

TIME, SPEED AND DISTANCES

1. Speed (s) = $\frac{\text{Distance (d)}}{\text{Time (t)}}$

2. Distance is constant

$$S \propto \frac{1}{t}$$

$$S_1 t_1 = S_2 t_2$$

Average speed :-

$$\begin{array}{ccc} x \text{ kmph} & & y \text{ kmph} \\ \xrightarrow{d_1} & & \xleftarrow{d_2} \end{array}$$

$$t_1 = \frac{d_1}{x}$$

$$t_2 = \frac{d_2}{y}$$

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

$$= \frac{d_1 + d_2}{t_1 + t_2}$$

$$= \frac{d_1 + d_2}{\frac{d_1}{x} + \frac{d_2}{y}}$$

$$= \frac{xy(d_1 + d_2)}{d_1 y + d_2 x}$$

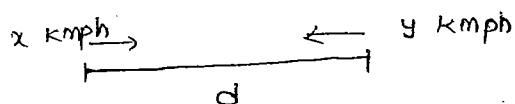
$$= \frac{xy(d + d)}{dy + dx}$$

$$\therefore d_1 = d_2 = d$$

$$\text{Average speed} = \frac{2xy}{x+y} \text{ kmph}$$

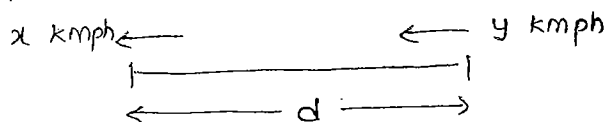
Relative speeds :-

1. In opposite directions :-



$$\text{Relative speed} = (x+y) \text{ kmph}$$

2. In same direction :-



$$\text{Relative speed} = (y-x) \text{ kmph}$$

3. Time is constant :-

$$\begin{aligned} S &\propto d \\ S_1 d_2 &= S_2 d_1 \end{aligned}$$

4. Speed is constant :-

$$\begin{aligned} d &\propto t \\ d_1 t_2 &= d_2 t_1 \end{aligned}$$

5. Units :-

$$\begin{aligned} \text{Speed} \begin{cases} \text{kmph} = \frac{1000 \text{ m}}{60 \times 60 \text{ s}} = \frac{5}{18} \text{ m/s} \\ \text{mps} = \frac{18}{5} \text{ kmph} \end{cases} \end{aligned}$$

P.g No:- 75

$$1. \text{ speed} = \frac{\text{distance}}{\text{time}}$$

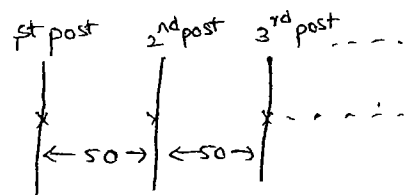
$$\text{distance} = (20 \times 50) = 1000 \text{ m} = 1 \text{ km}$$

$$\text{time} = 1 \text{ min} = 1 \times \frac{1}{60} \text{ hr}$$

$$\therefore \text{ speed} = \frac{1 \text{ km}}{\frac{1}{60} \text{ hr}} = 60 \text{ km/hr}$$

$$2. S_c = \frac{d}{t}, \quad S_j = \frac{d/2}{2t}$$

$$\frac{S_j}{S_c} = \frac{d}{4t} \times \frac{t}{d} = 1:4$$



In 3 post $\rightarrow$ two
50's are
coming

like that

21 post $\rightarrow$ 20 (50's)
are coming

$$3. \text{ Speed} = \frac{\text{distance}}{t}$$

$$\text{distance} = \text{speed} \times t$$

$$= 80 \times \left(2 \text{ hr } \frac{15}{60}\right)$$

$$= 80 \times 2.25$$

$$= 180 \text{ km}$$

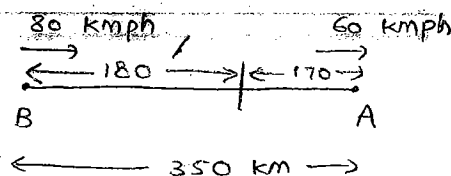
$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

$$= \frac{170}{60}$$

$$= 2.83 \text{ hrs} \Rightarrow (2 + 0.83 \text{ hrs})$$

$$= 2 \text{ hours } 50 \text{ min}$$

2 hr 15 min



$$\begin{aligned} & \downarrow \text{min} \\ & 0.83 \times 60 \\ & = 49.8 \text{ min} \end{aligned}$$

