

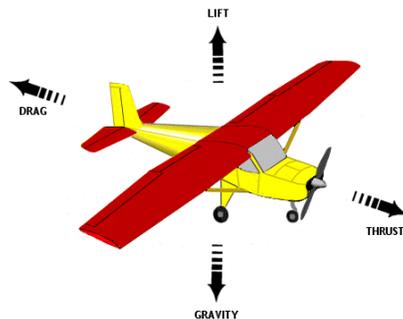
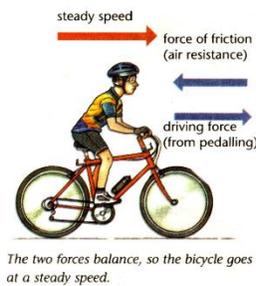
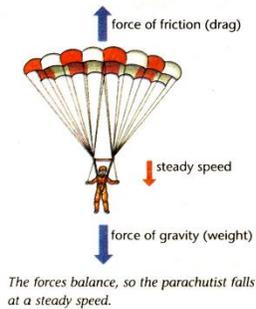
Forces

- Force is a push or a pull.
- Changing the direct.
- Acceleration.
- Moves a stationary object.
- Force can change the size, shape and motion of a body.
- Unit of force is NEWTON (N).
- Force can be measured with a spring balance.
- Examples:
 - Friction,
 - Weight.
 - Air resistance due to matter is a contact force.
 - Electrostatic force.
 - Magnetic force is a non-contact force.

Balances Forces:

If the forces acts on a body is balanced:

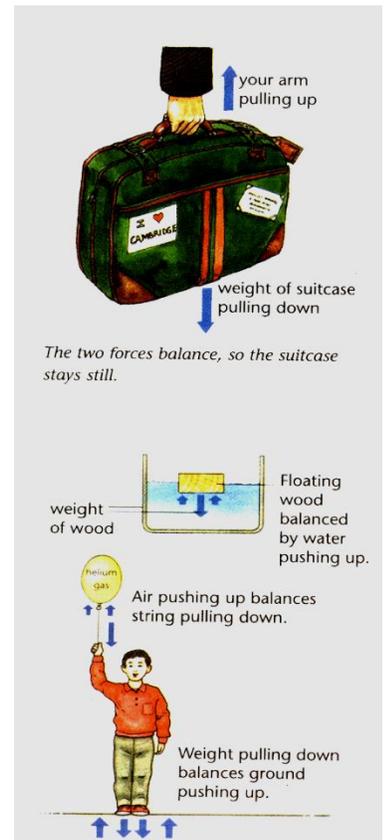
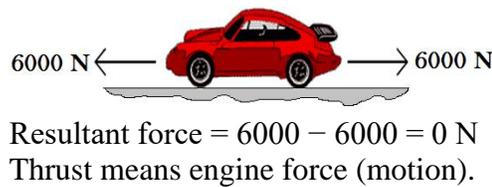
- it stay at rest
- It moves with constant speed.



Lift + Gravity =
Resultant force
(Net)

Drag + Thrust =
Resultant force
(Net)

- If the forces acts on the body is balanced, then the resultant force is zero (at rest or constant speed.)



Contact Force:

Gravitational force is downward. Air resistance or frictional force is upward.

- Decrease in speed.
- Change in speed = change in air resistance $\Delta s = \Delta ar$
- Speed increases every second of time.
- Parachute increases S.A. decreases velocity.
- Air resistance increases with S.A. – air resists.

Newton's first law of motion:

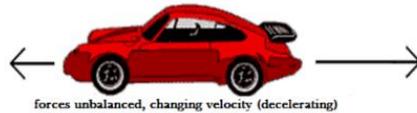
If the forces acting on a body is balanced, then

- If it is at rest, it will continue to stay at rest.
- If it is moving, it will keep on moving at a constant speed in a straight line.

Unbalanced forces:

Unbalanced forces causes

- a stationary body to move
- a moving body to change its velocity



If the forces acts on a body is unbalanced, then there will be a resultant force.

Example:



Resultant force = $5000 - 1500 = 3500 \text{ N}$

The forces act on a car is unbalance, so it accelerates because forward force is greater than backward force.

The forces act on a car is unbalance, so it decelerates because backward force is greater than forward force.

Newton's second law of motion

The acceleration of the body is directly proportional to the direction of force applied and inversely proportional to the mass of the body.

The greater the mass of an object, the smaller acceleration it is given by a particular force.

The force, mass and acceleration can be combined into the following equation:

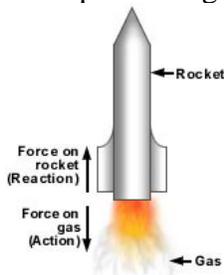
$$\text{Force} = \text{mass} \times \text{acceleration}$$

$$\mathbf{F} = \mathbf{ma}$$

Newton's third law of motion

To every action there is an equal but opposite reaction i.e. if object A exerts a force on object B (action), then object B will exert an equal but opposite force on object A (reaction).

Examples: firing gun, hammering a nail, book kept on a table and launching rocket.



Friction

- Friction as the force between two surfaces that may impede motion and produce heating.
- Friction is the force which opposes motion. i.e., stopping force
- It always acts opposite to the direction of travel.
- Friction (drag) acts on an object moving through a liquid
- Friction (drag) acts on an object moving through a gas (e.g. air resistance)
- Friction can be reduced by adding lubricants. E.g. lubricating oil, grease.

Sliding surfaces must be smooth. If they are rough or rusty there will be a lot of friction. Ball bearings reduce friction because they roll rather than slide.

Cause of friction

1. Molecules in materials have a tendency to stick to each other when materials are pressed or rubbed together.
2. Nature of the surface: rough surfaces have more friction due to up's and down's which catch each other.

Advantages of friction:

- Friction helps us to walk.
- Friction helps us to hold the objects.
- Friction helps us to stop a moving object.

Disadvantages of friction:

- Machine parts rub together and become loose.
- Shoes and clothes wear and tear.
- It heats up the moving parts and some energy is wasted in the form of heat.

Effects of friction on the motion of a vehicle:

Tire surface:

- If the vehicle is having more tyre surface, then the frictional force acting on it will be more.
- If tire surface of vehicle is less, then the frictional force acting on it will be less.



more friction acts

Road conditions:

- If the road is having rough surface, the frictional force will be more.
- If the road is having smooth surface, the frictional force will be less.

Normal Reaction force:

Is the reaction force produced by an object holding another object has a limit. Balanced force.

When unbalanced, products fell.

Circular motion:

When any object is moving in a circular path, then the object is in **circular motion**.

Objects are moving in circular path due to constant force acting towards center of the circle. This force is called **centripetal force**.

The centripetal force will increase:

- If the mass of the object increased.
- If the speed of the object increased.
- If the radius of the circle reduced.

Pivot: fixed point around which moment takes place. $M = F \times d$

Perpendicular Distance: right angled perpendicular distance between the pivot & the point where the force is applied.

The planets are orbiting around the sun due to constant gravitational force acting towards the sun.

The satellites are orbiting around the earth due to constant gravitational force acting towards the earth.

The electrons are orbiting around the nucleus due to constant electrostatic force acting towards nucleus of the atom.

