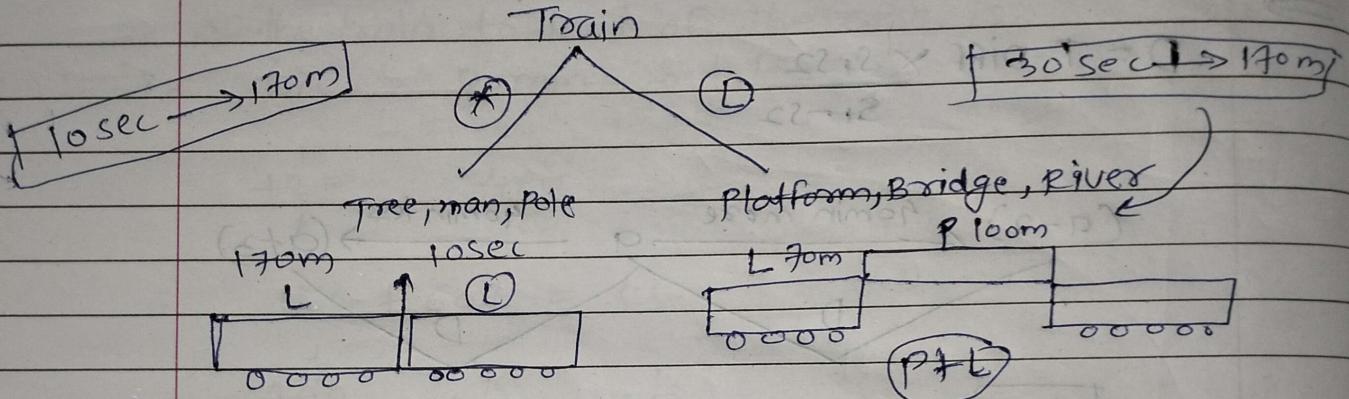
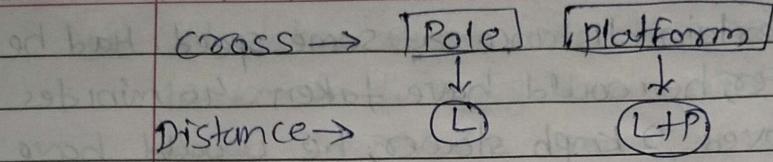


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14. Train



$$\boxed{\text{Speed} = \frac{L}{t}}$$

$$\boxed{\text{Speed} = \frac{P+L}{t}}$$

$$\textcircled{1} \quad \frac{L_1}{S_1} \rightarrow \quad \frac{L_2}{S_2}$$

$$\textcircled{2} \quad \frac{L_1}{S_1} \rightarrow \quad \frac{L_2}{S_2}$$

$$\boxed{t = \frac{L_1 + L_2}{S_1 + S_2}}$$

$$\boxed{t = \frac{L_1 + L_2}{S_1 - S_2}}$$

$$\textcircled{3} \quad \frac{L}{S_1} \rightarrow \quad \frac{S_2}{S_2}$$

$$\textcircled{4} \quad \frac{L}{S_1} \rightarrow \quad \frac{S_2}{S_2}$$

$$\boxed{t = \frac{L}{S_1 - S_2}}$$

$$\boxed{t = \frac{L}{S_1 + S_2}}$$

$$\text{km to m} \rightarrow \frac{5}{18}$$

$$\text{m to km} \rightarrow \frac{18}{5}$$

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1) A train running at the speed of 60 km/hr crosses a pole in 9 seconds. What is the length of the train?

\Rightarrow

$$\text{Speed} = \frac{L}{t}$$

$$60 \times \frac{5}{18} = \frac{L}{9}$$

Convert into meter

$$60 \times \frac{5}{18} \times 9 = L$$

$$L = 150 \text{ m}$$

2) A train 125 m long passes a man, running at 5 km/hr in the same direction in which the train is going in 10 seconds. The speed of the train is:

\Rightarrow

$$t = \frac{L}{(S_1 - S_2)}$$

convert m to km

$$(S_1 - S_2) = \frac{L}{t} = \frac{125}{10} \times \frac{18}{5} \Rightarrow 45 \text{ km/hr}$$

$$S_1 - S_2 = 45 \text{ km/hr}$$

$$S_1 - 5 \text{ km/hr} = 45 \text{ km/hr}$$

$$S_1 = 45 + 5$$

$$S_1 = 50 \text{ km/hr}$$

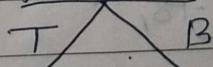
3) The length of the bridge, which a train 130 metres long and travelling at 45 km/hr can cross in 30 seconds is:

