Lesson 3
Thursday, September 16, 2010
11:47 PM

Physics 11 SI units standard units of measurement

length = meters, "m" (lower case)
time = seconds, "s"
mass = grams, "g" but, for calculations we use kilograms. "kg"

} base units

current = Amperes "A"
Amount of substance = mole "mol"
Temperature = Kelvin "K" (uppercase)
luminous intensity = candela "cd"

Prefixes pg 17 T/B

Kilo	"k"	$\times 10^{3}$
milli	"m"	10^{-3}
centi	"c"	10^{-2}
micro	"μ" (mu)	10^{-6}
nano	n	10^{-9}

Later on we'll do Unit conversions

Manipulating equations

if you are given $y = mx + b$

Isolate, or solve for b

$y = mx + b$
$-mx \quad -mx$
$b = y - mx$

Solve for a if you are given

$a t = \frac{d}{a} \times a \Rightarrow a \cdot \frac{t}{t} = \frac{d}{t}$

A)

A)

$$a = \boxed{\frac{d}{t}}$$

Solve $c^2 \Rightarrow$ $\qquad V_T = \dfrac{V_1 + V_2}{1 + \dfrac{V_1 V_2}{c^2}}$

$$u = \frac{V + u'}{1 + \dfrac{Vu'}{c^2}} \qquad \text{solve for } c^2$$

$$= \frac{\dfrac{V+u'}{1}}{\dfrac{c^2}{c^2} + \dfrac{Vu'}{c^2}} = \frac{\dfrac{V+u'}{1}}{\dfrac{c^2+Vu'}{c^2}} = \frac{(V+u')}{1} \cdot \frac{c^2}{c^2+Vu'}$$

$$(c^2+Vu')u = \frac{c^2(V+u')}{c^2+Vu'} \cdot (c^2+Vu')$$

$$c^2u + Vuu' = c^2V + c^2u'$$

$$Vuu' = c^2V + c^2u' - c^2u$$

$$\frac{Vuu'}{V+u'-u} = \frac{\boxed{c^2}(V+u'-u)}{V+u'-u}$$

Solve for a if you are given

$$V = \sqrt{2as}$$

$$(V)^2 = \left(\sqrt{2as}\right)^2$$

$$\frac{V^2}{2s} = \frac{2as}{2s}$$

$$a = \frac{V^2}{2s}$$

~~[illegible]~~

$$V = V_0 + at \qquad \text{solve for } t$$

$$-V_0 \quad -V_0$$

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

Unit Conversions look @ table 2-1 pg 17 of TIB

Ex $\underbrace{565{,}900\text{ s}}_{4\text{ sig figs}} \times \underbrace{\frac{1\text{ hr}}{3600\text{ s}}}_{\text{unit conversion}} = 157.944\text{ hr}$ days

$157.944\text{ hr} \left|\frac{1\text{ day}}{24\text{ hr}}\right| = 6.5497\text{ days}$

$\doteq 6.550\text{ days}$

17 years into minutes

$17\text{ yr} \left|\frac{365\text{ d}}{1\text{ yr}}\right| \left|\frac{24\text{ hrs}}{1\text{ day}}\right| \left|\frac{60\text{ min}}{1\text{ hr}}\right| = 8935200$

$\doteq 8{,}900{,}000\text{ min}$

Recall prefixes, and base units

Kilo - 10^3

Kilo gram 10^3 gram

1 kilogram = 1×10^3 grams

2 Tera meters = 2×10^{12} meters

$4.0 \times 10^3\ \mu m = 4.0 \times 10^{-6}\ m$

Convert $4.0 \times 10^3\ \mu m$ into km

$1\ \mu m = 10^{-6}\ m$

$1\text{ km} = 10^3\ m$

$4.0 \times 10^3\ \mu m \times \left|\frac{10^{-6}\ m}{1\ \mu m}\right| \left|\frac{1\text{ km}}{10^3\ m}\right| = 4 \times 10^{-6}\text{ km}$

3.8×10^4 Mg into nano

$$3.8 \times 10^4 \times \frac{10^6 \text{ g}}{1 \text{ Mg}} \times \frac{1 \text{ ng}}{10^{-9} \text{ g}} =$$

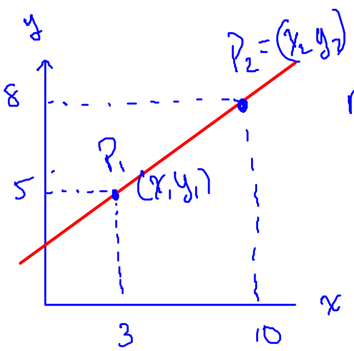
50 km/hr into m/s

$$\frac{50 \text{ km}}{\text{hr}} \cdot \frac{10^3 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ hr}}{3600 \text{ s}}$$

