1. A test for drugs accurate to the following degree. If a person is using the drug, the test will be positive 80% of the time. If a person is not using the drug, the test will be negative 90% of the time. It is estimated that 5% of the population uses the drug. If a person is chosen at random and tests positive, what is the probability that they actually use the drug?

2. What is the probability of being dealt two cards of the one rank, two cards of a second rank, and one card of a third rank (called two pair in poker, such as AAKKQ) in a five card hand?

3. An urn contains 5 white balls and 15 red balls.
   a) 5 balls are drawn with replacement. Let \( Y \) = the number of white balls drawn. Find \( P(Y \leq 1) \).
   b) What are the mean and variance of \( Y \) for the situation in a)?

4. An urn contains 5 white balls and 15 red balls.
   a) 5 balls are drawn without replacement. Let \( X \) = the number of white balls drawn. Find \( P(X \leq 1) \).
   b) What are the mean and variance of \( X \) for the situation in a)?

5. Three dice are thrown. Let \( Y \) be the sum of the three upper faces.
   a) List a few elements of the sample space. Use a sample space for which all elements are equally likely. How many are in the sample space?
   b) Find \( P(Y < 17) \).
   c) If the above experiment is repeated over and over (three dice thrown each time) what is the probability that the first time a sum of 17 is obtained \( (Y=17) \) is on the 10th trial? What are the mean and variance for the number of trials it takes to obtain a sum of 4?

6. Two cards are drawn from a 52 card deck. Let A be the event that the first card is an ace, and B the event that the second card is a king.
   a) Find \( P(A) \).
   b) Find \( P(B) \).
   c) Find \( P(A \cap B) \).
   d) Are A and B independent? Explain.

7. The number of people arriving at a store during a 20 minute period has an approximate Poisson distribution with \( \lambda = 5 \). Find the probability exactly 15 arrivals during a 1 hour period.

8. The moment generating function for a random variable \( Y \) is given by

\[
(0.2e^t + 0.8)^{10}. \text{Find } E(Y) \text{ and } P(Y \geq 2).
\]