

Module 18: Introduction to Discrete Probability

- 1 Three fair coins are tossed. Find each of the following
 - (a) The sample space, S
 - (b) The event, E_1 , that exactly two are tails.
 - (c) The event, E_2 , that at least two are tails.
 - (d) The probability of E_1
 - (e) The probability of E_2

- 2 A card is dealt from a well-shuffled, standard deck of 52 playing cards. Find the probability of being dealt each of the following.
 - (a) A red card
 - (b) A queen
 - (c) A club
 - (d) The queen of clubs
 - (e) A queen or a club
 - (f) Not a queen

- 3 Five cards are dealt (without replacement) from a well-shuffled 52 card standard deck. Find the probability of the following:
 - (a) being dealt 5 spades.
 - (b) being dealt 4 spades and 1 heart.
 - (c) being dealt all the same suit.
 - (d) not being dealt all the same suit

- 4 A drawer has 7 socks. 4 socks are black and 3 are white socks. John randomly pulls out 4 socks. Find the probability of the following:
- (a) all 4 socks are black.
 - (b) exactly 2 are white.
 - (c) at least 3 are white.
 - (d) at most 2 are black.
- 5 A fair six-sided dice is rolled 5 times. Find the probability of the following:
- (a) All 2's are rolled.
 - (b) Four 2's are rolled and the 5th roll is a 1.
 - (c) Not all 2's are rolled.

Module 19: Conditional Probability and Bayes' Theorem

- 6 A car dealership has created an app that will randomly select one vehicle from their inventory to show a potential customer. The current state of their inventory is shown in the following table.

Color\ Type	Sedan	Sports	SUV
Black	12	3	7
Blue	10	4	6
Red	9	9	4
White	9	5	2

- (a) What is the probability that a red sports car is shown?
- (b) What is the probability that the car shown is blue or red?
- (c) What is the probability that the car shown is black or a sedan?
- (d) The app has filters and white is chosen. What is the probability that the car shown is an SUV?
- (e) Let A be the event of showing a blue car and D be the event of showing a sedan. Are A and D independent events?
- (f) Let C be the event of showing a black car and E be the event of showing a sports car. Are C and E independent events?

- 7 Bag #1 contains 10 blue marbles. Bag #2 appears identical but contains 5 red marbles and 5 blue marbles. Suppose you randomly choose a bag and then randomly pick a blue marble. What is the probability that you choose Bag #2?
- 8 The zombie apocalypse has come. However, it's not as bad as the movies. Only 1% of the population will get infected. 90% of the people who are infected with this disease will test positive, but 5% of the people tested will have false positives (meaning the test shows positive but they are **not** infected). What is the probability that a person is infected if the test shows positive? Approximate your answer to the 4th decimal place.

Module 20: Random Variables

- 9 A hand of three cards is dealt from a well-shuffled **standard deck of 52 playing cards**. Let C denote the number of clubs in the hand.
- (a) What is the range of C ?
 - (b) What is the distribution over C ?
 - (c) What is the expected value of C and interpret this value in context?
- 10 In a certain game, a player pays \$5 to play. There is a 25% chance that the player wins and receives \$7, a 25% chance the player wins and receives \$15, and a 50% chance the player wins nothing. What is the expected outcome of this game? Round to the nearest cent.
- 11 WGU is holding a raffle to raise money for a new internet service. The tickets cost \$10 each. The value and number of each prize to be given away is listed in the provided table. Find the expected value of a ticket under the given circumstances.

Prize	Value	#
Vacation	\$3,000	1
Stereo	\$500	5
Books	\$100	10
T-shirt	\$20	100

- (a) 200 tickets
- (b) 1000 tickets