CHAPTER 6 EXERCISES AND PROBLEMS
Solutions

EXERCISE 6-24 (15 MINUTES)

1. Cost per Broadcast Hour

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>July</th>
<th>September</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production crew:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$4,875/390 hr.</td>
<td>$12.50</td>
<td>$12.50</td>
</tr>
<tr>
<td>$8,000/640 hr.</td>
<td>$12.50</td>
<td></td>
</tr>
<tr>
<td>Supervisory employees:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$5,000/390 hr.</td>
<td>12.82</td>
<td>7.81</td>
</tr>
<tr>
<td>$5,000/640 hr.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Rounded.

2. December cost predictions:

Production crew (420 × $12.50 per hr.) .............................................. $5,250
Supervisory employees ........................................................................ 5,000

3. 

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Cost per Broadcast Hour in December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production crew</td>
<td>$12.50 per hr.</td>
</tr>
<tr>
<td>Supervisory employees</td>
<td>11.90 per hr.*</td>
</tr>
</tbody>
</table>

*Rounded.

EXERCISE 6-25 (15 MINUTES)

1. Variable cost per pint of applesauce produced = \( \frac{24,100 - 22,100}{41,000 - 21,000} = \$0.10 \)

Total cost at 41,000 pints ................................................................. $24,100
Variable cost at 41,000 pints 
(41,000 × $0.10 per pint) ............................................................... 4,100
Fixed cost ............................................................................................ $20,000
Cost equation:

Total energy cost = $20,000 + $.10X, where X denotes pints of applesauce produced

2. Cost prediction when 26,000 pints of applesauce are produced

Energy cost = $20,000 + ($.10)(26,000) = $22,600

EXERCISE 6-26 (30 MINUTES)

1. Scatter diagram and visually-fitted line:
EXERCISE 6-26 (CONTINUED)

2. Answers will vary on this requirement because of variation in the visually-fitted lines.

Based on the preceding plot, the cost prediction at 26,000 pounds is:

\[ \text{Energy cost} = \$22,600 \]

3. The July cost observation at the 40,000-pint activity level appears to be an outlier. The cost analyst should check the observation data for accuracy. If the data are accurate, the outlier should be ignored in making cost predictions.

EXERCISE 6-29 (15 MINUTES)

1. a. Fixed  
b. Variable  
c. Variable  
d. Fixed  
e. Semivariable (or mixed)

2. Production cost per month = $33,000* + $2.00X†

\[ *33,000 = \$19,000 + \$10,000 + \$4,000 \]

\[ †2.00 = \$1.10 + \$.70 + \$.20 \]

EXERCISE 6-30 (15 MINUTES)

1. Variable maintenance

\[ \text{cost per tour mile} = \frac{(12,500r - 11,000r)}{(20,000 \text{ miles} - 8,000 \text{ miles})} = .125r \]

\( r \) denotes the real, Brazil’s national currency.

Total maintenance cost at 8,000 miles ................................................................. \( 11,000r \)
Variable maintenance cost at 8,000 miles (.125r \( \times \) 8,000) ........................... \( 1,000r \)
Fixed maintenance cost per month ............................................................................. \( 10,000r \)
2. Cost formula:

Total maintenance cost per month = \(10,000r + 0.125rX\), where \(X\) denotes tour miles traveled during the month.

3. Cost prediction at the 22,000-mile activity level:

\[
\text{Maintenance cost} = 10,000r + (0.125r)(22,000) \\
= 12,750r
\]

SOLUTIONS TO PROBLEMS

PROBLEM 6-36 (25 MINUTES)

1. Machine supplies: \(\frac{102,000}{34,000}\) direct-labor hours = $3 per hour
   January: 23,000 direct-labor hours x $3 = $69,000
   Depreciation: Fixed at $15,000

2. Plant maintenance cost:

\[
\begin{array}{l}
\text{March} & \text{January} \\
(34,000 \text{ hrs}) & (23,000 \text{ hrs}) \\
\hline
\text{Total cost} & $586,000 & $454,000 \\
\text{Less: Machine supplies} & 102,000 & 69,000 \\
\text{Depreciation} & 15,000 & 15,000 \\
\text{Plant maintenance} & $469,000 & $370,000 \\
\end{array}
\]

* Excludes supervisory labor cost

Variable maintenance cost = difference in cost ÷ difference in direct-labor hours
\[
= \frac{($469,000 - $370,000)}{(34,000 - 23,000)} \\
= \frac{$99,000}{11,000 \text{ hours}} \\
= $9 per hour
\]

Fixed maintenance cost:

\[
\begin{array}{l}
\text{March} & \text{January} \\
(34,000 \text{ hrs}) & (23,000 \text{ hrs}) \\
\hline
\text{Total maintenance cost} & $469,000 & $370,000 \\
\text{Less: Variable cost at$9 per hour} & 306,000 & 207,000 \\
\text{Fixed maintenance cost} & $163,000 & $163,000 \\
\end{array}
\]
3. Manufacturing overhead at 29,500 labor hours:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine supplies at $3 per hour</td>
<td>$88,500</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$15,000</td>
</tr>
<tr>
<td>Plant maintenance cost:</td>
<td></td>
</tr>
<tr>
<td>Variable at $9 per hour</td>
<td>$265,500</td>
</tr>
<tr>
<td>Fixed</td>
<td>$163,000</td>
</tr>
<tr>
<td>Supervisory labor</td>
<td>$90,000</td>
</tr>
<tr>
<td>Total</td>
<td>$622,000</td>
</tr>
</tbody>
</table>

4. A fixed cost remains constant when a change occurs in the cost driver (or activity base). A step-fixed cost, on the other hand, remains constant within a range but will change (rise or fall) when activity falls outside that range. A fixed cost is constant over a much larger range of activity than is a step-fixed cost.

