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Sahi Prep Hai Toh Life Set Hai

TRAINS

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Agenda

Trains

- → Difference b/w Meeting & Crossing
- → Basic concepts require for Trains Question
- Practice 14 Question
- → Accident → 2 Ques

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BASIC CONCEPT OF TRAINS

$$D = S \cdot T$$

Distance = Speed × Time

Speed → "Relative speed"

$S_A - S_B$ (same)

$S_A + S_B$ (opp)

Meeting → "Instantaneous Process"

CROSSING → "Time Consuming Process"

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Difference between Meeting and Crossing

Meeting : "Instantaneous process"

Crossing : "It is a time taking process".

* In Max Question

Crossing of Trains

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Distance covered by the train when the train crosses an object:

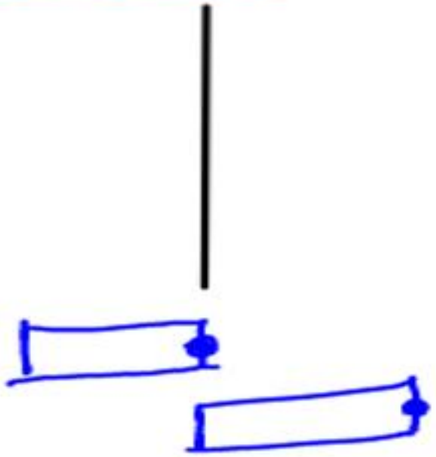
$$D = L_T + L_O$$

I Train Crosses

Pole | Man | Tree

$L_O = 0$

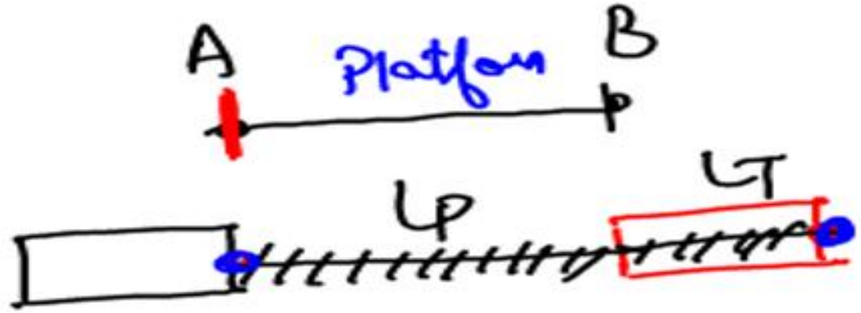
$D = L_T$



Where:

L_T = Length of Train

L_O = Length of Object



$D = L_P + L_T$

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Speed → Relative Speed

$S = (S_A - S_B)$ [Same Direction]

$S = (S_A + S_B)$ [Opposite Direction]

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Generally, Distance is given in 'm' and Speed is given in 'km/hr'.

So, always focus on the units.

$1\ \text{Km/h} = \frac{5}{18}\ \text{m/sec}$

$1\ \text{m/sec} = \frac{18}{5}\ \text{km/h}$

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BASIC POINTS WHICH WILL HELP IN SOLVING QUESTIONS

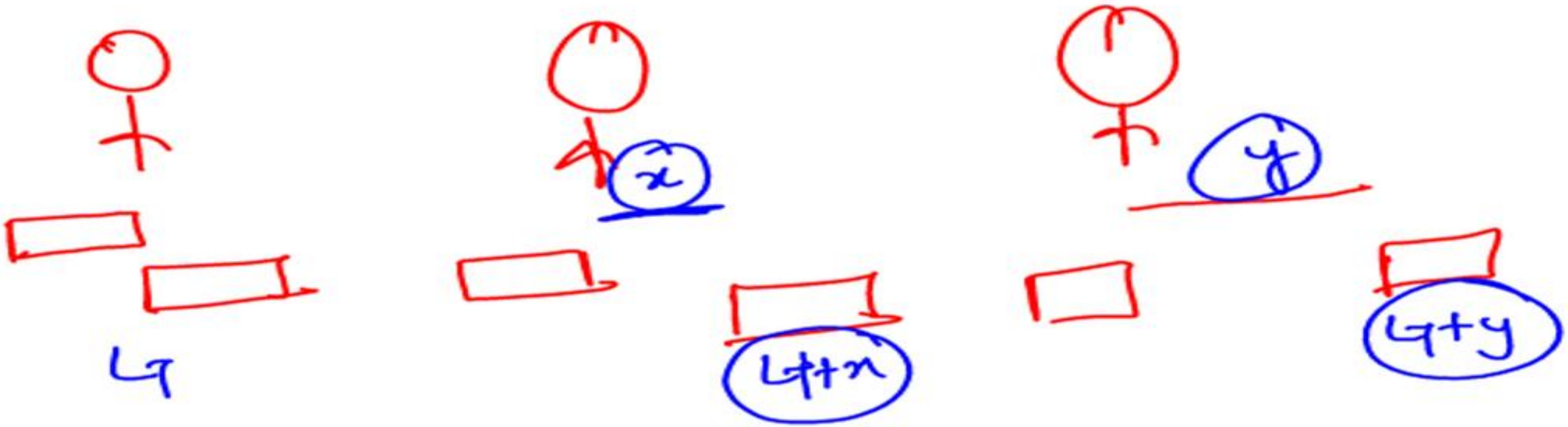
1. When a train crosses a man (stationary), crosses a man walking @ 2km/hr

or crosses a man ~~walking~~ running @ 10 km/hr.

