Matlab programming exercises: The NJ Pick Six Simulator
ME345 – Modeling and Simulation

The NJ Pick Six Lottery is a game of chance where a customer tries to choose six numbers (ranging from 1 to 49) that will be selected at random. (This sort of lottery typically involves a televised drawing using numbered ping-pong balls.) The overall goal of this assignment is to develop a Matlab code which will allow the user to simulate a large number (say 10,000) such drawings and, assuming that the customer purchases tickets with the same numbers selected each day, determine how many 'winning tickets' the customer has bought. The problem has been broken up into the parts below.

Part A1. Write Matlab code that will allow the user to *input* their 6 chosen numbers from 1 to 49. The code should check that all numbers are appropriate (between 1 and 49), and that there are six such numbers with no repeats. [Hint: the *sort* command arranges an array from smallest to largest number, and might be useful here.]

Part A2. Write Matlab code that will have the computer randomly select 6 numbers from 1 to 49. (This can be done using the *rand* command with appropriate multiplier and *floor* command.) Note that these 6 numbers should be integers, and again numbers should not be repeated. [Hint: one way to deal with the issue of repeating numbers is to choose 6 random numbers in the given range, and if one of the numbers repeats than throw out that results and re-choose 6 random numbers until a proper one is chosen.]

Part B. Compare the selections of the customer with your simulated Pick Six Lottery winners. How many numbers did the customer get correct? Which numbers were they? After the simulation develop an output display which shows the customers guess, the Pick Six results, and the numbers which were correctly guessed.

Part C1. Now expand upon the earlier code by developing the necessary structure to simulate a large number (i.e. 10,000) of random drawings (assuming the customer will pick the same numbers each night). After the drawings are finished, display the number of simulations that were run and tabulate the success of the customer (i.e. how many of their tickets had zero correct, one correct, two correct, three correct, etc.) [Hint: one my computer with the code running properly, selecting 10k 'days' of numbers and doing the computations takes approximately a few seconds; 50k 'days' takes on the order of 5 minutes. Be sure that you code works for a much smaller number (i.e. 5 days) before running a much larger simulation.

Part C2. Typically the way such Lottery games works is that one ticket costs $1, with the following payout schedule: 3 correct = $3, 4 correct = $56, 5 correct = $2700, 6 correct = JACKPOT (>$2 Million dollars). Customers are drawn by the chance to hit the JACKPOT, which rises each day that no one picks all six correct numbers; unfortunately the likelihood of doing this are statistically insignificant (almost 14,000,000:1). For your simulation, calculate the net profit/loss of the customer based on the success they had of choosing their numbers.

Part D. Finally, add the ability to read and write your results to a file. [Hint: I used the commands *load* and *xlswrite*; although you are free to use any commands you wish.] In this manner, you should be able to compile a complete history of the results of your simulation (i.e. if you run 20 simulations, with each simulation covering 10k days, what are the statistics of how many times the customer had 5 correct numbers, and what was their overall net profit/loss?

Alternative Problem: National Basketball Association (NBA) Draft Lottery. The order of selection of the NBA draft is determined by a lottery system. Here non-playoff teams from the previous year are entered into a lottery system weighted to give the teams with poorer records greater chances of having higher/earlier picks (for example, the team with the worst record may have 250 chances to receive the first pick in the draft, while the team non-playoff team with the best record may have 5 chances to receive the first pick). Similar to above, develop a code in Matlab that will allow you to simulate a large number of NBA Lotteries and determine how the various teams would be slotted in the draft. [An added complication in real-life is that the NBA now only randomly assigned the first three picks in the draft, with the remaining non-playoff teams slotted in the draft according to their record. This is a complication that you may or may not choose to incorporate in your code.]