

Unit One: Vectors and Scalars; 1D Motion in equilibrium

Skills 1-11

Facts and Concepts

- Values expressed in correct scientific notation have a coefficient greater than or equal to 1 but less than 10.
- Scalar quantities Do NOT require direction for calculation. They have Magnitude only. Distance, speed, mass, time, Energy, work, Power, most electricity variables (except force & field lines)
- Vector quantities - Do require direction for calculation - Magnitude & Direction displacement, velocity, acceleration, field strength, force

Parallel Vectors

Assign + or -
 "x" East right
 "y" North South
 up down

Add including sign

- Max resultant occurs for two parallel vectors in the same direction (0° difference)

- Min resultant occurs for two parallel vectors in opposite directions (180° difference)

Perpendicular Vectors

- Identify horizontal component (A_x), Vertical Component (A_y), the resultant (A) or direction (θ)

$A_x = A_y$
 $\theta = 45^\circ$
 $A_x > A_y$
 $\theta < 45^\circ$

- If more than 1 vector is present on an axis simplify to sum of horizontal & sum of vertical

- Objects that are moving at constant speed are in equilibrium
 Equilibrium means all forces are balanced (ie Fnet = 0)

- Constant speed can be represented by dot diagrams with equal spacing

..... fast
 equal time frames
 slow

Variables, Equations and Units

A = resultant

A_x = horizontal component

A_y = vertical component

θ = angle for x axis

$$A = \sqrt{A_x^2 + A_y^2} \quad \theta = \tan^{-1}\left(\frac{A_y}{A_x}\right)$$

$$A_x = A \cos \theta \quad \theta = \cos^{-1}\left(\frac{A_x}{A}\right)$$

$$A_y = A \sin \theta \quad \theta = \sin^{-1}\left(\frac{A_y}{A}\right)$$

A can be substituted for any vector
 d (displacement), v (velocity)

$$v = \frac{d}{t} \quad d = vt$$

distance/displacement
 (m)

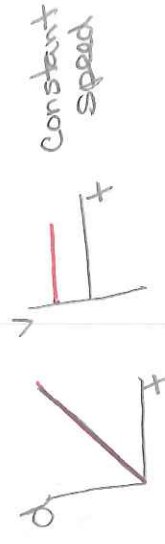
speed/velocity
 (m/s)

time
 (s)

$$v = \frac{v_i + v_f}{2}$$



Graphs and other skills



Small angle between 2 vectors leads to largest resultant & vice versa