\Rightarrow

$$30 \text{ sec} \longrightarrow 130 + B$$

$$45 \times \frac{5}{18} \times 30 \longrightarrow 375 \text{ m}$$

Convert Km to m



- 4) Two trains running in opposite directions cross a man standing on the platform in 27 seconds and 17 seconds respectively and they cross each other in 23 seconds. The ratio of their speeds is:



$$\frac{L_1}{27} \leftarrow \frac{L_2}{17} \rightarrow \frac{81}{27} = 3 \quad \frac{34}{17} = 2$$

$$= [3:2]$$

$$t = \frac{L_1 + L_2}{\text{relative speed}}$$

$$\frac{L_1}{27} + \frac{L_2}{17}$$

$$23 = \frac{L_1 + L_2}{(17 \times 27)} \quad (17 \times 27) \text{ is common factor}$$

$$17L_1 + 27L_2$$

$$(23 \times 17)L_1 + (27 \times 23)L_2 = (17 \times 27)L_1 + (17 \times 27)L_2$$

$$391L_1 + 621L_2 = 459L_1 + 459L_2$$

$$68L_1 = 162L_2$$

$$\frac{L_1}{L_2} = \frac{162}{68} \Rightarrow \frac{81}{34}$$

- 5) A train passes a station platform in 36 seconds and a man standing on the platform in 20 seconds. If the speed of the train is 54 km/hr, what is the length of the platform?



$$20 \text{ sec} \longrightarrow L$$

$$36 \text{ sec} \longrightarrow L + P$$

$$16 \text{ sec} \longrightarrow P$$

$$54 \times \frac{5}{18} \times 16 \rightarrow 1240 \text{ m}$$

Convert km to
m

6) A train 240m long passes a pole in 24 seconds. How long will it take to pass a platform 650m long?

$$\Rightarrow 240 \xrightarrow{\frac{1}{10}} 24 \text{ sec}$$

$$L \quad P \\ | 240 + 650 |$$

$$890 \xrightarrow{\frac{1}{10}} [89 \text{ sec}] \checkmark$$

7) Two trains of equal length are running on parallel lines in the same direction at 46 km/hr and 36 km/hr. The faster train passes the slower train in 36 seconds. The length of each train is:-

$$\Rightarrow t = \frac{L_1 + L_2}{S_1 - S_2} \quad | \quad (L_1 + L_2) = (S_1 - S_2) \times t \quad | \quad (46 - 36) = 10$$

$$= 10 \times \frac{5}{18} \times 36$$

convert km to m

$$= 100$$

Two trains equal length

$\circlearrowleft 50 \quad \circlearrowright 50$

$$\underline{\text{Ans}} = \underline{50}$$

8) A train 360m long is running at a speed of 45km/hr. In what time will it pass a bridge 140m long?

$$\Rightarrow \frac{L}{S} = \frac{b}{s}$$

$$360 + 140 = \frac{500}{\frac{45 \times 5}{18}} \quad \text{km to m}$$

$$\Rightarrow \frac{500 \times 2}{25}$$

$$\Rightarrow \boxed{40 \text{ sec}}$$

9) Two trains are moving in opposite directions 60 km/hr and 90 km/hr. Their lengths are 1.10 km and 0.9 km respectively. The time taken by the slower train to cross the faster train in seconds is:



$$t = \frac{L_1 + L_2}{S_1 + S_2} \rightarrow \frac{1.10 + 0.9}{60 + 90}$$

$$\Rightarrow \frac{2 \text{ km}}{150 \text{ km/hr}}$$

$$\Rightarrow \frac{2000 \text{ m}}{150 \text{ km to hr}} \text{ km to m}$$

$$5 \cancel{180} \times \cancel{5} \frac{5}{18}$$

$$\Rightarrow \frac{8}{25} \times 6$$

$$= \boxed{48 \text{ sec}}$$

10) A jogger running at 9 kmph along side a railway track in 240 metres ahead of the engine of a 120 m long train running at 45 kmph in the same direction. In how much time will the train pass the jogger?



