

## Mechanical Systems

We use machines to make work easier, or to speed up a job, or to change the direction of an effort. When a machine makes work easier, we say the machine is providing a mechanical advantage. An inclined plane has a mechanical advantage that is determined by dividing the length of the incline by its height. So the longer the incline, the greater the mechanical advantage.

Let's calculate the mechanical advantage for the ramp used to lift a heavy container into the van. The board is 4 meters long, and the height of the incline is 1 meter. So the mechanical advantage is 4. That means if the container or load weighs 60 newtons, it will only take 15 newtons of effort to get it into the truck.

To find the mechanical advantage of a wedge, you divide the length of the wedge by its thickness. That's why people sharpen their knives. A long narrow wedge has a greater mechanical advantage than a short fat wedge.

These two knives are about the same size, but the steak knife will cut through things with greater ease because it is not as thick as the butter knife. A screw has a high mechanical advantage determined by how far away the threads are from each other, as well as other things. It will take longer to get the screw into the wood or metal, but the screw will hold better and with greater strength than a nail or tacks.

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