Sample Questions from Ch 12.3, 12.4 and Ch 13 Math 216

1. If two fair dice are rolled, find the probability that the sum is 8 given that the sum is greater than 7.

2. A family has 3 children. At least one is a girl. Find the probability that only one is a girl.

3. Suppose that you have a batch of red-flowering pea plants, of which 20% are of genotype CC and 80% of genotype Cc. You pick one plant at random and cross it with a white-flowering (cc) pea plant.
   a. What is the probability that the offspring will have red flowers?
   b. What is the probability that the plant picked was CC given that the offspring was red?

4. Consider the sample space \( S = \{1, 2, 3, 4, 5\} \) and events \( A = \{1, 2, 5\} \) and \( B = \{2, 4, 5\} \). Assume \( P(1) = P(4) = .2, P(2) = P(5) = .1 \) and \( P(3) = .4 \). Are \( A \) and \( B \) independent (justify your answer)?

5. An urn contains 3 green and 9 blue balls. Two balls are drawn out. \( A \) is the event that the first ball is green; \( B \) is the event that the second ball is green.
   a. Are \( A \) and \( B \) independent?
   b. Suppose the first ball is put back before the second ball is drawn. Now are \( A \) and \( B \) independent?

6. Suppose \( X \) is a random variable with values \( \{0, 1, 2\} \). Suppose \( P(X = 0) = .4, P(X = 1) = .4 \) and \( P(X = 2) = .2 \). Find \( E(X) \) and \( \text{Var}(X) \). What are \( E(2X + 1) \) and \( \text{Var}(2X + 1) \)?

7. Let \( f(x) = kx \) on the interval \([0, 3]\).
   a. Find a value of \( k \) that will make \( f \) a probability density function.
   b. For a random variable \( X \) having this probability density function, calculate \( P(0 \leq X \leq 1) \).
   c. Calculate \( E(X) \) and \( \text{Var}(X) \).

8. Suppose \( X \) has a normal distribution with mean 2 and standard deviation 3, and \( Z \) has the standard normal distribution. Use the following table to compute \( P(-\infty < X < 8) \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P(Z &lt; x) )</td>
<td>.5000</td>
<td>.8413</td>
<td>.9772</td>
<td>.9987</td>
</tr>
</tbody>
</table>