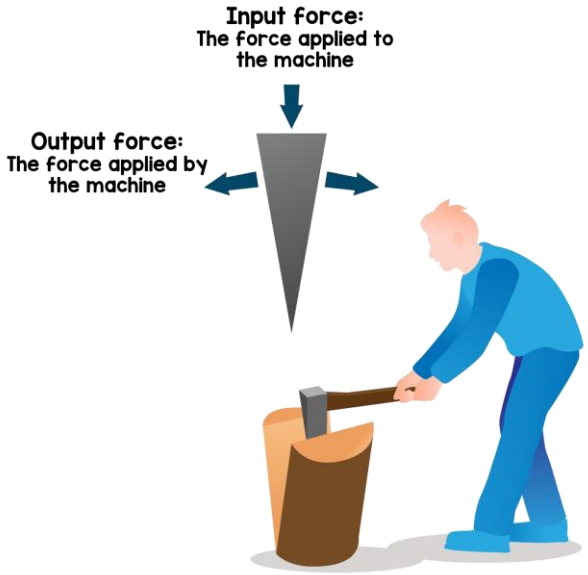
Energy, Work, & Simple Machines

Section 4: Using Machines



A **machine** is a device that makes it easier to do work. We use machines to build, lift heavy loads, and move things faster. Machines make work easier by changing the applied force, or the **input force**, or changing the force applied by the machine called the **output force**. Machines make work easier in three ways. Work is made easier by increasing the force that can be applied to the object; work is made easier by increasing the distance over which a force can be applied; work is made easier by changing the direction of an applied force.

The **mechanical advantage** is the amount of help a machine provides in doing work. It's the ratio of the output force to the input force. The mechanical advantage of a machine without friction is called the **ideal mechanical advantage**.

$$\text{Mechanical advantage} = \frac{\text{output force (in newtons)}}{\text{input force (in newtons)}}$$

$$MA = \frac{F_{out}}{F_{in}}$$

Efficiency is the amount of work put into a machine that is changed into useful output work by the machine. A machine is made more efficient by reducing friction. For example, adding a lubricant to a surface like oil or grease makes surfaces able to slide past each other more easily.

Review:

1. How do machines make work easier?
2. Compare input force to output force.
3. Explain efficiency.