

# Forces

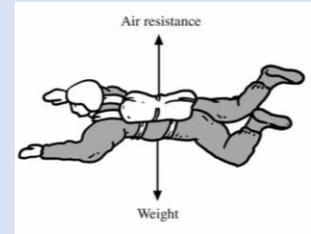
Big idea: Forces predict motion

Key words	Definition
Friction	When two objects rub together
Air resistance	When an object rubs against air particles
Weight	The force an object exerts on the ground due to gravity
Tension	Force extending or pulling apart
Friction	Force opposing motion which is caused by the interaction of surfaces moving over one another. The amount of friction depends on the type of surface. For example: There is less friction on ice than on a gravel road.
Drag	A type of friction when one of the surfaces is a fluid.
Newton	Unit for measuring force (N)
Resultant force	The total force acting on an object
Balanced force	When the resultant force on an object is 0
Unbalanced force	When the resultant force on an object is more or less than 0

## Balanced force:

When forces acting in opposite directions are the same size we say the forces are balanced. This means two things.

1. The object is stationary
2. The object is moving at a constant speed



The force of Air resistance and gravity are equal. The skydiver is travelling at a constant speed. Air resistance or 'drag' slows down falling or accelerating objects.

## Unbalanced force:

If the forces are unbalanced on an object two things can happen:

1. If the object is stationary then it will move in the direction of the resultant force
2. If the object is moving, then the object will speed up or slow down in the direction of the resultant force

For example:

$$400\text{N} - 300\text{N} = 100\text{N to the left}$$

## Density

The degree of compactness of a substance

$$\text{Density } (\rho) = \frac{\text{Mass (kg)}}{\text{Volume (cm}^3\text{)}}$$

The density of water is 1g/cm<sup>3</sup>.

This means that 1cm<sup>3</sup> of water would have a mass of 1gram.

### Method 1: A regular shaped object

1. Use a ruler to measure the length (l), width (w) and height (h) of the object.
2. Place the object on the top pan balance and measure its mass.
3. Calculate the volume of the cube using (LxWxH).
4. Use the measurements to calculate the density of the object.

### Method 2: An irregular shaped object

1. Place the object on the top pan balance and measure its mass.
2. Fill a measuring cylinder so that there is enough water to cover the object when it is placed inside the cylinder. Take the reading of the volume.
3. Carefully lower the object into the cylinder.
4. Take the new reading of the volume. Subtract the original reading to obtain the volume of the object.
5. Use the measurements to calculate the density of the stone.

**Contact forces:** Friction, Air resistance, water resistance, tension, spring  
**Non-contact:** Gravity, magnetism

Moments & Levers

moment:

$$\text{Moment(Nm)} = \text{Force (N)} \times \text{Distance (m)}$$

$$M = F \times D$$

Two factors affecting

1. The size of the force
2. The distance from the pivot