Module 14—Class Exercises

E14-17. Automatic versus Manual Processing (LO2) Mid-Town Copy Service processes 1,800,000 photocopies per month at its mid-town service center. Approximately 50 percent of the photocopies require collating. Collating is currently performed by high school and college students who are paid $8 per hour. Each student collates an average of 5,000 copies per hour. Management is contemplating the lease of an automatic collating machine that has a monthly capacity of 5,000,000 photocopies, with lease and operating costs totaling $1,550 plus $0.05 per 1,000 units collated.

Required
a. Determine the total costs of collating 500,000 and 1,500,000 per month:

1. With student help.
   \[
   \frac{\$8}{\$0.05} = \frac{500,000}{x} \times 3 \times \frac{\$2400}{1,500,000}
   \]

2. With the collating machine.
   \[
   \frac{1,550}{x} + 0.05 \times 1575 + 1625
   \]

b. Determine the monthly volume at which the automatic process becomes preferable to the manual process.
   \[
   0016x = 1550 + 0.0005x
   \]

E14-19. High-Low Cost Estimation (LO2, 3) Assume the local Pearle Vision has the following information on the number of sales orders received and order-processing costs.

<table>
<thead>
<tr>
<th>Month</th>
<th>Sales Orders</th>
<th>Order-Processing Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3,000</td>
<td>$32,000</td>
</tr>
<tr>
<td>2</td>
<td>1,500</td>
<td>22,400</td>
</tr>
<tr>
<td>3</td>
<td>4,000</td>
<td>52,000</td>
</tr>
<tr>
<td>4</td>
<td>2,800</td>
<td>31,200</td>
</tr>
<tr>
<td>5</td>
<td>2,300</td>
<td>25,600</td>
</tr>
<tr>
<td>6</td>
<td>1,000</td>
<td>16,000</td>
</tr>
<tr>
<td>7</td>
<td>2,000</td>
<td>24,000</td>
</tr>
</tbody>
</table>

Required
a. Use information from the high- and low-volume months to develop a cost-estimating equation for monthly order-processing costs.

b. Project the order processing costs for a month with 3,230 sales orders.
   \[
   \frac{4,000 + 12 \times 3,230}{52,000 - 16,000} = \frac{52,000 - 16,000}{4,000 - 10,000} = 12
   \]

E14-22. Developing an Equation from Average Costs (LO2) The Pampered Dog Hotel is a pet hotel located in Las Vegas, Nevada. Assume that in March, when dog-days (occupancy) were at an annual low of 500, the average cost per dog-day was $21. In July, when dog-days were at a capacity level of 4,000, the average cost per dog-day was $7.

Required
a. Develop an equation for monthly operating costs.

b. Determine the average cost per dog-day at an annual volume of 24,000 dog-days.
   \[
   12 \times 8000 = \frac{96000 + 2400 \times 8}{24,000} = \frac{26,000}{9}
   \]
P14-26. Multiple Cost Drivers (LO4) Scottsdale Ltd. manufactures a variety of high-volume and low-volume products to customer demand. Presented is information on 2011 manufacturing overhead and activity cost drivers.

<table>
<thead>
<tr>
<th>Level</th>
<th>Total Cost</th>
<th>Units of Cost Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>$500,000</td>
<td>20,000 machine hours</td>
</tr>
<tr>
<td>Batch</td>
<td>100,000</td>
<td>1,000 customer orders</td>
</tr>
<tr>
<td>Product</td>
<td>200,000</td>
<td>50 products</td>
</tr>
</tbody>
</table>

**Total Cost = $800,000** per 20,000 machine hours = $40

Product X1 required 2,000 machine hours to fill 10 customer orders for a total of 8,000 units.

**Required:**

a. Assuming all manufacturing overhead is estimated and predicted on the basis of machine hours, determine the predicted total overhead costs to produce the 8,000 units of product X1.

