1. Identify whether or not each of the following random variables is Binomial?
   a. \(X = \) number of doubles rolled out of 4 rolls (assume fair, six-sided dice)
   b. \(Y = \) number of rolls it takes to roll 2 pairs of doubles (assume fair, six-sided dice)
   c. \(W = \) number of aces selected out of 4 draws (without replacement) from a standard deck

2. Timmy has a special penny that lands on heads with probability 0.8. He flips the penny 12 times. Let the random variable, \(X\), represent the number of times Timmy flips heads.
   a. State the distribution of \(X\). Check all relevant criteria.
   b. Calculate the probability Timmy observes...
      i. Exactly nine heads
      ii. Between six and nine heads
      iii. At least one tails
   c. Calculate \(\mu_X\) and \(\sigma_X\).

3. Consider the letters in word “STAPLER”. In how many ways can we...
   a. Rearrange all seven letters?
   b. Rearrange all seven letters such that it ends in a vowel?
   c. Rearrange five letters such that it begins with a consonant?
   d. Choose four consonants?

4. A classroom consists of 4 freshmen, 8 sophomores and 8 juniors. A committee of three students is selected. How many ways can we select a committee containing...
   a. Exactly one freshman?
   b. No juniors?
   c. All freshmen?

5. Suppose \(X \sim \text{Bin}(6, p)\) such that \(\mu_X = 2\).
   a. Calculate \(P(X = \mu_X)\)
   b. Calculate \(\text{Var}(X)\)

6. Approximately 2% of the world’s population has green eyes. A random survey of nine people is taken and their eye color recorded. We are interested in the number of people surveyed who have green eyes.
   a. Define the random variable of interest, \(Y\). What is the distribution of \(Y\)? Explain.
   b. What is the probability that at least two people surveyed have green eyes?
   c. What is the probability that none of the people surveyed have green eyes?

7. Five fair, six-sided dice are rolled. Calculate the probability that you roll...
   a. Exactly two sixes.
   b. The following sequence: 4, 6, 1, 2, 6. Why is this answer different than in part a?

8. Let \(X\) be a Binomial random variable with parameters \(n = 2\) and \(p = 0.1\). Construct a pdf and cdf for \(X\).