Name:

Simulation Practice (show work on own paper)

1.

Does power corrupt decision making? "Absolutely" according to an article in *The Economist* (January 23–29, 2010). In an experiment described by the article, a group of 15 volunteers were primed to feel powerful and then asked to roll two 10-sided dice (each having sides 0-9) and combine the results to form a number between 01 and 100 (letting 00 = 100). After rolling the dice in a secluded area, the subjects were asked to report the number they rolled. This number would determine the number of tickets they would receive for a raffle at the end of the study. The mean of their rolls was 70, much higher than the expected value of 50.5. Does this provide convincing evidence that the subjects were lying or is it plausible that they obtained a mean this high just by random chance?

(a) Design and carry out a simulation to estimate the probability that the mean value for 15 honest subjects would be at least 70, assuming that the subjects were told to roll the dice one at a time and use the first roll for the tens digit and the second roll for the ones digit.

(b) Suppose that the subjects were not told which die to use for the tens digit and which die to use for the ones digit. Design and carry out a simulation to estimate the probability that the mean value for 15 honest subjects would be at least 70, assuming that the larger die roll would be used for the tens digit.

2. State how you would use the following aids to establish a correspondence in a simulation that involves a 75% chance with each of the following:

a) a coin

b) a six-sided die

c) a random number table

d) a standard deck of playing cards

3. A couple plans to have children until they have a girl or until they have four children, whichever comes first. Assume it is equally likely to have a boy as it is to have a girl. What is the probabillity that the couple will have a girl? Use the Random Number Table below for your simulation. Run the simulation 10 times.

TABLE 1 Random Numbers

92630	78240	19267	95457	53497	23894	37708	79862	76471	66418
79445	78735	71549	44843	26104	67318	00701	34986	66751	99723
59654	71966	27386	50004	05358	94031	29281	18544	52429	06080
31524	49587	76612	39789	13537	48086	59483	60680	84675	53014
06348	76938	90379	51392	55887	71015	09209	79157	24440	30244

4. Amarillo Slim is a card shark who likes to play the following game. Draw 2 cards from a standard deck of cards (52). If at least one of the cards is a heart, you win $1. If neither card is a heart, you lose $1.

a) Describe a correspondence between random numbers and possible outcomes in this game.

b) Simulate playing the game for 20 rounds. See if you can beat Amarillo Slim.

5. Suppose a major league baseball has a current batting average of .320 where batting average = (number of hits)/(number of at-bats).

a) Describe an assignment of random numbers to possible results in order to simulate the player's next 20 at-bats.

b) Carry out the simulation for 20 repetitions, and report your results. What is the relative frequency of at-bats in which the player gets a hit?

c) Compare your simulated experimental results with the player's actual batting average of .320.

FRAP prep - Old AP problem

3. Every Monday a local radio station gives coupons away to 50 people who correctly answer a question about a news fact from the previous day's newspaper. The coupons given away are numbered from 1 to 50, with the first person receiving coupon 1, the second person receiving coupon 2, and so on, until all 50 coupons are given away. On the following Saturday, the radio station randomly draws numbers from 1 to 50 and awards cash prizes to the holders of the coupons with these numbers. Numbers continue to be drawn without replacement until the total amount awarded first equals or exceeds $300. If selected, coupons 1 through 5 each have a cash value of $200, coupons 6 through 20 each have a cash value of $100, and coupons 21 through 50 each have a cash value of $50.

   (a) Explain how you would conduct a simulation using the random number table provided below to estimate the distribution of the number of prize winners each week.

   (b) Perform your simulation 3 times. (That is, run 3 trials of your simulation.) Start at the leftmost digit in the first row of the table and move across. Make your procedure clear so that someone can follow what you did. You must do this by marking directly on or above the table. Report the number of winners in each of your 3 trials.

72749	13347	65030	26128	49067	02904	49953	74674	94617	13317
81638	36566	42709	33717	59943	12027	46547	61303	46699	76423
38449	46438	91579	01907	72146	05764	22400	94490	49833	09258