

Simulation Station

Activities

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Simulation Station: Martha Frank, Central Michigan University
This one is by Christie LeBlanc and Karri Sanders, CMU students

Muffin Mania

Dr. Frank makes one dozen homemade blueberry muffins each week to pass out to her neighbors. She has been putting 48 blueberries in the muffin batter because she wants each muffin to have at least four blueberries in it. Why is her reasoning incorrect? What advice would you give to Dr. Frank?

Dr. Frank has a new idea. She decides to think about her muffin batter as all 12 muffins packed together. She has been studying simulation and knows that each blueberry added to the batter has an equally likely chance to end up in any of the 12 muffins. She also knows she wants each muffin to have at least 4 blueberries. To figure out how many blueberries she should add, she will make a simulation by generating random integers from 1 to 12 on her TI-73 (a TI-83 calculator will also do this). When a 1 is generated, she will add a blueberry tally to muffin 1. Similarly, when a 12 is generated, she will add a blueberry tally to muffin 12. She will continue generating random integers until all 12 muffins have at least 4 blueberry tallies, and she will add the tallies to determine the final number of blueberries. Complete this simulation to help Dr. Frank decide how many blueberries she needs to add. **When you are finished, Dr. Frank will put the stems for a stem and leaf plot on the board: add your leaf to the appropriate line on the plot.**

Muffin 1	_____	
Muffin 2	_____	
Muffin 3	_____	
Muffin 4	_____	
Muffin 5	_____	
Muffin 6	_____	
Muffin 7	_____	
Muffin 8	_____	
Muffin 9	_____	
Muffin 10	_____	
Muffin 11	_____	
Muffin 12	_____	Total blueberries _____

Dr. Frank wants to make sure every muffin gets 4 blueberries but doesn't want to wasted money. Based on the stem and leaf plot, how many should she add? Explain your reasoning.

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Too many boxes of cereal?

A cereal manufacturer includes a plastic toy in each box of SuperSugar cereal. There are 6 different toys. How many boxes of cereal will you have to buy to get a complete set of toys??

Manipulative Model: 6-sided die

Trial: Roll the die until you have rolled all 6 numbers. Keep track of how many rolls this is. Is there an upper limit on how many times you have to roll the die?

Data for _____ Trials:

of rolls: 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

#of roll, cont: 24 25 26 27 28 29 30 31 32 33 34 35 more than35

Which average is best? Mean, median, or mode? Why?

Can we do it on the TI-73?

1. Press APPS and select ProbSim. Select Roll Dice. Under “set” (zoom) select 1 six-sided die and press OK (graph). Press enter to roll one die once. Keep pressing enter and watch the bars on your histogram until you have at least one roll for each number. Press the right and left arrows to see how tall each bar is. How many rolls did you have for your trial?
2. Or you could press MATH, and then PRB and then dice(. Enter a 1 after the (and just keep pressing enter until you get all six numbers.

Can we do it on the TI-83?

1. If your TI-83+ has the ProbSim App, follow the directions in #1 above.
2. Press MATH, and then PRB and then randInt and press enter. Enter a 1, a comma, and a 6, close the parenthesis, and press enter, for one roll of a die. Keep pressing enter until you get all six numbers. Note that this also works on the TI-73.

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Simulation with RandInt on the TI-73 and TI-83

Pick any of the simulations below. Collect data (see bold type at bottom of the page) for 5 trials and pool your data with your group. Then compute the simulation answer. See the bottom of the page for how to make your calculator generate random integers.

1. Weather in Michigan: Suppose that in the month of November in central Michigan there is a 25% chance of having bad weather (rain, sleet, snow, fog, etc) on any given day. How many nice days can we expect to have the first week in November? (We have instructions for doing this simulation with Fathom, also).
2. The Speed Trap: Dr. Frank commutes from Big Rapids to Mt. Pleasant 4 days a week. She has determined that there is a $\frac{1}{8}$ chance that a state trooper will be parked behind the barn near Remus (the speed trap) on any given trip (Big Rapids to Mt. P or Mt. P to Big Rapids) at the times that she commutes. What is the probability that she makes it through an entire week without getting stopped?
3. Too Many Babies?: Mr. and Mrs. Bigfamily have decided that they will keep on having children until they have a boy. How many children can they expect to have?
4. Random Ties: Mark Mathbrain is a first-year teacher. He has 10 ties. If he chooses a tie at random to wear to work each day, what is the probability that he wears the same tie to work more than once during his 5-day work week?
5. It's a Gusher!!!: The probability that an exploratory oil well will strike oil is .20. Each exploratory well costs \$5000 to drill. How many wells can you expect to have to drill BEFORE finding oil? What is the mean cost of exploration, including the first successful well drilled?

To make your calculator generate a list of random integers between any two endpoints, decide how many random integers you want—let's say, 5. Then decide what your endpoints of the range are—let's say I want random integers from 1 through 6, so my endpoints are 1 and 6. Enter MATH, select PRB, and then arrow down to randInt(and press enter. For the example of generating 5 random integers between 1 and 6, you need the command randInt(1,6,5), so fill in the numbers and close your parentheses and then press enter to see your 5 random integers.