Homework 6
of
STAT 3355 Data Analysis for Statisticians & Actuaries

Due: 11:30 am

April 11 (Monday), 2022

Problem 1 (1 **point**)

Suppose we flip a fair coin 10 times. What is the probability of observing seven or more heads (Event A)? What is the probability of observing three or less heads (Event B)? Which event is more likely to happen? Show your derivations and round your numeric answer to 2 decimal places.

Problem 2 ($1 \times 3 = 3$ **points**)

Let's play the Monopoly board game. Each player needs to roll a pair of dice and move his/her game piece the same number of spaces. Suppose you rolled a pair of dice 100 times before the end of the game. Let X be the total value shown on the two dice.

- Use the function `sample()` to simulate the process (i.e. generate 100 realizations of X; before your implementation, run `set.seed(20220404)` to set the seed of R's random number generator so that the simulation can be reproduced).

- Use the function `ggplot()` to plot the histogram of those 100 values of x.

- Write down the formulae to calculate sample mean and the sample variance. Show your numeric answers by using R code and round your numeric answer to 2 decimal places.

Problem 3 ($1.5 \times 2 = 3$ **points**)

Currently, there are 52 enrolled students in STAT 3355. It is known that 13.1% of the population in U.S. are left-handed.

- Use related `d`, `p`, `q`, and `r` functions to calculate the probability that 10 or fewer left-handed students in this class?

- Use the function `ggplot()` to plot a bar chart, where x axis represents the number of left-handed students between 0 and 20, while y represent the corresponding probabilities of observation such a number of left-handed students.

Problem 4 ($1.5 \times 2 = 3$ points)

Cereal is sold by weight not volume. This introduces variability in the volume due to settling. As such, the height to which a cereal box is filled is random. Suppose the heights for a certain type of cereal box have a normal distribution with mean 12 and standard deviation 0.5 in units of inches.

- Use related `d`, `p`, `q`, and `r` functions to calculate the probability that a randomly chosen cereal box has heights of 10.7 inches or less?

- Use related `d`, `p`, `q`, and `r` functions to find the lower-quartile, median, and upper-quartile of the normal distribution used in this problem. Round your numeric answer to 2 decimal places.