Show all work for full credit, and use correct notation. Simplify answers completely. See other side for additional problems.

1. (10 points) For a double decrement model, \( q_x^{(1)} = 0.06, q_x^{(2)} = 0.19, \) and \( q_x^{(2)} = 0.20. \) Determine \( q_x^{(1)}. \)
   
   \[
   q_x^{(2)} = 0.06 + 0.19 = 0.25 \implies p_x^{(2)} = 0.75 = p_x^{(1)} \cdot (0.8)
   
   \therefore p_x^{(1)} = 0.9375 \implies q_x^{(1)} = 0.0625
   
2. You are given the double decrement table:

<table>
<thead>
<tr>
<th>( x )</th>
<th>( l_x )</th>
<th>( d_x^{(1)} )</th>
<th>( q_x^{(1)} )</th>
<th>( d_x^{(2)} )</th>
<th>( q_x^{(2)} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>1000</td>
<td>-200</td>
<td>0.20</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>56</td>
<td>-700</td>
<td>100</td>
<td>-</td>
<td>200</td>
<td>-</td>
</tr>
<tr>
<td>57</td>
<td>-400</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

   Determine

   (a) (10 points) \( q_{56}^{(2)} = \frac{d_{56}^{(2)}}{l_{56}} = \frac{2}{7} \)

   (b) (10 points) \( 2q_{55}^{(2)} = \frac{l_{57} - l_{55}}{l_{55}} = \frac{4}{10} = 0.4 \)
3. (5 points each) Use the L-TAM Standard Service Table to determine

(a) \( q_{40}^{(w)} = \frac{w_{40}}{l_{40}} = 0.0487 \ldots \)

(b) \( s_{45}^{(d)} = \frac{5 d_{45}}{l_{45}} = \frac{d_{45} + d_{46} + d_{47} + d_{48} + d_{49}}{l_{45}} \)

\[ = 0.004368 \ldots \]

(c) \( p_{58}^{(r)} = \frac{l_{61}}{l_{58}} = 0.6008 \ldots \)

(d) \( 3l_{57}^{(r)} = \frac{2 d_{60}}{l_{57}} = \frac{r_{60} \text{ (both)} + r_{61}}{l_{57}} = 0.397 \ldots \)