Chapter 3 Homework

**Show all work using methods discussed on the lecture notes. Correct answers without supporting work will receive no credit.**

1. In a particular college class, there are male and female students. Some students have long hair and some students have short hair. Write the **symbols** for the probabilities of the following events. (Note that you cannot find numerical answers here. Concentrate on understanding the symbols.)

   - Let \( F \) be the event that a student is female
   - Let \( M \) be the event that a student is male
   - Let \( S \) be the event that a student has short hair
   - Let \( L \) be the event that a student has long hair

   a. The probability that a student does not have long hair.
   b. The probability that a student is male or has short hair.
   c. The probability that a student is a female and has long hair.
   d. The probability that a student is male, given that the student has long hair.
   e. The probability that a student has long hair, given that the student is male.
   f. Of all the female students, the probability that a student has short hair.
   g. Of all students with long hair, the probability that a student is female.
   h. The probability that a student is female or has long hair.
   i. The probability that a randomly selected student is a male student with short hair.
   j. The probability that a student is female.

2. On February 28, 2013, a Field Poll Survey reported that 61% of California registered voters approved of allowing two people of the same gender to marry and have regular marriage laws apply to them. Among 18 to 39 year olds (California registered voters), the approval rating was 78%. Six in ten California registered voters said that the upcoming Supreme Court’s ruling about the constitutionality of California’s Proposition 8 was either very or somewhat important to them. Out of those CA registered voters who support same-sex marriage, 75% say the ruling is important to them. In this problem, let:

   - \( C \) = California registered voters who support same-sex marriage.
   - \( B \) = California registered voters who say the Supreme Court’s ruling about the constitutionality of California’s Proposition 8 is very or somewhat important to them
   - \( A \) = California registered voters who are 18 to 39 years old.

   a. Find \( P(C) \).
   b. Find \( P(B) \).
   c. Find \( P(C|A) \).
   d. Find \( P(B|C) \).
   e. In words, what is \( C|A \)?
   f. In words, what is \( B|C \)?
   g. Find \( P(C \text{ AND } B) \).
   h. In words, what is \( C \text{ AND } B \)?
   i. Find \( P(C \text{ OR } B) \).
   j. Are \( C \) and \( B \) mutually exclusive events? Show why or why not.
3. A special deck of cards has ten cards. Four are green, three are blue, and three are red. When a card is picked, its color of it is recorded. An experiment consists of first picking a card and then tossing a coin.
   a. List the sample space.
   b. Let A be the event that a blue card is picked first, followed by landing a head on the coin toss. Find P(A).
   c. Let B be the event that a red or green is picked, followed by landing a head on the coin toss. Are the events A and B mutually exclusive? Explain your answer.
   d. Let C be the event that a red or blue is picked, followed by landing a head on the coin toss. Are the events A and C mutually exclusive? Explain your answer.

4. In a box of assorted cookies, 36% contain chocolate and 12% contain nuts. Of those, 8% contain both chocolate and nuts. Sean is allergic to both chocolate and nuts.
   a. Find the probability that a cookie contains chocolate or nuts (he can't eat it).
   b. Find the probability that a cookie does not contain chocolate or nuts (he can eat it).

5. The following table identifies a group of children by one of four hair colors, and by type of hair.

<table>
<thead>
<tr>
<th>Hair Type</th>
<th>Brown</th>
<th>Blond</th>
<th>Black</th>
<th>Red</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavy</td>
<td>20</td>
<td>15</td>
<td>3</td>
<td></td>
<td>43</td>
</tr>
<tr>
<td>Straight</td>
<td>80</td>
<td>15</td>
<td>12</td>
<td></td>
<td>215</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>215</td>
</tr>
</tbody>
</table>

   a. Complete the table.
   b. What is the probability that a randomly selected child will have wavy hair?
   c. What is the probability that a randomly selected child will have brown or blond hair?
   d. What is the probability that a randomly selected child will have wavy brown hair?
   e. What is the probability that a randomly selected child will have red hair, given that he or she has straight hair?
   f. If B is the event of a child having brown hair, find the probability of the complement of B.
   g. If two different children are selected, find the probability the first has black hair and the second has brown hair.
   h. If two different children are selected, find the probability one has black hair and the other has brown hair.
   i. If three different children are selected, find the probability they all have wavy hair.
   j. Is it unusual to select three different children and they all have wavy hair? Why or why not?

6. A box of cookies contains three chocolate and seven butter cookies. Miguel randomly selects a cookie and eats it. Then he randomly selects another cookie and eats it.
   a. Draw the tree that represents the possibilities for the cookie selections. Write the probabilities along each branch of the tree.
   b. Are the probabilities for the flavor of the SECOND cookie that Miguel selects independent of his first selection? Explain.
   c. For each complete path through the tree, write the event it represents and find the probabilities.
   d. Let S be the event that both cookies selected were the same flavor. Find P(S).
   e. Let T be the event that the cookies selected were different flavors. Find P(T) by two different methods: by using the complement rule and by using the branches of the tree. Your answers should be the same with both methods.
   f. Let U be the event that the second cookie selected is a butter cookie. Find P(U).