

Energy and Motion Activity Bag

Simple Machines: Student Activity Guide

Have you ever wondered how nail clippers and scissors work? Nail clippers and scissors apply an amazing amount of force to the things they cut. You apply force to them, and they press down on your fingernails or a piece of paper - really hard. Somehow, they turn a small force from your hand into a larger one. They can do this because they are “simple machines.” They are made so that parts that move farther use less force and parts that move less apply more force. Apply a small force to a simple machine over a long distance, and the machine puts more force to something else, over a short distance. For example, push a lever a long way down with a little force, and the other end of the lever applies a lot of force to a heavy object but only lifts it a short distance.

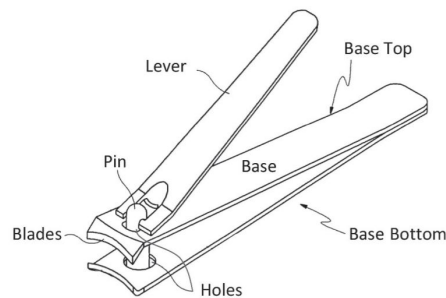
These directions will get you started. Your teacher will be in contact to guide you and provide information.

Materials From The Bag

- Nail Clippers
- Toothpick
- Tape Measure

Part 1: Exploration

First, let’s take apart the nail clippers. With the lever up, squeeze the base (**not the lever**) with your thumb on the bottom of the pin. Push until the blades close. You’ll see the pin notch rise above the base and the lever get loose. With the base squeezed shut and blades closed, use your other hand to work the lever free. When the lever is free, the pin will fall out.



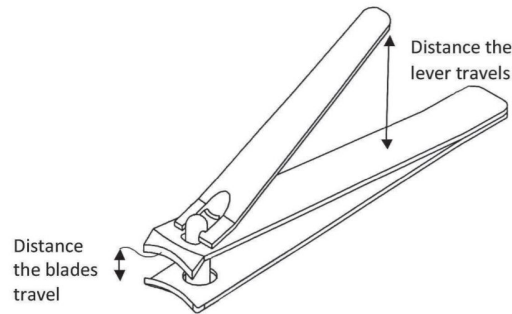
1. Draw the nail clipper base in your notebook.
2. Using only the base, try to cut a toothpick.
3. On your drawing label the point where you pressed to try to cut the toothpick. Also, point out the part of the clipper that applied force to the toothpick.
4. Reassemble the nail clippers. To do this push the pin through the holes. Hold the base in one hand with your thumb on the pin bottom and squeeze the base to close the blades. Again, the pin notch will rise above the base. The lever has a small square hole at one end. Hook the outer edge of that hole into the pin notch. Release pressure on the base and line up the lever so you can use the clippers. If you need help, watch this YouTube video: <https://www.youtube.com/watch?v=hXVfPtewN1M>
5. Draw your assembled clipper in your notebook.
6. Use the nail clippers to cut a toothpick.
7. On your drawing, label where you pressed to cut the toothpick and where the clippers applied force to the toothpick.

Write down as many differences as you can think of between the way the clipper worked as one piece, and the way it worked completely assembled.

Part 2: What makes them work

Now, we will look at how the assembled clipper makes it easier to cut the toothpick.

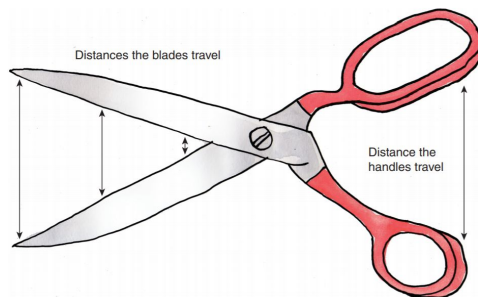
1. Use your ruler and measure the distance, in millimeters, that the blades travel from completely open to completely closed. Write that number beside the blades on your diagram of the clippers.
2. Measure the distance, in millimeters, that the lever travels from the point where the blades are completely open to the point where the blades are completely closed. Measure the lever from the end farthest away from the pin. Write that number beside the lever on your diagram.



What do you notice about the two measurements? Write a rule in your own words about what allows the clippers to apply a greater force.

Scissors Extension

1. With a pair of scissors, try cutting a toothpick from three different places on the scissors: at the tip of the blades, in the middle of the blade, and right next to the joint.
2. Draw the scissors in your notebooks and label the three points where you cut the toothpicks with easier, harder, hardest. *Describe anything you notice that is similar between the ways that these two tools cut.*
3. Using a pencil, make marks on the scissor blades at each of the three points where you cut.
4. Open the scissor's blades as far as they will go, and measure the distance the blades travel from all the way open to all the way closed at each of the three points you marked. Write the numbers on your drawing.
5. Measure the distance the scissors handles travel from all the way open to all the way closed. Write that number on your drawing next to the scissors handles.



What similarities do you see between the measurements of the scissors and the clippers? What do these similarities tell you about what makes the items press harder? Look around your home and locate a simple machine with a lever. Explain how that lever works.