Energy and the Physical Setting

Simple Machines, Part 6:Levers 1

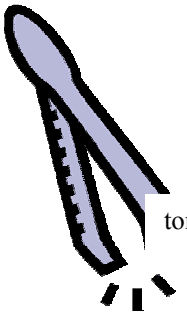
Last week we looked at the **wedge** and **screw**, examples of inclined planes. We left you with this question:

In what sense is the **screw** an example of a **lever**?

Keep that question in mind as we begin our study of levers.
There are many examples of levers in our daily lives including:

scissors (actually two levers put together)

wheelbarrow



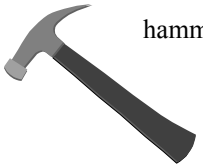
tongs

car jack

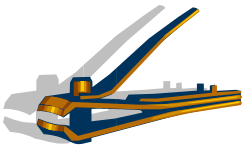
bottle opener

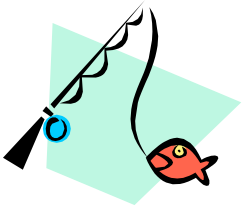
stapler

hammer



nail clipper





fishing pole

Was a shovel an example of a lever you identified? Let's begin our study of the lever by reviewing the shovel as it is used to lift a heavy rock. Remember the shovel allows you to multiply the force you exert on the rock. It is a simple machine, the lever.

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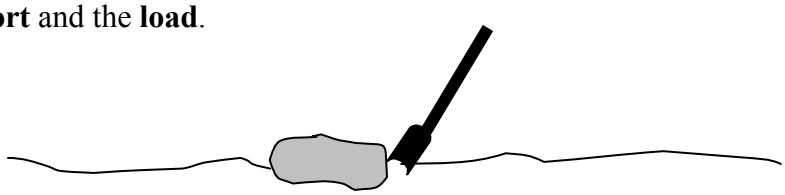
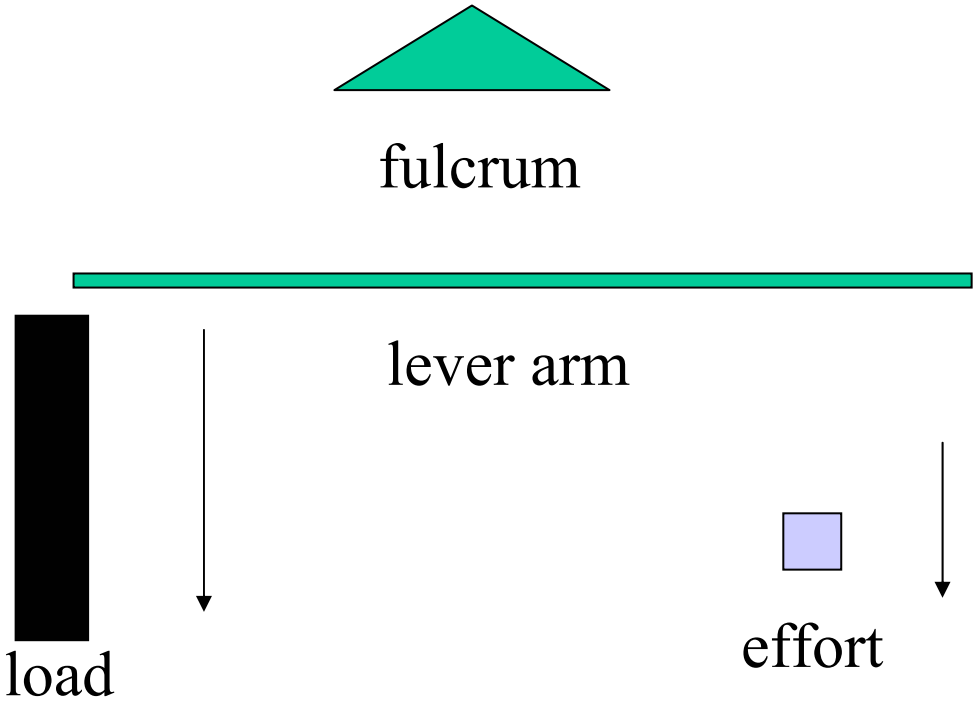
Imagine that you've got a large rock in your yard you want to remove. You stick a shovel under one end and use that to loosen and pry up the rock. The shovel is the **lever**, the point on the ground the shovel rests (supporting point) is the **fulcrum**. Your push on the *lever*, a force, is the **effort**. The rock, the thing you want to move, is the **load**. In this example, the **fulcrum** is between the **effort** and the **load**.



