

AMAT 362—Work Sheet 16

Dr. Justin M. Curry

Due: April 4th, 2022. Worth 20 points.

Name: _____

1. (7 points) Suppose an urn has 3 red balls and 1 green ball. Suppose I make draws with replacement until I get the green ball. Call this number of draws the random variable D .

(a) (1 point) What's the probability that $D = 1$?

(b) (1 point) What's the probability that $D = 3$?

(c) (1 point) What's the probability that $D > 3$?

(d) (2 points) What's the probability that $D > 7$ *given* the information that $D > 4$?

(e) (2 points) What's mean and standard deviation of D ?

2. (4 points) I like to compete in apple bobbing¹ competitions. Everytime I dunk my head underwater to get an apple, I have a probability of $1/5$ of successfully retrieving the apple with my teeth. I win the competition after successfully retrieving 3 apples.
- (a) (1 point) Name the probability distribution that governs the number of times I need to dunk my head to get 3 apples.
- (b) (1 point) Compute the probability that I retrieve my third apple on the 7th attempt.
- (c) (2 points) Compute the mean and standard deviation of the number of times I need to bob for apples to get 3 apples.
3. (2 points) Suppose $S_2 = X_1 + X_2$ represents the sum of two rolls of a 6 sided die. Compute the mean and standard deviation of S_2 .

¹https://en.wikipedia.org/wiki/Apple_bobbing

4. (3 points) *The Collector's Problem*—*This is a challenging problem that we will discuss in class.* When I was young, I loved the power rangers. My favorite cereal started including small action figures of the following five power rangers: The Red Ranger, The Pink Ranger, The Blue Ranger, the Yellow Ranger and the Black Ranger. Assuming there is a uniform distribution of the 5 rangers across cereal boxes. How many boxes of cereal should I expect to buy before collecting all five?
5. (2 points) Suppose only 1% of the population is over 6 feet 3 inches tall. Out of a randomly selected group of 200 people, what's the probability that at least 4 of them are over 6'3".
6. (2 points) How many raisins must cookies contain on average for the chance of the of a cookie containing at least one raisin to be at least 99%?