Topic 1C: Constant Velocity/Speed (One Dimension)

Skill 9: Speed (Scalar) and Velocity (Vector)

Speed & velocity both measure the rate of change in position, which can be expressed as distance (scalar) or displacement (vector)

$V = \frac{d}{t}$ V = speed or velocity; d = distance or displacement

$\text{speed} = \frac{\text{distance}}{\text{time}}$

$\text{velocity} = \frac{\text{displacement}}{\text{time}}$

Speed and velocity are the same magnitude (size) if no change in direction occurs.

- You cannot have a negative speed
- A negative velocity refers to a direction (down, backward, West, South, degrees)

Skill 10: Concurrent Velocity and Displacement

Only vectors of the same type can be combined (ie 2 or more displacements) (2 or more velocities)

When switching between displacement and velocity you must consider a common time interval

Example: given the following displacement in 5 seconds you can find Velocities

$d = \sqrt{d_x^2 + d_y^2}$

$d = \sqrt{(15m)^2 + (7m)^2}$

$d = \sqrt{274m^2}$

$d = 16.55m$

$\theta = \tan^{-1}\left(\frac{7m}{5m}\right)$

$= 25°$

$V_x = \frac{d_x}{t} = \frac{15m}{5s} = 3\,m/s$

$V_y = \frac{d_y}{t} = \frac{7m}{5s} = 1.4\,m/s$

$V = \frac{d}{t} = \frac{16.55m}{5s} = 3.3\,m/s$

$\theta = \tan^{-1}\left(\frac{V_y}{V_x}\right) = \tan^{-1}\left(\frac{1.4\,m/s}{3\,m/s}\right)$

$= 25°$

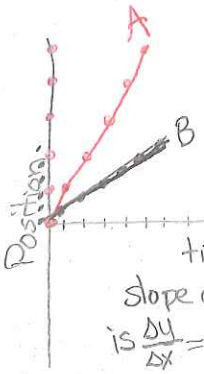
Skill 11: Graphs of constant velocity ("d vs t" and "v vs t")

Graphs of d vs t and V vs t represent motion on a single axis.

Motion can be represented as a dot diagram (dots represent equal time)

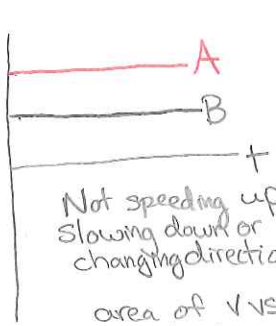
A start (t=0) • • • • • • • end — Fast, constant speed rightward velocity

B • • • • • • • Slow constant speed, rightward velocity



Slope of d vs t is $\frac{\Delta y}{\Delta x} = \frac{d}{t} = V$

V is constant for both



Not speeding up, slowing down or changing direction

area of V vs t is displacement

$d = vt$

If object is approaching the observer we would get a negative slope on a d vs t and therefore a negative velocity