45 km/hr

240m

9 km/hr

$$t = \frac{L + P}{S_1 - S_2}$$

$$t = \frac{240 + 120}{45 - 9} = \frac{360}{36} = \frac{240 + 120}{288 \times \frac{5}{18}}$$

convert km to m

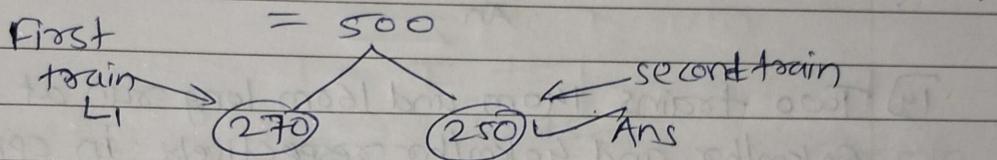
$$= \frac{360}{10}$$

$$= \boxed{36 \text{ sec}}$$

- 11) A 270 metres long train running at the speed of 120 kmph crosses another train running in opposite direction at the speed of 80 kmph in 9 seconds. what is the length OF the other train?

$$t = \frac{L_1 + L_2}{S_1 + S_2} \rightarrow$$

$$\begin{aligned}(L_1 + L_2) &= (S_1 + S_2) \times t \\ &= (120 + 80) \times 9 \\ &= \frac{200}{\cancel{100}} \times \frac{5}{\cancel{18}} \times 9 \mid \text{convert Km to m}\end{aligned}$$



- 12) A goods train runs at the speed of 72 kmph and crosses a 250 m long platform in 26 seconds. what is the length of the goods train?

$$26 \text{ sec} \rightarrow L + 250$$

$$\begin{aligned}72 \times \frac{5}{\cancel{100}} \times \frac{5}{\cancel{18}} \times 26 &\rightarrow 520 \\ \text{Convert Km to m} &\quad T \quad P \\ 270 &\quad 250 \\ \text{Ans } [270m] &\end{aligned}$$

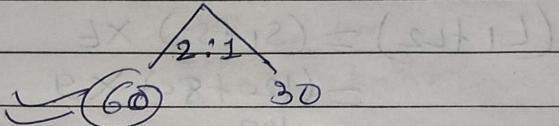
- 13) Two trains, each 100m long, moving in opposite directions cross each other in 8 seconds. if one is moving twice as fast the other, then the speed of the faster train is:

$$(S_1 + S_2) = \frac{L_1 + L_2}{t}$$

$$\Rightarrow \frac{100+100}{8}$$

$$= \frac{200}{8} \times \frac{18}{5}$$

$$= 90 \text{ km/hr}$$



method trains - Faster train

An

- 14) Two trains 140m and 160m long run at the speed of 60 km/hr and 40 km/hr respectively in opposite directions on parallel tracks. The time (in seconds) which they take to cross each other is:

$$t = \frac{L_1 + L_2}{S_1 + S_2} = \frac{160 + 140}{60 + 40} = \frac{300}{100} \times \frac{5}{18}$$

Convert Km to m

$$= \frac{5}{18} \times 10 = 10.8 \text{ sec}$$

- 15) A train 110 metres long is running with a speed of 60 kmph. In what time will it pass a man who is running at 6 kmph in the direction opposite to that in which the train is going?

$$\Rightarrow t = \frac{L}{S_1 + S_2}$$

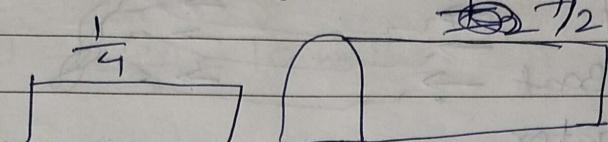
$$t = \frac{110}{60 + 6} = \frac{110}{66} \times \frac{5}{18}$$

Convert Km to m

$$\Rightarrow \frac{30}{5} = 6 \text{ sec}$$

- 16] A train travelling at a speed of 75 mph enters a tunnel $3\frac{1}{2}$ miles long. The train is $\frac{1}{4}$ mile long. How long does it take for the train to pass through the tunnel from the moment the front enters to the moment the rear emerges?

⇒



$$7\cancel{0} \quad 7\frac{1}{2}$$

$$\boxed{3\frac{1}{2} = \frac{7}{2}}$$

$$\frac{1}{4} + \frac{7 \times 2}{2 \times 2} = \frac{15}{4}$$

$$\frac{75}{75}$$

$$= \frac{15}{4 \times 75}$$

$$\Rightarrow \frac{1}{20} \times 60$$

$$= \boxed{3 \text{ min}}$$

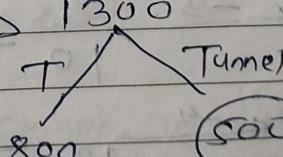
for min

- 17] A train 800 metres long is running at a speed of 78 km/hr. if it crosses a tunnel in 1 minutes, then the length of the tunnel (in meters) is:

⇒

$$60 \text{ sec} \longrightarrow 800 + T$$

$$\begin{aligned} & 78 \times \frac{5}{78} \times 60 \Rightarrow 1300 \\ & \text{Convert} \quad \cancel{78} \quad \cancel{60} \\ & \text{Km to m} \quad \cancel{5} \end{aligned}$$



$$\boxed{\text{Tunnel} = 500 \text{ m}}$$