5. Ideally, the company should operate on the right-most portion of a step, just prior to the jump in cost. In this manner, a firm receives maximum benefit (i.e., the maximum amount of activity) for the dollars invested.

PROBLEM 6-38 (25 MINUTES)

1. Variable maintenance cost per hour of service = \( \frac{4,470 - 2,820}{520 - 300} \) 
   = \$7.50

   Total maintenance cost at 300 hours of service = $2,820
   Variable maintenance cost at 300 hours of service (300 hr. \( \times \) $7.50) = \$2,250
   Fixed maintenance cost per month = $570

   Cost formula:
   Monthly maintenance cost = $570 + $7.50X, where X denotes hours of maintenance service.

PROBLEM 6-38 (CONTINUED)

2. The variable component of the maintenance cost is $7.50 per hour of service.

3. Cost prediction at 590 hours of activity:
Maintenance cost = $570 + ($7.50)(590) = $4,995

4 Variable cost per hour [from requirement (2)].......................... $7.50

Fixed cost per hour at 600 hours of activity ($570/600).................. $ .95

The fixed cost per hour is a misleading amount, because it will change as the number of hours changes. For example, at 500 hours of maintenance service, the fixed cost per hour is $1.14 ($570/500 hours).

PROBLEM 6-43 (25 MINUTES)

1. Scatter diagrams:

   - Present, in graphic form, the relationship between costs and cost drivers via a plot of data points
   - Require that a straight line be fit through the data points, with approximately the same number of data points above and below the line
   - Easy to use
   - Provide a means to easily recognize outliers

   Least-squares regression:

   - Uses statistical formulas to fit a cost line through the data points
   - Is a very objective method of cost estimation that uses all the data points
   - Requires more computation than other cost-estimation methods; however, software programs are readily available

   High-low method:

   - Relies on only two data points (for the highest and lowest activity levels) in drawing conclusions about cost behavior
   - Is considered more objective than the scatter diagram; however, is weaker than the scatter diagram because it relies on only two data points

   The least-squares regression method will typically produce the most accurate results.

2. Yes. The three methods produce equations by different means. Scatter diagrams and least-squares regression rely on an examination of all data points. The scatter diagram, however, requires an analyst to fit a line through the points by visual approximation, or “eyeballing.” In contrast, least-squares regression involves the
use of statistical formulas to derive the best possible fit of the line through the points. Finally, the high-low method is based on an analysis of only two data points: the highest and the lowest activity levels.

3. These amounts represent the fixed and variable cost associated with the ticketing operation. Fixed cost totals $312,000 within the relevant range, and Global American incurs $2.30 of variable cost for each ticket issued.

4. 
   \[ C = 320,000 + 2.15PT \]
   \[ C = 320,000 + (2.15 \times 580,000) \]
   \[ C = 1,567,000 \]

5. Yes, she did err by including November data. November is not representative because of the effects of the Delta Western strike. The month is an outlier and should be eliminated from the data set.

6. Currently, most of the airline’s tickets are written through reservations personnel, whose wages are likely variable in nature. Heavier reliance on the Internet means a greater investment in software, Web-site maintenance and development, and other similar expenditures. Outlays that fall in these latter categories are typically fixed costs, assuming that the cost driver is the number of tickets. The outcome would parallel the experiences of a manufacturing firm that automates its processes and reduces its reliance on direct-labor personnel.

PROBLEM 6-44 (35 MINUTES)

1. The regression equation’s intercept on the vertical axis is $200. It represents the portion of indirect material cost that does not vary with machine hours when operating within the relevant range. The slope of the regression line is $4 per machine hour. For every machine hour, $4 of indirect material costs are expected to be incurred.

2. Estimated cost of indirect material at 900 machine hours of activity:
   \[ S = 200 + (4 \times 900) \]
   \[ = 3,800 \]

3. Several questions should be asked:
(a) Do the observations contain any outliers, or are they all representative of normal operations?

(b) Are there any mismatched time periods in the data? Are all of the indirect material cost observations matched properly with the machine hour observations?

(c) Are there any allocated costs included in the indirect material cost data?

(d) Are the cost data affected by inflation?

4.  

<table>
<thead>
<tr>
<th></th>
<th>April</th>
<th>August</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning inventory</td>
<td>$1,200</td>
<td>$950</td>
</tr>
<tr>
<td>+ Purchases</td>
<td>6,000</td>
<td>6,100</td>
</tr>
<tr>
<td>– Ending inventory</td>
<td>(1,550)</td>
<td>(2,900)</td>
</tr>
<tr>
<td>Indirect material used</td>
<td>$5,650</td>
<td>$4,150</td>
</tr>
</tbody>
</table>

5. High-low method:

Variable cost per machine hour

\[
\text{Variable cost per machine hour} = \frac{\text{difference in cost levels}}{\text{difference in activity levels}} = \frac{$5,650 - $4,150}{1,100 - 800} = $1,500 / 300 = $5 \text{ per machine hour}
\]

Fixed cost per month:

Total cost at 1,100 hours

\[
\text{Total cost at 1,100 hours} = $5,650
\]

Variable cost at 1,100 hours

\[
\text{Variable cost at 1,100 hours} = ($5 \times 1,100) = 5,500
\]

Fixed cost

\[
\text{Fixed cost} = $150
\]

Equation form:

\[
\text{Indirect material cost} = $150 + ($5 \times \text{machine hours})
\]

6. The regression estimate should be recommended because it uses all of the data, not just two pairs of observations when developing the cost equation.