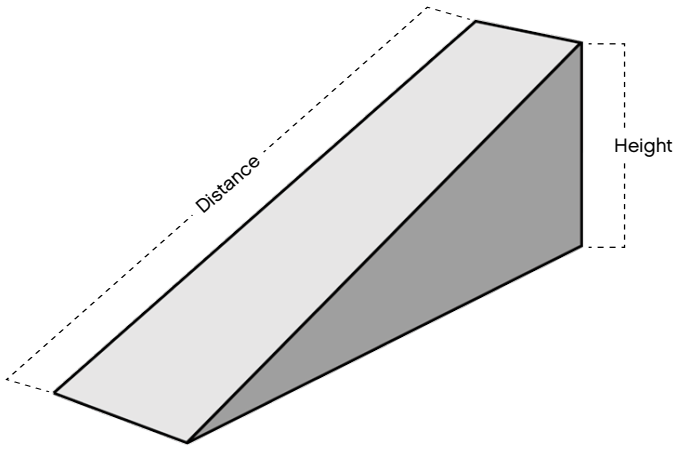
education

Inclined Plane

Student Worksheet

Simple Machines: Inclined Plane

An inclined plane is a slanted surface used to raise objects, e.g. a ramp.



Using an inclined plane to raise an object to a given height, the object must be moved a longer distance, but with less effort needed, than if the object was to be raise straight up.
It's a trade-off either to use a lot of effort to raise a given load a short distance straight upwards or to apply much less force to raise it gradually over the longer distance of an inclined plane.

Common examples of inclined planes are ramps, ladders and stairs.

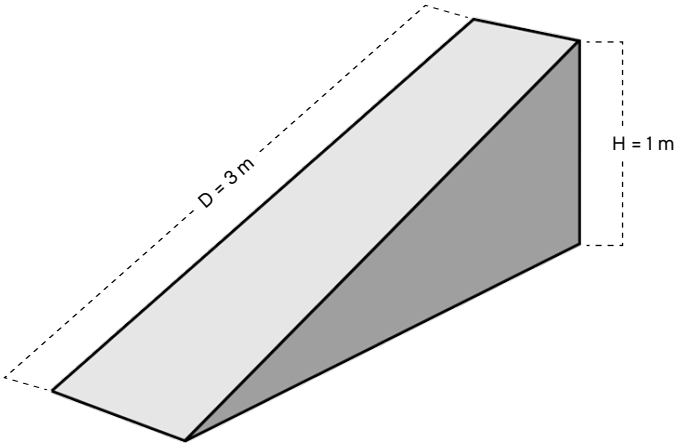
Did you know?
The advantage of using an inclined plane has been known and used for thousands of years. The ancient Egyptians used inclined planes made of earth to ease the transport of their giant stone blocks to the top of the pyramids.

The mechanical advantage of an inclined plane

The mechanical advantage of an inclined plane describes the relationship between the length of the slope and the height of the inclined plane.

The mechanical advantage can be calculated using the following formula:

$$\text{Mechanical advantage} = \frac{\text{Distance load travels}}{\text{Height load is lifted}}$$



$$\text{Mechanical advantage} = \frac{3\text{ m}}{1\text{ m}}$$

$$\text{Mechanical advantage} = 3$$

Did you know?
The mechanical advantage of straight vertical lift will always be 1. Meaning you would have to raise the entire load without any kind of mechanical advantage.

Calculating the effort needed to raise a known load can be done using this formula:

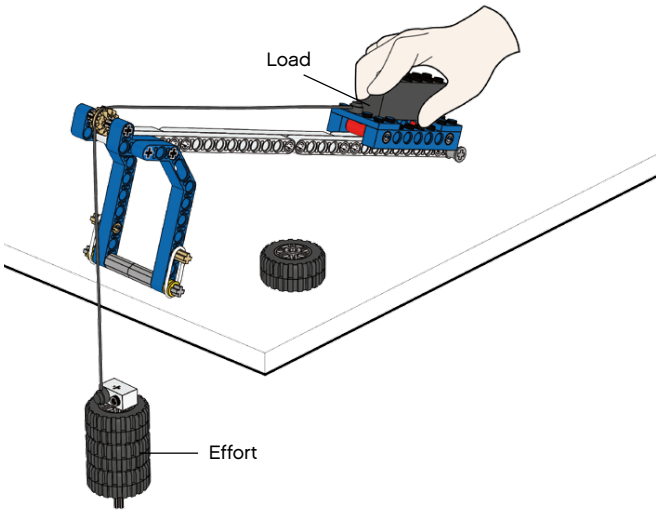
$$\frac{\text{Load}}{\text{Effort}} = \frac{\text{Distance}}{\text{Height}}$$

Calculating the effort needed to move a load is also simple in theory. But in practice friction between the load and the surface of the ramp can affect the effort forces greatly.

D1

Build D1 book II, pages 2 to 12

Calculate the mechanical advantage. Then let go of the load. Explain what happens and why.



D2

Build D2 book II, pages 13 to 15

Calculate the mechanical advantage. Then let go of the load. Explain what happens and why.