1.2 Graphs of Motion

Accelerating: The rate of change in velocity or the change in velocity per unit time.

$$\textbf{Acceleration}=\frac{Change\ in\ velocity}{Time}$$

$$a=\frac{\Delta V\ (m/s)}{t\ (s)}$$

$$a=\frac{V-U\ (m/s)}{t\ (s)}$$

V is the final velocity
U is the initial velocity
t is the time
Acceleration is measured in m/s^2
Acceleration if the distance is given:

$$2as= V^2 - U^2$$

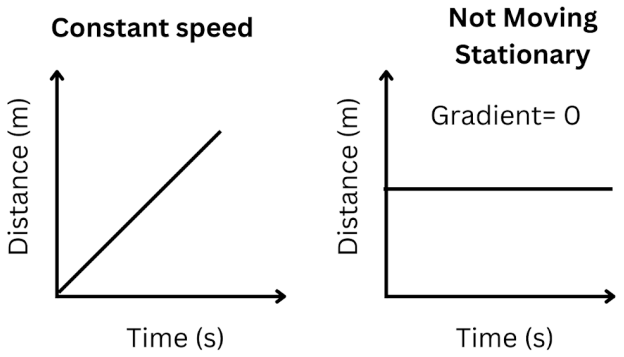
a is acceleration (m/s^2)
s is distance (m)
V is the final velocity (m/s)
U is the initial velocity (m/s)

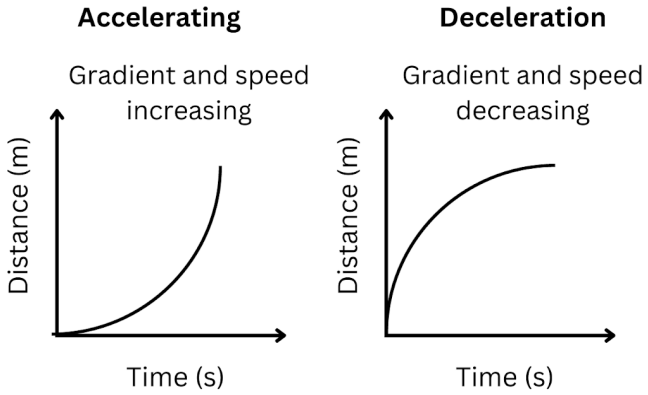
Note: If an object starts from stationary, then its initial velocity U should be 0m/s.

Distance-Time Graph

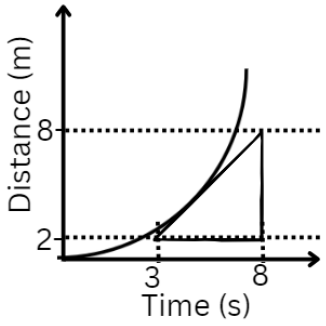
The **gradient** of the line at any point tells you the speed the object is traveling.

$$\text{Gradient}= \frac{\Delta Distance}{\Delta Time}$$





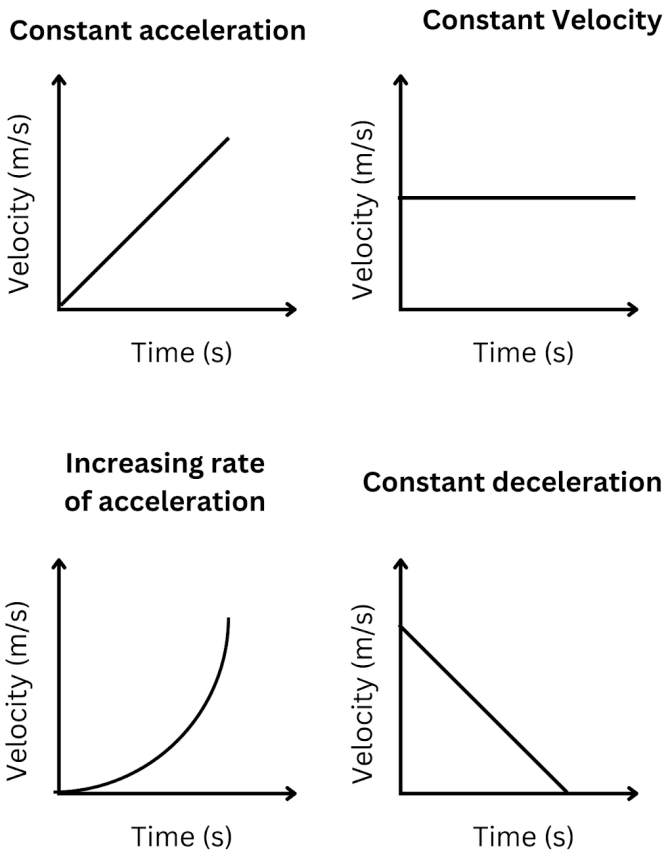
For example:



Gradient= $\frac{\Delta Distance}{\Delta Time}$ = $\frac{8-2}{8-3}$ = $\frac{6}{5}$ = 1.2 m/s

The speed of this journey is 1.2m/s

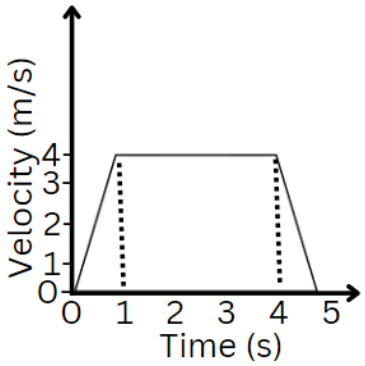
Velocity-Time Graphs



To find the distance traveled:

- Use the area of the shape formed in a particular time given.

For example:



Find the distance traveled for the first 4 seconds:

Shape: Trapezium

A= $\frac{(a+b)h}{2}$

A= $\frac{(4+3)4}{2}$

A= 14m/s

Terminal velocity: is a point reached whereby the velocity reaches a constant rate.
When an object falls in a uniform gravitational field, the air resistance opposing its motion increases as its speed rises, reducing its acceleration. Eventually, air resistance acting upwards

equals the weight of the object acting downwards. The resultant force on the object is zero since the gravitational force balances frictional force. The object falls at terminal velocity.