Motion in a straight line

Speed

Average $= \dfrac{\text{Total distance travelled}}{\text{Total time taken}}$

i.e.

$$\text{Average speed} = \frac{s_1 + s_2 + s_3 \ldots}{\left(\frac{s_1}{v_1} + \frac{s_2}{v_2} + \frac{s_3}{v_3} \ldots\right)}$$

Instantaneous speed

$$= \lim_{\Delta t \to 0} \frac{\Delta s}{\Delta t} = \frac{ds}{dt}$$

Velocity

Average velocity

$$\bar{v} = \frac{\text{Total displacement}}{\text{Total time taken}}$$

$$= \frac{\Delta x}{\Delta t}$$

Instantaneous Velocity

$$v = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t}$$

$$= \frac{dx}{dt}$$

Relative Velocity (Relative velocity of object *A* with respect to *B*)

$$v_{AB} = v_A - v_B$$

Acceleration

Average Acceleration

$$a_{av} = \frac{a_1 t_1 + a_2 t_2}{t_1 + t_2}$$

Instantaneous Acceleration

$$a_{inst} = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt}$$

Equations of Uniformly Accelerated Motion

(if an object is falling freely under gravity then, value of a is equal to g)

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 - u^2 = 2as$$