property Taxes:	Fixed
Travel Expense:	Fixed
Direct Labor:	Variable
Maintenance Expense	Mixed

**Topic: Computing Average Unit Costs**

**LO: 1**

3. The total monthly operating costs of Joe's Yogurt Ice Cream Shack are:

$$\$1,500 + \$0.45X, \text{ where } X = 12 \text{ ounce serving}$$

Calculate the average cost per serving at each of the following monthly volumes: 1,000, 2,000, 3,000 and 5,000, and determine the monthly volume at which the average cost per serving is \$0.70.

*Answer:*

$$\text{Average cost @ 1,000 units} = [\$1,500 + (\$0.45 \times 1,000)] / 1,000 = \$1.95$$

$$\text{Average cost @ 2,000 units} = [\$1,500 + (\$0.45 \times 2,000)] / 2,000 = \$1.20$$

$$\text{Average cost @ 3,000 units} = [\$1,500 + (\$0.45 \times 3,000)] / 3,000 = \$0.95$$

$$\text{Average cost @ 5,000 units} = [\$1,500 + (\$0.45 \times 5,000)] / 5,000 = \$0.75$$

Average cost = \$0.70 = To achieve a unit cost of \$0.70, the fixed cost per unit would have to be \$0.25 because the variable cost per unit is \$0.45. With a total fixed cost of \$1,500, 6,000 units would have to be sold to achieve an average unit cost of \$0.70:  $[\$1,500 + (\$0.45 \times 6,000)] / 6,000 = \$0.70$

**Topic: Committed and Discretionary Fixed Costs**

**LO: 1**

4. Indicate whether each of the following fixed costs are committed or discretionary.
- a. Depreciation on the factory
  - b. Cancellable lease on the corporate jet
  - c. Super Bowl TV advertisement
  - d. Annual scheduled maintenance on the air conditioning system
  - e. Annual donation to the local Boys and Girls Clubs
  - f. Salary of the director of training who is on a three-year contract
  - g. Travel for employees to attend professional development seminars

*Answer:*

- a. Committed
- b. Discretionary
- c. Discretionary
- d. Discretionary
- e. Discretionary
- f. Committed
- g. Discretionary

**Topic: High-Low Cost Estimation**

**LO: 2**

5. Assume the local cable company has the following information available about fleet miles and operating costs for its service department:

<u>Year</u>	<u>Fleet Miles</u>	<u>Operating Costs</u>
2011	267,000	\$228,700
2010	363,000	\$286,300

Using the high-low method, develop a cost-estimating equation for total annual operating costs.

*Answer:*

Variable costs =  $(\$286,300 - \$228,700) / (363,000 - 267,000) = \$0.60$  per mile.

Fixed costs =  $\$228,700 - \$0.60(267,000) = \$68,500$  or  $\$286,300 - \$0.60(363,000) = \$68,500$ .

