

Force & Motion

Force

A force is a push or a pull on an object
Forces are measured in Newtons (N)

There are two main categories of force:

Contact Force

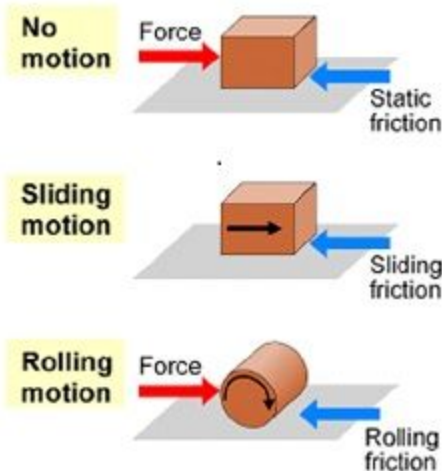
A force which physically touches an object.
Example: pushes or pulls

Noncontact Force

A force which does not touch an object.
Ex: gravitational, magnetic, nuclear, electric

Types of Forces:

Friction: the resistance of **motion** when one object rubs against another



Static friction: friction between two or more solid objects that are not moving relative to each other.

The friction is greater than the force applied so the object doesn't move.

Sliding (kinetic) friction: the friction between two objects that are in sliding contact

Rolling friction: force resisting the motion when an object (such as a ball, tire, or wheel) rolls on a surface

Fluid friction: the resistance to an object's motion through a liquid or gas

Gravitational forces act between any two masses in the universe and pull them toward each other

All masses attract one another

Strength of force depends on mass and distance

Bigger mass=stronger force Smaller mass=weaker force



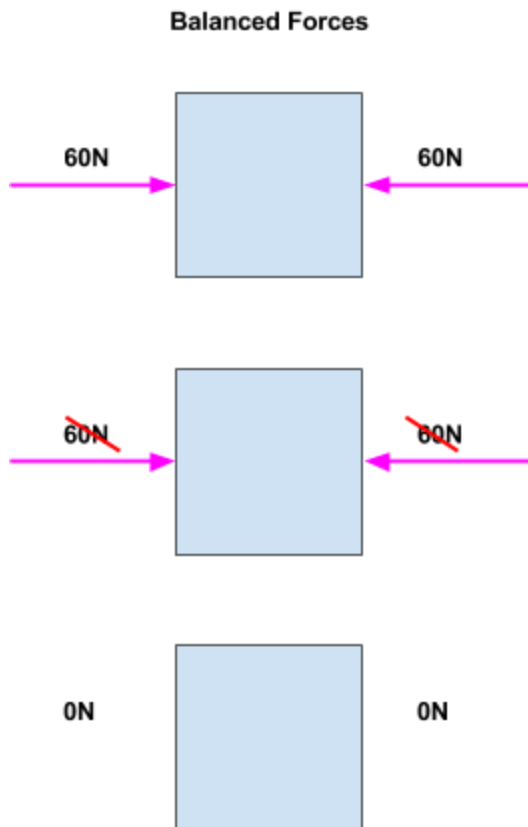
- Electromagnetic forces are associated with electric and magnetic fields.
- Nuclear forces are the forces that hold atoms and their particles together.
- Tension is a pulling force that is exerted by a string/cable/chain on another object.
- Elastic force is a force exerted by an object trying to return to its natural length.