Ph 11 The metric System WS - 100

Try 2 a c e
3 a c e
5 a c e } 15 min

Calculating slopes of graphs



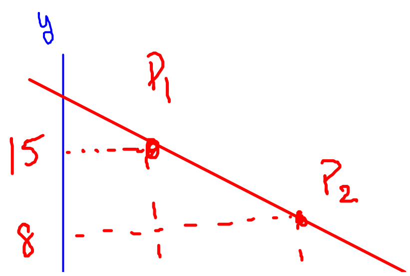
Calculate slope

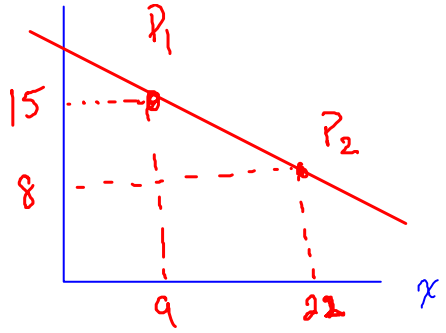
$$m = \frac{\Delta y}{\Delta x} = \frac{\text{change in } y}{\text{change in } x}$$

$$= \frac{y_2 - y_1}{x_2 - x_1}$$

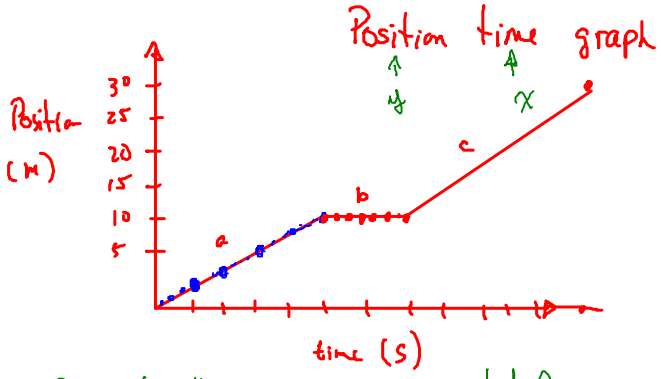
$$m = \frac{8 - 5}{10 - 3} = \frac{3}{7}$$

Does Not matter which point is 1 or 2





$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 15}{22 - 9} = \frac{-7}{13}$$



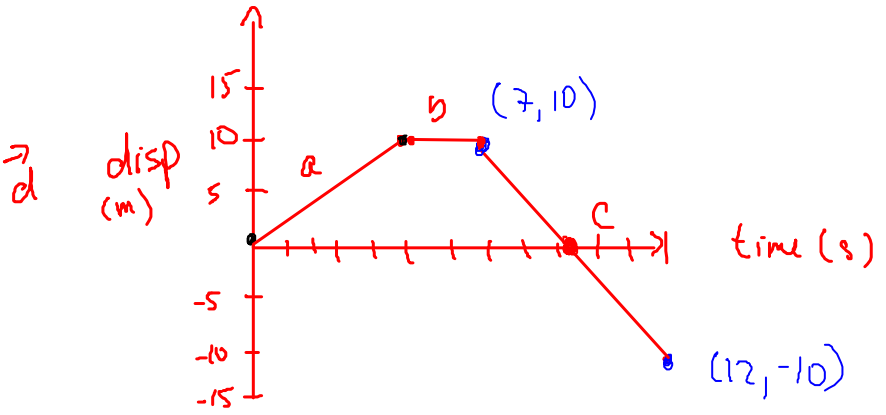
I walked 10m in 5s, rested for 2s, ran 20m in 5s

calc slope @ "a" $m = \frac{2m}{s} = \frac{y_2 - y_1}{x_2 - x_1}$ $\frac{10m - 0m}{5s - 0s} = \frac{10m}{5s} = \frac{2m}{s}$

"b" $m = \frac{0m}{s}$

"c" $m = \frac{4m}{s} = \frac{30m - 10m}{12s - 7s} = \frac{4m}{s}$

If no direction is given, you calculated speed → slope of a distance time graph is speed