Cost per machine hour = $40

Cost for 8,000 units = $40,000 / 8,000 = $5

b. Assuming manufacturing overhead is estimated and predicted using separate rates for machine hours, customer orders, and products (a multiple-level cost hierarchy), determine the predicted total overhead costs to produce the 8,000 units of product X1.

<table>
<thead>
<tr>
<th></th>
<th>Rate</th>
<th>Quantity</th>
<th>Cost Allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine hours</td>
<td>25</td>
<td>2,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Batches</td>
<td>100</td>
<td>10</td>
<td>1,000</td>
</tr>
<tr>
<td>Product</td>
<td>400</td>
<td>1</td>
<td>4,000</td>
</tr>
</tbody>
</table>

**Total = $55,000 / 8,000 = $6.88**
Module 14—Review Questions

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

2. 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

3. 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

4. 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

5. 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.

6. 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

7. 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.

<table>
<thead>
<tr>
<th>Month</th>
<th>Heating Degree-Days</th>
<th>Gas Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td>February</td>
<td>1,900</td>
<td>$195</td>
</tr>
<tr>
<td>April</td>
<td>600</td>
<td>$78</td>
</tr>
</tbody>
</table>

   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

8. The following procedure performed by a dairy is the best example of a unit-level activity:
   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
Exercise Foxboro Company manufactures and sells specialty items. The following representative direct labor-hours and production costs are provided for a four-month period:

<table>
<thead>
<tr>
<th>Month</th>
<th>Hrs. Direct Labor</th>
<th>Production Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>3,000</td>
<td>$450,000</td>
</tr>
<tr>
<td>February</td>
<td>4,200</td>
<td>530,000</td>
</tr>
<tr>
<td>March</td>
<td>5,000</td>
<td>600,000</td>
</tr>
<tr>
<td>April</td>
<td>3,800</td>
<td>500,000</td>
</tr>
<tr>
<td>Total</td>
<td>16,000</td>
<td>$2,080,000</td>
</tr>
</tbody>
</table>

Required:

a. Estimate the variable and fixed production costs using the high-low method.

\[
\text{Variable cost} = \left(\frac{600,000 - 450,000}{5,000 - 3,000}\right) = \frac{150,000}{2,000} = 75
\]

\[
\text{Fixed cost} = 450,000 - 75 \times 3,000 = 225,000
\]

b. Estimate the total production costs for May when the labor hours are expected to be 4,500.

\[
225,000 + (75 \times 4,500) = 562,500
\]

Exercise Clout, Inc. has the following production overhead costs for the coming year:

<table>
<thead>
<tr>
<th>Level</th>
<th>Total Cost</th>
<th>Units of Cost Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>$400,000</td>
<td>100,000 machine hours</td>
</tr>
<tr>
<td>Batch</td>
<td>200,000</td>
<td>1,000 batches</td>
</tr>
<tr>
<td>Product</td>
<td>400,000</td>
<td>100 products</td>
</tr>
<tr>
<td>Total</td>
<td>$1,000,000</td>
<td></td>
</tr>
</tbody>
</table>

Product U3 is planned for 700 machine hours, to be scheduled in 50 batches and result in 10,000 units of output.

a. Assuming that total overhead is estimated and predicted on the basis of machine hours, determine the predicted overhead costs to produce Product U3 for the coming year.

\[
\frac{610 \times 700}{10,000} = 427 \text{dollars}
\]

b. Assuming that total overhead is estimated and predicted using separate rates for machine hours, batches, and products, determine the predicted overhead costs to produce Product U3 for the coming year.

\[
\frac{64 \times 200}{10,000} = 1.28 \text{dollars} \times 50 = 64 \text{dollars}
\]

SHORT ANSWER

1. Give an example of each of the following types of costs:

   a. Fixed cost \(\text{Example: Depreciation}\)
   b. Mixed cost \(\text{Example: Maintenance}\)
   c. Step cost \(\text{Example: Supervision}\)
   d. Batch-level cost \(\text{Example: Inspection}\)