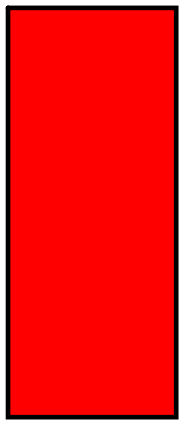
What are the variables (characteristics you can measure) of an object in motion?

d
t
v
a



$v_c = d/t$

v_c constant velocity

varying velocity

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

$\bar{v}$

v_v (varying/acceleration)

by difinition

$\bar{v} = \frac{v_1 + v_2}{t}$

$\frac{v_1 + v_2}{2} = d/t$ multiply by "t"

d v t

Δ

$d = \left(\frac{v_1 + v_2}{2}\right) t$

$\bar{v} = \frac{v_1 + v_2}{2}$

or,

$d = \bar{v}\, t$

You go from 15 m/s to 25 m/s in 2.0 s.
How far did you go?

What are the steps in solving this problem??????

You go from 15 m/s to 25 m/s in 2.0 s.
How far did you go?

1) list data- do any conversions if needed
   1a) draw diagram/picture if needed

2) "TM" type motion ...
   list base formula ... simplify...

3) isolate variable

4) plug in measurements
   -estimate
5) solve equation
   -reasonableness
6) do unit analysis

$$d = \left(\frac{v_1 + v_2}{2}\right)t$$

You go from 15 m/s to 25 m/s in 2.0 s.
How far did you go?

① $v_1 = 15\ m/s$
$v_2 = 25\ m/s$
$t = 2.0\ s$
$d = ?$

② d v t

$$d = \left(\frac{v_1 + v_2}{2}\right)t$$

TM $\quad d = \left(\frac{15\ m/s + 25\ m/s}{2}\right)2.0\ s$

$d = 40\ m$

$(m/s + m/s)\,s$
$m/s \times s$
m

by definition

$$a = \frac{\Delta v}{t}$$

$\Delta v = v_2 - v_1$
$= v_f - v_i$
$= v - v_0$

$$a = \frac{v_2 - v_1}{t}$$

multiply by "t" and add v_1

$$v_2 = v_1 + at$$

$v = at$

You are traveling at 15 m/s and accelerate at 2.0 m/s^2 for 3.0 s. What is your ending velocity?

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You are traveling at 15 m/s and accelerate at 2.0 m/s^2 for 3.0 s. What is your ending velocity?

$v_1 = 15\ m/s$

$a = 2.0\ m/s^2$

$t = 3.0\ s$

$v_2 = ?$

$v_2 = v_1 + at$

$v_2 = 15\ m/s + 2.0\ m/s^2 (3.0\ s)$

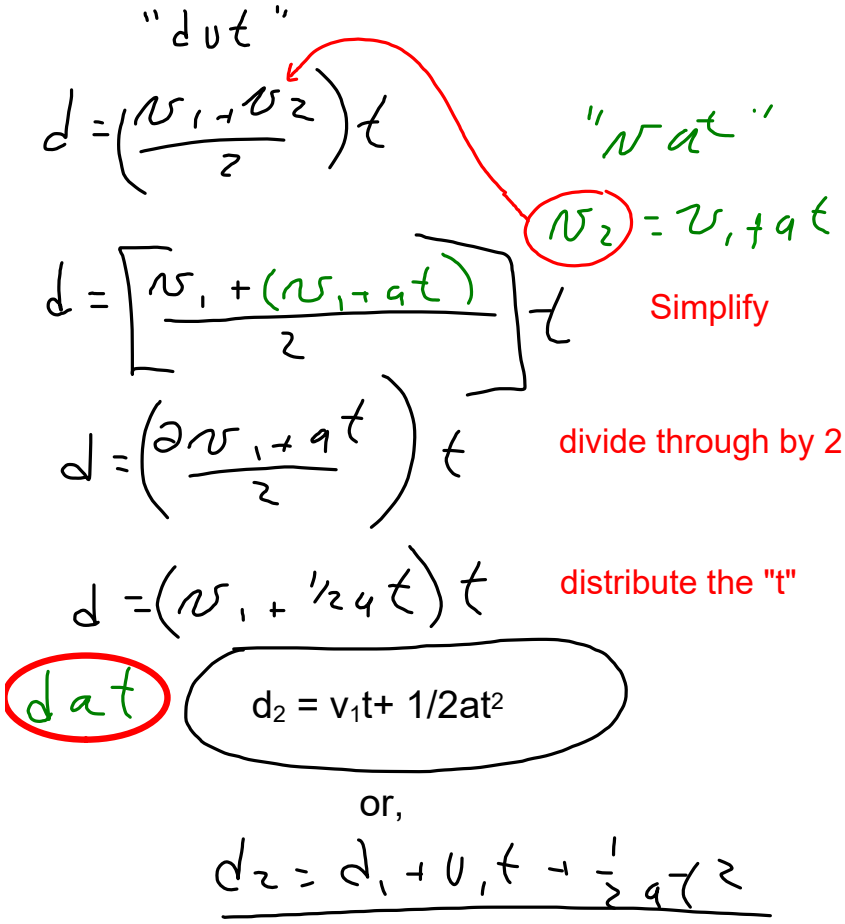
$v_2 = 15\ m/s + 6\ m/s$

$v_2 = 21\ m/s$

$m/s = m/s + m/s^2(s)$

$m/s = m/s + m/s$

$m/s = m/s$



How far does a ball fall if it is thrown downward at -15 m/s and strikes the ground 2.0 s later?

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$d = ?$

$v_1 = -15\ m/s$

$t = 2.0\ s$

$a = -9.8\ m/s^2$ (understood)

$$d = v_1 t + \frac{1}{2} a t^2$$

$$d = -15\ m/s(2.0\ s) + \frac{1}{2}(-9.8\ m/s^2)(2.0\ s)^2$$

$$d = -30\ m + (-20\ m)$$

$$d = -(50)\ m$$

– down

$$d = v_1 t + \frac{1}{2} a t^2$$

$$m = m/s(s) \quad m/s^2(s^2)$$

$m + m$

d vs t

$$d = \left(\frac{v_1 + v_2}{2}\right) t$$

v vs t

$v_2 = v_1 + at$

$t = \frac{v_2 - v_1}{a}$

$$d = \left(\frac{v_1 + v_2}{2}\right)\left(\frac{v_2 - v_1}{a}\right)$$

dist

$$d = \frac{v_1 v_2 + v_2 v_2 - v_1 v_1 - v_2 v_1}{2a}$$

$$d = \frac{-v_1 v_2 + v_2^2 - v_1^2 - v_2 v_1}{2a}$$

$$d = \frac{v_2^2 - v_1^2}{2a}$$

v_2 ?

$\times 2a + v_1^2$

$$v_2^2 = v_1^2 + 2ad$$

v a d

What velocity does a ball hit the ground at if it's thrown downward at -15 m/s from a 25 m cliff?

What velocity does a ball hit the ground at if it's thrown downward at -15 m/s from a 25 m cliff?

$v_2 = ?$

$v_1 = -15\ m/s$

$d = -25\ m$

$a = -9.8\ m/s^2$

"no d" $v_2^2 = v_1^2 + 2ad$

$v_2 = \sqrt{v_1^2 + 2ad}$

$v_2 = \pm\sqrt{(-15\ m/s)^2 + 2(-9.8\ m/s^2)(-25\ m)}$

$v_2 = \sqrt{225\ m^2/s^2 + (+490\ m^2/s^2)}$

$v_2 = \pm\sqrt{715\ m^2/s^2}$

$v_2 = -27\ m/s$

Downward! you have to choose the correct sign