Simulation of probability NAME:

To calculate the experimental probability of an event, we perform the experiment many times and record the number of successes. When it is too time consuming or difficult to perform an experiment many times, we will simulate the experiment. The following are examples. A random number table is provided on the last page.

1. Rebecca and John are going to have ten children. Let's use random numbers to simulate their ten children and their sexes.

The true probability of having a girl is .49 or $49/100$. (It is often incorrectly assumed to be 50 %.) We will use this fact to assign the random numbers. (Source: 1996 Information Please Almanac US birth rates for 1992)

We will pick ten two-digit numbers from the random number table to represent the ten children. Out of every 100 children, 49 are girls. So we will assign the numbers 00 to 48 to be girls and 49 to 99 to be boys. This means 49 of the 100 available two-digit numbers will represent girls and 51 of the numbers will represent boys. This matches the true ratio of girls to boys.

Pick ten two-digit numbers out of the random number table. Start on line 102. Write the numbers below along with the sex that each number represents. Circle the numbers that represent girls. What is your experimental probability of getting a girl?

2. Consider a deck of poker cards. A poker deck contains four suits: diamonds, hearts, spades, and clubs. The diamonds and hearts are red and the spades and clubs are black. Each suit has thirteen cards: Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, and King. This makes a total of 52 cards. A face card will be defined to be a Jack, Queen, or King.

Consider the experiment of choosing one card from the poker deck. What is the theoretical probability that the card is a Spade?

We want to calculate an experimental probability by doing this experiment many times. However, instead of actually choosing a card from the deck over and over, we'll use random numbers to simulate it.

We'll work with two-digit numbers from the random number table. Which numbers from 00 to 99 will represent Spades? Which numbers will represent everything else?

Use your random table to simulate choosing a card 20 times. Start on line 106. Write down your 20 numbers. Circle the numbers that represent Spades. What is your experimental probability of choosing a Spade?

3. I have a bag with 10 marbles, four red, three green, and three blue. From this bag, I will select one marble. What is the theoretical probability that the marble I select is red?

Let's find the experimental probability by simulation. We will work with the ten one-digit numbers, 0 to 9. Which numbers would you assign to represent the red marbles? Which numbers represent the other colors?

Use your random number table to simulate picking a marble out of the bag 20 times. Start on line 110. Write down the numbers and circle the ones that represent a red marble. What is your experimental probability of selecting a red marble?

4. Consider the experiment of tossing two coins. What is the theoretical probability of getting at least one head?

Let's find the experimental probability of tossing at least one head. We will work with the two-digit numbers, 00 to 99. Which numbers would you assign to represent the successes? Which numbers represent the failures?

Use your random number table to simulate tossing two coins 20 times. Start on line 121. Write down the numbers and circle the ones that represent the successes. What is your experimental probability of tossing at least one head?

5. Consider the experiment of rolling two distinguishable dice. What is the theoretical probability of rolling a pair (the two dice are the same number)? (It might be helpful to consider the 36 possibilities for this experiment. How many are pairs?)

Now, write this theoretical probability as a percent, rounding to a whole number. Let's simulate this experiment 20 times. We will use the random number table. Will you look up one or two digit numbers in your table? Which numbers are you going to assign as successes and which are failures?

Use simulation to find the experimental probability when you roll the dice 20 times. Start on line 130. Write down the numbers from the table. Circle the ones that represent successes. What is your experimental probability of rolling a pair?