Simulation Steps:

Step 1: State the problem or describe the random phenomenon.
Ex: Toss a coin 10 times. What is the likelihood of a run of at least 3 consecutive heads or 3 consecutive tails?

Step 2: State the assumptions.

- A head or tail is equally likely to occur on each toss.
- Tosses are independent of each other.

Step 3: Assign digits to represent outcomes.

- One digit simulates one toss of the coin.
- Odd digits represent heads; even digits represent tails.

Step 4: Simulate many repetitions. From Line 101, read groups of 10 digits. Be sure to keep track of whether or not the event we want (a run of at least three consecutive heads or at least 3 tails) occurs on each repetition.

Here are the first three repetitions. Runs of 3 or more heads or tails have been underlined.

Digits:	1 9 2 2 3	9 5 0 3 4	0 5 7 5 6	2 8 7 1 3	9 6 4 0 9	1 2 5 3 1
Heads/tails:	HHTTH	HHTHT	THHHT	TTHHH	HTTTH	HTHHH
		YES		YES		YES

Twenty-two additional repetitions were done for a total of 25 repetitions; 23 of them did have a run of 3 or more heads or tails.

Step 5: State your conclusion. We estimate the probability of a run of size 3 by the proportion: estimated probability = 23/25 = 0.92.

Example: Frozen Yogurt Sales
Orders of frozen yogurt flavors (based on sales) have the following relative frequencies: 38% chocolate, 42% vanilla, and 20% strawberry. We want to simulate customers entering the store and ordering yogurt.

Step 1: State the problem:
Step 2: State the assumptions:
Step 3: Assign the digits:

Step 4: Simulate many repetitions:

Step 5: State your conclusions:

Is this discrimination?

A gentleman sent the following letter to the editor at his local newspaper. "The company I worked for recently laid off 10 of its sales staff, including me, due to budget cuts. But after talking with one of my former fellow workers, we both realized that 6 of the 10 people fired were older than 55, while a large proportion of the younger sales staff---who are paid less---kept their jobs. How can I find out if I have an age-discrimination case, and where can I turn for help? What the gentleman is asking is whether this can reasonably be attributed to chance. We learn from the Bureau of Labor Statistics that 24% of all sales people in the last census were 55 or older. Here is the plan. In this investigation, you will use your calculator's random number generator to conduct 20 repetitions of a simulation. Place the results in a frequency table. Then estimate the relative frequency that 6 or more sales people in a randomly selected group of 10 are 55 years old or older.

1. Let digits 1 to 100 represent the salespeople. Let digits 1 to 24 represent salespeople 55 or older, and let 25 to 100 represent salespeople younger than 55. Now randomly select 10 salespeople:
randInt(1,100,10)→L_1:SortA(L_1)

2. Look at your sample of 10 salespeople (in L_1) and count the number of salespeople 55 or older (numbers 1 to 24). Record a tally mark in the appropriate column of your frequency table.

3. Repeat steps 1 and 2 for a total of 20 repetitions (20 tally marks). It will go faster if you edit the above command to read
randInt(1,100,10)→L_1: SortA(L_1) : ($L_1 \leq 24$)→sum(L_2).
Then all you have to do is keep pressing enter and record the appropriate tally mark.

3. Where should the center of the distribution be? Where is the center of your sample?

4. Calculate the relative frequency that 6 or more of the 10 salespeople laid off are 55 or older.

6. Combine your results with those of your classmates to obtain a more accurate relative frequency. Theory tells us that, in the long run, only about 1.6 times in 100 would you see 6 or more people 55 or older out of 10 if only chance were involved. This is unlikely to happen by chance alone. The gentleman appears to have a case. Compare your relative frequency with the theoretical relative frequency of 0.016.

Number of Salespeople 55 or older	Frequency
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	