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How can machines affect our lives? @

Imagine you are living thousands of years ago before there is any technology. Your job is to get something that is stuck under a big rock. The rock is so heavy it is difficult to move on your own. You find a long, strong stick to use as a tool. How would you use it?

A **machine** is a tool that can make work easier. Sometimes, machines and other tools can do things our body cannot do on its own. The stick works like a machine. You can put one end of the stick under the rock and push down on the other end to lift the rock off the ground. Some machines are so simple you probably don't even realize they are machines. Door handles, hammers, seesaws, wheelbarrows, and the wheel and axle on a car are all machines.

- (P) In pairs, discuss these questions.
- 1 What machines do you think make your lives easier?
- 2 Which machines do you use every day?
- 3 If you could invent a machine, what type of machine would you invent?
- 2. Read the first paragraph again. In pairs, discuss other ways to solve the problem.

Word Box machine

Lesson 1

What are simple machines?

1. Read the text and identify the simple machines mentioned in it. Make a list in your notebook.

Simple Machines

Simple machines have few or no moving parts. They work on a simple principle: you put in force at one end, and a stronger force comes out the other end. Try pulling a nail out of wood with your fingers. Then try doing it with a claw hammer. The claw hammer magnifies the force on the nail and makes the work easier.

There are six different kinds of simple machines that help you do work.

The **inclined plane**, or ramp, is a flat, slanted surface that connects a lower level to a higher level. It's much easier to carry or push a heavy load up a long ramp than it is to lift it up vertically.

The **lever** is a machine with a straight plane, like a board or bar, that pivots on a fixed point—the **fulcrum**. When you push down on one end, the other end lifts up. A lever increases your input force, helping to lift and move things. There are three types, or classes, of levers. They differ depending on the position of the object being lifted (the **load**), the pivot point (fulcrum), and the **effort** (force used to push down or up).



effort





How do simple machines work?

The **wheel and axle** is made up of a round object—a wheel—which is attached to a rod, called an axle. The wheel and axle works in two basic ways. You can turn the wheel to turn the axle.

With a doorknob, the turning of the axle with the wheel unlocks the mechanism inside the door. Or, you can apply force to the axle, which then turns the wheel.



load

The gear, a type of wheel and axle, is a wheel with teeth that turns a second, similar wheel.

The **wedge** is a triangular-shaped tool made of two inclined planes. It is thick on one end and slopes to a thin or sharp edge on the other end. Wedges are used in many ways.

The **screw** is an inclined plane wrapped around a rod. The thread on a screw is the inclined plane. Screws can be used to move objects, like an earth drill, or hold them together, like a wood screw.

force

The **pulley** is a wheel with a **groove** and a **rope** that fits into the groove. You can tie the load to one end of the rope and pull down on the other end. The downward force turns the wheel and pulls the load upwards on the other end. Pulleys change the direction of the force. How does the pulley move the load in the picture?

axle

2. You need to move a heavy box. Design and draw a tool to help you move it. In pairs, share and describe your tool.

Word Box

wheel and axle wedge screw pulley groove rope

wheel





3. (P) In pairs, read the first part of the text and discuss the title question. Then read the rest of the text to check your answer.

What is work?

Machines can make work easier. But what is **work**? You might think that getting good grades at school is hard "work," but to a scientist, work only occurs when a force is applied to an object, causing the object to move. The measure of work you do depends on how much force you apply and the amount of movement of the object. You may push against a large, heavy rock with all your strength, but it is not work if the rock does not move. You only do work when you move an object over a distance.

4. Label the pictures with the correct names of simple machines. In pairs, describe how work occurs in each case.



The Great Pyramid of Giza

Over 3,000 years ago, the Egyptians built the Great Pyramid of Giza. The pyramid contains around two million stone blocks that weigh between 2 and 70 tons! The Egyptians didn't have the tools or technology we have today. So how did they do it? They used simple machines, such as the inclined plane, levers, and the wheel and axle. The stones were placed onto wooden sleds using levers. The wooden sleds had wheels and axles, making it easier to transport the stones up dirt ramps on the sides of the pyramid.

6. Underline the simple machines that were used to build the Great Pyramid of Giza. In pairs, explain how they were used.







What are complex machines?

1. Look at the picture of the can opener and complete the sentences with words from the box.

wedge wheel and axle lever

Complex Machines



Scissors are another example of a complex machine. They are composed of two simple machines, which multiply the force on the object to be cut. What are the simple machines? How do these machines help make scissors work?

2. Label the parts of the scissors with *lever* or *wedge*. Then explain how these simple machines work together to cut.



3. List three complex machines you have used or seen this week.

disc used



5. In pairs, describe how each simple machine in the bicycle works. Then read the text and check your ideas.

Bicycles

Bicycles are complex machines made up of many simple machines. An important feature of a bicycle is its wheels, which rotate on an axle. To move the wheels, a force needs to be applied to them. The force is applied using a pulley system. The bicycle chain is wrapped Word Box brakes handlebars belts blades

around a pulley, which turns and causes the wheels to turn on their axles. The force applied to the chain comes from pushing down on the pedals of the bicycle. The pedals work as levers, magnifying the force from your legs into the pulley system. **Brakes** and **handlebars** are levers, too. Handlebars make it easy to turn the front wheel. The wider the handlebar, the easier it is to make small turns.

- 6. (P) In pairs, decide which simple machines work together inside a lawn mower. Give reasons for your answer.
- 7. Read the text below and check your ideas from Activity 6.

Lawn mowers are made up of different parts. Some of these parts are simple machines, such as the wheel and axle. A lawn mower has two wheels and axles which help you push it over the grass. Screws are used to hold the lawn mower pieces together. Inside the lawn mower, there are pulleys. When you turn on the lawn mower, the **belts** on the pulleys move. Sharp wedges (**blades**) can then cut the grass.