



Student Guide: Lifting with a Lever

Summary

How can you lift a heavy object without straining your arm muscles too much? Using the power of a lever is one way. See how levers make lifting easier by using one you create with a ruler, a pencil, and a plastic bag.

Useful Vocabulary

- **Lever:** A simple machine that can be used to lift heavy objects. A common type of lever is made up of a rigid beam, a load or object that sits on one end of the beam, and a force that is applied to the other end of the beam to lift the load. Between the load and the force is a point called the fulcrum. Two examples of this kind of lever are scissors and a seesaw.
- **Fulcrum:** The point on which the lever beam rests and moves up, down, and around.
- **Force:** A physical power that can move or affect an object.

Materials

To do this activity you will need:

- Ruler (1)
- Pen or pencil (1)
- Tape (masking tape, duct tape, packing tape, or other strong tape)
- Bar of soap (in its packaging) (1)
- Pennies (about 300) or other small, numerous, identical items, such as marbles or beans
- Plastic sandwich bag with a taped hole cut in it (1)

Directions

1. Line up the long side of the bar of soap with one end of the ruler and tightly tape the soap to the ruler there. What part of the lever do you think the soap is? What about the ruler?



Figure 1. Tape the long side of the bar of soap to the end of the ruler. Make sure the soap is tightly taped on the ruler.

2. Insert the other end of the ruler into the taped hole in the plastic bag.
3. Tape the plastic bag to the end of the ruler. Make sure the bag is securely taped to the ruler, inside the bag and out, but be careful not to tape the plastic bag shut.



Figure 2. Put the other end of the ruler in the hole in the plastic bag and tape it to the bag. Make sure the ruler is securely taped to the bag, but do not tape the bag shut.

4. Tape a pencil or pen lengthwise to the edge of the table, parallel to the edge of the table.
5. Place the ruler on top of the pencil, perpendicularly, so that the soap bar is resting on the table and the bag is hanging over the side of the table. What part of the lever does the pencil represent?
6. You now have a functional lever. Move the ruler so that the bag is 6 centimeters (cm) from the pencil.
7. Slowly fill the bag with pennies, counting as you go, until the soap just barely lifts off the table and looks like it is balanced with the bag of pennies. How many pennies did it take to lift the soap?



Figure 3. Tape a pencil or pen to the edge of the table and place the ruler perpendicularly over the pencil. Rest the soap on the table, and let the bag hang over the side of the table. Slowly fill the bag with pennies until the soap lifts off the table.

8. Carefully empty the bag and move the ruler so that the bag is 12 cm from the pencil. Again, slowly fill the bag with pennies until the soap lifts off the table. How many pennies did it take to lift the soap this time? Was it half the number of pennies you used when the bag was 6 cm away? Or was it more than half? Less than half?
9. Carefully empty the bag and move the ruler so that the bag is 18 cm from the pencil. Again, slowly count pennies into the bag until the soap lifts off the table. How many pennies did it take to lift the soap this time?

You can find this page online at: http://www.sciencebuddies.org/science-fair-projects/Classroom_Activity_Student_Levers.shtml



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