Total annual costs =  $\$68,500 + \$0.60X$  where: X = annual fleet miles

**Topic: Scatter Diagrams and High-Low Cost Estimation**

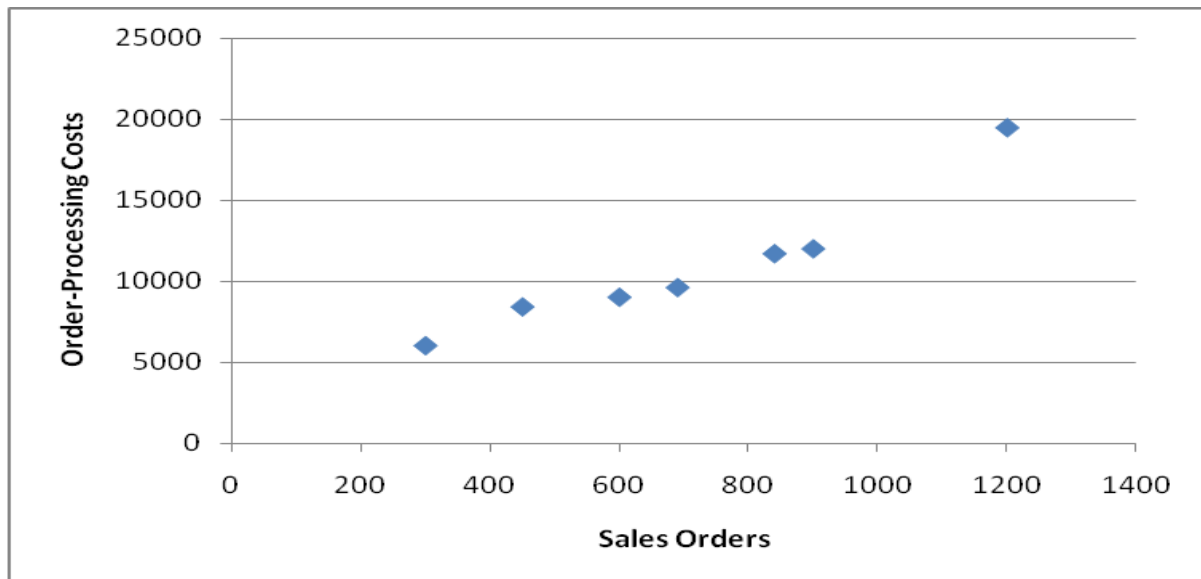
**LO: 2, 3**

6. Assume the local custom print shop has the following information on the number of sales orders received and order-processing costs.

<u>Month</u>	<u>Sales Orders</u>	<u>Order-Processing Costs</u>
Jan	900	\$12,000
Feb	450	8,400
Mar	1,200	19,500
Apr	840	11,700
May	690	9,600
Jun	300	6,000
Jul	600	9,000

Plot the data on a scatter diagram. Using the information from representative high- and low- volume months, and develop a cost-estimating equation for monthly production costs.

*Answer:*



$$\text{Variable costs} = (\$12,000 - \$6,000) / (900 - 300) = \$10 \text{ per sales order}$$

$$\text{Fixed costs} = \$12,000 - \$10(900) = \$3,000 \text{ or } \$6,000 - \$10(300) = \$3,000$$

$$\text{Monthly order processing costs} = \$3,000 + \$10X, \text{ where } X = \text{sales orders}$$

**Topic: Cost Classification Hierarchy**

**LO: 4**

7. Identify Cooper and Kaplan's four categories of activities and provide an example of each activity level.

*Answer:*

Unit level:

- Cost of raw materials
- Cost of inserting a component
- Utilities cost of operating equipment
- Costs of packaging
- Sales commissions

Batch level:

- Cost of processing a sales order
- Cost of issuing and tracking a work order
- Cost of equipment set-up
- Cost of moving batches between workstations
- Cost of inspection

Product level:

- Cost of product development
- Cost of product marketing such as advertising
- Cost of specialized equipment

Facility level:

- Cost of maintaining general facilities such as buildings and grounds
- Cost of nonspecialized equipment
- Cost of maintaining nonspecialized equipment
- Cost of real property taxes
- Cost of general advertising
- Cost of general administration salaries

**Topic: Cost Behavior**

**LO: 1**

8. Classify each of the following costs as variable, fixed, mixed, or step by writing an X under one of the following headings (Sales volume is the cost driver).

	<u>Variable</u>	<u>Fixed</u>	<u>Mixed</u>	<u>Step</u>
1. Total selling and administrative costs	_____	_____	_____	_____
2. Salaries of supervisors (each supervisor is in charge of five employees)	_____	_____	_____	_____
3. Raw materials used in production	_____	_____	_____	_____
4. Power consumption in a restaurant	_____	_____	_____	_____
5. Cost of goods sold in a restaurant	_____	_____	_____	_____
6. Salaries of employees who handle 20 claims per month	_____	_____	_____	_____
7. Pulpwood in a paper mill	_____	_____	_____	_____
8. Salaries of two secretaries in the corporate office	_____	_____	_____	_____
9. Total current manufacturing costs	_____	_____	_____	_____
10. The cost of an automobile rented on the basis of a daily charge plus \$0.50 per mile	_____	_____	_____	_____

