

# Kinematics Equations

$$a = \frac{V - V_0}{t}$$

$$at = V - V_0$$

$$\textcircled{1} V_0 + at = V$$

$$\textcircled{2} D = V_0 t + \frac{1}{2} at^2$$

$$\textcircled{3} V^2 = V_0^2 + 2aD$$

## units Variables

(m) D = Displacement

( $\frac{m}{s}$ )  $V_0$  = Starting velocity

( $\frac{m}{s}$ ) V = final velocity

( $\frac{m}{s^2}$ ) a = acceleration

(s) t = time



## steps

① Read Problem

② ID variables

③ Pick equation

④ Solve

Grasshopper starts from rest & accelerates at  $10 \frac{m}{s^2}$  for 3s, how far does it go?

$V_0 = 0$  (starts from rest)

$a = 10 \frac{m}{s^2}$   $D = V_0 t + \frac{1}{2} at^2$

$t = 3s$

$D = ?$

$D = (0)3 + \frac{1}{2}(10)(3)^2$

$D = 0 + (5)(9)$

$= 45m$



Special case (free fall / gravity)

"Dropped"  $\rightarrow v_0 = 0$  &  $a = 10 \text{ m/s}^2$



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