

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

Skills 1-11

Facts and Concepts

Order of magnitude is determined by expressing value in correct scientific notation
ie coefficient greater than or equal to 1 but less than 10.

Scalar quantities DO NOT require direction for calculation. (Magnitude only)

Examples: Distance, speed, mass, time, Energy (KE, PE, Q, W, E photon, Electrical etc)
Power, most electricity variables (R, I, V, Q), wavelength, frequency
Period, speed of a wave

Vector quantities - Require a Magnitude (Size) and a direction (or angle) (N, E, W, S)

Examples: Displacement, Velocity, acceleration, field strength, force, momentum & Impulse

Combining

Parallel Vectors: Assign + or - based on direction then add

ex: 4m east plus 6m west = $4m + (-6m) = -2m = 2m$ west
Resultant

Perpendicular Vectors: Step 1 Simplify the x-axis & y-axis by combining any parallel vectors

Step 2: Use equations to solve for unknown

Keep in mind the following: IF

θ is relative to x

unless shown otherwise

always draw x then y

IF

$A_x = A_y$

$\theta = 45^\circ$



IF

$A_x < A_y$

$\theta > 45^\circ$



IF

$A_x > A_y$

$\theta < 45^\circ$



Max Resultant

occurs for 2 parallel vectors in the same direction
0° difference. (IF not parallel choose smallest difference)

Min Resultant

occurs for 2 parallel vectors in opposite direction
180° difference. (IF not parallel choose largest difference)

Small angle between vectors equals large resultant and vice versa

Equilibrium: moving at constant speed (not speeding up, slowing down or changing direction)

all forces are balanced, $F_{net} = 0$

Variables, Equations and Units

A: Resultant

A_x : horizontal component

A_y : vertical component

θ : angle relative to x-axis

Equations

$$A_x = A \cos \theta$$

$$A_y = A \sin \theta$$

$$A = \sqrt{A_x^2 + A_y^2}$$

$$\theta = \tan^{-1} \left(\frac{A_y}{A_x} \right)$$

Any vector can be substituted for "A"
ie Displacement, velocity, force

For equilibrium: ie no net force, no acc



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

units

distance or displacement (m)

Speed or velocity (m/s)

time (s)

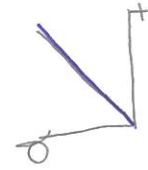
for velocity (vector)
consider direction

Graphs and other skills

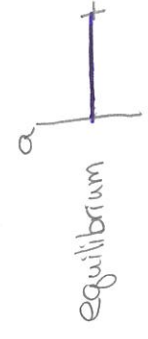
Constant speed on a dot diagram

..... slow fast

Graphs of equilibrium



Constant speed



equilibrium
acceleration equals zero