*Answer:*

	<u>Variable</u>	<u>Fixed</u>	<u>Mixed</u>	<u>Step</u>
1. Total selling and administrative costs	_____	_____	X	_____
2. Salaries of supervisors (each supervisor is in charge of five employees)	_____	_____	_____	X
3. Raw materials used in production	X	_____	_____	_____
4. Power consumption in a restaurant	_____	_____	X	_____
5. Cost of goods sold in a restaurant	X	_____	_____	_____
6. Salaries of employees who handle 20 claims per month	_____	_____	_____	X
7. Pulpwood in a paper mill	X	_____	_____	_____
8. Salaries of two secretaries in the corporate office	_____	X	_____	_____
9. Total current manufacturing costs	_____	_____	X	_____
10. The cost of an automobile rented on the basis of a daily charge plus \$0.50 per mile	_____	_____	X	_____

**Topic: Committed and Discretionary Fixed Costs**

**LO: 1**

9. Identify each of the following costs as fixed-committed or fixed-discretionary by writing an "X" under one of the following headings:

	<u>Fixed Committed</u>	<u>Fixed Discretionary</u>
1. Cost of entertainment at the company awards banquet	_____	_____
2. Research and development staff salaries	_____	_____
3. Cost of placing an ad in a corporate magazine	_____	_____
4. Rent on an exhibition at a trade show	_____	_____
5. Depreciation on manufacturing equipment	_____	_____
6. Depreciation on the corporate jet	_____	_____
7. Interest on bonds payable	_____	_____
8. Exclusivity fee paid by a franchise	_____	_____
9. Corporate charitable contributions	_____	_____
10. Employee training workshops	_____	_____

*Answer:*

	<u>Fixed Committed</u>	<u>Fixed Discretionary</u>
1. Cost of entertainment at the company awards banquet	_____	X
2. Research and development staff salaries	_____	X
3. Cost of placing an ad in a corporate magazine	_____	X
4. Rent on an exhibition at a trade show	_____	X
5. Depreciation on manufacturing equipment	X	_____
6. Depreciation on the corporate jet	_____	X
7. Interest on bonds payable	X	_____
8. Exclusivity fee paid by a franchise	X	_____
9. Corporate charitable contributions	_____	X
10. Employee training workshops	_____	X



**Topic: High-Low Method****LO: 2**

10. Foxboro Company manufactures and sells specialty items. The following representative direct labor-hours and production costs are provided for a four-month period:

<u>Month</u>	<u>Hrs. Direct Labor</u>	<u>Production Costs</u>
January	3,000	\$ 45,000
February	4,000	52,500
March	5,000	60,000
April	<u>4,000</u>	<u>45,000</u>
Total	<u>16,000</u>	<u>\$202,500</u>

a = fixed production costs per month

b = variable production costs per direct labor hour

n = number of months

X = direct labor-hours per month

Y = total monthly production costs

Using the symbols above, indicate the cost estimation equation based on number of direct labor hours per month, and calculate total monthly production costs for May using the high-low method, during which hours of direct labor are expected to be 4,500 hours.

*Answer:*

$$Y = a + bX$$

$$b = (\$60,000 - \$45,000) / (5,000 - 3,000) = \$7.50 \text{ variable production cost per direct labor hour}$$

$$a = \$60,000 - \$7.50(5,000) = \$22,500 \text{ or } 45,000 - \$7.50(3,000) = \$22,500$$

$$Y = \$22,500 + \$7.50X$$

$$\text{Total Production Costs for May} = \$22,500 + \$7.50(4,500) = \$56,250$$

**Topic: Cost Behavior****LO: 1**

11. The Hartford Furniture Company has the following information available regarding costs at various levels of monthly production:

