



Core Math Tools Simulation Lesson

Title: *Donating Blood*

Overview

In this lesson, students are presented with a situation in which random donors arrive at a blood center and we wish to determine the probability of a particular number having type B blood. In this scenario, the number of donors and the percentage of donors having type B blood are known. We want to estimate how many donors with type B blood there will be in a fixed number of donors and then determine the experimental probability. Students will investigate the scenario using the Simulation App of the Core Math Tools.

CCSSM Standards

7.SP.6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability

7.SP.8c. Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?

S-IC- 2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

CCSSM Mathematical Practices

1. Make sense of problems and persevere in solving them.
4. Model with mathematics
5. Use appropriate tools strategically.

Core Math Tools

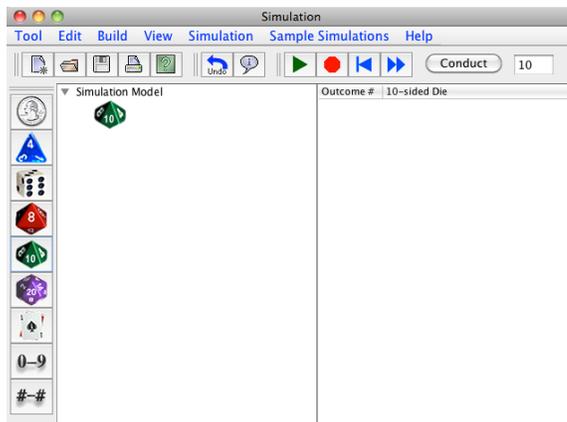
This investigation uses the Simulation App.

Instructional Plan

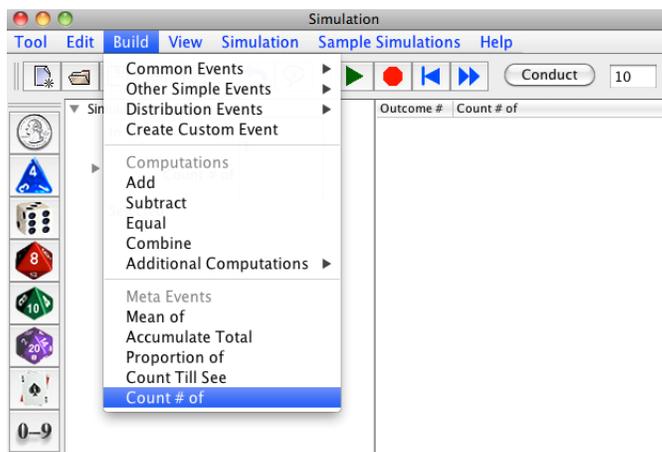
1. Introduce the donating Blood Scenario: In the United States, approximately 10% of the population has type B blood. A person with type B blood can donate blood to a person with type B or type AB and can receive blood from a person with type B or type O.
2. Present the question: If 20 donors came to a particular blood center in one day, what is the probability of at least 4 type B blood donors?
3. Discuss with your students the key components of the simulation.
 - a. Assumptions: Probability of getting a donor with type B blood is 0.10 and the blood types of the different donors are independent.
 - b. Set up a model: The model we choose must match the probability of a donor having type B blood, which is 10%.

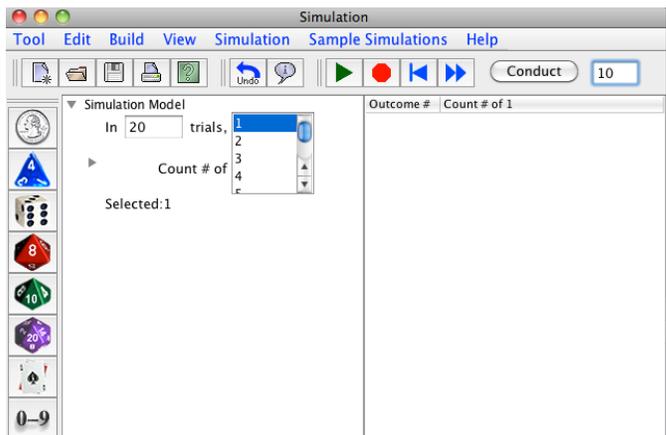


4. Ask the students to explore the features of the Simulation Tool and to find a model that they could use to match the probability of a random donor having type B blood.
5. Share with the class that one student decided to use the green 10-sided die and designate a 1 as a person with type B blood. Show the following screens. Ask the students how their models compare with this student's model.

