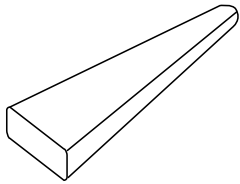


PRE-VISIT ACTIVITIES

FOR SIMPLE MACHINES FIELD TRIP



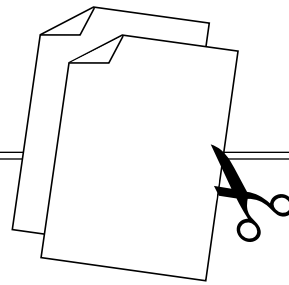
WEDGE

A **wedge** is an inclined plane that is thick at one end and tapers to a point on the other, often used to separate things.



MATERIALS

- Two pieces of paper
- Scissors



STEPS

- 1) Give each student two pieces of paper.
- 2) Have students rip paper in two with their hands.
- 3) Give students a pair of scissors. Using scissors have students cut through the paper with the scissors. Did the scissors make the job easier or harder?

WHAT'S GOING ON HERE?

The scissors should have made cutting the paper much easier. The scissor edges are wedges and when they cut into the paper they divide it. Another example of a wedge is your teeth, which are used to cut through food.

INCLINED PLANE



An **inclined plane** is a flat surface with one edge raised higher than the other.

MATERIALS

- A stack of books tied together
- A chair
- Long board
- Spring scale (note: a large rubber band can be used for a spring scale)

STEPS

- 1) Place stack of books on floor next to chair. Attach the spring scale to stack of books tied together.
- 2) Have a student lift the books using the spring scale onto the chair. How much force was used?



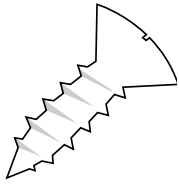
- 3) Put the board against the chair to create an incline.



- 4) Have a student pull the books up the incline using the spring scale. How much force was used? Was it easier with or without the incline?

WHAT'S GOING ON HERE?

Inclined planes are used to increase the distance over which work is done, reducing the amount of force needed. Pushing a box up a ramp requires less force than lifting it straight up off the ground.



SCREW

Screws are specialized inclined planes that are used to raise and lower things as well as hold things together. Screw tops help hold lids on tight.

HOLDING IT TOGETHER

MATERIALS

- A screw-top milk jug
- A push-top milk jug



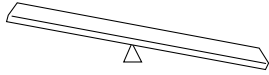
STEPS

- 1) Fill both milk jugs with water.
- 2) Place the tops on the milk jugs.
- 3) Step outside or to an area where you can make a mess.
- 4) Drop the milk jug with the push-top to the ground, what happens?
- 5) Drop the milk jug with the screw-top to the ground, what happens?

WHAT'S GOING ON HERE?

The screw top of the milk jug is tighter than the push top. When dropped to the ground, the water forces off the push-on cap, where the screw-top holds the cap in place.

LEVER

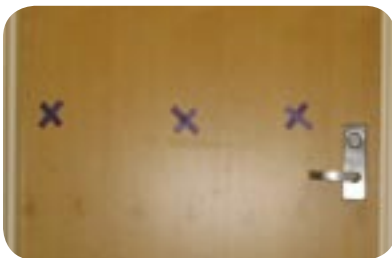


A door is a type of lever. Depending on where you push on it, it takes more or less force (effort) to move it.

MATERIALS

- Door
- Masking tape

STEPS



1) Place one piece of tape near the hinge of the door half way up the height of the door.

2) Place a second piece of tape near the door knob at the same height as the first piece of tape.



3) Place a third piece of tape in between the first and second pieces of tape making the three pieces of tape in a line.

4) Using one finger, push on the piece of tape nearest to the hinge. Is it hard or easy?



5) Using one finger, push on the piece of tape in the middle of the door. Is it hard or easy?

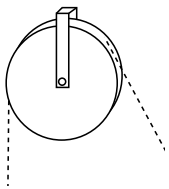
6) Using one finger, push on the piece of tape closest to the knob. Is it hard or easy?

WHAT'S GOING ON HERE?

Because the door is a lever, it pivots on a fulcrum (the hinge).

Work = Distance X Force, and because of that equation we know if we decrease the force, we have to increase the distance to get the same amount of work done. The distance is the length from the point we are pushing, from the fulcrum, and the force (effort) is pushing the door with your finger. It should have been easiest near the knob of the door, because it is the farthest from the hinge or fulcrum.

SIMPLE MACHINES PRE-VISIT ACTIVITIES



PULLEY

A **pulley** is a simple machine with one or more grooved wheels connected by a rope.

MATERIALS

- Two brooms
- Long piece of rope or twine

STEPS



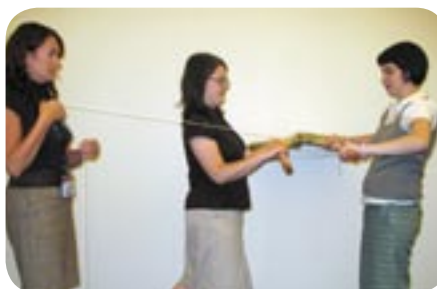
- 1) Have two students hold two brooms handles apart about 2-3 feet from each other.



- 2) Attach one end of the rope to one broom handle, thread it around the other broom handle, and back again, making a Z shape.



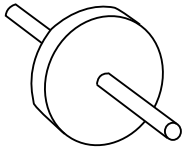
- 3) Have another student hold the free end of the rope.



- 4) Have the student holding the rope pull on the rope, while the other students hold onto the broom sticks. Observe what is happening. Is it easy or hard? Does it remind them of anything?

WHAT'S GOING ON HERE?

The brooms are acting like a pulley. The student holding onto the loose rope is acting like you would if pulling on a rope threaded through a pulley.



WHEEL AND AXLE

A wheel with a rod, called an axle, through its center: both parts move together to help us move a heavy load with less effort.

MATERIALS

- A toy car that has removable wheels and axle
- Several heavy boxes
- 2 skateboards
- Plywood (large enough to hold a heavy box or a student)

STEPS

- 1) Show students the toy car without wheels or axles. Ask one student to push the car on a table or desk. Ask students: "How well does this car move? What is missing from the car?" Make sure the students mention the missing axles as well as the missing wheels. If they don't know what the rod connecting the wheels is called, provide the word "axle."
- 2) Tell students that a wheel and axle is a simple machine that helps us move the car with less effort.
- 3) Place several heavy boxes or have a student sit on the piece of plywood. Ask another student to move the plywood forward several feet by dragging it. How difficult is it to move the plywood?
- 4) Ask students to think of an easier way to move the load. What simple machines could help? If students suggest "wheel and axle," pull out the two skateboards. Invite them to figure out how to use the skateboards to help move the load. Let them experiment until they are able to arrange the skateboards beneath the plywood and move the student or boxes on the plywood more easily.

WHAT'S GOING ON HERE?

The simplest wheel and axle has a large wheel and a cylinder that are fastened together and turn together. The wheel and axle form a kind of round lever. The center of the wheel and axle is the fulcrum of the rotating lever. As the wheel and axle rotate, the wheel moves a greater distance than the axle, but it takes less effort to move it. The axle moves a shorter distance, but it turns with greater force. Many machines use the wheel and axle to increase force.