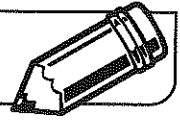


LESSON
11·5**A Boat and a Stone**

A thought experiment uses the imagination to solve a problem. Mathematicians, physicists, philosophers, and others use thought experiments to investigate ideas about nature and the universe.

One early example of a thought experiment attempts to show that space is infinite. Use your imagination to picture what is being described in the experiment below.

If there is a boundary to the universe, we can toss a spear at it. If the spear flies through, it isn't a boundary after all. If the spear bounces back, then there must be something beyond the supposed edge of space—a cosmic wall which is itself in space that stopped the spear. Either way, there is no edge of the universe; space is infinite.

Often it is impossible to investigate the situation in a thought experiment directly. This might be because of physical or technological limitations. But the thought experiment in Problem 1 can be modeled directly. Solve Problem 1, and then follow the directions in Problem 2 to model the experiment.

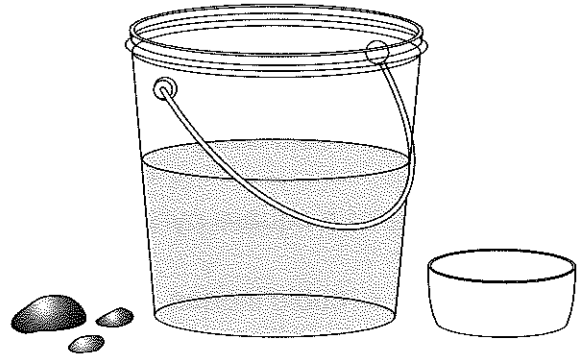
1. Imagine that you are in a small boat. There is a large stone in the bottom of the boat. The boat is floating in a swimming pool. If you throw the stone overboard, does the level of the boat on the water go up, down, or stay the same? Does the level of the water in the pool go up, down, or stay the same?

LESSON
11•5
A Boat and a Stone *continued*


2. Model the thought experiment, "A Boat and a Stone."

Materials

- bucket or clear container
- small container that floats and fits in the bucket or clear container with plenty of space all around
- several rocks water
- waterproof marker


Directions:

- a. Fill the bucket part way up with water. Make sure the water is deep enough to cover the rock.
- b. Place a rock in the small container, and float it in the bucket. If the small container sinks, try a smaller rock. If the small container tilts over into the water, try a larger rock.
- c. After the water settles, mark the height of the water on the bucket with the marker. If your bucket is clear, mark the outside. If not, mark the inside wall. Also, mark the height of the water on the outside of the small container.
- d. Take the rock out of the small container, and gently drop it into the water.
- e. Describe the changes in the height of the water on the outside of the small container.

- f. Describe the changes in the height of the water in the bucket.

- g. Do the changes agree with your thought experiment solutions? Why or why not?