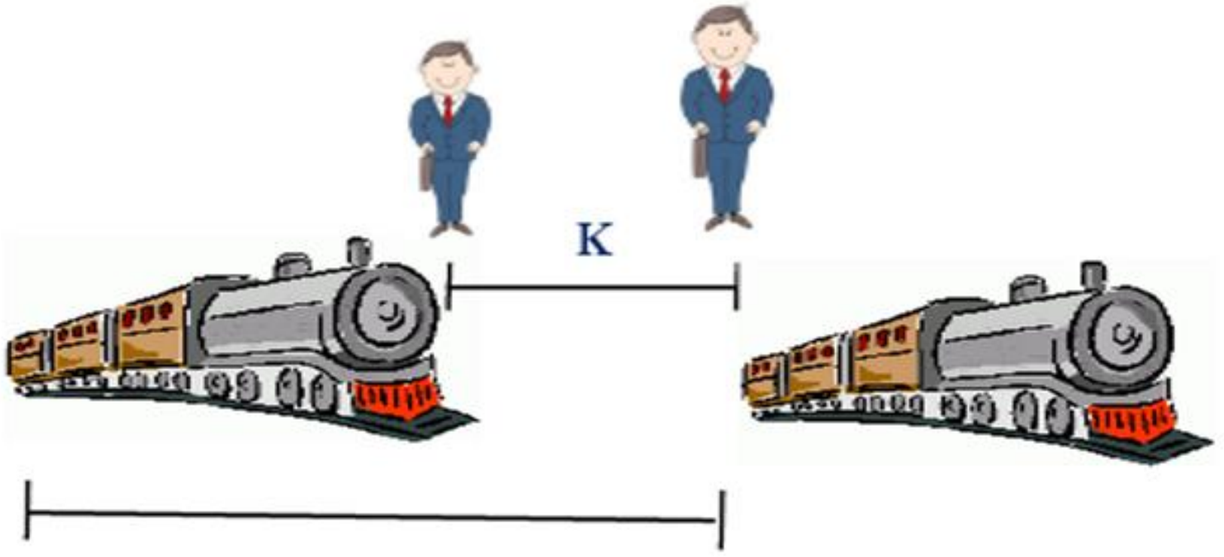
In every case:

D = L_T (Length of the train)

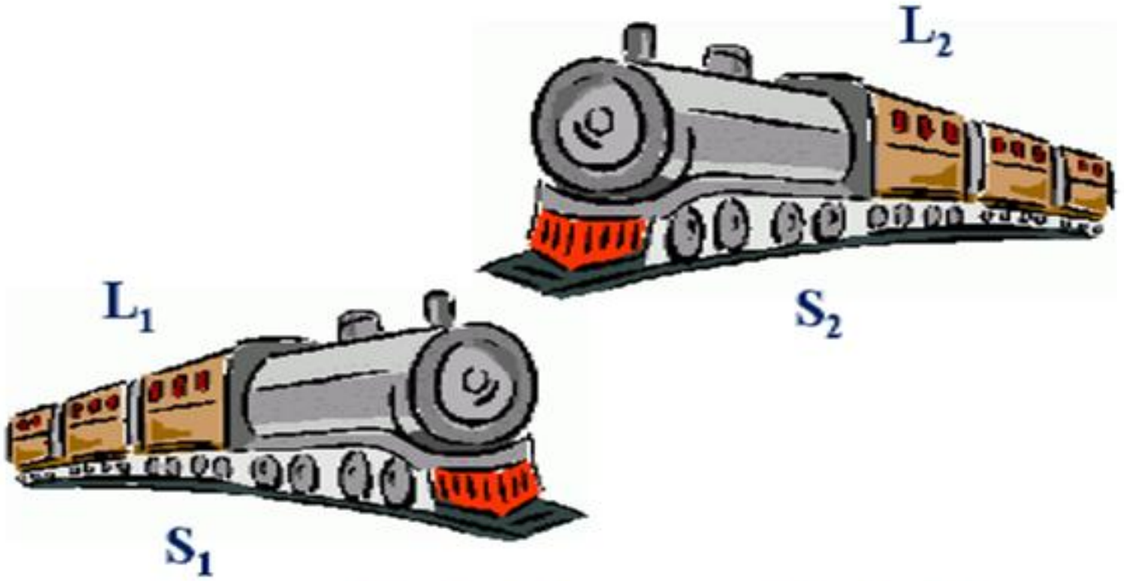
Here, D refers to the distance which the train has covers extra with respect to the man.



