(c) The firm will hire an additional worker as long as that worker’s MRPL exceeds the wage. Adding a third worker increases revenue by $40 \times 2 = 80$. Since the wage is $75$/day, the firm will hire this worker. However, adding a fourth worker would increase revenue by $35 \times 2 = 70$, which is less than the wage. Thus, the firm will stop after hiring three workers.
2. (a)

<table>
<thead>
<tr>
<th>Workers</th>
<th>Output</th>
<th>MPL</th>
<th>Capital (units)</th>
<th>Output</th>
<th>MPK</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td>100</td>
<td>1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>150</td>
<td>50</td>
<td>2</td>
<td>95</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>190</td>
<td>40</td>
<td>3</td>
<td>135</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>225</td>
<td>35</td>
<td>4</td>
<td>170</td>
<td>35</td>
</tr>
<tr>
<td>5</td>
<td>250</td>
<td>25</td>
<td>5</td>
<td>200</td>
<td>30</td>
</tr>
</tbody>
</table>

Cost minimization requires producing where \( w/MPL = C/MPK \). Here, \( w = 100 \) and \( C = 60 \). Thus, the firm should produce where \( MPK/MPL = C/w = 60/100 = 0.6 \).

From the table, we see that when \( MPK = 30 \) and \( MPL = 50 \), the ratio of the marginal products is 0.6. Moreover, \( MPK = 30 \) when the firm employs 5 units of capital, yielding 200 widgets per day. MPL is 50 when the firm employs 2 workers, yielding 150 widgets.

Thus, the least cost method of producing 350 widgets is with 2 workers and 5 units of capital.

2. (b)

3. (a) Prior to the tax:

\[
L^s = L^d
\]
\[
\implies 40 + 15w^* = 200 - 5w^*
\]
\[
\implies w^* = \frac{200 - 40}{5 + 15} = 8
\]
\[
\implies L^* = 40 + 15(8) = 160
\]

With the payroll tax, the labor demand curve shifts down by $2 at each point. This implies the intercept decreases by two. However, one must be careful as this corresponds to an increase in the intercept when the Ld curve is in the form \( w = a - bLd \) since in the corresponding graph, w is on the y-axis. Re-writing Ld in this form (before the payroll tax) implies: \( w = 200/5 - (1/5)Ld = 40 - (1/5)Ld \). With the payroll tax, the new labor demand curve is given by \( w = 38 - (1/5)Ld \implies Ld = 190 - 5w \). (Thus, the intercept in the Ld curve written in this form decreases by 10, which is equal to the tax, 2, multiplied by the coefficient on w, 5). Solving for the new equilibrium implies:

\[
L^s = L^{d'}
\]
\[
\implies 20 + 15w^* = 190 - 5w^*
\]
\[
\implies w^* = \frac{190 - 40}{5 + 15} = 7.50
\]
\[
\implies L^* = 40 + 15(7.5) = 152.5
\]
The new equilibrium wage received by workers is $7.50/hr and employment falls by 7.5 labor hours. Graphically,

(b) Since the equilibrium wage fell by $0.50/hr, 50 cents of every two dollars paid by firms according to the payroll tax, or 25%, is passed onto workers.

4. (a) Prior to the tax:

\[ L^s = L^d \]

\[ \Rightarrow 160 = 200 - 5w^* \]

\[ \Rightarrow w^* = \frac{200 - 160}{5} = 8 \]

\[ \Rightarrow L^* = 160 \]

As in the previous question, the labor demand curve with the payroll tax is given by \( L_d = 190 - 5w \). Solving for the new equilibrium implies:

\[ L^s = L^{d_t} \]

\[ \Rightarrow 160 = 190 - 5w^* \]

\[ \Rightarrow w^* = \frac{190 - 160}{5} = 6 \]

\[ \Rightarrow L^* = 160 \]

The new equilibrium wage received by workers is $6/hr and employment is fixed at 160.
(b) Since the equilibrium wage fell by $2/hr, the entire payroll tax, or 100%, is passed onto workers.

5. Prior to the policy:

\[ L^s = L^d \]

\[ 20 + 5w^* = 120 - 15w^* \]

\[ w^* = \frac{120 - 20}{15 + 5} = 5 \]

\[ L^* = 20 + 5(5) = 45 \]

After the policy takes effect, the labor demand curve shifts up by $4 at each point. This implies the intercept increases by four. However, one must be careful as this corresponds to an increase in the intercept when the Ld curve is in the form \( w = a - bLd \) since in the corresponding graph, \( w \) is on the y-axis. Re-writing Ld in this form (before the policy change) implies: \( w = 120/15 - (1/15)Ld \Rightarrow Ld = 8 - (1/15)Ld \). After the subsidy goes into effect, the new labor demand curve is given by \( w = 12 - (1/15)Ld \Rightarrow Ld = 180 - 15w \). (Thus, the intercept in the Ld curve written in this form increases by 60, which is equal to the subsidy, 4, multiplied by the coefficient on \( w \), 15). Solving for the new equilibrium implies:
\[ L^s = L^d \]
\[ \implies 20 + 5w^* = 180 - 15w^* \]
\[ \implies w^* = \frac{180 - 20}{15 + 5} = 8 \]
\[ \implies L^* = 20 + 5(8) = 60 \]

Consequently, the equilibrium wage received by workers is $8/hr and employment increased by 15. Graphically,