Homework 8: Answer Key

1. c: The probabilities of all outcomes must sum to 1.
2. d
3. c
4. c: If two events are mutually exclusive, their intersection is \( \emptyset \), the empty set.
5. b: By the addition rule, \( P(A \cup B) = P(A) + P(B) - P(A \cap B) \), so

\[
0.78 = 0.5 + 0.65 - P(A \cap B) \\
\Rightarrow P(A \cap B) = 0.37
\]

Using the Multiplication Law we get

\[
P(B|A) = \frac{P(A \cap B)}{P(B)} = \frac{0.37}{0.5} = 0.74
\]

6. d
7. b: If \( A \) and \( B \) are independent, \( P(A \cap B) = P(A) \times P(B) = 0.1 \). So

\[
\Rightarrow P(A \cup B) = 0.4 + 0.25 - 0.1 = 0.55
\]

8. The probability of getting the MC choice question right is 0.2 (one in five). The probability of getting the T/F question right is 0.5 (one in two). The two events are independent of each other, so the probability of getting the MC question right and getting the T/F question right is \( 0.2 \times 0.5 = 0.1 \). With this information we can fill out the following joint probability chart:

<table>
<thead>
<tr>
<th>TRUE/FALSE</th>
<th>RIGHT</th>
<th>WRONG (NOT)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>MULTIPLE CHOICE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRONG (NOT)</td>
<td>0.4</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.5</td>
<td>0.5</td>
<td>1.00</td>
</tr>
</tbody>
</table>

a) 0.10
b) 0.4 + 0.1 = 0.5
c) 0.4
d) 0.1
e) 0.4