$D = L_T$



$D = L_T$



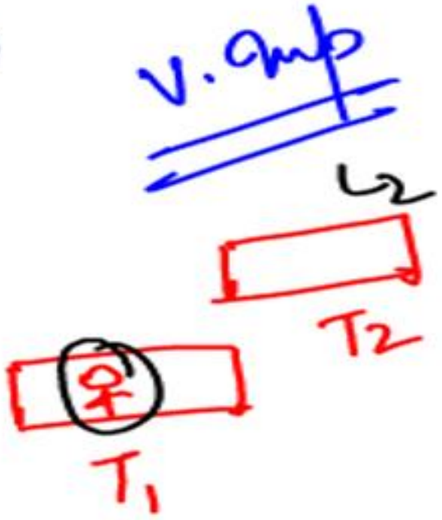
Train 1 crosses Train 2

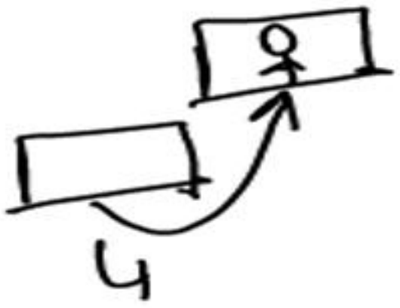
$$D = L_1 + L_2$$

$$S = S_1 - S_2 \quad \text{(Same Direction)}$$

$$S_1 + S_2 \quad \text{(Opposite Direction)}$$

$$T = \frac{D}{S}$$





Train 1	Train 2
L_1	L_2
S_1	S_2

A person sitting in Train 1 crosses Train 2.

$D = L_2$

$S = S_1 - S_2$

Train 1 crosses a person sitting in Train 2.

$D = L_1$

$S = S_1 - S_2$

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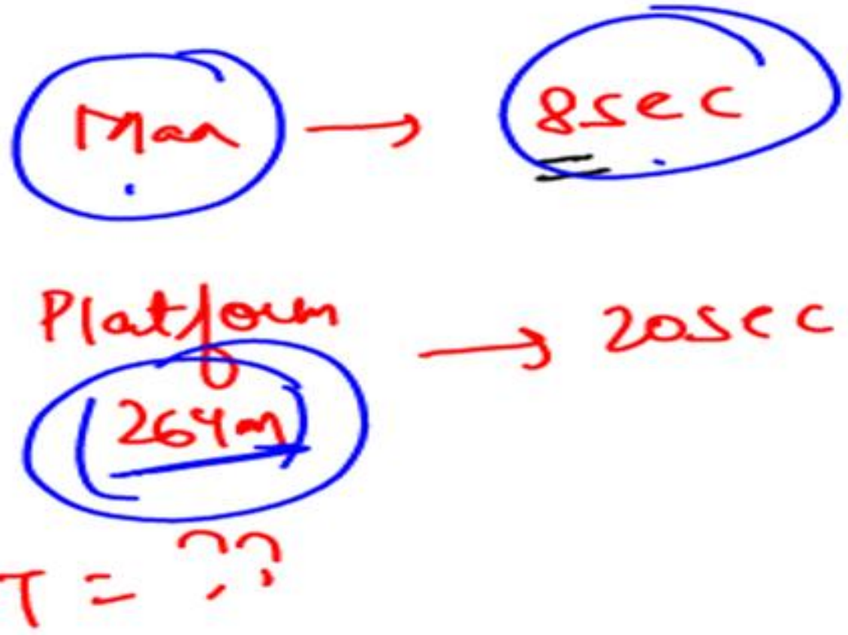
Q1. A train passes a man standing on a platform in 8 seconds and also crosses the platform which is 264 metres long in 20 seconds. The length of the train (in metres) is:

(a) 188
(b) 176
(c) 175
(d) 96



I st

Speed of Train is constant

$$\frac{L_T}{L_T + 264} = \frac{8^2}{20^5}$$

$$5L_T = 2L_T + 528$$

$$L_T = 176m$$

Time → 60sec

II nd

12sec → 264m

22m/sec

22 × 8 = 176m

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Ans. (b)

