Don't get me wrong: I love nuclear energy! It's just that I prefer fusion to fission. And it just so happens that there's an enormous fusion reactor safely banked a few million miles from us. It delivers more than we could ever use in just about 8 minutes. And it's wireless!

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Energy in Everyday Life

Dynamics

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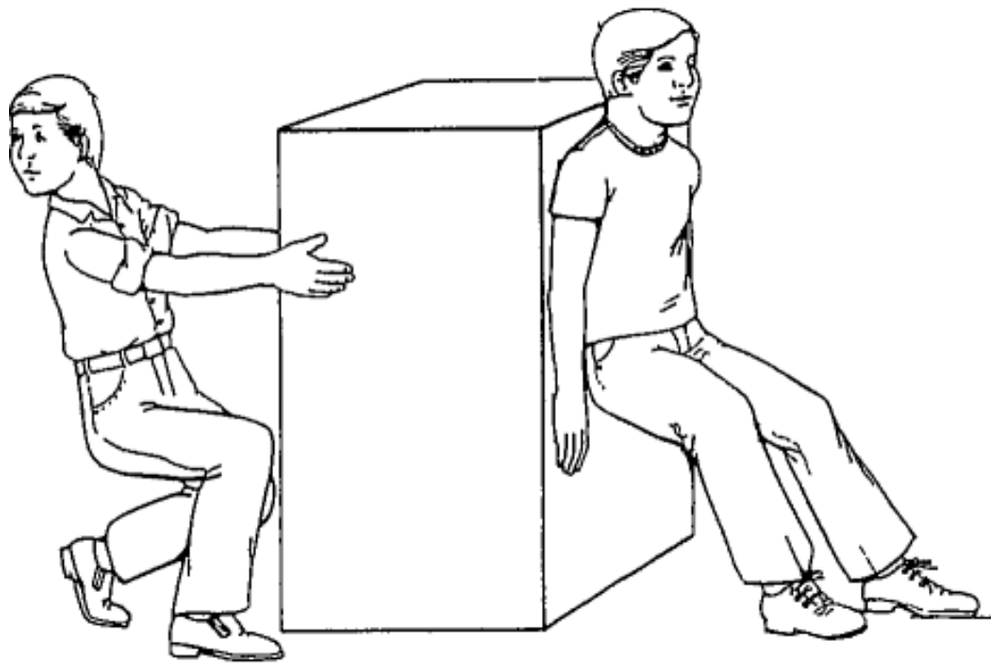
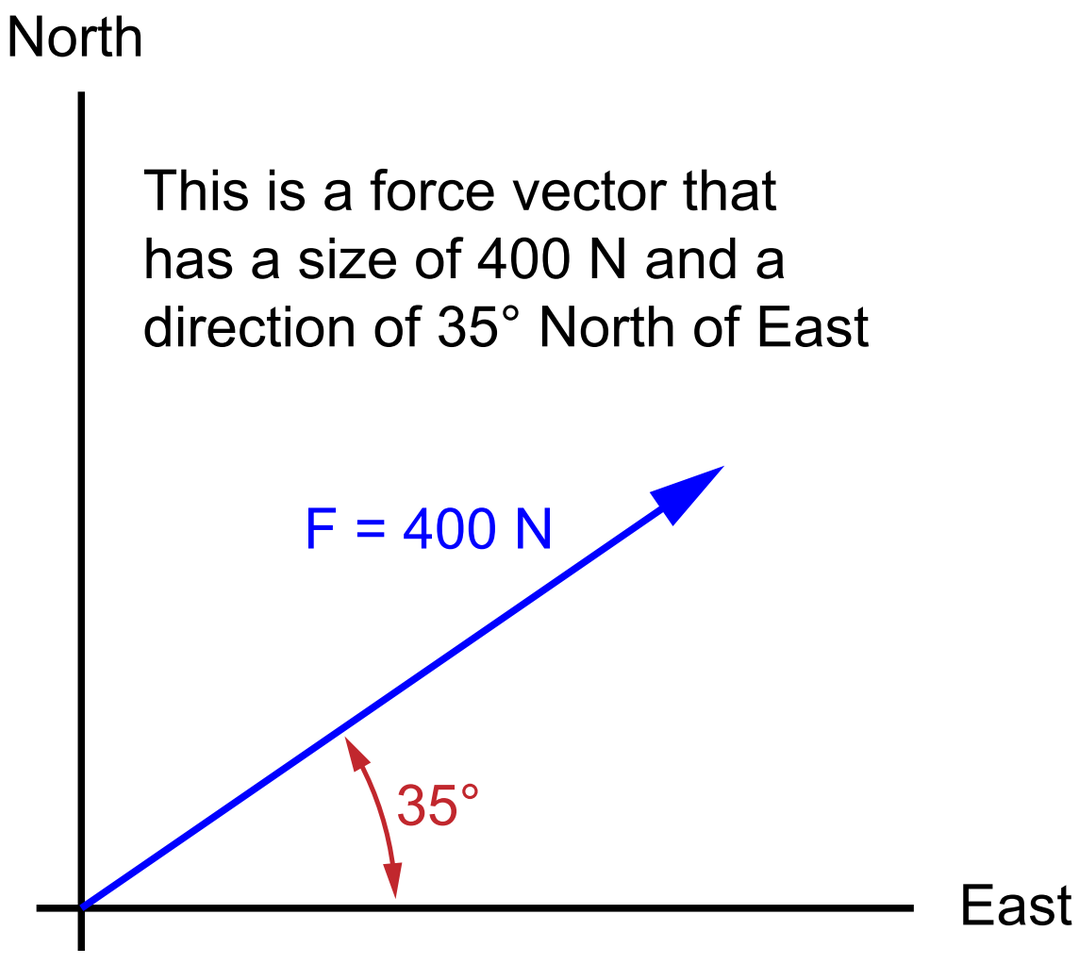
We intuitively recognize that a force is a push or a pull.



