

## Math 141 Week-in-Review 8 Problem Set

1. For the following random variables, list the values that  $X$  can assume and state whether it is finite discrete, infinite discrete, or continuous.
  - (a) Let  $X$  be the number of times it takes for you to hit the bull's eye while playing darts.
  - (b) Let  $X$  be the amount of water (in liters) that a person drinks each week.
  - (c) Cards are drawn from a standard deck of cards with replacement until a king is drawn. Let  $X$  be the number of draws needed.
  - (d) Bingo numbers are pulled out of a bag without replacement until B1 is called. Let  $X$  be the number of pulls needed. (There are 75 total bingo numbers.)
  - (e) Three marbles are pulled in succession with replacement from a jar containing 3 red, 4 blue, and 5 green. Let  $X$  be the number of blue marbles pulled.
  - (f) Let  $X$  be the distance (in miles) between College Station and a student's hometown.
  
2. Two 4-sided die are rolled and the numbers are observed. Let  $X$  be the product of the numbers rolled.
  - (a) Find the sample space for this experiment.
  - (b) What values can  $X$  take on?
  - (c) Find the probability distribution for  $X$ .
  - (d) Draw a histogram of this distribution.
  - (e) What is  $P(X \geq 8)$ ?
  
3. In a bag of 20 Starbursts, it is known that 7 are orange. A sample of 5 Starbursts are selected at random from the bag. Let  $X$  be the number of oranges selected.
  - (a) Find the probability distribution of  $X$ .
  - (b) Draw a histogram for  $X$ .
  - (c) What is  $P(X < 3)$ ?
  - (d) Find the expected value of  $X$ .
  - (e) What are the variance and standard deviation for this probability distribution?
  
4. (Modified from *Finite Mathematics* by Waner/Costenoble) Data is given below showing the number of cars that are of a certain age (in years). The data was taken from a study of 2000 cars on a university campus.

Age of Car	0	1	2	3	4	5	6	7	8	9	10
Number of Cars	140	350	450	650	200	120	50	10	5	15	10

- (a) Find the mean, median, mode, variance, and standard deviation for the age of a car on this campus.
- (b) Let  $X$  be the age of a randomly selected car. Find the probability distribution for  $X$ .

5. Suppose the probability that a person likes pizza is 0.73.
- What are the odds that this person likes pizza.
  - What are the odds that this person does NOT like pizza?
6. A gambler wants to bet on a horse race. There are 6 horses entered in the race. The odds of each horse winning are given below.

Horse	A	B	C	D	E	F
Odds	1 to 19	2 to 3	1 to 3	3 to 17	1 to 9	1 to 19

- Suppose the gambler places a \$20 bet on Horse B. If Horse B wins the race, the gambler gets \$45. Otherwise, he wins nothing. What are the expected net winnings for the gambler?
  - Suppose the gambler places a \$30 bet on Horse A. If Horse A wins the race, the gambler gets \$150. Otherwise, he wins nothing. What are the expected net winnings for the gambler?
  - Suppose the gambler wants to place a bet on Horse E. He knows that if Horse E wins, he will get an amount of money equal to 3 times his bet plus an extra \$140. How much should he bet so that this “game” would be considered fair?
7. A game at a carnival costs \$4 to play. The game consists of first tossing a coin. If a tail is tossed, the game is over and you win nothing. If a head is tossed, then a tile is selected from a bag of tiles filled with a tile for every letter of the alphabet. If a vowel is selected, you win \$15. If  $w$  is selected, you win \$40. If  $l, m,$  or  $n$  is selected, you win \$5. If the dreaded  $x$  is selected, you have to pay an extra \$1. Otherwise, you win nothing. What are the expected net winnings for a person who plays this game? Is this game fair?
8. A car insurance policy covers damages from a car accident. If you get in a wreck. the insurance company pays out \$1500.
- Suppose your monthly payment is \$110 and the probability that you get in a wreck is 0.05. What is the insurance company’s expected gain?
  - Suppose that you provide an extra risk to the insurance company because the probability that you get in a wreck is 0.15. If the insurance company requires an expected gain that is greater than or equal to 0, what would be your minimum monthly payment?

Note: The following problem requires the use of Chebychev’s Inequality, which some instructors may not cover.

9. A random variable  $X$  has expected value 34 and a standard deviation of 6. Estimate the probability that a randomly chosen outcome of the experiment lies between 10 and 58.