

Chapter 3: Forces and Newton's Laws

Section 1: Forces

Force: a push or a pull on an object

- A force can cause the motion of an object to change

Net force: the sum of all the forces acting on an object.

- Measured in the SI unit of Newtons (N)
- A force of 3 N is needed to lift a full can of soda at constant speed.
- *Unbalanced forces*
 - Imagine 2 students push a box at 3 N each. The overall force (net force) between the 2 students would be 6 N of force on the box.
 - Look at the image below. How much and in which direction will the net force be applied?



- 100 N to the left
- *Balanced forces*
 - Look at the image below. How much and in which direction will the net force be applied?



- 0 N and there is no change in direction

Friction: the force that opposes the sliding motion of two surfaces that are touching each other

- When 2 surfaces are rough – higher friction between the 2
 - Moving a couch on shag carpet
 - More force must be applied
- When 2 surfaces are smooth – lower friction between the 2
 - Sliding on ice with bald tires
 - Less force must be applied

3 types of friction forces

1. Static friction

- a. Called resting friction - the force that keeps objects stationary
- b. Imagine pushing a heavy object. You apply a force, and it does not move. This is because the static friction force is great!

2. Sliding

- a. Called kinetic friction – the force that makes objects stop when they are moving
- b. Imagine rolling a ball. It will eventually stop because the friction between the ball and surface is great.

3. Rolling

- a. This friction relies on static friction on wheels.
- b. Think of someone stuck in the snow. They push on the gas, but the wheels just spin. The friction between the ground and wheels is lower than the friction of the wheels. Spreading sand increases the friction between the wheels and ground. Physics refers this to friction, but we call it traction.

Gravity: an attractive force between any two objects that depends on the masses of the objects and the distance between them

- 4 basic forces:
 1. Gravity – acts on all objects with mass
 2. Electromagnetic force – acts on all charged particles
 3. Strong nuclear force – affects particles in atoms
 4. Weak nuclear force – affects particles in atoms
- Sir Isaac Newton discovered a relationship between the force of an object between two masses and its distance
 - More massive the objects, the higher the attractive force and vice versa
 - Greater distance between the objects, the less the attractive force and vice versa

Weight: the gravitational force exerted on an object

- Weight is a force – how much gravity affects an object
- Mass is a measure of the amount of matter an object contains