$= -4 \frac{m}{s}$

I walked 10 m East in 5s, stopped for 2s

ran 20m West in 5s

calc slope $a = 2 m/s$

$b = 0 m/s$

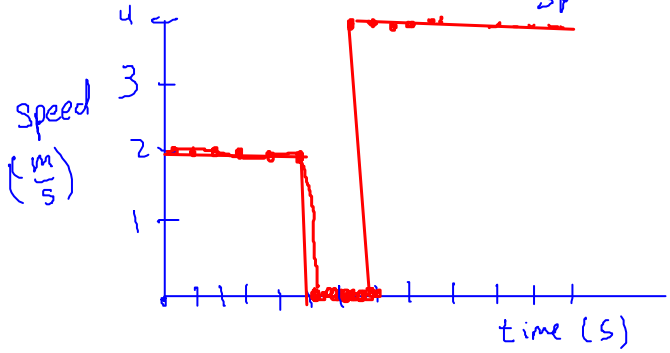
$c = -4 m/s$

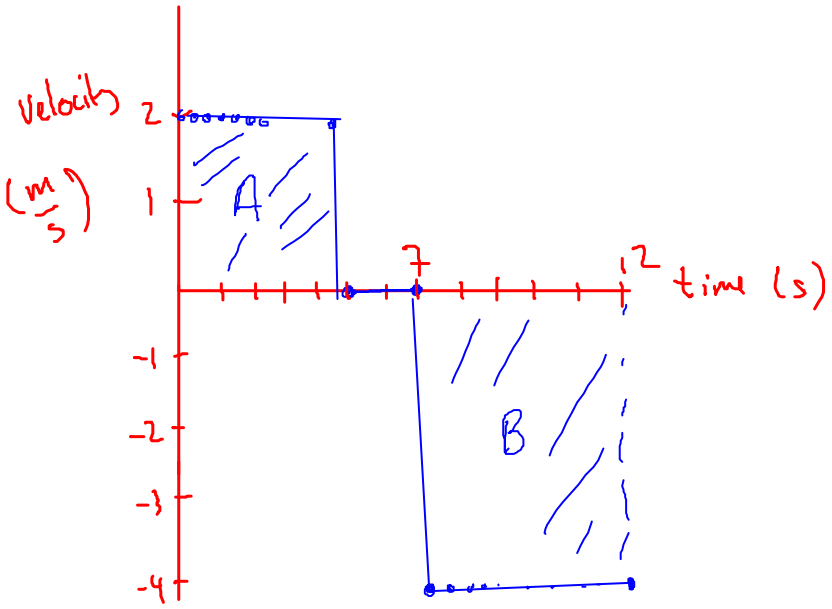
} since we have direction, this is velocity

dist, speed } scalars

disp, velocity } vectors

speed time graph





Calc The Area $A = \frac{2m}{s} \cdot \frac{5s}{1}$

$= 2.5 \cdot \frac{m}{\cancel{s}} \cdot \frac{\cancel{s}}{1} = +10m$ E

$B = \frac{-4m}{s} \cdot 5s = = -20m$

Net disp = $-10m$ or $10m$ W

Area under $\vec{V}$-t graph = disp

$disp = \vec{V} \cdot t$

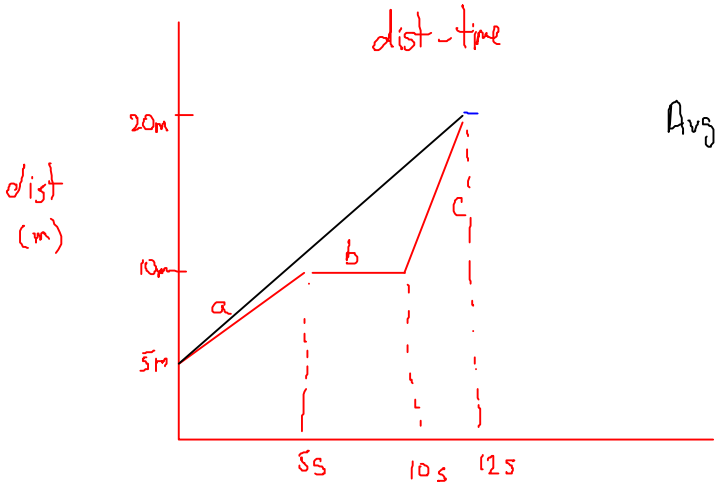
$\vec{d} = \vec{v}t$

slope of v-t graph is "$\vec{a}$"

w/B pg 27 1, 2, 3, 6, 7, 8, 9, 12 hard

Quiz Next class

soln will be online by Friday night.



Avg speed = $\frac{\Delta dist}{\Delta time}$

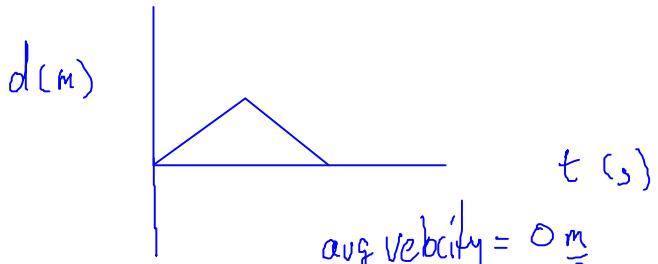
$= \frac{d_f - d_i}{t_f - t_i}$

$= \frac{20m - 5m}{12s} = 1.25 \frac{m}{s}$

time (s)

Calc ~~speed~~ for "c" $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{20m - 10m}{12s - 10s} = \frac{10m}{2s}$

avg speed : $\frac{d_f - d_i}{t_f - t_i} = \frac{\Delta dist}{\Delta t} = \frac{20m - 5m}{12s} = 1.25 \frac{m}{s}$ $= 5 m/s$



avg velocity = $0 \frac{m}{s}$

Avg velocity = $\frac{\text{Total disp}}{\text{total time}}$