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Understanding Simple Machines

What is a machine? At first, you may think of something very large, like an airplane. The word machine also makes us think of very complex structures, such as computers. You may be surprised to find out that machines can also be very simple. **A machine can be defined as any tool that makes work easier.** In fact, something as small and easy to use as a hammer is a machine. Even your elbow is a kind of machine!

The big, powerful tools that we call machines are usually made up of many smaller parts called **Simple Machines**. Scientists agree that there are six kinds of simple machines. These are the lever, inclined plane, wheel and axle, screw, pulley, and wedge. Now we will talk more about each of these machines and how they make work easier.

A **lever** can be described as a straight rod that rests on a single point, like a see-saw. Levers are used to move or lift heavy loads. They have three parts: the load, the fulcrum, and the effort. The support that the lever rests on is called the fulcrum. In this picture of a see-saw, the fulcrum is the triangle in the middle. The person pushing off the ground represents the effort. He is applying energy to make the seesaw move. The person being lifted on the other end of the seesaw is the load. He is the weight that is being lifted or moved.

The fulcrum does not have to be in the middle, so levers come in many forms. For example, a wheel barrow is a lever. The fulcrum of a wheel barrow is the wheel. The load is the bucket where the heavy item is carried. The effort is at the handles, where a person can lift the wheel barrow up. Other examples of levers include shovels, bottle openers, and nutcrackers.

An **inclined plane** is a slanted surface, like a ramp, that connects one level to a higher or lower level. It is used to move heavy items up or down. For example, it takes a lot of effort to lift a heavy object straight up, so workers learned to push larger objects up ramps. Using an inclined plane usually takes longer than lifting an item straight up, but requires much less force.

Inclined planes do not always have a smooth surface. They can be a set of platforms that gradually get higher. Stairs are a kind of inclined plane, because they allow us to move along a slanted surface to go up or down.

A **wheel and axle** is a simple machine that consists of a wheel with a rod through its center. If the wheel turns, so does the axle. If the axle turns, so does the wheel. For example, the wheels of a car are attached to axles. When the axles turn, the wheels turn to move the car forward.

A wheel and axle is most often found as a smaller part of a larger machine. It is used to move or turn other parts. However, there are some very small machines that also use a wheel and axle to work. Mechanical pencil sharpeners, doorknobs, and electric mixers are just a few.

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Understanding Simple Machines (Cont'd)

A **Screw** is a simple machine used to lift loads or press objects together. To understand how a screw works, picture an inclined plane that wraps around a pole over and over again from top to bottom. If a screw is placed against a piece of wood and turned, the inclined plane will dig deeper and deeper into the wood. To lift objects, a screw is turned and the load slowly rises up the post.

You already know about the screws we use to build or attach things. But we use this simple machine in more ways than you think. Even a jar lid follows an inclined plane around the rim of the jar to screw into place!

A **Pulley** is a wheel that is grooved so a rope can fit around it. Pulleys allow us to move objects up, down, or sideways with very little effort. Pulling on a rope tied to a heavy object takes a lot of energy. But if the rope goes through a pulley, it's like having an extra muscle to help. The more pulleys you add, the less work you have to do to move the object. With enough pulleys, you could lift an elephant just by tugging lightly on a string!

Examples of pulleys you may use include flagpoles and mini-blinds. Cranes and tow trucks also use pulleys to move heavy loads.

A **Wedge** may be the simplest of the simple machines. It has at least one slanting side and is used to cut or move objects apart. Wedges are often described as two inclined planes stuck together, and can be thick, like a doorstop, or thin, like a knife.

One of the most common examples of a wedge is an axe. When you swing an axe, the very sharp edge digs into the wood and drives it apart. This narrow part of the axe is actually the thinnest side of a wedge. Other examples of wedges include pins, nails, paint scrapers, and snow plows.

Summing Up

As you can see, the world all around you is full of millions of simple machines. These machines can work together or alone to make our lives easier. Simple machines require no electrical power or engines to work, and have very few or no moving parts. They are some of the world's oldest inventions. As long as man has had work to do, he has used simple machines. Even though scientists and engineers continue to build bigger and faster tools, we will still turn to simple machines to get the job done!

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Understanding Simple Machines Questions

Read the questions below and circle the letter of the correct answer.

1. What is a simple machine?
 - a. A tool that gives electricity to other machines
 - b. A machine that does only one job
 - c. Any tool that makes work easier
 - d. A machine that is made up of many smaller parts
2. How many kinds of simple machines do scientists identify?
 - a. 7
 - b. 6
 - c. 4
 - d. 2
3. Which of the following is NOT a simple machine?
 - a. Engine
 - b. Lever
 - c. Screw
 - d. Inclined plane
4. A lever is supported on a single point. What is this point called?
 - a. Axle
 - b. Fulcrum
 - c. Rod
 - d. Wedge
5. You need to lift a piano to the third floor. Which simple machine would not work?
 - a. Pulley
 - b. Lever
 - c. Inclined plane
 - d. Wedge

Read the sentences. Fill in the blanks with words from the word bank.

WORD BANK					
Load	Inclined Plane	Screw	Pulley	Wedge	Wheel and Axle

1. A _____ is a simple machine used to attach or press objects together.
2. An escalator moves people up or down a slanted surface. It is an example of a _____.

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Understanding Simple Machines Questions (Cont'd)

3. A _____ is a simple machine with one slanted edge that can be very sharp.
4. The three parts of a lever are the fulcrum, effort, and _____.
5. A _____ is a simple machine with two parts that turn together to move loads.
6. More than one _____ can be used to lift a heavy load up, down, or sideways.

Read the name of each tool in the list on the left. Decide what kind of simple machine it is and write the correct letter in the blank.

___ Playground slide

A. Lever

___ Drill

B. Inclined Plane

___ Chisel

C. Wheel and Axle

___ Bike

D. Screw

___ Shovel

E. Pulley

___ Clothes line

F. Wedge

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Understanding Simple Machines Answers

Multiple Choice

1. C
2. B
3. A
4. B
5. D

Fill in the blank

1. A Screw is a simple machine used to attach or press objects together.
2. An escalator moves people up or down a slanted surface. It is an example of an inclined plane.
3. A wedge is a simple machine with one slanted edge that can be very sharp.
4. The three parts of a lever are the fulcrum, effort, and load.
5. A wheel and axle is a simple machine with two parts that turn together to move loads.
6. More than one pulley can be used to lift a heavy load up, down, or sideways.

Matching

B. Playground slide/Inclined Plane

D. Drill/Screw

F. Chisel/ Wedge

C. Bike/ Wheel and Axle

A. Shovel/ Lever

E. Clothes line/ Pulley