**Simulation I**

1. **Rolling Dice**

*Objective:* Create a function called *dice\_roll()* that takes no arguments and returns “You Win”, “Draw” or “You lose”.

*Functions to use:* *function()*, *if()*, *rdunif()*, and *return()*

*Explanation:* The function simulates the roll of two fair dice. Each die can take a value from one to six. If the toss adds up to a value greater than seven the house wins. If the dice add up to seven or six there is a draw. If the dice add up to less than six you win.

*Application:* Run the function five times. How many times did you win/draw/lose? Would you decide to play (not play) this game after playing it five times?

1. **Simulating Several Tosses**

*Objective:* Create a function called *dice\_roll\_results()* that takes a single argument called *times*. The function should return a vector of results obtained from the *dice\_roll()* function. The length of the vector should be *times*.

*Explanation:* The new function should call the function generated in 1). The user will provide the number of times they want to roll the dice and the function should return the results (“You Win”, “Draw”, “You Lose”) in a vector of size *times*.

Functions to use: *for(), plot(), points(), abline()*

*Application:* Use your function to estimate the probability of winning. Theoretically, you should win this game 27.78% of the times. Create a plot that illustrates how increasing the number of simulations gets you closer to the theoretical value. To do this, use 100, 200, 500, 1000, 5000, 10000, and 20000 simulations to estimate the probability of winning. Plot the probabilities in the y-axis.

1. **Casino**

Assume that 100 people arrive at the casino on average per day and accept the following gamble: An entry fee of $10,000 dollars. Each admitted person plays the game in 1) once and then leaves the casino. The casino will pay $1,000,000 to the participants (to be divided equally between the people who attended) if more than 25 win the dice roll game. Assume that the casino has no costs and only consider the revenues provided by the event.

*Functions:* *rpois(), map(), map\_dbl(), hist()*

*Explanation:* Try simulating the results. Start by simulating 100 days. Create rows (or vectors) that track the number of people that arrive, when the casino wins, when the people win, the profit per person, and the profit of the casino.

*Application:* Should the casino pursue this event or cancel it? First think about an analysis that just uses averages, what would your recommendation be?

With simulation, how much money will the casino win/lose in this event on average? How much money will the typical person win/lose on average when playing this game? How does your recommendation change (if at all)?