

Human Levers

Overview: Levers are classified into three types: first-class, second-class, or third-class. Their class is identified by the location of the load, the force moving the load, and the fulcrum. In this activity, you will learn about the types of levers and then use your body to make each type.

Materials

- can of soup
- meter stick
- rubber band
- lemon

Experiment

1. Use the rubber band to attach the lemon to one end of the meter stick. Wrap the rubber band around so that you can easily slide the lemon down to adjust its position.
2. In a *first-class lever*, the fulcrum is in the middle. The load and effort are on opposite sides with the fulcrum between them. A familiar example of a first-class lever is a seesaw. To make one, place the soup can (fulcrum) in the middle and the lemon on one end.
3. A second-class lever has the fulcrum on one end, the load in the middle, and the force on the end opposite the fulcrum. A wheelbarrow is a good example of a second-class lever. To make one, put the soup can at one end of the meter stick with the lemon in the middle. Lift the other end of the meter stick for the effort.
4. Lastly, a third-class lever has a fulcrum on one end and the load on the opposite end. The force is applied in the middle in this type of lever. A golf club is an example of a third-class lever. To make one, push the soup can to the end and lift in the middle of the meter stick.

Reading

Your head moving up and down on your spine is an example of a first-class lever. Your neck joint in the middle is the fulcrum, with load and effort on either side. In this example, load and effort switch depending on whether you are moving your head up or down.

Standing on tiptoe is an example of a second-class lever where your toes are the fulcrum. The effort, or force, is in your heels – they are lifting your body up. And the resistance is located between your toes and heels.

This leaves us with bicep curls, which are an example of a third-class lever. Your elbow serves as the fulcrum, the bicep is the force, and the weight in your hand on the end is the load.

Just for fun, did you know your knee is the largest joint in your whole body? It connects your femur, the largest bone, to the bones of your lower leg. Your smallest joints are the anvil, hammer, and stirrup in your inner ear.

Exercises

1. Draw a diagram of a first-class lever. Where in your body is this type of lever?
2. Draw a diagram of a third-class lever. Where will you find this?
3. Draw a diagram of a second-class lever. Can you give an example of this type of lever in the real world?

Answers to Exercises: Human Levers

1. Draw a diagram of a first-class lever. Where in your body is this type of lever? (Your neck joint in the middle is the fulcrum, with load and effort on either side. In this example, load and effort switch depending on whether you are moving your head up or down. You'll also find this when you extend your elbow and lift a weight.)
2. Draw a diagram of a third-class lever. Where will you find this? (If you're sitting down and lifting a load with your legs straight out in front of you. You'll also find this in action when you swing a baseball bat at a ball or shovel snow. There is also an example of this at your foot when you stand on the tip of your toes. The axis would be at your toes, the resistance would be your leg bones (tibia), and the rest of your body and the force would be your calf muscles.)
3. Draw a diagram of a second-class lever. Can you give an example of this type of lever? (This is the most common lever in your body by far. An example would be your arm. The axis would be your elbow, the resistance is your forearm and hand, and the force would be your biceps (think arm curls). You'll also find this by doing a push up, moving a wheelbarrow, using a nutcracker, rowing the oars of a boat.)