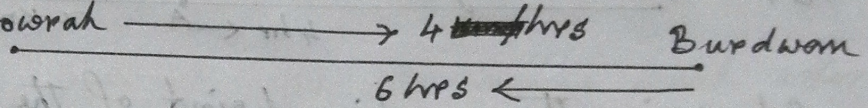
Exercise - 18 (K. C. Nag, Arithmetic)

10.



Let the distance between Howrah and Burdwan be x km.

∴ The speed of the train from Howrah to Burdwan is $x/4$ km/hr and the speed of the train from Burdwan to Howrah is $x/6$ km/hr.

As two trains are approaching each other, their relative speed is $\left(\frac{x}{4}+\frac{x}{6}\right)$ km/hr $= \frac{5x}{12}$ km/hr.

$$\frac{x}{4}+\frac{x}{6} = \frac{3x+2x}{12} = \frac{5x}{12}$$

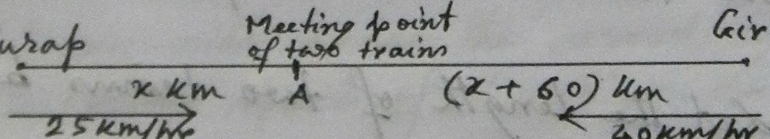
With this relative speed time needed to cover x km

$= \left(x \div \frac{5x}{12}\right)$ hours $= x \times \frac{12}{5x} = 2\frac{2}{5}$ hrs $= 2$ hrs 24 min

∴ They will take 2 hrs 24 mins before they meet each other.

∴ They will meet at (7 + 2 hrs 24 mins) = 9.24 am.

11.



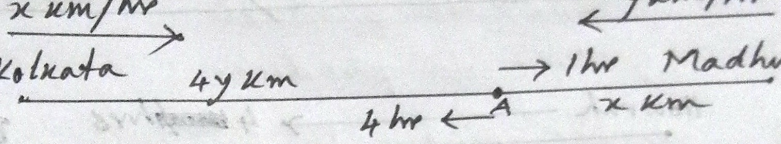
Suppose two trains meet at point A in the diagram and the distance from of A from Gurap is x km. ∴ The distance of A from Giridi will be $(x+60)$ km. Before meeting each other, both train has to travel for same time.

∴ $\frac{x}{25} = \frac{x+60}{40}$ or $40x = 25x + 1500$

or $15x = 1500$ or $x = 1500/15 = 100$

∴ The required distance $= (2x+60)$ km $= (2\times100+60)$ km $= 260$ km

13.



Let A is the meeting point of the two trains. After A the train from Kolkata took 1hr and that from Madhupur took 4 hours to arrive at their destinations. Let the speed of the ~~first~~ trains from Kolkata be x km/hr and that from Madhupur be y km/hr.

∴ The distance of A from Kolkata is 4y km and the distance A from Madhupur is x km.

∴ We may say,

$$\frac{4y}{x} = \frac{x}{y} \quad \text{or } x^2 = 4y^2$$

$$\text{or } x = \sqrt{4y^2} = 2y$$

$$\therefore \frac{x}{y} = \frac{2}{1} \quad \text{or } x : y = 2 : 1$$

∴ One travels twice as fast as the other.

15. Let the length of two trains be x m each.

∴ The speed of the first train $\frac{x}{18}$ m/sec and that of the second train is $\frac{x}{12}$ m/sec.

As they are running in the opposite direction, their relative speed $= \left(\frac{x}{18} + \frac{x}{12}\right)$ m/sec

$$= \frac{2x + 3x}{36} \text{ m/sec} = \frac{5x}{36} \text{ m/sec}.$$

To cross each other they will have to cover $2x$ m with a relative speed of $\frac{5x}{36}$ m/sec.

$\therefore$ The required time to cross each other

$= \left(2x \div \frac{5x}{36}\right)$ seconds $= 2x \times \frac{36}{5x}$ seconds

$= \frac{72}{5}$ seconds

$= 14\frac{2}{5}$ seconds.

17. i) Let the length of the train be x m

The train will cross the first cyclist at a relative speed of $(14-4)$ km/hr $= 10$ km/hr.

$\therefore$ In 60×60 or 3600 seconds the train goes 10000 m

" 1 " " " " $\frac{10000}{3600}$ "

" 18 " " " " $\frac{5}{\cancel{10000}} \times 18$ "

$\therefore$ The length of the train is 50 m.

ii) Let the speed of the second cyclist be y km/hr

$\therefore$ The train will cross the second cyclist with a relative speed of $(14+y)$ km/hr.

$\therefore$ $(14+y) \times 1000$ m can be covered in 3600 seconds

1 " " " " " $\frac{3600}{(14+y) \times 1000}$ "

50 " " " " " $\frac{3600 \times 50}{(14+y) \times 1000}$ "

$\therefore \frac{\cancel{3600} \times \cancel{5}}{(14+y) \times \cancel{1000}} = 10$ or $10 \times (14+y) = 36 \times 5$

$\therefore 10y + 140 = 180$, $\therefore y = 4$

$\therefore$ The speed of the second cyclist is 4 km/hr.