**Exam III Points: \_\_\_/**

MAT 135 July 23rd, 2018

Introduction to Statistics

Instructions: Take out several sheets of paper and put your name at the top of each page. Solve each of the following problems on these sheets. You may write on the test for scrap paper, but please write all of your answers on these separate sheets of paper. Follow the instructions for each problem. Staple everything together and turn in at the front desk when you are finished.

1.List the sample spaces for the following experiments:

a. Flipping three coins

*Hint: Make a tree diagram.*

b. A race with three people: Marilyn, Carolyn and Steve.

*Hint:* *What are the different ways the race could finish?*

c. Selecting two balls with replacement from a bag that contains: a red, a blue and a green ball.

2. You and Doc Brown hop into your time-traveling DeLorean and start speeding down the highway. Once you hit 88 mph, you'll create a time warp and get sent back in time to a random year between 1900 and 2000 (including 1900 and 2000).

a. What is the probability you wind up in the Eighties (1980 – 1989)?

*(Better pop your collars and put on your leg warmers.)*

b. What is the probability you'll wind up in an even numbered year?

c. What is the probability you'll wind up somewhere in the three month period from June to August during the Summer of Love in 1969?

*Hint: How many three-month periods are in a year? How many years are between 1900 and 2000? Multiply!*

3. As an avid coin enthusiast, you flip a fair coin eight times.

a. How many ways can this experiment occur?

b. What is the probability of getting no heads in eight coin flips?

c. What is the probability of getting at least 1 head in eight coin flips?

4. The Happy Meal at McDonald's comes with one of five figurines: A Red Power Ranger, a Blue Power Ranger, a Green Power Ranger, a Red Pinkie Pie and a Blue Princess Luna. The first three figurines are Power Ranger characters, while the second two are My Little Pony characters. Being a closeted MLP fan, you order a Happy Meal hoping to collect the rare Blue Princess Luna.

a. What is the probability of getting a Happy Meal that contains a blue figurine?

b. What is the probability of getting a Happy Meal that contains a My Little Pony character?

c. What is the probability of getting a Happy Meal that contains Princess Luna?

d. Given that you have gotten a happy meal that contains a blue figurine, what is the probability it is a Princess Luna?

i. Is the event of getting a blue figurine independent of the event of a My Little Pony figurine?

5. You conduct a very important survey on the FRCC Boulder campus and obtain the following results,

|  |  |  |  |
| --- | --- | --- | --- |
| *FRCC Boulder*  *Survey Results* | **Has Read *War and Peace*** | **Hasn't Read *War and Peace*** | **Total** |
| **Knows Who Kim Kardashian Is** | 27 | 105 |  |
| **Doesn't Know Kim Kardashian Is** | 53 | 35 |  |
| **Total** |  |  |  |

a. What is the probability a randomly selected student at FRCC knows who Kim Kardashian is?

b. What is the probability a randomly selected student at FRCC has read *War and Peace*?

c. What is the probability a randomly selected student hasn't read *War and Peace* or knows who Kim Kardashian is?

d. Of the people who know who Kim Kardashian is, what is the probability they have read *War and Peace*?

e. Of the people who have read *War and Peace*, what is the probability they know who Kim Kardashian is?

f. If a student has not read *War and Peace*, what is the probability they don't know who Kim Kardashian is?

6. Professor Moore keeps the answers to the final exam on his computer. After studiously observing him, you discover Professor Moore's computer password is 4 characters long and only involves lower case letters. You attempt to break into the computer by randomly typing in lower case letters. Each attempt at guessing the password is independent of your previous attempts, meaning your previous guess does not affect your current guess. However, you get locked out of the computer entirely if you input the password incorrectly more than three times.

a. How many possible passwords are there?

b. What is the probability you will succeed in one try?

c. What is the probability you will succeed in two tries?

*Hint:* *If you succeeded on the second attempt, that means you failed on the first.*

d. What is the probability you will break into the computer and get the answers to the final?

7. Archimedes, Anaxagoras, Epicurus, Euclid and Pythagoras are running a foot race to determine who is the greatest mathematician in Athens.

a. How many different ways can this race finish?

b. What is the probability Pythagoras wins the race?

*Hint:* *If Pythagoras comes in first, how many ways can the rest of the mathematicians finish?*

c. What is the probability that both Archimedes and Anaxagoras place in the top two?

8. A couple has two children. Assume the gender of each baby is equally likely to be male or female and the event of the oldest's birth gender is independent of the event of the youngest's birth gender.

a. What is the probability the couple has two girls?

b. Given that the couple has a girl, what is the probability the couple has two girls?

9. In Power Ball, 6 numbers are selected from 1 – 59 without replacement. In order to win the grand prize, a person must correctly pick all 6 numbers. Second prizes are awarded to anyone who correctly picks 5 of the 6 numbers

a. How many different ways can the Power Ball numbers be drawn?

b. What is the probability of winning the grand prize?

c. What is the probability of winning the second prize?

10. You are given the following probability distribution for the random variable **X**, the number of Star Wars references on a given MAT 135 Exam,

|  |  |
| --- | --- |
| **x** | **p(x)** |
| 0 | 0.3 |
| 1 | 0.32 |
| 2 | .2 |
| 3 | .1 |
| 4 | .08 |

a. What is the probability a MAT 135 Exam contains 2 or more Star Wars references?

b. What is the expected number of Star Wars references on a MAT 135 Exam?

c. What is the variance of the number of Star Wars references on a MAT 135 Exam?

**Extra Credit (2 pts)**

What is the probability of getting a flush in 5 Card Poker?

*Hint*: A flush is when all of the cards in a hand are of the same suit. How many suits are in a deck of cards? How many ways can you get a flush per suit?