Probability Homework

1. A survey was done of students in a high school to see if there was a connection between a student’s hair color and her or his eye color. If a student is chosen at random, find the probability of each of the following events.

<table>
<thead>
<tr>
<th>Hair Color</th>
<th>Black</th>
<th>Blond</th>
<th>Red</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>0.15</td>
<td>0.20</td>
<td>0.05</td>
<td>0.40</td>
</tr>
<tr>
<td>Brown</td>
<td>0.25</td>
<td>0.10</td>
<td>0.00</td>
<td>0.35</td>
</tr>
<tr>
<td>Green</td>
<td>0.05</td>
<td>0.05</td>
<td>0.15</td>
<td>0.25</td>
</tr>
<tr>
<td>Total</td>
<td>0.45</td>
<td>0.35</td>
<td>0.20</td>
<td>1.00</td>
</tr>
</tbody>
</table>

a) The student had black hair. \( \frac{0.45}{1.00} = 0.45 \)
b) The student had blue eyes. \( \frac{0.40}{1.00} = 0.40 \)
c) The student had brown eyes and black hair. \( \frac{0.35}{1.00} = 0.35 \)
d) The student had blue eyes or blond hair (be careful!) \( \frac{0.40 + 0.35 - 0.20}{1.00} = 0.55 \)
e) The student had black hair or blue eyes (be careful) \( \frac{0.45 + 0.40 - 0.25}{1.00} = 0.57 \)
f) Given that the student has black hair, what is the probability that they have green eyes? \( \frac{0.05}{0.45} = \frac{1}{9} \approx 0.11 \)
g) Given that the student has brown eyes, what is the probability that they have blond hair? \( \frac{0.05}{0.35} = \frac{1}{7} \approx 0.14 \)

2. Mr. Lion was doing a science fair project by surveying his class. He found that of the 30 students in the class, 3 had brown hair and blue eyes, 10 had brown hair, and 18 had blue eyes. (HINT: Draw a Venn Diagram or two-way table for this problem)

<table>
<thead>
<tr>
<th>Brown</th>
<th>Blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
</tr>
</tbody>
</table>

a) How many people had brown hair OR blue eyes? \( 7 + 3 + 15 = 25 \)
b) What is the probability that a person chosen at random has brown hair OR blue eyes? \( \frac{25}{30} \)
c) What is the probability that a person chosen at random has neither brown hair nor blue eyes? \( \frac{5}{30} \)
3. The probability that a customer orders a hamburger is 0.3. The probability that the customer orders french fries is 0.2. The probability that the customer orders both a hamburger and fries is 0.05. What is the probability that a customer orders a hamburger or french fries?

\[ P(H \text{ or } F) = P(H) + P(F) - P(H \text{ and } F) \]
\[ = 0.3 + 0.2 - 0.05 \]
\[ = 0.45 \]

4. The probability that a student likes ice cream is 0.8. The probability that a student likes French fries is 0.7, and the probability that a student likes both is 0.6. What is the probability that a student likes ice cream or French fries?

\[ P(I \text{ or } F) = P(I) + P(F) - P(I \text{ and } F) \]
\[ = 0.8 + 0.7 - 0.6 \]
\[ = 0.9 \]

5. Pat rolls a six-sided dice and flips a coin.

a) Are these events independent? Explain:

Yes, they do not have an effect on one another

b) What is the probability that he flips a heads?

\[ \frac{1}{2} \]

c) What is the probability that he lands on 6?

\[ \frac{1}{6} \]

d) What is the probability that he lands on 6 AND flips a heads?

Multiple events → means multiply!

\[ \frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12} \]

e) What is the probability that he lands on a number greater than 4 and flips tails?

\[ \frac{2}{6} \cdot \frac{1}{2} = \frac{2}{12} = \frac{1}{6} \]

f) What is the probability he lands on an even number and flips heads?

\[ \frac{3}{6} \cdot \frac{1}{2} = \frac{3}{12} = \frac{1}{4} \]

6. The probability that someone wants to vote for Larry is \( \frac{1}{2} \). The probability that someone wants to vote for Smith is \( \frac{1}{3} \). The probability that someone wants to vote for Barry is \( \frac{1}{6} \). Assume that all voting happens independently.

a) What is the probability that the first person votes for Larry and the second person votes for Smith?

\[ \frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6} \]

b) What is the probability that the first three people vote for Smith?

\[ \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{27} \]

c) What is the probability that the first person votes for Larry, the second person votes for Smith, and the third person votes for Barry?

\[ \frac{1}{2} \cdot \frac{1}{3} \cdot \frac{1}{6} = \frac{1}{36} \]