

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) OR Randint (1, 57, 3)
 23, 51, 19 5, 19, 7
 1 team members, 2 non-members all team members
 this counts as "not 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 $\frac{1}{10}$ trial out of 10 that has the room going to three team members, so the probability would be $\frac{1}{10}$ or 0.1. 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

Since the simulation shows that there is a $\frac{6}{100} = .06$ or 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 questions right.

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

P(guessing right) = $\frac{1}{4}$ P(guessing wrong) = $\frac{3}{4}$

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.

$\frac{1}{4}$ = right answer $\frac{1, 2, 3}{4}$ = 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	1
5	1, 3, 4, 3, 1, 2	1
6	3, 1, 3, 1, 3, 2	0
7	1, 2, 4, 1, 3, 4	2
8	2, 4, 4, 2, 4, 3	3
9	4, 3, 3, 3, 2, 4	2
10	2, 1, 4, 3, 2, 2	1

What percentage of the trials had at least three answers correct? $\frac{1}{10}$ or 10%

What's prob of getting at least 2 ans. correct? $\frac{4}{10}$