

Mechanical Advantage

Some machines make work easier than others do because they can increase force more than other machines can. A machine's **mechanical advantage** is the number of times the machine multiplies force. In other words, the mechanical advantage compares the input force with the output force.

Calculating Mechanical Advantage

You can find mechanical advantage by using the following equation:

$$\text{mechanical advantage (MA)} = \frac{\text{output force}}{\text{input force}}$$

For example, imagine that you had to push a 500 N weight up a ramp and only needed to push with 50 N of force the entire time. The mechanical advantage of the ramp would be calculated as follows:

$$MA = \frac{500 \text{ N}}{50 \text{ N}} = 10$$

A machine that has a mechanical advantage that is greater than 1 can help move or lift heavy objects because the output force is greater than the input force. A machine that has a mechanical advantage that is less than 1 will reduce the output force but can increase the distance an object moves.

Figure 4 shows an example of such a machine—a hammer.