Chapter 1 :

1. start at rest ∴ $V_i = 0$ "accelerated uniformly"

ⓐ $a = ??$ $d = 5\ m$ $V_f = ??$ when it reaches the 5m

1s ⟶ to cover 5 m

$$d = \cancel{V_i t}^{0} + \frac{1}{2} a t^2$$

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

$$\frac{2 \times 5}{(1)^2} = \boxed{a = 10\ m/s^2}$$

ⓑ

$$V_f = V_i + at$$

$$V_f = 0 + (10)(1)$$

$$\boxed{V_f = 10\ m/s}$$

Q2

During car crash

$t = 0.18s$ to stop

$V_i = 50\ km/h$

$V_f = 0$ (stopped)

ⓐ at what rate is the car accelerating during the crash ?!

$$V_i = \frac{50\ km}{h} \times \frac{10^3\ m}{1\ km} \times \frac{1\ h}{3600\ s} = 13.9\ m/s \approx 14\ m/s$$

$$a = \frac{\Delta V}{\Delta t} = \frac{0 - 13.9}{0.18} = -77.2\ m/s^2$$

deceleration (slow down)

ⓑ how many times larger than the acceleration due to g

$$\frac{77.2}{9.8} = 7.9 \approx 8 \text{ times greater than } g$$

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$V_f = 8 \, km/h$ $\quad V_i = 0$ $\quad X_0 = 0$

$d = 20 \, m$ $\quad t_f = 5 \, s$

$$V_f = \frac{8 \, km}{h} \times \frac{10^3 \, m}{1 \, km} \times \frac{1 \, h}{3600 \, s} = 2.2 \, m/s$$

$$a = \frac{\Delta V}{\Delta t} = \frac{V_f - V_0}{\Delta t} = \frac{2.2}{5} = 0.44 \, m/s^2$$

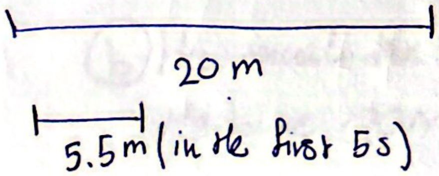
Now: we need to find how far the jogger travels while accelerating.

$$\cancel{X = X_0 +} \quad \Delta X = V_0 + \frac{1}{2} a t^2$$

$$X = 0 + \frac{1}{2} a t^2$$

$$X = \frac{1}{2} \times 0.44 \times (5)^2$$

$$\boxed{X = 5.5 \, m}$$



$\therefore L = 20 - 5.5 = 14.5 \, m$

⟹ Now, to find How Long does it take the jogger to reach the end of their 20m Long driveway

$$t = \frac{d}{V_i} = \frac{14.5}{2.2} = \underline{\underline{6.6}}\,sec$$

the accelerating time = 5 sec to reach 5.5 m

then it took t = 6.6 sec to end the driveway with d = 14.5 m

The traveling time from the starting point

$$t = 5 + 6.6 = 11.\underline{\underline{6}}\,sec$$

Q4

blue car at

$V_b = 50$ km/h

red car

$d = 30$ m (red car behind the blue car)

$V_r = 60$ km/h

(a)

$V_b = 13.89$ m/s

$V_r = 16.67$ m/s

$\Delta V = 16.67 - 13.89$

$= 2.8$ m/s

∴ red car faster than the blue by this amount

∴ then the time needed to the red one to travel the 30 m

$$t = \frac{d}{V} = \frac{30}{2.8} = 10.71 \text{ sec}$$ to pass the blue car.

(b) How much ~~the~~ further down the road will the blue car travel in this time.

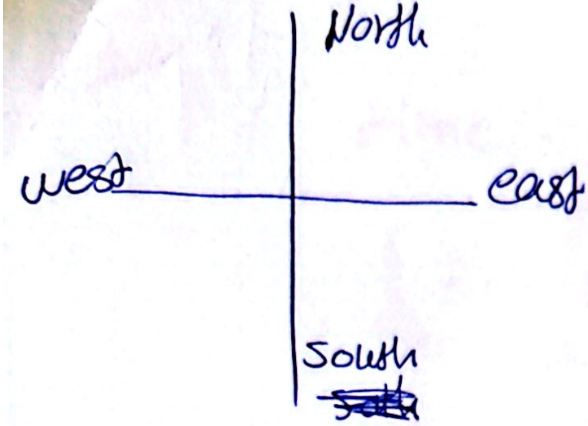
$V_b = 13.8$ m/s

t for the red car to pass $= 10.71$

$\therefore \quad d_{blue} = t \times V$

$= 13.8 \times 10.71$

$= 147.86$ m traveled



jogger took this path
120m (North) then, (west) 100m
35 (south) and finally
(west) 50m

$t = 2$ min, 18 sec

① the distance.

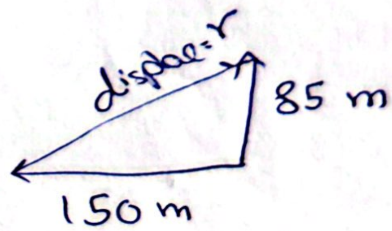
$d = 120 + 100 + 35 + 50$

$= 305$ m

② the displacement.

$X = -50 + -100 = -150$ m

$y = 120 - 35 = 85$ m



$r = \sqrt{x^2 + y^2} = \sqrt{(150)^2 + (85)^2} =$

$= 172.4$ m

$\tan^{-1}\left(\frac{y}{x}\right) = \theta$

$\theta = \tan^{-1}\left(\frac{85}{150}\right) = 29.5^\circ$ North of west

$$time = 2\,min * \frac{60\,s}{1\,min} = 120\,sec$$

$$time = 120 + 18$$

$$\boxed{t = 138\,sec}$$

$$speed = \frac{distance}{time} = \frac{305}{138} = 2.21\ m/s$$

(d) velocity

$$\vec{V} = \frac{\overrightarrow{Displacment}}{time}$$

$$= \frac{172}{138} = 1.246\,m/s$$

in the same direction of $\vec{D}$

60° west of North.