Computer Lab Project No. 4

Exploring Probabilities

Today's lab will allow us to further explore the concept of probability through the use of simulation.

1. Simulation allows you to replicate or produce data similar to the way a true physical process would behave. We can simulate the result of a birth by generating a list of 0s and 1s, 0 representing a boy and 1 representing a girl. Here are the steps to simulate 152 births:

   (a) Click Data → Simulate → Discrete Uniform.

   (b) In the pop-up window, put "152" in the text field labeled "Rows".

   (c) Put "1" in for "Columns".

   (d) Put "0" in for minimum and "1" in for maximum.

   (e) Under "Seeding", choose "Dynamic".

   (f) You may choose a name for the column (such as "boy/girl").

   (g) Click "Compute!".

   Use your simulation to estimate the probability of having a boy. Is is reasonable to expect at least 127 boys in 152 births? Why or why not? You may make a frequency distribution in order to analyze the results of the simulation.

2. Shaquille O'Neal is a professional basketball star who had a reputation for being a poor free throw shooter with a success rate of 0.528. We can simulate 200 free throws as follows:

   (a) Click Data → Simulate → Bernoulli.

   (b) In the pop-up window, put "200" in the text field labeled "Rows".

   (c) Put "1" in for "Columns".

   (d) Put "0.528" in for **p**.

   (e) Click "Compute!".

   Repeat the simulation of free throws five times and record the number of times that the free throw was made. Is the percentage of successful free throws from the simulation reasonably close to 0.528 in each case? You may use an appropriate frequency table for this. Study the sequences of hits and misses, how long is the longest run of misses? How long is the longest run of hits? Compare this with your classmates.

3. The probability of randomly selecting an adult who recognizes the brand name of McDonald's is 0.95. Conduct a simulation of size 10 and record the number of consumers who recognize the brand name of McDonald's. Is the proportion of those who recognize McDonald's reasonably close to the 0.95? Try another simulation this time with sample size 75. How do the results compare?

4. Lastly, let's consider a well know probability example called *The Birthday Problem*. Similarly to number 1 above, simulate 30 random birthdays (Hint: birthdays can be represented by whole numbers between 1 and 365). Examine your 30 simulated birthdays, how many people have the same birthday? Now perform 10 replications of simulating 30 birthdays, and estimate the probability of getting at least two people sharing the same birthday when you have 30 people. Compare with your classmates.