

Lesson Summary

To design a simulation:

- Identify the possible outcomes, and decide how to simulate them, using coins, number cubes, cards, spinners, colored disks, or random numbers.
- Specify what a trial for the simulation will look like and what a success and a failure would mean.
- Make sure you carry out enough trials to ensure that the estimated probability gets closer to the actual probability as you do more trials. There is no need for a specific number of trials at this time; however, you want to make sure to carry out enough trials so that the relative frequencies level off.

Problem Set

1. A model airplane has two engines. It can fly if one engine fails but is in serious trouble if both engines fail. The engines function independently of one another. On any given flight, the probability of a failure is 0.10 for each engine. Design a simulation to estimate the probability that the airplane will be in serious trouble the next time it goes up.
 - a. How would you simulate the status of an engine?
 - b. What constitutes a trial for this simulation?
 - c. What constitutes a success for this simulation?
 - d. Carry out 50 trials of your simulation, list your results, and calculate an estimate of the probability that the airplane will be in serious trouble the next time it goes up.
2. In an effort to increase sales, a cereal manufacturer created a really neat toy that has six parts to it. One part is put into each box of cereal. Which part is in a box is not known until the box is opened. You can play with the toy without having all six parts, but it is better to have the complete set. If you are really lucky, you might only need to buy six boxes to get a complete set. But if you are very unlucky, you might need to buy many, many boxes before obtaining all six parts.
 - a. How would you represent the outcome of purchasing a box of cereal, keeping in mind that there are six different parts? There is one part in each box.
 - b. If it was stated that a customer would have to buy at least 10 boxes of cereal to collect all six parts, what constitutes a trial in this problem?
 - c. What constitutes a success in a trial in this problem?
 - d. Carry out 15 trials, list your results, and compute an estimate of the probability that it takes the purchase of 10 or more boxes to get all six parts.

3. Suppose that a type A blood donor is needed for a certain surgery. Carry out a simulation to answer the following question: If 40% of donors have type A blood, what is an estimate of the probability that it will take at least four donors to find one with type A blood?
- How would you simulate a blood donor having or not having type A?
 - What constitutes a trial for this simulation?
 - What constitutes a success for this simulation?
 - Carry out 15 trials, list your results, and compute an estimate for the probability that it takes at least four donors to find one with type A blood.