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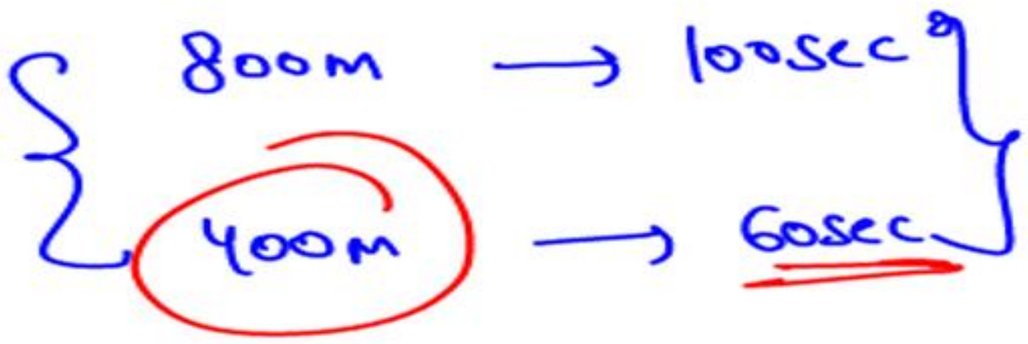
Q2. A train passes two bridges of lengths 800 m and 400 m in 100 seconds and 60 seconds respectively. The length of the train is:

(a) 80 m
(b) 90 m
(c) 200 m
(d) 150 m



400M / 40sec → 10m/sec

600M → 400 + LT

LT = 200M

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Ans. (c)

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Q3. Two trains 105 m and 90 m long runs at the speed of 45 km/hr and 72 km/hr respectively, in opposite directions on parallel tracks. The time which they take to cross each other is

(a) 8 sec
(b) 6 sec
(c) 7 sec
(d) 5 sec

$D = 195\ m$

$S = 117\ km/h$

$195 = \left(117 \cdot \frac{5}{18} \cdot T\right)$

$T = 6\ sec$

Time → 45sec

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Ans. (b)

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$$\frac{200}{4} = \left(10 \cdot \frac{5}{18}\right) \cdot T$$

$$T = 72 \text{ sec}$$

Q4. Two trains, 80 m and 120 m long, are running at the speed of 25 km/hr and 35 km/hr respectively in the same direction on parallel tracks. How many seconds will they take to pass each other?

(a) 48
(b) 64
(c) 70
(d) 72

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Ans. (d)

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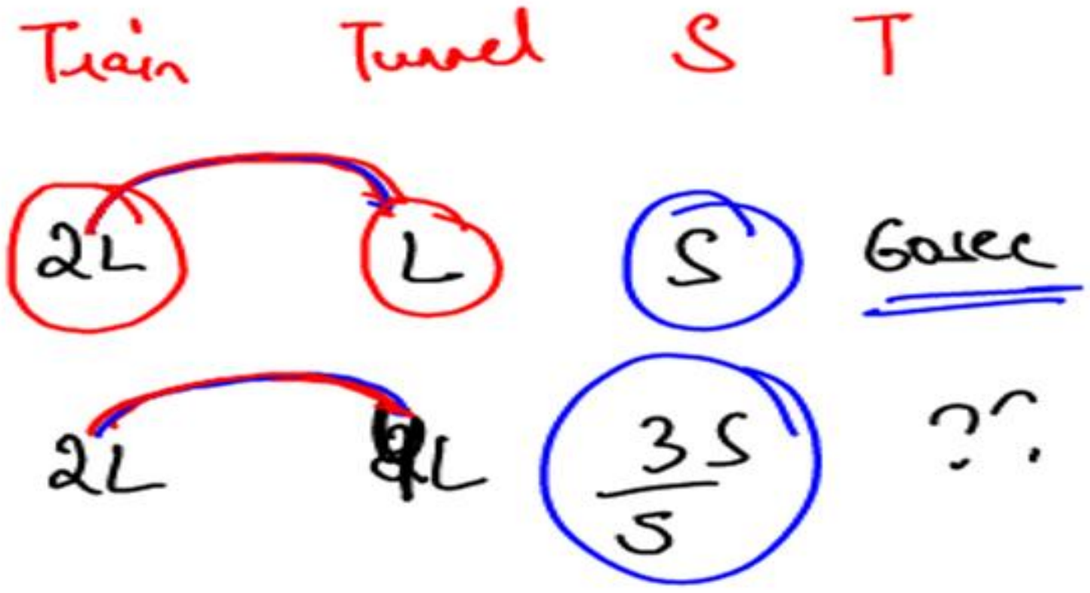
Q5. A train crosses a tunnel half of its length with a speed of 72 Km/Hr in 1 min., then find in how much time it will cross another train of double length which is standing on platform with 60% of its speed?