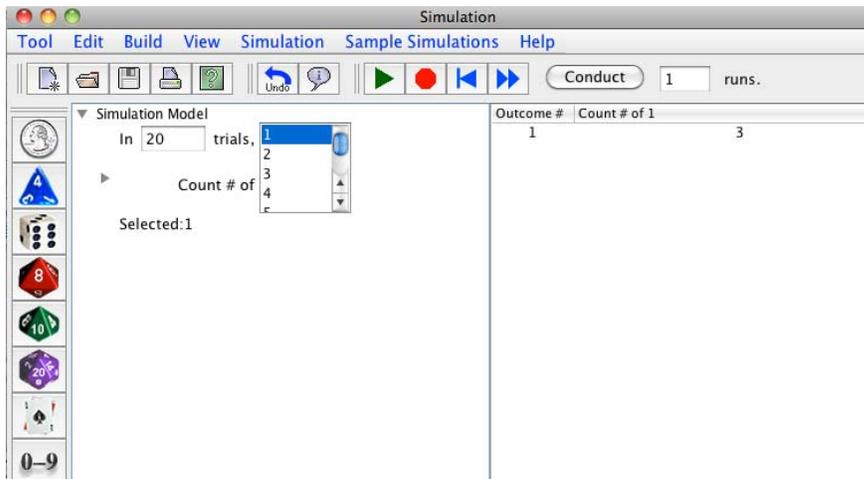


6. Now that the students have shared their models, ask them what the next step is. Share that one student decided to roll the die 20 times and count the number of 1's. Ask the students if they think this method will work and why. Also ask the students to share how they would conduct the simulation using the model that they have chosen. They should justify why their chosen model is appropriate.





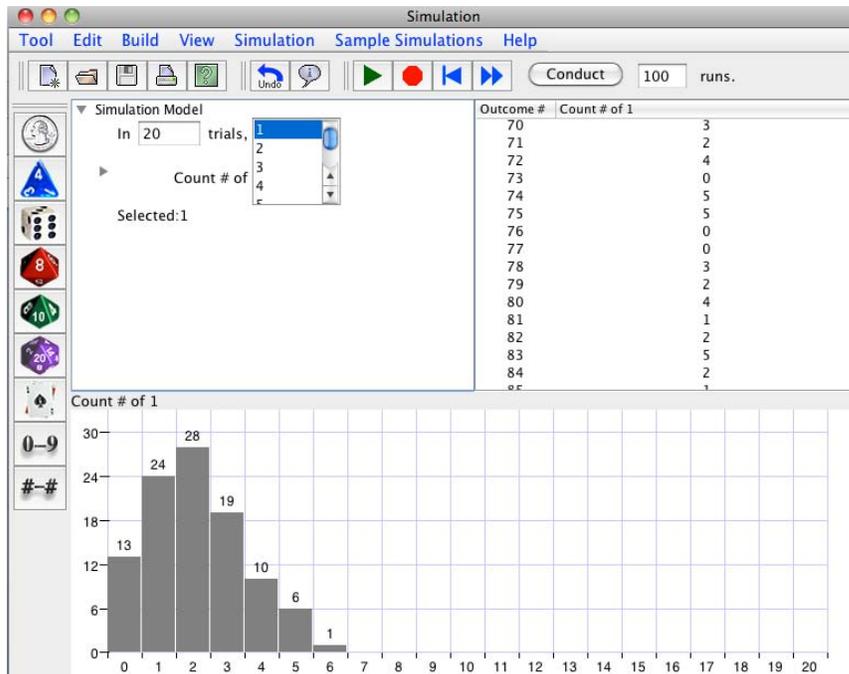
7. Share that the student conducted one trial as shown below. Ask the students what the results show. Ask them to conduct a trial using their model, share the results, and explain what the results indicate.



8. Remind the students that the question we are trying to answer is: If 20 donors came to a particular blood center in one day, what is the probability of at least 4 type B blood donors? Ask if we can answer this question having done one trial.
9. Discuss with the students that in order to answer the question we will need a large number of trials to be conducted. Have the students suggest how many trials they think should be run so that they would be fairly confident in answering the question.
10. Share that one student conducted 100 additional trials. Each trial indicates how many 1's out of 20 rolls. Ask the students how they can use the results



- from their many trials to answer the question: What is the probability of having at least 4 type B blood donors out of 20?
11. Share with the students that one student decided to view a histogram of the results. Show the students the screen with a histogram displayed. Ask the students how they could use the histogram to answer the probability question.



12. Have the students share other features of the app that could be used to find the probability of at least 4 out of 20 being 1's.
13. Have the students summarize their finding and report and answer to the probability question.
14. Have the students work in pairs to design a simulation that could help answer the following question: What is the experimental probability of at least 10 donors having type A blood out of 20 assuming that approximately 40% of people have type A blood?

Credit:

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References:

Gnanadesikan, Mrudulla, Richard L. Schaeffer, and Jim Swift. *The Art and Techniques of Simulation*. Palo Alto, Calif.: Dale Seymour Publications, 1987.

Hopfensperger, Patrick, Henry Kranendonk, and Richard L. Schaeffer. *Probability Models*. White Plains, N.Y.: Dale Seymour Publications, 1999.