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USING A MODEL TO UNDERSTAND THE SCIENTIFIC METHOD

Getting hit by a meteorite—what are the odds?

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This activity helps students understand the scientific method by creating and using a model, formulating a hypothesis, collecting data, and testing predictions.

Concepts to learn

- Scientists create models to understand complex systems.

- Scientific models are simplifications of phenomena in the world.

- A globe is a model of Earth.

- Scientists formulate hypotheses, make testable predictions, collect data and make observations.

- We can estimate the probability of low-occurrence events by repeated trials.

Background

The earth receives a near-constant "rain" of space rocks or meteors entering its atmosphere. Most meteors burn up long before reaching the earth's surface; those that hit the ground are called meteorites.

How likely are you to be struck—even killed—by a meteorite in Wisconsin?

Meteorites are called *falls* when the meteorite is recovered after it is observed falling to the ground; those recovered later are *finds*. At least 13 meteorites have been found in Wisconsin since the 1860s. They ranged in size from less than 1 pound to around 530 pounds. (Read more about these finds at http://wgnhs.uwex.edu/wisconsin-geology/meteorites.)

Wisconsin meteorite finds since 1860
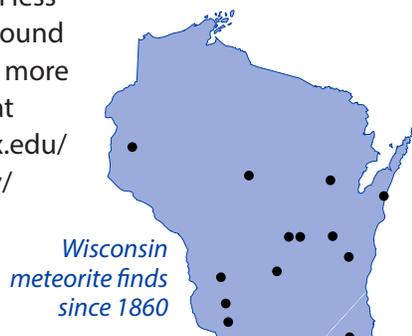
Assuming that meteorite impacts to the earth are randomly coming from space, we can design an experiment to find out how likely they are to land in specific areas of the earth.

What you will need

- Beach ball globes

- Notepad or whiteboard to tally results

- Calculator

What to do

Formulate your hypothesis

1. Are you likely to be struck by a meteorite?

2. Why do you think you will or will not?
   - Does your personal experience give you a clue?
   - Does the globe give you a clue?

3. Can you make a prediction?

4. What's your hypothesis?

Test your hypothesis

Three students are needed for each group—two to toss the globe and one to record the results.

1. Toss and catch the beach ball globe.

2. Note where your index finger is when you catch the ball (ocean, island, continent, or Wisconsin).

3. Record each result as a tally mark in a table like the one below.

4. Repeat at least 30 times.

5. Count the tallies to get the total number of falls in each area.

6. Add up the number of falls to get a total and then calculate the probability in each category.

🜨 Percent =
(falls in a given category/total falls) x 100

🜨 *Example:*
(28 falls in ocean/40 total falls) x 100 = 70%

Questions to consider

1. What is the chance of being struck be a meteorite in Wisconsin?

2. Do your results support your hypothesis?

3. Do you believe your results?

4. How could you improve the design of your experiment?

🜨 Would more repetitions make it a better experiment?

🜨 Should the globe be rotated, like Earth? Thrown faster or slower?

5. How could you improve your model?

🜨 What if the globe were more accurate?

🜨 What if the globe were larger?

🜨 Which variables make a difference? How do you know?

Explanation

This activity demonstrates formulating a hypothesis and using a model to test it. Earth's surface is 71 percent ocean and 29 percent land so the results table should reflect those proportions. Experimental design or a faulty hypothesis could lead to results different from those expected.

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Example data table

	LOCATION			
	OCEAN	**ISLAND**	**CONTINENT**	**WISCONSIN**
Tally of falls				
Subtotals				
Percent				