$$5. \text{ Average speed} = \frac{2xy}{x+y}$$

$$= \frac{2\left(\frac{5x}{4}\right)(x)}{\frac{5x}{4} + x} = \frac{800}{16}$$

$$x = 5 \times 9 = 45 \text{ kmph}$$

$$\therefore \frac{5x}{4} = \frac{5 \times 45}{4} = 56.25 \text{ kmph}$$

$$25\% \text{ of } x = \frac{5x}{4}$$

$$\text{800 km}$$

$$x \text{ kmph}$$

$$25\% \text{ of } x = \frac{25}{100} \times x = \frac{x}{4}$$

$$x + \frac{x}{4} = \frac{5x}{4}$$

P.9 No:- 76

$$1. \text{ (A)} \rightarrow 1 \text{ hr} \rightarrow 50 \text{ kmph} \rightarrow (50 \times 1) = 50 \text{ km}$$

$$\text{(B)} \rightarrow 2 \text{ hrs} \rightarrow 48 \text{ kmph} \rightarrow (2 \times 48) = 96 \text{ km}$$

$$\text{(C)} \rightarrow 3 \text{ hrs} \rightarrow 52 \text{ kmph} \rightarrow (52 \times 3) = 156 \text{ km}$$

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

$$= \frac{50 + 96 + 156}{6}$$

$$= 50 \frac{1}{3} \text{ kmph}$$

$$9. \text{ 6 km} \rightarrow 1 \frac{1}{2} \text{ kmph} \rightarrow \frac{6}{3/2} = 4 \text{ hrs}$$

$$8 \text{ km} \rightarrow 2 \text{ kmph} \rightarrow \frac{8}{2} = 4 \text{ hrs}$$

$$32 \text{ km} \rightarrow 8 \text{ kmph} \rightarrow \frac{32}{8} = 4 \text{ hrs}$$

$$\frac{d}{s} = t$$

$$\text{Avg. Speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{6 + 8 + 32}{6 + 4 + 4} = 3 \frac{5}{6} \text{ kmph}$$

$$3. \quad t_1 = \frac{715}{s} \quad t_2 = \frac{715}{s+10}$$

$$t_1 - t_2 = 2 \text{ hrs}$$

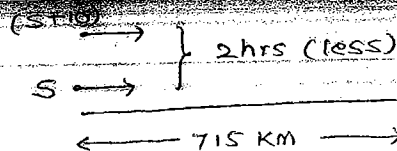
$$\frac{715}{s} - \frac{715}{s+10} = 2 \text{ hrs}$$

$$715 \left[\frac{s+10-s}{s^2+10s} \right] = 2 \text{ hrs}$$

$$2s^2 + 20s - 7150 = 0$$

$$= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$s \approx 55 \text{ km/hr}$$



$$\frac{\text{product of speed}}{d} = \frac{D/f \text{ of speed}}{D/f \text{ of time}}$$

$$(or) \quad \frac{s(s+10)}{715} = \frac{10}{2}$$

$$2s^2 + 20s - 7150 = 0$$

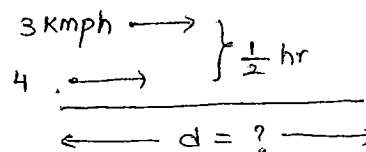
$$11. \quad 4 \text{ km/hr}$$

$$3 \text{ km/hr}$$

$$\frac{\text{product of speed}}{d} = \frac{\text{Difference of speed}}{D/f \text{ of time}}$$

$$\frac{3 \times 4}{d} = \frac{1}{1/2}$$

$$d = 6 \text{ hrs}$$



$$4 - 3 = 1$$

$$12. \quad \frac{20 \times 30}{d} = \frac{10 \text{ hrs}}{4} \rightarrow (30 - 20)$$

$$d = 240 \text{ km}$$

$$1 \frac{1}{2} \left\{ \begin{array}{l} 30 \text{ kmph} \rightarrow \\ 20 \text{ kmph} \rightarrow \end{array} \right\} 2 \frac{1}{2} = \frac{3}{2} + \frac{5}{2} = 4 \text{ hrs}$$

$$A \leftarrow d = ? \rightarrow B$$

2.