(a) 120 sec
(b) 200 sec
(c) 240 sec
(d) 300 sec



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Ans. (b)

Q6. A train travelling at 48 km/hr crosses another train, having half its length and travelling in opposite direction at 42 km/hr, in 12 seconds. It also passes a railway platform in 45 seconds. The length of the railway platform is

(a) 200 m **(b) 300 m**

(c) 350 m **(d) 400 m**

Time → 90sec

$$3L = 90 \cdot \frac{5}{18} \cdot 12$$

$$L = 100\text{m}$$

$$200 + L_p = 48 \cdot \frac{5}{18} \cdot 45$$

$$L_p = 400\text{m}$$

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Ans. (d)

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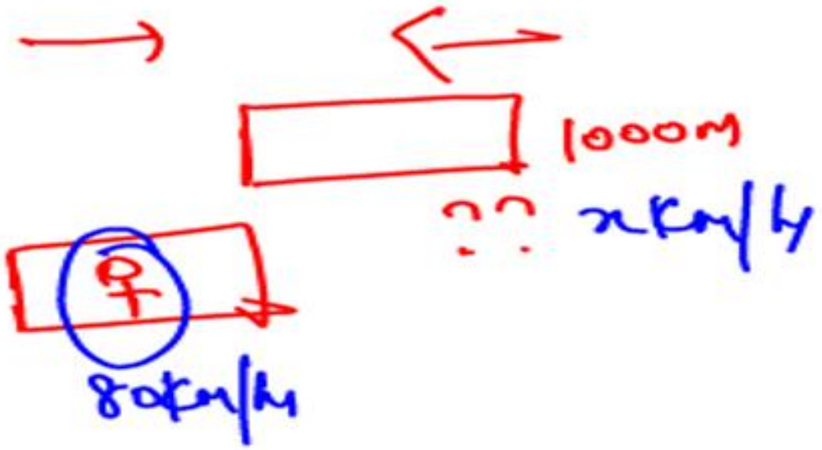

Q7. Two trains are moving on two parallel tracks but in opposite directions. A person sitting on a train running at 80km/hr passes the second train in 18 sec If the length of 2nd train is 1000m, its speed is (in km/hr)

(a) 100 (b) 120

(c) 140 (d) 150

$$1000 = (80+x)\cdot\frac{5}{18}\cdot 18$$

Time → 45sec

$$200 = 80 + x$$

$$x = 120 \text{ km/h}$$

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Ans. (b)

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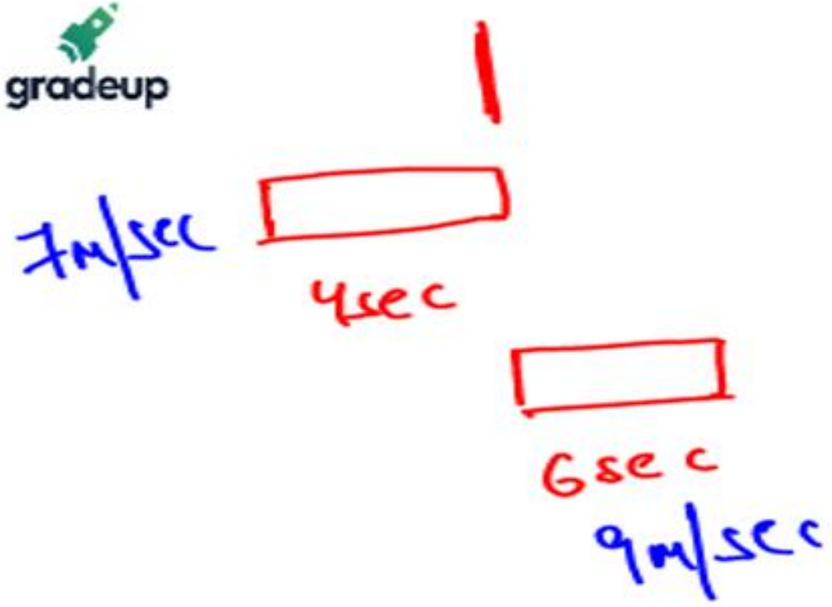

$L_1 = 7 \cdot 4 \Rightarrow 28m$

$L_2 = 9 \cdot 6 \Rightarrow 54m$

Q8. 2 trains can cross a pole in 4 sec and 6 sec respectively find in how much time will they cross each other if they are coming from same direction and the speed of the trains are in 7:9 ratio.