If you apply a force to something, you mean that you change a state of rest into a state of motion, or vis versa, or that you change the state of motion.

This intuitive understanding nearly describes the technical use of the word as well.

An agent that acts to change a body's motion is called a force. There is always a direction associated with a force, so force is a vector quantity.



Newton's First Law defines force by telling us it is the agent responsible for a change in the motion of an object.

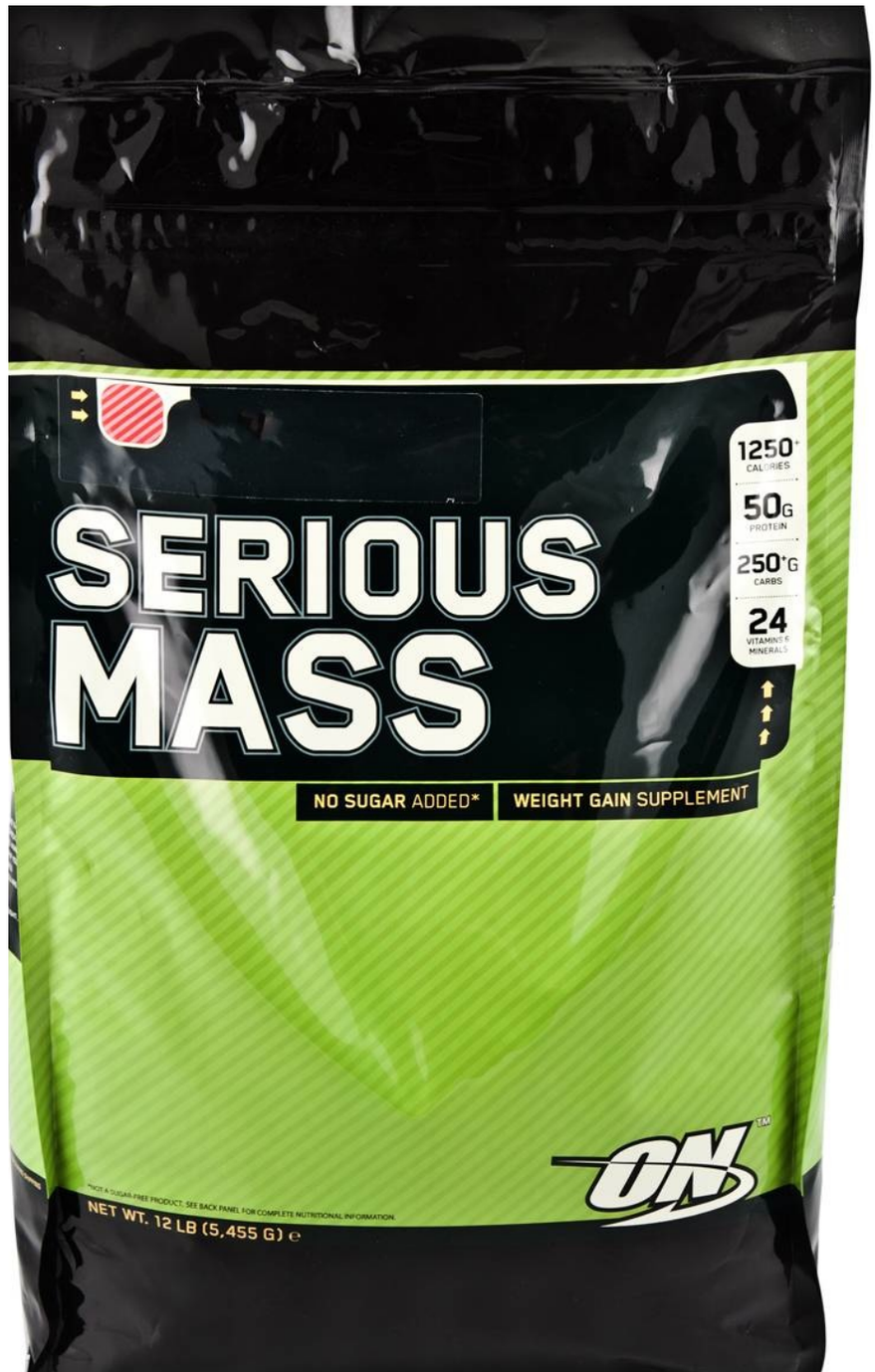
An object at rest remains at rest, and an object in motion remains in motion along a straight line at a constant speed, unless acted on by a force.

This does not say that force is responsible for the motion, but rather a force is responsible for any change in the motion.

Often, people confuse the idea of mass with that of weight.

A mass is a fixed quantity of matter. The weight that mass feels depends on the forces acting on the mass.

Mass has units of kilograms (kg), a weight has units of force (N).



For example, the average US adult male has a mass of 81 kg.

In Earth's gravitational field this mass has a weight of 794 N (or 178 lbs) but on, say, the surface of the Moon this same mass has a weight that is 6 times less:

Both the mass and the strength of a force influence the subsequent acceleration. This is just Newton's 2nd Law:

In the presence of a net force, an object experiences an acceleration:

Force = mass × acceleration

A force is in the direction of the change in motion, not the direction of motion.