Extension Perform Simulations

GOAL Perform simulations to make predictions.

Key Vocabulary
- **simulation**

A **simulation** is an experiment that you can perform to make predictions about real-world situations.

EXAMPLE 1 Perform a simulation

CONCESSION PRIZES Each time you buy an item from the concession stand at a baseball stadium, you receive a prize coupon, chosen at random. There is an equal chance of winning each prize from the following list: hot dog, popcorn, peanuts, pretzel, ice cream, and small drink. About how many times must you buy an item from the concession stand before you win each prize at least once?

Solution

You can perform a simulation to answer the question.

STEP 1 **Write** each prize on a separate piece of paper. Put the pieces of paper in a container.

STEP 2 **Draw** a piece of paper from the container at random. Record the result in a table like the one shown. Put the piece of paper back in the container. Repeat until you put a tally mark in the last empty cell of the table.

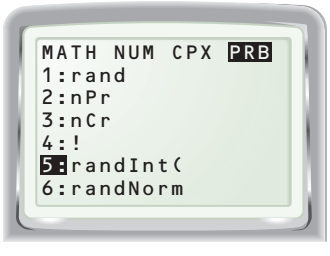
Prize	Hot dog	Popcorn	Peanuts	Pretzel	Ice cream	Small drink
Tally	𝍸	𝍸 𝍸	𝍸	𝍸 𝍸	𝍸 𝍸	𝍸

The sum of all of the tally marks is the number of times you must buy an item from the concession stand before you win each prize at least once.

▸ In this simulation, you must buy an item from the concession stand 20 times.

USING A GRAPHING CALCULATOR You can also use the random integer generator on a graphing calculator to perform simulations.

The random integer generator is found by pressing the MATH key and selecting the PRB menu. It is the fifth item on the list and is displayed as randInt(.



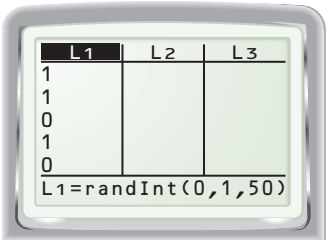
EXAMPLE 2 Perform a simulation using technology

GAME CARDS You receive a game card with every purchase at a sandwich shop. Each card has two circles to scratch. One circle reveals a prize, and the other says "Not a Winner." You cannot claim a prize if you scratch both circles. There is a $\frac{1}{6}$ chance that a card is for a CD, a $\frac{1}{2}$ chance that it is for a drink, and a $\frac{1}{3}$ chance that it is for a sandwich. About how many game cards must you scratch before you win a CD?

Solution

STEP 1 **Use** List 1 to show whether you scratch the circle with the prize. Generate a list of 50 random 1s and 0s. Each 1 means that you scratch the circle with the prize, and each 0 means that you scratch "Not a Winner."

Press STAT and select Edit. Highlight L_1. Enter randInt(0,1,50).

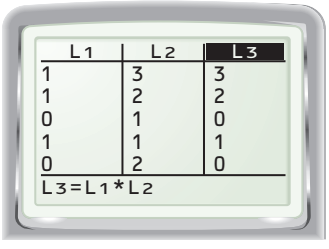


STEP 2 **Use** List 2 to show whether your game card contains the CD as the prize. Generate a list of 50 random integers from 1 to 6. Each 1 represents a prize card with a CD.

Highlight L_2. Enter randInt(1,6,50).

STEP 3 **Compare** the results of your two lists using List 3. Multiply the numbers from List 1 and List 2. Each 0 in List 3 means that you chose the wrong circle, so the prize does not matter. Because $1 \cdot 1 = 1$, you chose the correct circle *and* your card contains the CD prize when you see a 1 in L_3.

Highlight L_3. Enter $L_1 * L_2$.



STEP 4 **Find** the first occurrence of a 1 in List 3. In this simulation, you can see that the first occurrence of a 1 in List 3 happens after 4 trials.

▶ For this simulation, you must scratch 4 game cards before you win a CD.

PRACTICE

EXAMPLE 1 for Exs. 1–3

1. In Example 1, suppose you can receive a prize coupon for nachos in addition to the items listed in the example. About how many times must you buy an item from the concession stand before you win each prize at least once? *Explain* how you found your answer.

EXAMPLE 2 for Exs. 2–3

2. In Example 2, about how many game cards must you scratch before you win one of each prize? *Explain* how you found your answer.

3. In Example 2, there are 3 prizes. *Explain* why the results of the simulation would be inaccurate if you generated random integers from 1 to 3.