$$\frac{s(s+10)}{d} = \frac{10}{1}$$

$$10d = s^2 + 10s \rightarrow (1)$$

$$1 + \frac{3}{4} = \frac{7}{4} \text{ hr} \left\{ \begin{array}{l} (s+20) \rightarrow \\ (s+10) \rightarrow \\ s \rightarrow \end{array} \right\} \begin{array}{l} 45 \text{ min} = \frac{3}{4} \text{ hr (less)} \\ 1 \text{ hr (less)} \end{array}$$

$$\leftarrow d \rightarrow$$

$$\frac{s(s+20)}{d} = \frac{20}{7/4}$$

$$20d = \frac{7}{4}s^2 + 35s \rightarrow (2)$$

Solve (1) & (2)

$$20d = \frac{7}{4}s^2 + 35s$$

$$20d = 2s^2 + 20s$$

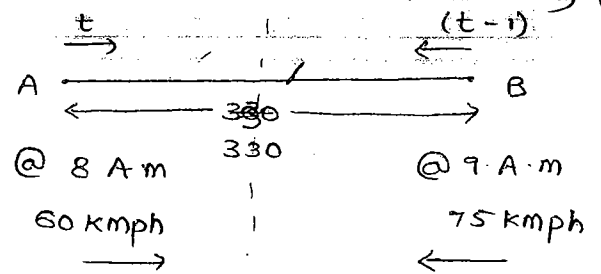
$$2s^2 + 15s = 0 \Rightarrow s = 60 \text{ km}$$

5. $60 \times t + 75 \times (t-1) = 330$

$135t = 405$

$t = 3 \text{ hrs}$

@ $8 + 3 = 11 \text{ A.M.}$



6.

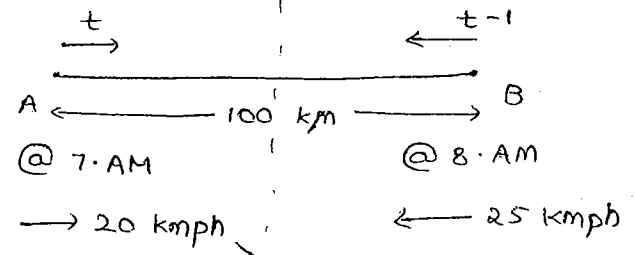
$20 \times t + 25 \times (t-1) = 100$

$20t + 25t - 25 = 100$

$45t = 125$

$t = 2 \text{ hrs } 47 \text{ min}$

@ $7 + 2 \text{ hr } 47 \text{ min} = 9:47 \text{ AM}$



7.

$d = \frac{t}{s} \quad t = \frac{d}{s}$

$\frac{x}{50} = \frac{x+120}{60}$

$60x - 50x = 120 \times 50$

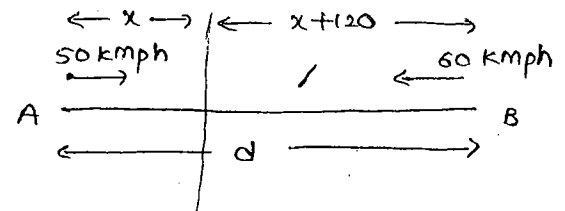
$10x = 120 \times 50$

$x = 12 \times 50$

$x = 600 \text{ km}$

$x + 120 = 600 + 120 = 720 \text{ km}$

$d = 600 + 720 = 1320 \text{ km}$



(or)

A : B

$\frac{50}{60}$

$1p = 1200$

$11p = 1320 \text{ km.}$

8.

M : P

60 : 40

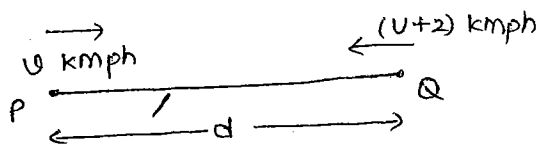
3 : 2

3 : 2

$(3-2) = 1p = 20 \text{ km}$

$(3+2) = 5p = 100 \text{ km}$

14. In opposite direction



$$R_s = u + u + 2 = 2u + 2$$

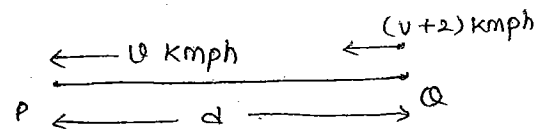
$$\frac{d}{2u+2} = \frac{72}{60}$$

$$5d = 12u + 112$$

$$\therefore 5(12) = 12u + 112$$

$$u = 4\frac{1}{2} \text{ kmph}$$

In same direction



$$\text{Relative speed} = u + 2 - u = 2 \text{ kmph}$$

$$\frac{d}{2} = 6$$

$$d = 12 \text{ km}$$