

Newton's

3

Laws of

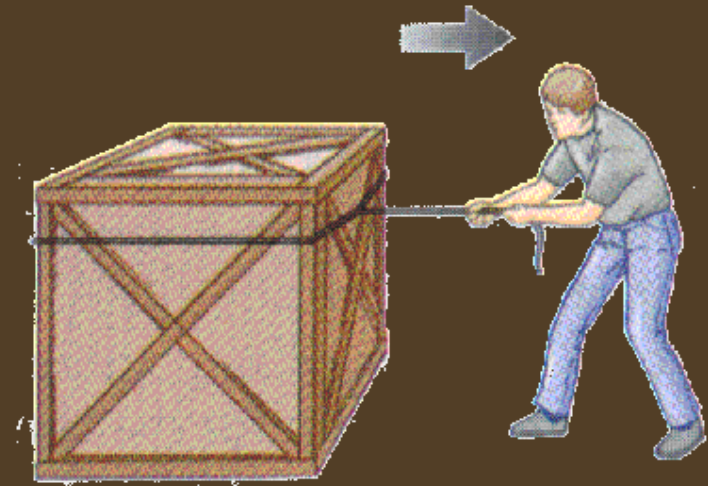
Motion

Sir Isaac Newton



- Newton was the first person to unravel the mysteries of motion
- Developed three basic laws that describe different aspects of motion

What is Force?



- A push or pull
- Force gives energy to an object which can set an object in motion, stop an object's motion, or change the speed or direction (acceleration) of an object's motion.
- Motion is the result of Forces

Newton's First Law of Motion

- The Law of Inertia - *“An object in motion or at rest will remain in that state unless acted upon by an unbalanced force”*
 - Inertia = the tendency to resist a change in motion
- An object moving in a straight path must have an outside force act on it in order to change its speed or direction.
- A force must act on an object to change its motion.

Newton's Second Law of Motion

- “The force on an object is equal to the **mass** times the **acceleration**”
- Mathematical relationship between force, mass, and acceleration

$$F = ma$$

Units of Force

- Forces are measured in Newtons (N)
- $F = \text{mass} \times \text{acceleration}$
 - Mass is measured in kilograms (kg)
 - Acceleration is measured in velocity over time (m/s^2)

$$1 \text{ Newton} = 1 \text{ kg}\cdot\text{m/s}^2$$

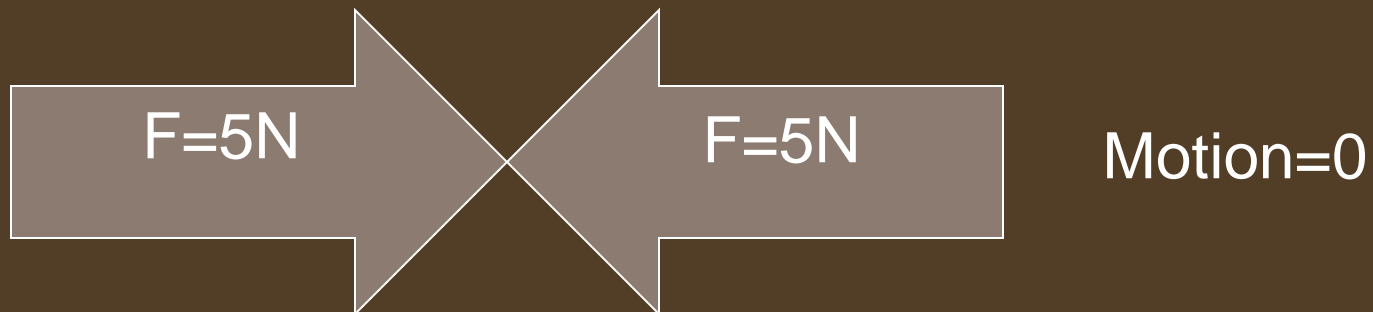
Newton's Third Law of Motion

- *“For every action, there is an opposite and equal reaction.”*
- Demonstrates a relationship between moving objects



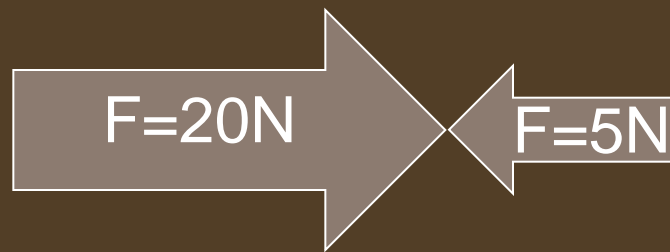
Balanced Forces

- Balanced forces = forces that are in **OPPOSITE** directions and are **EQUAL** in size (magnitude)
- Balanced forces do not change the motion or direction of an object



Unbalanced Forces

- Unbalanced forces = forces that are not equal and are not always in opposite directions
- Unbalanced forces change the motion or direction of an object
 - Opposite direction = forces subtract



Motion to the right with
Force = 15 N

- Same direction = forces add



Motion to the right with
Force = 25 N