(a) 14 sec
(b) 41 sec
(c) 27 sec
(d) 82 sec

Time → 75sec

$82 = 2 \cdot T$

$T = 41sec$

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Ans. (b)

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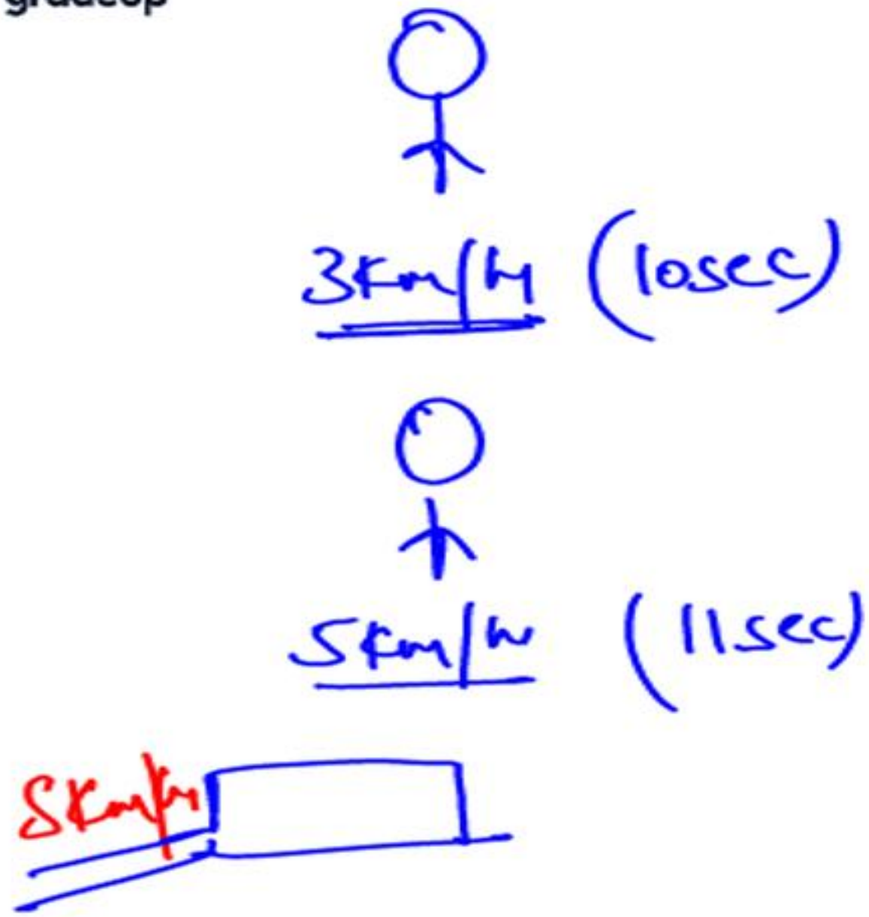
Q9. A train passes two persons walking in the same directions as of train at a speed of 3 km/hr and 5 km/hr respectively in 10 seconds and 11 seconds respectively. The speed of the train is

(a) 28 km/hr
(b) 27 km/hr
(c) 25 km/hr
(d) 24 km/hr



Time → 75sec

Distance is constant

$$\frac{(S-3)}{(S-5)} = \frac{(11)}{(10)}$$

$$10S - 30 = 11S - 55$$

$$\boxed{S = 25\ km/h}$$

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Ans. (c)

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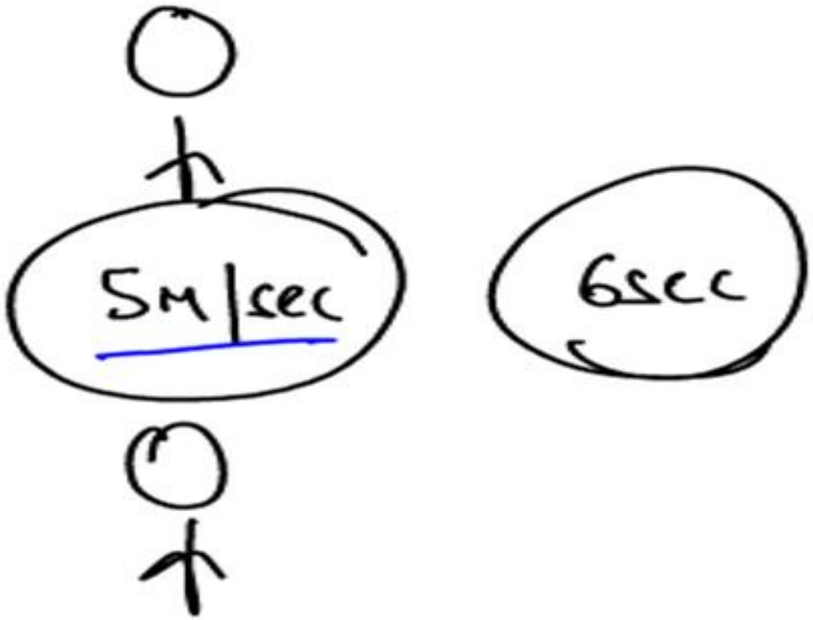
Q10. A train passes two persons walking with speed of 5 m/s and 10 m/s in 6 seconds and 5 seconds respectively. Both persons are walking in opposite direction train. Find the length of train?

