Assignment in ***R*** (Due 11:59PM April 28, 2024)

For all questions, all codes, plots, results, and a summary statement must be included. Your codes must be properly documented (in R using # for comments). Points will be deducted from unnecessary print out of simulated values, such as printing out all simulated values.

Exercise from Section 1.3:

1. The yield of an undesirable side product with two different catalysts: P39, Q5. Also construct stem-and-leaf plots for both catalysts. Is there any difference between the R-generated plots and your hand-drawn plots? *(?boxplot*, *?hist*, *?stem* for details)

A mathematical puzzler from Chevalier De Mere (taken from The Cartoon Guide to Statistics, by Gonick and Smith): (use *sample* in R for random picks and permutations, *?sample* for details).

2 Which one has a higher probability? Rolling at least one six in four throws of a single die, or rolling at least one double six in 24 throws of a pair of dice?

The Monty Hall problem:

3. If you are on a game show, and you are given a chance to pick one of three doors. Behind one of the doors is a car and the rest are empty. If you randomly pick one door, and the host, who knows where the car is located, will open an empty door out of the two doors not picked. What is the probability that you will pick a winning door before the host reveals a door? What is the probability that you will pick a winning door after the host reveals a door? If you are offered a chance to switch your selection after the host reveals a door, should you take it? What is the probability of winning?

Exercise from Section 2.4:

4. The main bearing clearance (in mm) in a certain type of engine: Page. 115, Q. 20 (a, b, c and f only). How do your results compare to the ones by integration?

Exercises for Section 4.10:

5. Measurements on anti-fungal gel: P. 290, Q.8, Produce the necessary plots and summarize your conclusion. Use *qqnorm* in R for probability plot *(?qqnorm* for details).
6. Data set with measurements: P. 290, Q.10. Summarize your conclusions. Use *qqnorm* function in R for plotting.

Exercises for Section 4.12:

7. Estimate the value of π: P. 316, Q.6. Use necessary plots (histograms, scatterplots) to check your simulations, and summarize your results. Use *runif* in R for generating random numbers from standard uniform distribution. *(?runif* for details)

8. Application to mobile computer networks: P. 317, Q.7. Produce necessary plots and summarize your conclusions. Use *runif* in R for generating standard uniform random numbers.
9. Estimation of λ: P. 318, Q13 (b,c,d,e). Use plots to visualize your simulations and summarize your conclusions. Compare your simulated results to the bias and uncertainty derived (See skeleton lecture notes for Topic 6-4). Use *rexp* function in R for generating numbers from exponential distribution.

Exercises for Section 5.9:

10. The pressure of air: P. 397, Q.1. Produce necessary plots to verify your simulation and support your results. Note: use *rnorm* function in R to generate random numbers from Normal distribution. *(?rnorm* for details)