Random Number Simulation

Objective: To create a project that will create random data holding to a theme. The data will be manipulated using python, the numpy library, and the mathplot library.

Hint: Use the example we did in class dealing with simulation of rolling a single die.

Ideas of what to simulate:

Level 1:

* 2 dice sum
* 2 dice averages

Level 2:

* Birthdays
* Cereal box

Level 3:

* Monty Hall

Specifics: You and a partner will do this project together. For a C you need to do both level 1’s. For a B you must do one Level 1 and 1 Level 2. For an A you must do one of each Level.

Summaries:

2 Dice sum: You will generate random data that will simulate the rolling of 2 dice. Manipulate this data so that you get the sum of the two dice. Store the sums into an array. Create a histogram of the sums.

2 dice averages: You will generate random data that will simulate the rolling of 2 dice. Manipulate this data so that you get the average of the two dice. Store the averages into an array. Create a histogram of the sums.

Birthdays: You will simulate a class of 30 student’s birthdays. You can assume that the birthdays are randomly distributed. The question you need to answer is: Do 2 students have the same birthday in the class. You should simulate a large number of these classes and keep track of the answer to the question. Create a Histogram that shows the number of yes’s and no’s.

(Extra Credit: Use databases found online to decide the distribution of birthdays. Not all are equally likely.

or

Deal with February 29th.)

Cereal Box: You will simulate the collecting of prizes from cereal boxes. You can assume that there is one prize per box and there are 6 different prizes. The question you need to answer is: How many boxes of cereal do I need to buy before I will get all 6 prizes. A trial is considered to be over when you get all 6 prizes. You need to simulate a large number of these trials. Compute the median and mean of the number of boxes bought for each trial and display these.

Monty Hall: You will simulate a popular game show from the past. The host gives the contestant a choice between 3 doors. 1 of the doors contains a large prize. The other 2 are nothing. Once the contestant chooses a door, the host reveals 1 of the remaining doors that does not contain a prize. (The host knows where the prize is.) They then give the contestant a choice to switch doors or keep the current door. The prize is then revealed. The question being asked is: Should the contestant switch or not. You will simulate this experience. There is no interactive capability. Use random numbers to decide on which door is picked and whether the contestant switches or not. Keep track of the data: Keep original door and win, Keep original door and lose, Switch doors and win, Switch doors and lose. Create a histogram of these 4 sets of data.