(a) 125 m
(b) 150 m
(c) 160 m
(d) 170 m

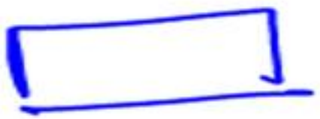


Time → 90sec

$$\frac{S+5}{S+10} = \frac{5}{6}$$

$$6S+30 = 5S+50$$

$$S = 20$$



5M/sec

25 × 6

= 150M

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Ans. (b)

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Q11. A goods train and passenger train are moving on parallel tracks in same direction. Driver of goods train notices that passenger train coming from back, passes his train completely in 60 seconds. But a passenger, who is sitting in passenger train notices that he passes the goods train in 40 seconds. If the speeds of trains are in ratio 1:2 then find the ratio of their length?

(a) 1:2 (b) 2:1

(c) 3:2 (d) 2:3

$$L_p + L_G = (S_p - S_G) \cdot 60 \quad (1)$$

$$L_G = (S_p - S_G) \cdot 40 \quad (2)$$

$$\frac{L_p + L_G}{L_G} = \frac{3}{2}$$

$$L_p = 1 \quad L_G = 2$$

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Ans. (b)

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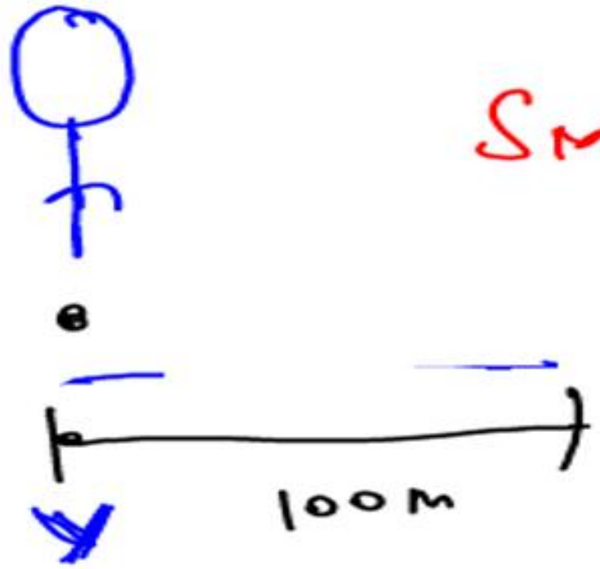
QUESTIONS BASED ON FOG

* A person can see 100m in fog

Here { D = 100m, S = S_V }



$S_M = 0$

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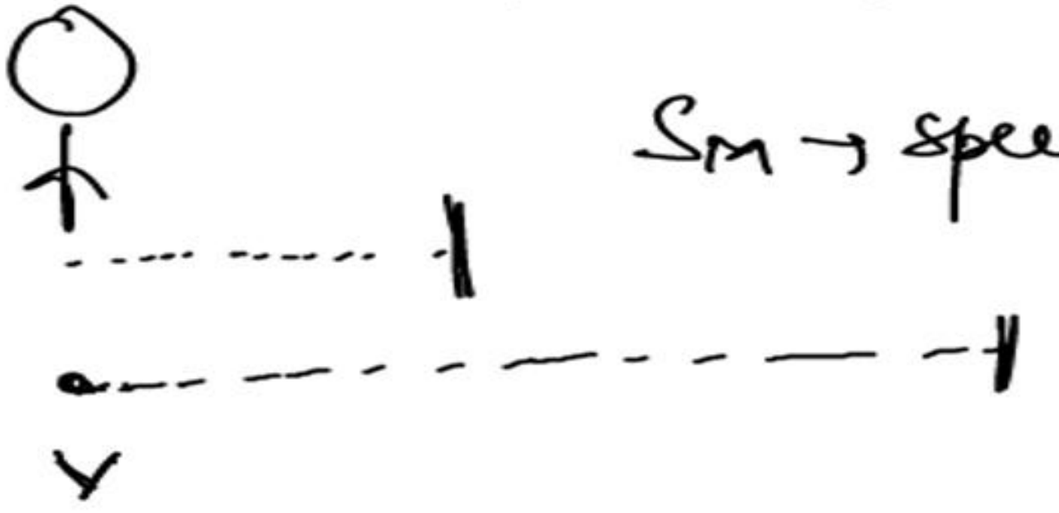
*

