GUIDED NOTES: Creating Probability Simulations

A simulation consists of a collection of things that happen at random.

Example: ***Fifty-seven students participate in a lottery for a particularly desirable dorm. When the results are in all three winners were from the varsity team. This seems fishy... Twenty of the participants were members of the varsity team.***

Use a simulation of determine whether an all-team outcome could reasonably be expected to happen.

The component here is the selection of a student for the room.
Since there are 57 students in the drawing, let's use 1 – 57 to represent the students.
Let's use 1 – 20 represent the team members and 21 – 57 represent the rest of the students.

You may get something like this:

RandInt (1, 57, 3)
23, 51, 19
1 team members, 2 non-members
this counts as "not all team members"

OR

RandInt (1, 57, 3)
5, 19, 7
all team members
this counts as "all team members"

When you run the trial once, it gives you one possible result, but that's not enough to make a decision. It will take lots of trials to decide whether an all-team outcome would be reasonable. Let's run 10 trials and look at the results:

Trial #	Numbers	Result
1	(14) 28, 56	only one team member
2	(4) 47, 23	1
3	(19) (15) (1)	3 *
4	45, 32 (11)	1
5	(6) (18) 35	2
6	(11) 51, 23	1
7	42, 27, (20)	1
8	22, 45, 51	0
9	55, 38, 29	0
10	(6) 22, 54	1

Looking at these results, there is 1 trial out of 10 that has the room going to three team members, so the probability would be 10%. Ten trials really isn't enough to make a decision either. It usually takes several hundred trials to get an accurate picture of the situation.

After 100 trials, results could look like this:

Room Selection	*frequency*
all team members	6
not all team members	94

→ 6%.

Since the simulation shows that there is a 6% chance that the room will be filled by all team members, it is unlikely that this occurred.

You take a quiz with 6 multiple choice questions. Each question has 4 possible answers. Unfortunately, you forgot there was a quiz today, so you didn't study at all, so you have to guess at the answers. Design a simulation for this situation and determine the probability of getting at least half of the questions right.

First, figure out the probabilities we're working with.

P(guessing right) = 0.25 P(guessing wrong) = 0.75

Now we have to assign numbers to use in our simulation that will have the same ratio as these probabilities. Since there are 4 options, use the digits 1 – 4. Let one number represent the correct answer, and the other three will represent the wrong answers.

1 = right answer 2,3,4 = wrong answers

Now we will run a random integer generator to simulate one try at the quiz. Since there are 6 questions on the quiz, we need 6 numbers. Run RandInt(1, 4, 6) – this will give us 6 numbers between 1 and 4.

Trial #	Numbers	Number of Right Answers
1	(1) 3, 2, 3, 4, 2	1
2	3, 4, 4, 2, (1) (1)	2
3	4, 2, 3 (1) 3, 3	1
4	3, 3 (1) (1) (1) 4	3 *
5	(1) 3, 4, 3 (1) 2	2
6	3 (1) 3 (1) 3, 2	2
7	(1) 2, 4 (1) 3, 4	2
8	2, 4, 4, 2, 4, 3	0
9	4, 3, 3, 3, 2, 4	0
10	2, (1) 4, 3, 2, 2	1

What percentage of the trials had at least three answers correct? 10%.