1. Classify each of the following random variables as finite discrete, infinite discrete, or continuous.

(a) An experiment consists of testing the bottling accuracy of a 20 ounce coke. Let \( X \) represent the actual amount of liquid in a 20 ounce bottle of coke.

(b) An experiment consists of selecting marbles without replacement from a bowl that contains 10 yellow, 13 green, and 8 red marbles. Let \( Z \) represent the number of marbles selected until a green marble is drawn.

(c) An experiment consists of selecting marbles with replacement from a bowl that contains 10 yellow, 13 green, and 8 red marbles. Let \( X \) represent the number of marbles selected until a green marble is drawn.

2. An experiment consists of flipping a fair coin 5 times. Let the random variable \( X \) represent the number of times the coin lands on heads.

(a) Find the probability distribution of \( X \).

(b) Draw the histogram for the random variable \( X \).

(c) Find \( P(X > 3) \)

3. An experiment consists of randomly selecting a sample of 4 radios out of a bin containing 30 radios, of which 6 are defective. Let the random variable \( Y \) represent the number of defectives in the sample. Find the probability distribution of \( Y \).

4. Jack and Jill decide to play a game. Jill rolls a pair of fair six-sided dice. If the sum of the numbers is less than 4, Jill pays Jack $1. If the sum of the numbers is greater than 9, Jack pays Jill $1. Otherwise, Jill pays Jack $0.50. Find the value of \( A \) that makes this game fair.

5. The weather forecaster predicts that the probability that it will rain on Friday is 0.52, and the probability that it will rain on both days is 0.25. What are the odds that it will NOT rain on either day?

6. The following is a histogram for the random variable \( X \).

(a) Find \( E(X) \).

(b) What is the mode?

(c) What is the median?

(d) What is the variance?

(e) Find \( P(X > 43) \)

7. A fair six-sided die is rolled 50 times.

(a) What is the probability of rolling a five 10 times?

(b) What is the probability of rolling a 3 at most 10 times?

(c) What is the probability of rolling an odd number between 20 and 35 times, inclusive?

(d) How many times would you expect to roll a number less than three?

(e) What is the standard deviation of the number of times you roll a number less than three?

8. A sample of two cards is randomly selected from a standard deck of 52 cards. If this experiment is repeated 20 times and the cards are replaced each time, what is the probability of getting exactly two spades at least four times?

9. An experiment consists of randomly selecting a sample of 2 coins from a bowl containing a penny, a nickel, a dime, and a quarter and observing which coins are in your hand.

(a) Give the sample space for this experiment.

(b) Find the event \( E \) where \( E \) is the event that the sum of the coins is greater than $0.11.

(c) Find the probability of the event \( E \).

10. For two events, \( E \) and \( F \), we know that \( P(E \cap F^c) = 0.2 \), \( P(F) = 0.5 \), and \( P(E \cap F) = 0.4 \). Find \( P((E \cap F^c) \cup (E^c \cap F)) \).

11. Eight freshmen, five sophomores, and twelve juniors all apply to attend a national conference. If three of these students are randomly selected to attend the conference, what is the probability that exactly two of the students have the same classification?

12. Sue’s mom is an Aggie and her dad is a Gator. She is packing her bag to go to College Station for a baseball game. Her drawer contains twelve Aggie shirts and nine Gator shirts. In packing her bag, she randomly selects five shirts.

(a) What is the probability that she packs exactly two Aggie shirts?

(b) What is the probability that the second shirt she packs is an Aggie shirt if the first shirt is a Gator shirt?

13. Let \( A \) and \( B \) be events in the sample space \( S \). If \( P(A) = 0.45 \), \( P(B) = 0.7 \), and \( P(A^c \cap B) = 0.4 \), what is \( P(A \mid B^c) \)?

14. A pharmaceutical company is in the process of researching a pregnancy test. Among those women who are pregnant, the probability that the test is positive is 0.99. However, the probability that the test will erroneously indicate that the woman is pregnant is 0.02. It is estimated that 30% of the women in this study are actually pregnant. If the pregnancy test is positive, what is the probability that the woman is actually pregnant?

15. Complete the following tree diagram and use it to answer the following questions:

(a) Find \( P(D \mid C) \)

(b) Find \( P(E) \)

(c) Find \( P(B \mid E) \)

(d) Find \( P(A \cup F) \)

16. Determine whether each statement is true or false.

(a) Given any two events \( A \) and \( B \), \( P(A \cap B) = P(A) \cdot P(B) \).

(b) The numbers 1, 2, and 3 are written separately on 3 pieces of paper. An experiment consists of drawing a sample of two slips from the bowl and observing the numbers. This experiment has 3 simple events.

(c) An experiment consists of casting two fair dice and recording the sum of the numbers appearing uppermost. The sample space for this experiment has equally likely outcomes.

(d) The sample space associated with an experiment is given by \( S = \{a, b, c, d, e\} \). The events \( E = \{a, b\} \) and \( F = \{c, d\} \) are mutually exclusive. Hence the events \( E^c \) and \( F^c \) are mutually exclusive.