Production volume (units)	<u>14,000 Units</u>	<u>20,000 Units</u>
Direct materials	\$ 70,000	\$100,000
Direct labor	56,000	80,000
Indirect materials	21,000	30,000
Supervisors' salaries	12,000	12,000
Depreciation on plant and equipment	10,000	10,000
Maintenance	32,000	44,000
Utilities	15,000	21,000
Insurance on plant and equipment	1,600	1,600
Property taxes on plant and equipment	<u>2,000</u>	<u>2,000</u>
Total	<u>\$219,600</u>	<u>\$300,600</u>

Identify each of the costs above as being variable, fixed, or mixed.

***continued next page***

Answer:

	<u>Variable</u>	<u>Fixed</u>	<u>Mixed</u>
Direct materials	X		
Direct labor	X		
Indirect materials	X		
Supervisors' salaries		X	
Depreciation on plant and equipment		X	
Maintenance			X
Utilities			X
Insurance on plant and equipment		X	
Property taxes on plant and equipment		X	

**Topic: Cost Estimation Using the High-Low Method**

**LO: 2**

12. The Hartford Furniture Company has the following information available regarding costs at various levels of monthly production:

Production volume (units)	<u>14,000 Units</u>	<u>20,000 Units</u>
Direct materials	\$70,000	\$100,000
Direct labor	56,000	80,000
Indirect materials	21,000	30,000
Supervisors' salaries	12,000	12,000
Depreciation on plant and equipment	10,000	10,000
Maintenance	32,000	44,000
Utilities	15,000	21,000
Insurance on plant and equipment	1,600	1,600
Property taxes on plant and equipment	<u>2,000</u>	<u>2,000</u>
Total	<u>\$219,600</u>	<u>\$300,600</u>

Develop an equation for total monthly production costs using the high-low method of cost estimation, and predict total costs for a monthly production volume of 18,000 units.

Answer:

Variable costs =  $(\$300,600 - \$219,600) / (20,000 - 14,000) = \$13.50$  per unit

Fixed costs =  $\$219,600 - \$13.50(14,000) = \$30,600$  or  $\$300,600 - \$13.50(20,000) = \$30,600$

Total monthly production costs =  $\$30,600 + \$13.50(\text{No. of Units})$

Total monthly production costs for 18,000 units =  $\$30,600 + \$13.50(18,000) = \$273,600$

**Topic: Cost Estimation Using the High-Low Method**

**LO: 2**

13. The University Logo Products Company needs to predict the labor cost in producing specialty coffee mugs. The following production information is available:

<u>Year</u>	<u>Production Volume</u>	<u>Labor Hours</u>	<u>Labor Dollars</u>
2006	2,500	1,700	\$8,500
2007	3,400	1,950	11,700
2008	2,400	1,600	12,800
2009	4,400	2,300	20,700
2010	3,200	1,900	17,100
2011	2,800	1,750	17,500

Wage rates have steadily increased since 2006; however, management expects no further increases in 2012.

- Select the appropriate independent variable for estimating labor cost. Explain the reason for your selection.
- Develop an equation to predict for 2012 the labor cost of producing specialty mugs. Use the high-low method.

*Answer:*

- In periods of changing prices, unadjusted cost data should not be used as the dependent variable. Assuming that the technology has not changed, labor-hours used in coffee mug production can be substituted for labor-dollars in developing the estimating equation:
- Total labor hours = a constant + b(Number of mugs produced)

Using labor hours:

$$b = (2,300 - 1,600) / (4,400 - 2,400) = 0.35 \text{ labor hours per coffee mug.}$$

$$A = 2,300 - (0.35 \times 4,400) = 760 \text{ fixed labor hours per year.}$$

$$\text{Total labor hours} = 760 + 0.35(\text{Number of mugs produced})$$

The wage rate for 2012 is the same as 2011.

$$\text{For 2011, } \$17,500 / 1,750 = \$10$$

$$\text{Total labor costs} = 760(\$10) + (0.35)(\$10)(\text{No. of mugs produced})$$

