

Newton's First Law

- A Force F is exerted on a body (unit: N)
- What is the relation of Force and Motion?
- Aristotle versus Galileo

Every body continues in its state of rest or of uniform speed in a straight line unless acted on by a nonzero net force

$$\mathbf{F} = 0 \Rightarrow \mathbf{v} = \text{const.}$$

Newton's Second Law

- A mass m is a measure of the inertial of a body
- $\mathbf{a} \sim \Sigma \mathbf{F}$, $a \sim 1/m$

The acceleration of an object is directly proportional to the net force acting on it and is inversely proportional to its mass. The direction of the acceleration is in the direction of the net force Acting on the object.

$$\Sigma \mathbf{F} = m\mathbf{a}$$

Newton's Third Law

- A force is exerted on a body by another body!
- To every action there is an equal and opposite reaction

Whenever one object exerts a force on a second object, the second exerts an equal and opposite force on the first.

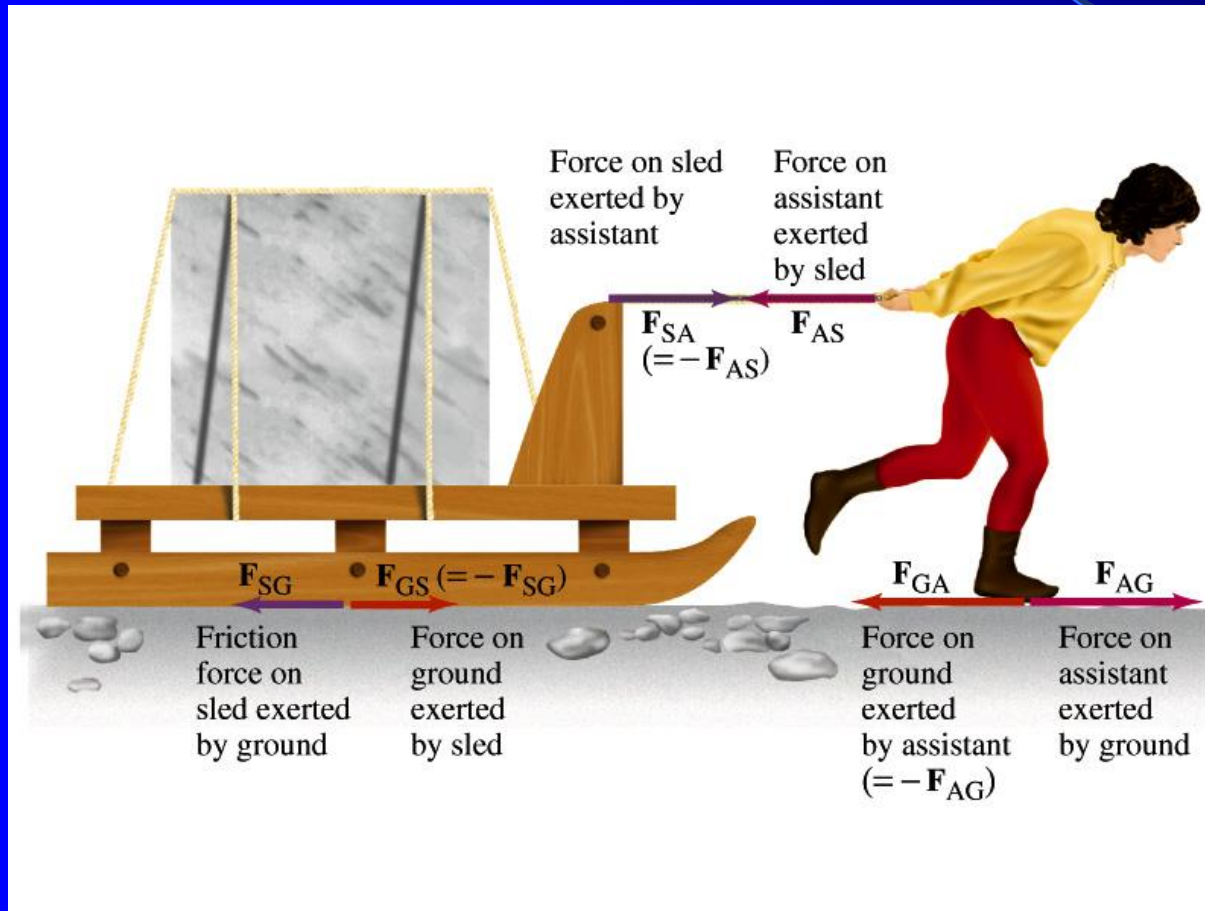
$$\mathbf{F}_{AB} = \mathbf{F}_{BA}$$

Third Law Examples



Some movie examples

Another 3rd Law Example



$$F_{SA} = -F_{AS}$$

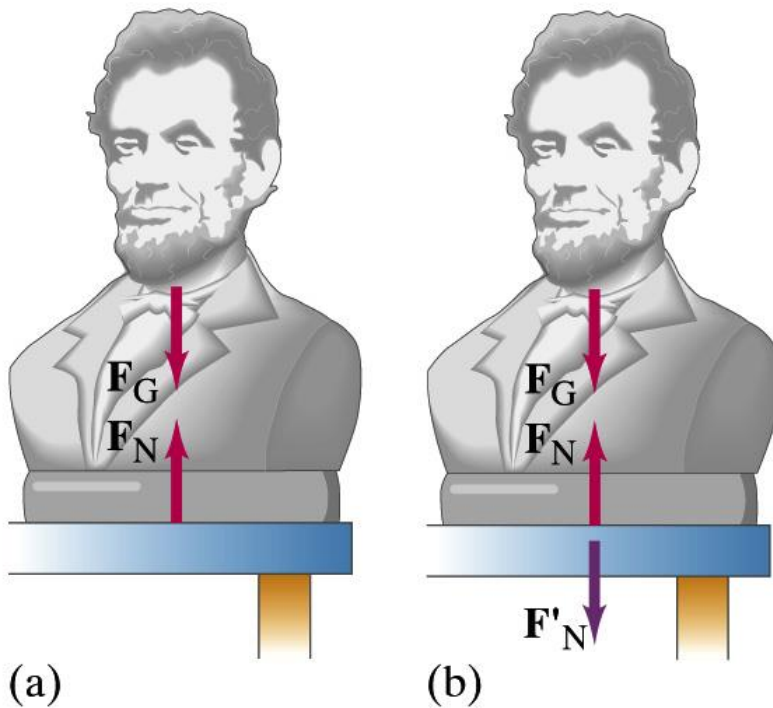
$$F_{SG} = -F_{GS}$$

$$F_{GA} = -F_{AG}$$

$F_{AG} + F_{AS} = ?$
Which direction?

Weight and the Normal Force

Weight = force of gravity



$$\mathbf{F}_G = mg$$

- Lincoln does not move

$$\Sigma \mathbf{F} = m\mathbf{a} = 0$$

$$\mathbf{F}_G = -\mathbf{F}_N$$

- Now: table breaks