SIMPLE MACHINES
(LEVERS)

Courtesy of: PBS Kids

In this activity the Brownies will learn about levers, how to lift objects too heavy for them to lift on their own.

Materials you will need:

- fulcrum: one-inch binder clip, handles removed
- foam board strips (1" wide and 8", 14" and 20" long) with weight containers attached
- weights: marbles

Instructions

Introduce the activity

Engineers design machines to do difficult jobs. A lever is a simple machine; simple machines are tools that make work easier. They have few or no moving parts (Depending on their grade, elementary school students may be familiar with the six simple machines.) Tell the students that they have all seen levers in action: a hammer used to remove nails and seesaws on the playground, for example.

Engineers have adapted levers to move heavy objects. Tools like car jacks, bucket loaders, cranes, and hydraulic lifts are all levers. Any time you see a small object lift a large weight, you can be sure that a lever is at work.

Have the girls take the following steps

Tip: As you talk about the different parts of a lever and how they're used, use the terms fulcrum, load end, effort end, and lever arm; then the kids will, too.

1. Point out something in the room that might be lifted by a lever, such as a file cabinet, a sink, or a desk. Demonstrate a simple lever.

   Ask: What has to happen at the effort end of the lever arm to make the lever lift the load? (The lever arm needs to be pressed down, either by pushing or with weight.)

2. Divide the class into groups; have them compare the lever arm lengths of 6, 12, and 18 inches.

   Ask: How do the lengths change? What pattern do you see in the lengths? (The 12" arm is twice the length of the first; the third is three times longer).

3. Have each group set up the shortest lever on the fulcrum. Explain that they will reuse the same marbles and fulcrum to experiment with all three levers. Have kids put one marble into the cup at the effort end, and explain that this single marble represents how much downward push they will use to lift a load of marbles at the load end. Have the kids drop marbles into the load end until they make the lever tip down.

   Explain: To find the number of marbles that the lever can lift, remove one marble from the load end (the load should lift up again), then count how many marbles are in the cup.

   Ask: Do you think the other levers will lift less, more, or the same weight?

4. Repeat steps 3 and 4 for the other two levers; make a chart and record the results on a board or large paper.

   Ask: How do the numbers change? Do you see any pattern? (Doubling the lever length should – roughly – double the number of marbles you can lift.)

5. Depending on time, encourage the kids to experiment with the levers. They might try moving the fulcrum point or adding marbles to the effort end where only one marble was used before.

   Ask: How many marbles do you think you could lift with a 24-inch lever arm? How about a 36-inch lever arm? (Hint: When the 6-inch lever arm was doubled, then tripled, the lever lifted approximately double and triple the number of marbles. A 24-inch arm is 4 times the original length, and 36 is 6 times the length.) The formula may not work precisely, but kids should be able to see a pattern.

Source: Leave it to leavers – PBS Kids: http://www-tc.pbskids.org/cyberchase/parentsteachers/lessons/pdf/buildersmath/Act2_Teacher.pdf