**Topic: Estimating Fixed and Variable Cost Components****LO: 2**

14. The Baxter Wood Products manufactures small tables. The overhead incurred in manufacturing the tables has both a fixed component and a variable component. The company's management wishes to explain variable overhead as a percentage of direct labor costs. Management has obtained the following cost data pertaining to the production of the small tables:

<u>Units Produced</u>	<u>Direct Labor Costs</u>	<u>Overhead Costs</u>
300	\$3,200	\$2,400
400	\$5,000	\$2,600
1,000	\$8,000	\$5,000
600	\$5,400	\$2,800
100	\$2,400	\$2,200

Compute the fixed and variable components of the overhead costs using the high-low method.

*Answer:*

$b = (\$5,000 - \$2,200) / (\$8,000 - \$2,400) = 50\%$ ; Variable overhead is 50% of Direct Labor Costs.

$a = \$5,000 - 0.50(\$8,000) = \$1,000$  fixed overhead costs

Overhead costs = \$1,000 + (0.50 X Direct Labor Cost)

**Topic: Estimating Fixed and Variable Cost Components****LO: 2**

15. The following data was obtained from the books of the Caldwell Home Painting Company:

<u>Month</u>	<u>Overhead Costs</u>	<u>Direct Labor Hours</u>
January	\$2,400	600
February	3,750	800
March	1,800	500
April	3,900	900
May	1,100	200

Compute the fixed and variable components of the monthly overhead costs using the high-low method.

*Answer:*

$b = (\$3,900 - \$1,100) / (900 - 200) = \$4.00$  per Direct Labor Hour (DLH)

$a = \$3,900 - \$4(900) = \$300$  or  $\$1,100 - \$4(200) = \$300$

Total Overhead Cost = \$300 + \$4.00(DLH)

**Topic: Cost Estimation Using the High-Low Method**

**LO: 2**

16. The Specialty Products Company needs to predict the labor cost in producing made-to-order mugs. The following production information is available:

<u>Year</u>	<u>Mugs Produced</u>	<u>Labor-Hours</u>	<u>Labor Cost</u>
2005	2,300	1,700	\$10,800
2006	3,200	1,950	\$14,000
2007	2,200	1,600	\$15,100
2008	4,200	2,300	\$20,700
2009	3,000	1,900	\$19,400
2010	2,600	1,750	\$19,800

- Select the appropriate independent variable for estimating labor cost. Explain the reason for your selection.
- Develop an equation for labor costs using the high-low method of cost estimation, and predict total costs for an annual usage of 2,000 labor hours.

*Answer:*

- The independent variable should be labor hours. Labor-hours has the most logical casual relationship with labor cost.
- Variable costs =  $(\$20,700 - \$15,100) / (2,300 - 1,600) = \$8.00$  per labor hour.  
Fixed costs =  $\$20,700 - (\$8.00 \times 2,300) = \$2,300$  per month  
Total annual labor cost =  $\$2,300 + \$8.00(\text{No. labor hours})$   
Total costs for 2,000 labor hours =  $\$2,300 + \$8.00(2,000) = \$18,300$

## Essay Questions

### Topic: Least-Squares Regression

#### LO: 2

1. Your company has just performed a least-squares regression analysis of the monthly costs of manufacturing a new product. What are some considerations that should be made before making a decision based on the results of this analysis?

*Answer:*

First of all, there are some factors relating to the manufacturing of a new product that should be considered. With a new product, data used in the analysis may not be representative of future costs because the process of producing a new product will likely undergo significant changes during the initial year. Also, new products are likely to be initially manufactured at low levels of production due to the preliminary development of the product's market. At low levels of production, variable costs per unit are likely to be higher than they would at normal levels of production. The least-squares regression assumes a linear relationship throughout the entire range. Therefore, results could be questionable for this reason.

