

**CONCEPT** Mechanical advantage is the ratio of output to the input force. It can also be described as the ratio of load to the effort applied. This force amplification obtained by the use of simple machines to raise higher loads with less effort is called Mechanical Advantage.

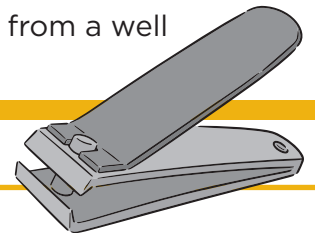
## EXAMPLE

The lever is a movable bar that pivots on a fulcrum attached to or positioned on or across a fixed point. The lever operates by applying forces at different distances from the fulcrum, or pivot. The motion of the lever's end-point describes a fixed orbit, where mechanical energy can be exchanged. As the lever pivots on the fulcrum, points farther from this pivot move faster than points closer to the pivot.

## REAL WORLD CONNECTIONS

Simple machines require mechanical advantage; the only way to get output work is to do input work. We use the following simple machines in our everyday lives:

- Using a ramp to load heavy objects onto a truck
- Using an axe (wedge) to cut a tree
- Playing on a seesaw (lever)
- Using a wheel & axle to drive & ride a bike for motion
- Using a screw to attach to new table
- Using a pulley to draw water from a well



## FORMULAS

The mechanical advantage for a simple machine such as a lever is:

$$\text{MECHANICAL ADVANTAGE} = \frac{\text{LOAD}}{\text{EFFORT}}$$