Instructions

- This homework assignment is worth 84 points.
- Please submit a **.ipynb** and a **.R** files to Blackboard.
- **Please strive for clarity and organization.**
- **Due Date: October 1, 2021 by 11:59 pm.**

Exercise 1

(7 points) After scoring a touchdown, a football team may elect to attempt a two-point conversion, by running or passing the ball into the end zone. If successful, the team score two points. For instance football team, the probability that this play is successful is 0.40. Let $X = 1$ be a successful, $X = 0$ if not. Find the mean and variance of X.

Exercise 2

(8 points) True or False: If A and B are mutually exclusive

(a) $P(A \cup B) = 0$

(b) $P(A \cap B) = 0$

(c) $P(A \cup B) = P(A \cap B)$

(d) $P(A \cup B) = P(A) + P(B)$

Exercise 3

Let $X \sim \text{Bin}(5, 0.3)$. Find

(a) (3 points) $P(X \geq 2)$

(b) (5 points) $P(1 \leq X \leq 3)$

(c) (3 points) $P(X = 0)$

(d) (3 points) $E(X)$

(e) (3 points) $Var(X)$

Exercise 4

Lionel Messi is one of the most popular athletes in the world. Suppose that the number of goals that Messi scored during his time in Barcelona per game follows a normal distribution with a mean of 1.5 goals and a standard deviation of 1 goal. Let X denote the number of goals that Messi scores in a game. **In R**, answer the following:

(a) (3 points) Write the distribution of X.

(b) (4 points) Find the probability that Messi scores more than 2 goals in a game.

(c) (4 points) Find the probability that Messi scores less than 1 goal in a game.

(d) (4 points) Find the probability that Messi scores more than 3 goals in a game.

Exercise 5

Consider the `Curry_2016_2017.csv` and `Thompson_2016_2017.csv` data-files. These two data files contains information related to Stephen Curry and Klay Thompson statistics from the 2016-2017 NBA season. **In Python**, answer the following:

(a) (5 points) Using the `pandas` library, read both csv files into Python and create two data-frames: `curry` and `thompson`, respectively.

(b) (8 points) Using the results from Section 4.3, report the average points per game and their margin of errors of Curry and Thompson for 2016-2017 NBA season.

(c) (12 points) Estimate the margin of error of the average points per game of Curry and Thompson via simulation. Use 1000 simulations. Are these results similar to the results from part (b)?

(d) (12 points) Estimate the margin of error of the difference of average points per game of Curry and Thompson via simulation. Use 1000 simulations. Is the different in averages points per game statistical significant?