Show all work for full credit, and use correct notation.

1. Given \( q_{80+k} = 0.1(k + 1) \) for \( k = 0 \) and \( 1 \), determine \( \Delta P_{80} \)

\[
\begin{align*}
q_{80} &= 0.1 \\
q_{81} &= 0.2 \\
\Delta P_{80} &= P_{80} \cdot P_{81} \\
\therefore \Delta P_{80} &= (0.9) \cdot (0.8) = 0.72
\end{align*}
\]

2. Given \( T_{40} = 39.35 \), determine the values of \( K_{40} \), \( K_{40}^{(2)} \), \( K_{40}^{(4)} \), and \( K_{40}^{(12)} \)

\[
K_{40} = 39 \\
K_{40}^{(2)} = 39.0 \\
K_{40}^{(4)} = 39.25 \\
K_{40}^{(12)} = 39.33
\]

3. Given \( K_{80}^{(4)} = 10.50 \), determine the range of possible values of \( T_{80} \)

\[
10.50 \leq T_{80} < 10.75
\]
4. Given

<table>
<thead>
<tr>
<th>$x$</th>
<th>$q_x$</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>0.3</td>
</tr>
<tr>
<td>91</td>
<td>0.4</td>
</tr>
<tr>
<td>92</td>
<td>0.5</td>
</tr>
<tr>
<td>93</td>
<td>0.6</td>
</tr>
</tbody>
</table>

determine the value of the deferred mortality probability $2_{|90}$

\[
2_{90} = e^{P_{90}} - 4P_{90} = P_{90} \cdot P_{91} - P_{90} \cdot P_{91} \cdot P_{92} \cdot P_{93} = (0.7)(0.6) - (0.7)(0.6)(0.5)(0.4) = 0.336
\]

There are several other correct ways to do this problem.

5. Given $k_{q6} = 0.1(k + 1)$ for $k = 0, 1, 2$, and 3, determine $Var[Min(K_{96}, 2)]$

\[
\begin{array}{c|c|c}
K_{96} & P_r & \text{Min}(K_{96}, 2) \\
0 & 0.1 & 0 \\
1 & 0.2 & 1 \\
2 & 0.3 & 2 \\
3 & 0.4 & 2 \\
\end{array}
\]

\[
\therefore \text{The question is to find } Var(X), \text{ given }
\begin{array}{c|c}
X & P_r \\
0 & 0.1 \\
1 & 0.2 \\
2 & 0.7 \\
\end{array}
\]

\[
Var(X) = E[X^2] - (E[X])^2
\]

\[
E[X^2] = 0^2(0.1) + 1^2(0.2) + 2^2(0.7) = 3
\]

\[
E[X] = 0(0.1) + 1(0.2) + 2(0.7) = 1.6
\]

\[
\therefore Var(X) = 3 - (1.6)^2 = 0.44
\]