Forces acting on objects can be balanced or unbalanced

Balanced Forces

Forces that don't cause a change in the motion of an object

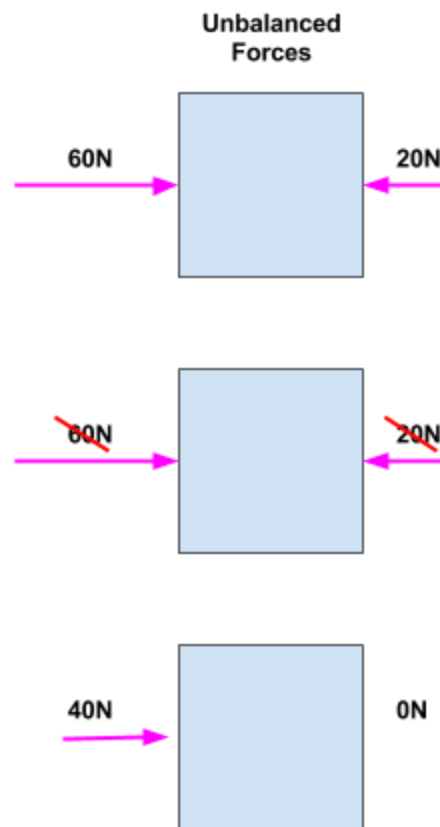
- Equal forces.
- They act in opposite directions of an object.
- They cancel each other out.
- The object will stay the same as before.



Unbalanced Forces

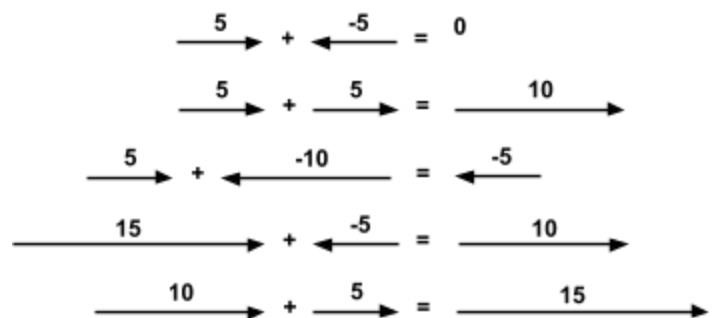
Forces that cause a change in the motion of an object.

- Unequal forces.
- One side will have a heavier force than the other.
- They do not cancel each other out.
- The object will have a change in motion.



Net force

- Is the *sum* of all forces acting on an object
- Force is measured in Newtons (N)
- a net force is capable of accelerating an object (if unbalanced)
- Example of calculations on right -->



Motion

Speed

65 mph

The measure of how far an object moves over time

Velocity

65 mph North

The speed an object is going in a certain direction

Acceleration

65 mph N to 45 mph N
65 mph N *turned* East

Any change in velocity (any change in speed or direction)

Newton's 3 Laws of Motion

1st Law

An object in motion will stay in motion, in the same direction and at the same speed, unless acted upon by an outside force.

Example: When you're in the car and the driver slams on the brakes, you fly forward. Your body was in motion and wants to stay in motion.

2nd Law

The greater the mass of an object, the more force it will take to accelerate the object.

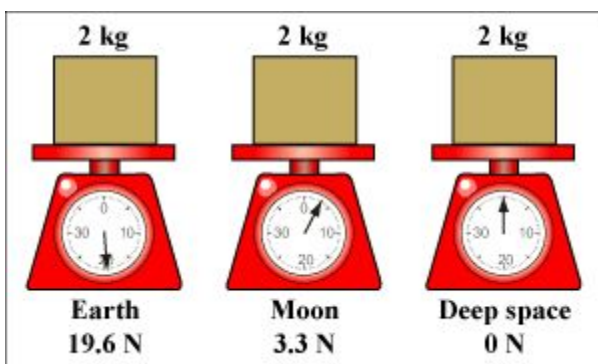
Force = mass x acceleration or $F=ma$.

Example: If you kick a soccer ball with a force of 10N it will fly. If you kick a bowling ball with a force of 10N it will roll slowly. The bowling ball has more mass than the soccer ball so it takes more force to accelerate it.

3rd Law

For every action, there is an equal and opposite reaction.

Example: If you blow up a balloon and let it go the air rushes downward and the balloon is forced upwards.



Mass and weight

Mass is the amount of matter within an object

- Mass stays the same at any amount of gravity

Weight is the force of gravity acting on an object

- Weight changes depending on gravity