# Motion & Forces

Unbalanced Forces

Forces are measured in Newtons, N. When one force is bigger than another, the object will experience a resultant force. If a resultant force acting on an object is bigger than 0 N it will either:
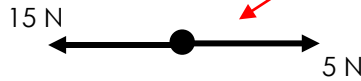- Change its speed (e.g. accelerate or decelerate)
- Change its direction
- Change the shape of the object
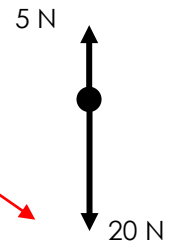
Resultant force examples:

The motion will remain constant

In these scenarios the object will accelerate

5 N

5 N
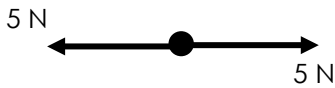
Resultant force = 5 N – 5 N
Resultant force = 0 N

15 N

5 N

Resultant force = 15 N – 5 N
Resultant force = 10 N

5 N

20 N

Resultant force = 20 N – 5 N
Resultant force = 15 N

Calculating Speed

Speed is how much distance you cover per second.

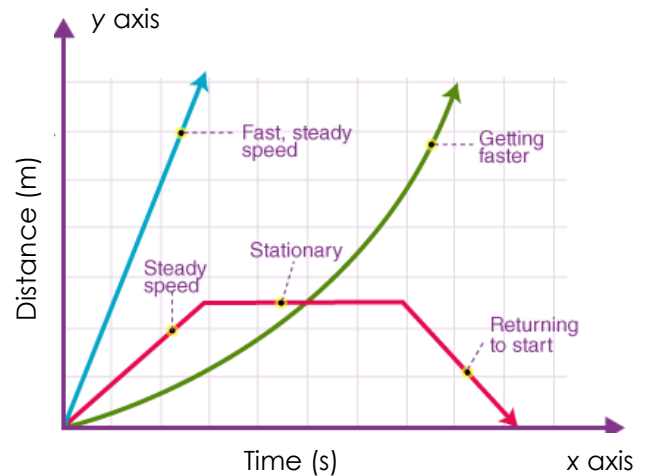In science you must use these units for speed:

Speed: metres per second, m/s
Distance: metres, m
Time: seconds, s

$$\text{Speed} = \frac{\text{Distance (m)}}{\text{Time (s)}}$$
(m/s)

Distance Time Graphs

A distance time graph will tell you about an objects motion.

Each line tells you about the objects motion.

y axis

Distance (m)

Fast, steady speed

Getting faster

Stationary

Steady speed

Returning to start

Time (s)

x axis

Turning Forces

Engineers use this concept to make rotating objects much easier. A turning force is called a moment. You can calculate it using:

Moment = Force x Distance from pivot

By increasing the distance from the pivot you don't need to apply as much force to turn the object

pivot

pivot

Measurement Errors

Stopping a stopwatch exactly when an object passes a finish line is difficult.

Stopping too early or too late can give you a **random error.**

To reduce errors, you should repeat the experiment three times and calculate a mean.
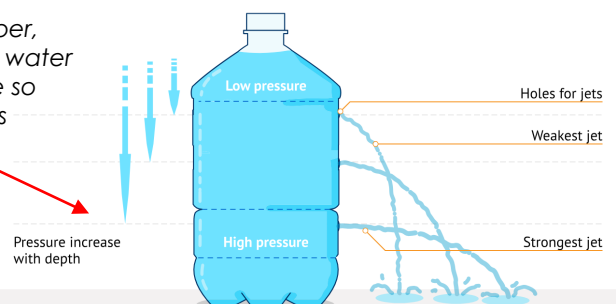
Pressure

We experience atmospheric pressure all the time. When you go in water, you experience water pressure.

How is pressure created…

- Particles collide against the walls of a surface
- The collision exerts a force
- The force creates a pressure over the area

Liquids and gases are fluids. Pressure acts in all directions in fluids.

As you go deeper, there are more water particles above so more pressure is exerted

Low pressure

High pressure

Pressure increase with depth

Holes for jets

Weakest jet

Strongest jet

CORE Questions

1	Put into an equation: speed, distance and time.	Speed = Distance / time
2	Calculate the speed of a man jogging 4m every 2 seconds.	S = D/t S = 4/2 S = 2m/s
3	What are the standard units for measuring speed?	m/s
4	On a distance- time graph. What would the labels of the x and y axis be?	X axis - Time, Y - Axis Distance
5	Sketch a distance time graph where a person walks at a constant speed and then stops.	Correctly labelled axis (x-time, y-distance), straight diagonal line from origin and straight horizontal line.
6	What does a straight horizontal line represent on a distance time graph?	That the object is stationary
7	What does acceleration mean?	Increasing speed.
8	Indentify three ways a force can effect the motion of an object.	Make it move or stop moving, change its direction, increase or decrease its speed.
9	True or False. If an object is moving and no forces act on it, it will eventually stop.	False. It will remain moving at the same speed.
10	True or False. IF an object is at rest it will remain at rest unless a force acts on it.	True.
11	What is the standard unit for a force?	Newtons, N
12	What is the standard unit for distance?	Meters, m
13	Convert 10cm into meters.	0.1m
14	What force always acts downwards on an object?	Weight
15	A student fails to stop a stopwatch on time. Is this known as random error or zero error?	Random Error
16	A student measures the time it takes a car to drive a certain distance at a constant speed three times. Suggest why.	This allows him to spot any mistakes and get a more accurate result by calculating a mean.
17	True or False. If you find an anomalous result, you should include it when calculating a mean.	False. You should not include it in your mean.
18	How is pressure created by gases and liquids?	Particles collide with surfaces exerting a force.
19	In what directions does fluid pressure occur?	All directions.
20	Describe why pressure increases as depth in water increases.	There are more water particles exerting more pressure as the depth increases.
21	Describe why pressure decreases as altitude increases.	There are less particles as the altitude increases decreasing pressure.