Practice For Test 2 (Chapters 4 & 5)  
MATH 1530

Instructions. Here are some questions I have asked on previous tests.

1. A bag contains 16 red marbles, 12 white marbles, 8 blue marbles, and 4 green marbles all the same size.
   a. If one marble is randomly selected from the bag, what is the probability it is red?
   b. If one marble is randomly selected from the bag, what is the probability it is \textbf{not} green?
   c. If two marbles are drawn out of the bag with replacement, what is the probability they are both white?
   d. If two marbles are drawn out of the bag without replacement, what is the probability they are both white?
   e. If four marbles are drawn out without replacement, what is the probability of drawing out a red, white, blue, and red again (in that order)?

2. What is the probability that two randomly selected people were both born in January?

3. What is the probability that one randomly selected person was \textbf{not} born in October or November?

4. The results of a vote on a bill by 335 representatives is summarized in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Democrat</th>
<th>Republican</th>
<th>Independent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>13</td>
<td>136</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>149</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>Abstain</td>
<td>3</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

Find the probability that a random selection of one of these representatives
   a. is a Republican.
   b. voted no.
   c. is a Democrat or voted yes.
   d. is a Democrat and voted yes.

5. The probability distribution for the number $x$ of speeding tickets given out by Maryville police on a particular day is given below.

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P(x)$</td>
<td>0.125</td>
<td>0.025</td>
<td>0.200</td>
<td>0.250</td>
<td>0.025</td>
<td>0.275</td>
<td>0.100</td>
</tr>
</tbody>
</table>

   a. Find the mean and standard deviation for the number of tickets given out.
   b. Assuming that unusual values are those that are more than 2 standard deviations from the mean, would giving out 6 tickets on this day be unusual?
6. In a recent study, 3% of all lightbulbs manufactured at the E.G. Company were defective. Assuming this rate is correct, find the probability that in a random sample of 20 E.G. lightbulbs 2 of them are defective.

7. A multiple-choice test has eight questions. Each question has four possible answers. A score of 60% is required to pass the test. If you randomly guess at each question, what is the probability you pass the test? If you do randomly guess, is it likely that you will pass the test?

8. A bag contains 40 marbles all the same size. Sixteen are red, fourteen are black, and ten are white.
   a. If you blindly reach in and draw ONE marble out at random, what is the probability that you draw out a red one?
   b. Suppose you blindly reach in and draw out TWELVE marbles WITH REPLACEMENT (i.e. each time you draw one out, note its color, and then place it back into the bag). What is the probability that you get
      i. four red marbles?
      ii. less than four red marbles?
      iii. at least ten red marbles?
   c. If you did randomly select 12 marbles with replacement and got at least ten red, would you be surprised? Explain.

9. Only 20% of college freshmen know the capital of the state of Maine. If 10 college freshmen are randomly selected, find the probability that
   a. eight do NOT know the capital of the state of Maine.
   b. at least three KNOW the capital of the state of Maine.

10. A multiple choice exam has 100 questions each with four possible answers.
    a. If you were to randomly guess at each of the 100 questions, what is the mean and standard deviation for the number of questions you guessed CORRECTLY? (Hint: This is a binomial experiment.)
    b. Using the criterion that an unusual value is one that is more than two standard deviations from the mean, estimate the minimum and maximum number of questions you would expect to guess correctly in this situation.