<u>Velocity</u>

Velocity is speed in a particular direction.

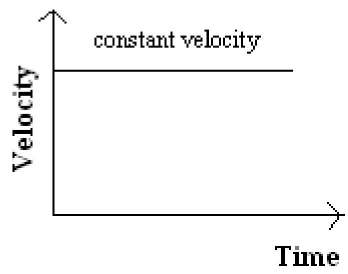
For example, the pilot of a plane might be told to fly at 100 ms^{-1} due North. The direction is important.

If an object changes its velocity, it is accelerating (or decelerating).

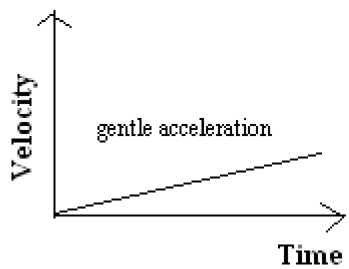
$$\text{Calculating Acceleration (in } ms^{-2}) = \frac{\text{change in velocity } (ms^{-1})}{\text{time taken for the change (s)}}$$

Velocity – Time Graphs for a car:

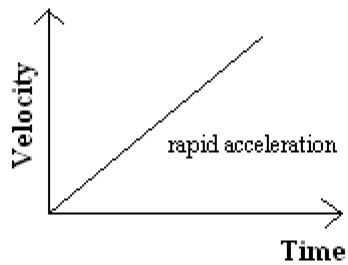
A horizontal line means that the car is travelling with a constant velocity.



In this graph the car starts off from rest (velocity = zero) and **accelerates uniformly** (in a straight line).



In this graph the car accelerates more rapidly. The graph has a steeper slope.
The area under the graph line represents the distance travelled.



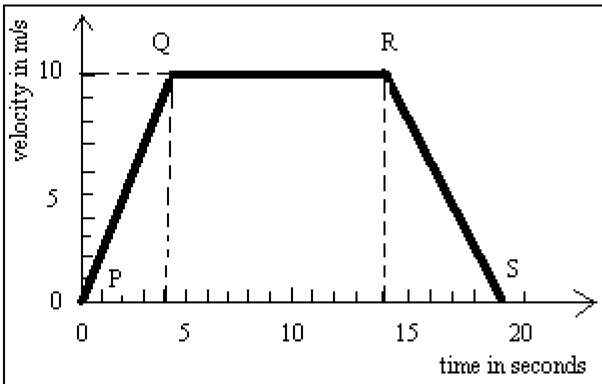
You can calculate the acceleration from the gradient or slope of the velocity-time graph.

In the graph shown to the right, the acceleration during P-Q

$$= \frac{\text{change in velocity}}{\text{time taken for change}}$$

$$= \frac{10 - 0\ (ms^{-1})}{4s}$$

$$= \boxed{2.5\ ms^{-2}}$$



P-Q The car starts from rest and accelerates uniformly, until it reaches a velocity of 10m/s after 4s.

Q-R It stays at this speed for 10 seconds.

R-S The car decelerates, from 10m/s to rest, in 5s.

The distance travelled is shown by the area under the velocity-time graph. In the graph to the right, the distance travelled during P-Q

= area of triangle under P-Q
= ½ x base x height
= ½ x 4 x 10
= $\boxed{20m}$