In any event, results should be measured against other available knowledge and data for reasonability. The real-world processes generating the data are constantly in a state of change. Consequently, common sense and prior expectations should consistently be applied to the interpretation of any results.

One tool that provides assistance in assessment of the degree to which the regression is well-specified is a scatter diagram. A scatter diagram can provide a visual assessment as to the degree to which the data are arranged in a straight line, and are thus suited for regression analysis. A scatter diagram can also direct attention to "outlier" observations, which represent months that are not necessarily representative of typical months of operations.

### Topic: Alternative Cost Estimation Methods

#### LO: 2

2. Identify the three different cost estimation methods discussed in this course and provide a description of the strengths and weaknesses of each.

*Answer:*

*Scatter Diagrams:* Scatter diagrams help identify representative high and low volumes. They are also useful in determining if costs can be reasonably approximated by a straight line. Scatter diagrams are simple to use, but professional judgment is required to draw a representative straight line through the plot of historical data. This method is subjective in nature, and probability intervals cannot be developed.

*High-Low Cost Estimation:* This method uses data from two time periods to estimate fixed and variable costs. This is a good method to use when data are limited. It is a subjective method, and probability intervals cannot be developed. It is very important that the high and low volumes represent the normal operating conditions of all observations. Again, professional judgment is required to select the appropriate data.

*Least-Squares Method:* This method uses all available data. It uses a mathematical criterion, which provides for an objective approach to cost estimation. In addition, this method can provide information on how well the cost estimating equation fits the historical cost data and information needed to construct probability intervals for cost estimates. It can also be used to develop equations that are not linear in nature. This method requires more data points than do the high-low or scatter diagram methods.

**Topic: Changing Technology and Cost Estimation****LO: 3**

3. Briefly explain why changes in technology and prices make cost estimation difficult.

*Answer:*

Care must be taken to make sure that data used in developing cost estimates are based on the existing technology. When this is not possible, professional judgment is required to make appropriate adjustments. In addition, only data reflecting a single price level should be used in cost estimation. The prices for various cost elements are likely to change at different rates and at different times. Old data should always be used cautiously. If data from different price levels are used, an attempt should be made to restate them to a single price level.

**Topic: Difficulties Regarding Cost Estimation****LO: 3**

4. Identify some of the areas of concern that make cost estimation difficult.

*Answer:*

Several items to be wary of when developing cost estimating equations include:

- Data that are not based on normal operating conditions
- Nonlinear relationships between total costs and activity
- Obtaining a high R-squared purely by chance
- Changes in technology and prices
- Matching activity and cost within each observation
- Identifying activity cost drivers

**Topic: Changing Cost Structures****LO: 4**

5. Describe the changes in composition of total manufacturing costs during the last century, using the three major cost categories: direct materials, direct labor, and manufacturing overhead.

*Answer:*

1. Direct materials, the cost of primary raw materials converted into finished goods, have increased slightly as organizations purchase components they formerly fabricated.
2. Direct labor, the wages earned by production employees for the time they spend converting raw materials into finished products, has decreased significantly as employees spend less time physically working on products and more time supporting automated production activities.
3. Manufacturing overhead, which includes all manufacturing costs other than direct materials and direct labor, has increased significantly due to automation, product diversity, and product complexity.

**Topic: Unit Level Cost Behavior Analysis****LO: 4**

6. Describe the unit level approach to cost behavior analysis. Discuss the appropriateness of this approach.

*Answer:*

The unit level approach to cost analysis assumes changes in an organization's costs are best explained by changes in the number of units or sales dollars (or some other measure of business volume). Because of its relative simplicity, unit level analysis has been widely used and accepted. In many circumstances this approach may provide acceptable results. However, in many other circumstances, this approach may be insufficient to capture the critical drivers of cost. This is especially true in organizations offering multiple products of various complexities, which vary in their consumption of the organization's resources. In these situations, an analysis that includes additional variables for considerations such as the influence of number of batch runs on costs and the influence of the number of products offered on costs would provide more accurate estimation.