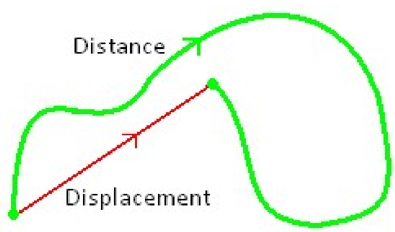
Velocity and Acceleration

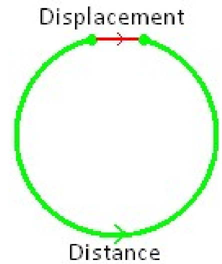
Distance

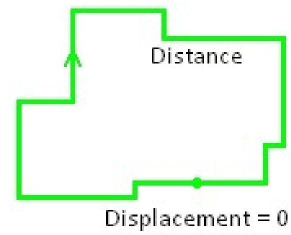
Distance is a scalar quantity. It is a measure of the total length you have moved.

Displacement

Displacement is a vector quantity. It is a measure of how far you are from the starting position.







If you complete a lap of an athletics track: distance travelled = 400m
displacement = 0

Distance and Displacement are measured in metres, m

Speed

Speed is a measure of how the distance changes with time. Since it is dependent on speed it too is a scalar.

$$\boxed{speed = \frac{\Delta d}{\Delta t}}$$

Velocity

Velocity is measure of how the displacement changes with time. Since it depends on displacement it is a vector too.

$$\boxed{v = \frac{\Delta s}{\Delta t}}$$

Speed and Velocity are is measured in metres per second, m/s
Time is measured in seconds, s

Acceleration

Acceleration is the rate at which the velocity changes. Since velocity is a vector quantity, so is acceleration. With all vectors, the direction is important. In questions we decide which direction is positive (e.g. → +ve)

If a moving object has a positive velocity:
* a positive acceleration means an increase in the velocity
* a negative acceleration means a decrease in the velocity (it begins the 'speed up' in the other direction)

If a moving object has a negative velocity:
* a positive acceleration means an increase in the velocity (it begins the 'speed up' in the other direction)
* a negative acceleration means a increase in the velocity

If an object accelerates from a velocity of u to a velocity of v, and it takes t seconds to do it then we can write the equations as $\boxed{a = \frac{(v-u)}{t}}$ it may also look like this $\boxed{a = \frac{\Delta v}{\Delta t}}$ where Δ means the 'change in'

Acceleration is measured in metres per second squared, m/s^2

Uniform Acceleration

In this situation the acceleration is constant – the velocity changes by the same amount each unit of time.
For example: If acceleration is 2m/s^2, this means the velocity increases by 2m/s every second.

Time (s)	0	1	2	3	4	5	6	7
Velocity (m/s)	0	2	4	6	8	10	12	14
Acceleration (m/s^2)		2	2	2	2	2	2	2

Non-Uniform Acceleration

In this situation the acceleration is changing – the velocity changes by a different amount each unit of time.
For example:

Time (s)	0	1	2	3	4	5	6	7
Velocity (m/s)	0	2	6	10	18	28	30	44
Acceleration (m/s^2)		2	4	6	8	10	12	14