

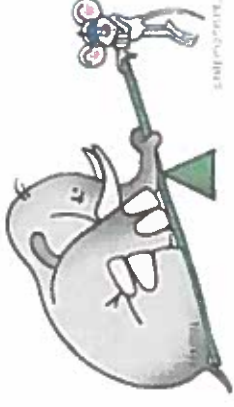
PHYSICS 11

SIMPLE MACHINES



Machines are tools that help people do work more easily. In physics, you do work anytime you use force to move an object. Skateboards, cars, bikes, shovels, boats, doors, light switches, and stairs are all machines.

Simple machines are the most simple tools. There are six of them:



Simple Machine	Sketch	Examples
		• • •
		• • •

Simple Machine	Sketch	Examples
		• • •
		• • •
		• • •

Simple Machine	Sketch	Examples
		<ul style="list-style-type: none"> • • •

➤ In the space below draw a cartoon of the Kent using all six simple machines. Label each machine.

SIMPLE MACHINES MAKE WORK EASIER BY:

CHANGING THE DIRECTION OF A FORCE. When you raise a flag on a flagpole, you pull down on a rope wrapped around a pulley to raise the flag up.

CHANGING THE DISTANCE OF A FORCE. Imagine you need to move a heavy box up to the second story of a building. It'd be easier to carry it up an inclined plane (like a set of stairs) than to throw it straight up. But as you move the box up the stairs, it travels a longer distance than if you threw it straight up.

CHANGING THE STRENGTH OF A FORCE. A bottle opener is a lever. You can apply a weak force to pull the bottle opener up over a long distance and it exerts a short but strong force on the bottle cap.

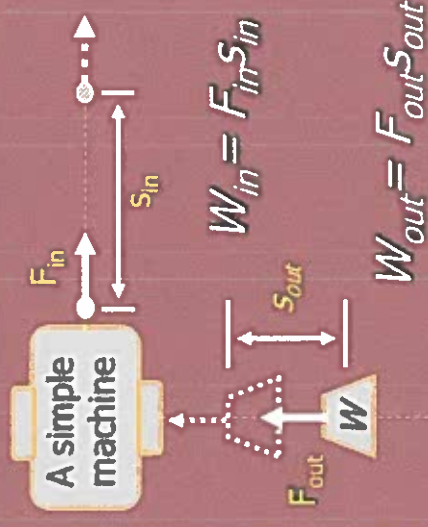
Simple machines make work easier, but they don't lessen the work done. While they can change a force, they don't add to a force. There's always a TRADEOFF. If distance is gained, then the strength of the force lessens. If strength is gained, the distance a force travels lessens.

Simple machines need energy or a power source to work. In many cases, you supply the energy to apply a force by pushing or pulling, but energy can come from gasoline or electricity, too. All of these are INPUT FORCES. The machine's reaction or effect is the OUTPUT. The input and output, the total amount of energy, always remain the same.

A bike is a machine that makes getting somewhere easier (and more fun!) but it doesn't make getting there less work. You still have to pedal or push, and sometimes you have to push hard. But together, machines and people can get across town — or build boats and construct skyscrapers!

A Simple Machine

In a simple machine, **input work** is done by the application of a single force, and the machine does **output work** by means of a single force.



Conservation of energy demands that the work input be equal to the sum of the work output and the heat lost to friction.

Important definitions:

➤ **Work**

➤ **Energy**

➤ **Load**

➤ **Effort**

➤ **Mechanical advantage**

➤ **Compound (complex) machine**