



# Exploring 4-H at Home



Science and  
Technology

**Pillar:** Science & Technology

**Project:** 4U Self Determined

**Activity:** Machines



CANADA  
4-H Saskatchewan

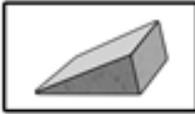
**4U Self  
Determined**

Reference and Activity  
Guide

# Machines

Simple machines are mechanical devices that make work easier by changing the magnitude, the direction or the distance and speed of a force. Our ancestors used simple machines to make their life easier, to solve everyday problems they encountered and to build incredible things, such as Stonehenge.

There are six types of simple machines. You can read more about them below:

| Machine   | Description   |
|---|---|
|  <p>Lever</p>            | <p>Levers have two parts: a fulcrum and a bar. A fulcrum is the point on which a bar rests or is supported. The use of a lever involves three things: the load that we're trying to move; the effort or force we are applying; and the fulcrum where the lever pivots. The closer a load is to the fulcrum, the less effort (or force) required to lift the load. Stone Age societies used levers to pry rocks from the ground or unearth edible roots and plants. In modern society, firefighters need to know which mechanism would be appropriate when rescuing people. A lever can be used to pry open a stuck car door.</p> <p>Examples: bottle opener, hammer</p>   |
|  <p>Pulley</p>          | <p>Pulleys are grooved wheels that are on an axle. Pulleys differ from the wheel and axle, in that they are designed to support the movement of a rope or cable around the pulley's circumference. As early as the eighth century BC, the Sumerians, Babylonians, Hittites and other peoples from the Middle East used a fixed pulley system to pull buckets of water from wells. Archimedes was believed to have used a series of fixed and moveable pulleys, called compound pulleys, or block and tackle, to launch a ship by himself.</p> <p>Examples: window blinds, flagpoles</p>   |
|  <p>Inclined Plane</p> | <p>Inclined planes are slanted surfaces. They can be used for raising or lowering a load. How much help an inclined plane provides will depend on just how high an object needs to move vertically – the higher the object needs to move, the longer the inclined plane needs to be in order to minimize the amount of force required to move the object. Ancient Romans built causeways and sloping roads to help navigate their hilly cities and transport items between towns. Ancient Egyptians built and used inclined planes, levers and wedges to assist in building the pyramids.</p> <p>Examples: slide, wheelchair ramp</p>   |
|  <p>Wedge</p>          | <p>A wedge can be considered a portable inclined plane. A wedge is used to separate two objects, such as an axe for splitting wood, or to lift or hold an object in place, like a doorstop. They consist of two inclined planes placed back to back. Egyptians were very clever in their use of wedges when it came to cutting stone. They would insert wooden wedges into natural cracks in a rock and then pour water over the wooden wedge. The water would cause the wedge to expand, pushing the rock apart. They would repeatedly insert larger and larger wooden wedges and keep dousing them with water until finally the stone would crack in two. Wedge tools are still used today but they are more commonly made from metal. They come in all shapes and sizes and have many different functions. There are small wedges like axes and knives, and large wedges like airplane wings and bulldozer blades.</p> <p>Examples: shovel, doorstop</p> |

|   |   |
|---|---|
|  <p style="text-align: center;">Screw</p>          | <p>A screw is actually a very thin and narrow inclined plane wrapped around a cylinder. Inclined planes can help movement in a straight line; screws can aid movement in a circular direction. Screws were invented by the ancient Greeks who first combined the screw with a lever to develop a “screw press” that squeezed oil or juice from olives and grapes. Screws can have two functions. The first is to help hold things together, for example, keeping doors in their frames and desks from collapsing. The second function is to lift up and out. This function is commonly seen in farm machinery, and the device is referred to as an auger. Augers move the harvested crop up to the top of the machine and deposit it into a truck.</p> <p>Examples: Jar or bottle tops, auger</p> |
|  <p style="text-align: center;">Wheel and Axel</p> | <p>A wheel and axle is a special type of lever comprised of two parts: the wheel and a rod inserted in the center of the wheel called the axle. Wheels can reduce friction and provide leverage. A small amount of force can be applied to the wheel which turns it around a longer distance and magnifies the original applied force. When the axle is turned, this will rotate the wheel faster which is what happens with an accelerating bicycle.</p> <p>Examples: toy car, wagon</p>   |

## Create your own catapult!

Using things you can find around your house, build three different catapults and test them to see which one can throw a ping pong ball the farthest.

If there is a group of you together, make it a challenge to see who can make the best one!

Materials you can use include:

- Popsicle sticks
- Pencils
- Elastics
- Clothespins
- Spoons

What type of simple machine is a catapult?

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Why are catapults used?

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