Drawing or Representing Levers

Levers are drawn or represented using symbols. The diagram below shows how the parts of a lever are represented. The load and effort can be represented using blocks. The forces exerted by the load and effort are represented using arrows. The length of the arrow shows the magnitude of the force. The head of the arrow shows the direction of the force.



LEVER COMPONENTS

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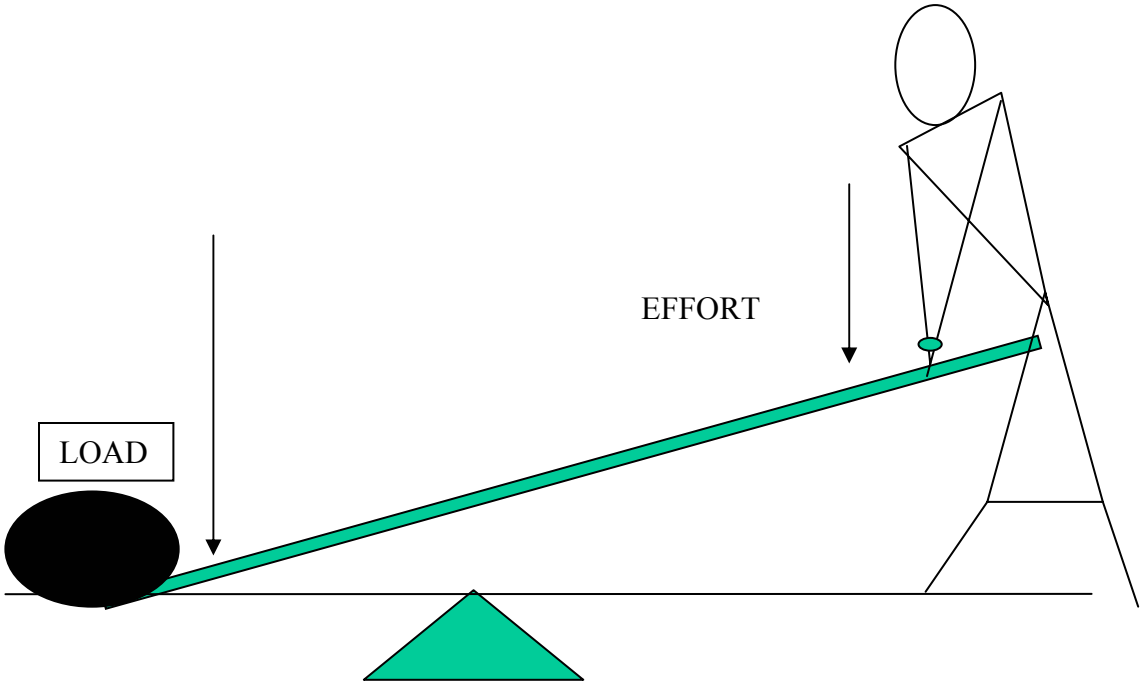
The diagram below shows a representation of a shovel lifting a heavy stone.



SHOVEL: A LEVER

Something to think about:

Can you and your students think of other real-life examples of this kind of lever? Objects that you might use around the house, perhaps? Where are the **effort**, **fulcrum**, and **load** located? Some examples you might have thought about are a hammer removing a nail, scissors cutting paper, and a jack.

Coming up

Next week we will think about the principles of levers. For each of the examples above, the hammer, scissors and a jack, sketch a diagram and try to figure out the relationship between the size or magnitude of the force exerted by effort and the load and the distance of the load and the effort from the fulcrum. That relationship is one of the principles of the lever.

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What do the NYS standards say?

In the Elementary Core Curriculum, Standard 4, The Physical Setting, one Major Understanding states:

- 5.1f Mechanical energy may cause change in motion through the application of force and through the use of simple machines such as pulleys, levers and inclined planes.

In the Intermediate Core Curriculum, Standard 4, The Physical Setting, Major Understandings state:

- 5.2f Machines can change the direction or amount of force, or the distance or speed of force required to do work.

- 5.2g Simple machines include a lever, a pulley, a wheel and axle, and an inclined plane. A complex machine uses a combination of interacting simple machines, e.g., a bicycle.

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