Useful facts: The 90%, 95%, 97.5%, and 99% quantiles of $N(0,1)$ are 1.282, 1.645, 1.960, and 2.326 respectively.

1. (40 points) Circle only one most appropriate answer.

1. There are two disjoint events A and B. Are they independent?
   a. true  b. false

2. Suppose there are 7 red balls and 3 green balls in one box. We took two balls out of it without replacement. What is the probability that both balls we took are red?
   a. 7/10  b. 3/10  c. 7/15  d. 7/30

3. The expected value of a discrete random variable must be one of the values in which the random variable can result.
   a. true  b. false

4. According to a recent study, 1 in every 10 women has been a victim of domestic abuse at some point in their lives. Suppose we have randomly and independently sampled twenty-five women and asked whether they have been a victim of domestic abuse at some point in their lives. How many of the 25 women do we expect to have been the victim of domestic abuse?
   a. 2.5  b. 10  c. 22.5  d. 25

5. The probability that an individual is left-handed is 0.13. In a class of 20 students, what is the mean and standard deviation of the number of left-handers in the class?
   a. mean: 2.6; standard deviation: 1.50  b. mean: 20; standard deviation: 1.50
   c. mean: 2.6; standard deviation: 1.61  d. mean: 20; standard deviation: 1.61

6. The length of time it takes college students to find a parking spot in the library parking lot follows a normal distribution with a mean of 5 minutes and a standard deviation of 1 minute. What is the probability that a typical student will spend more than 6.645 minutes to find a parking spot?
   a. 0.05  b. 0.10  c. 0.90  d. 0.95

7. Find a value of the standard normal random variable $Z$, called $z_0$, such that $P(Z < z_0) = 0.96$.
   a. -1.645  b. 1.645  c. 1.751  d. 1.96

8. Which of the following statements is NOT a property of the normal curve?
   a. mound-shaped (or bell shaped)
   b. not symmetric about mean $\mu$
   c. $Pr(\mu - 1.96\sigma < X < \mu + 1.96\sigma) = 0.95$
   d. $Pr(\mu - 3\sigma < X < \mu + 3\sigma) = 0.997$
2. (40 points) A box contains two white, two red, and two blue chips. Two chips are randomly chosen without replacement and their colors are noted. Define the following events:
A: \{ Both chips are of the same color \}
B: \{ Both chips are red \}
C: \{ At least one chip is red or white \}
Find \( P(B|A) \), \( P(B|A^c) \), \( P(B|C) \), and \( P(C|A^c) \).

3. (20 points) The distribution of a discrete random variable \( X \) is

<table>
<thead>
<tr>
<th>x</th>
<th>( p(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>.2</td>
</tr>
<tr>
<td>1</td>
<td>.3</td>
</tr>
<tr>
<td>2</td>
<td>.5</td>
</tr>
</tbody>
</table>

a. Compute the mean and variance of \( X \).

b. Suppose \( X_1 \) and \( X_2 \) are two i.i.d. sample which are from the above distribution. Find the sampling distribution of \( \bar{X} = (X_1 + X_2)/2 \).