He can 100m in fog

S_M → speed of Man

$D = 100m$

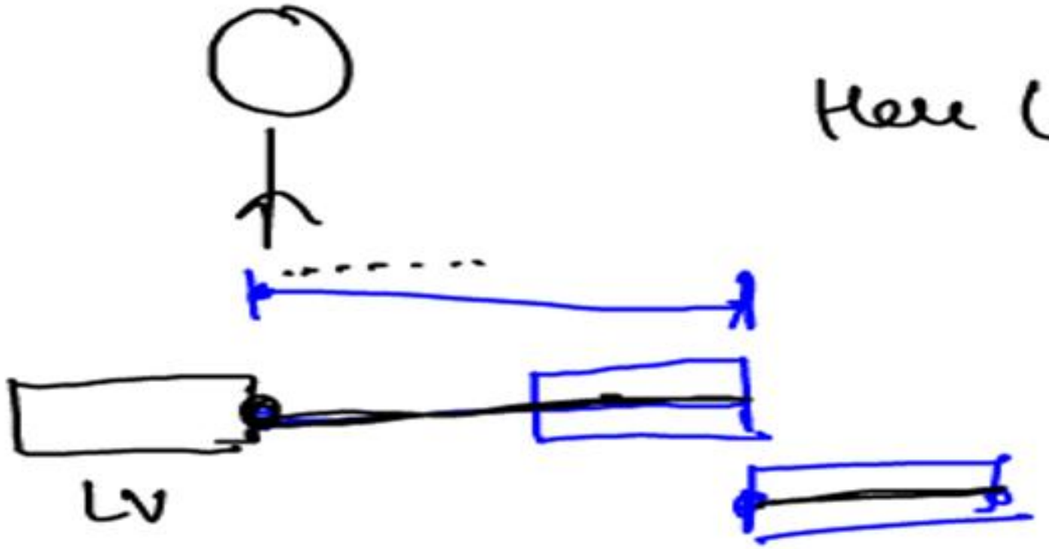
$S = S_V - S_M$



$D = 100 + Lv$

$S = Sv - S_M$

Here Lv → length of vehicle



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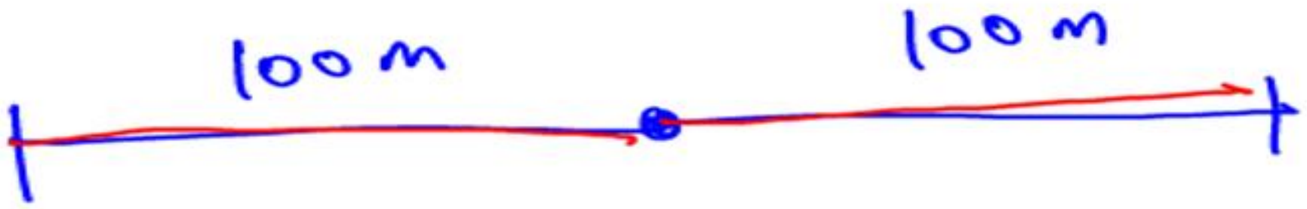
* If the vehicle is coming from behind

He can see 100 m



$$\begin{cases} D = \dfrac{200 + Lv}{Sv - SM} \\ S = \end{cases}$$

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Generalizing ⟶ fog Question

If Visibility = V

$D = V + L_V$

$S = S_V - S_M$

$L_V \rightarrow$ Length of vehicle

$S_V \rightarrow$ Speed of vehicle

$S_M \rightarrow$ Speed of Mar

If vehicle is coming from behind

$$D = 2V + L_V$$

$$S = S_V - S_M$$

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Q12. A carriage driving in fog passed a man who was walking at the rate of 6km/hr, in the same direction. He could see the carriage for 4 minutes and if visibility was 200m, the speed of the carriage was:

(a) 8.75 kmph
(b) 8.5 kmph
(c) 8 kmph
(d) 9 kmph

$S_M = 6 \text{ km/h}$

$S_C = ??$

$T = 4 \text{ min}$

$Y = 200 \text{ m}$

Time → 75sec

$0.2 = (S_C - 6) \cdot \frac{4}{60}$

$3 = S_C - 6$

$S_C = 9 \text{ km/h}$

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Ans. (d)

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Q13. A man could see 400 m during fog when he was moving with 4 Km/Hr, he saw a train coming from behind & disappeared in 3 minute if the length of train is 200 m, find the speed of the train?

(a) 20 km/hr (b) 24 km/hr
(c) 30 km/hr (d) 40 km/hr

$$1 = (S_T - 4) \cdot \frac{3}{60}\,1$$

$$S_T = 24\,\text{km/h}$$

Time → 60sec

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Ans. (b)

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$S_M = 6$ Km/hr

$T = 2$ min

$1.5 = (S_T - 6) \cdot \frac{2}{60}$

$\frac{1}{30}$

$S_T = 51$ Km/hr

Q14. A train crosses a man going along the railway track at 6 Km/Hr. The man could see the train upto 2 minute and find the speed of the train if at the time of disappearance the distance between train to man was 1200 metre & length of train is 300 metre ?

(a) 39 km/hr
(b) 45 km/hr
(c) 51 km/hr
(d) 57 km/hr

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Ans. (c)

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QUESTIONS BASED ON ACCIDENT OF TRAINS

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Q15. A train meets with an accident after travelling 30 kms, after which it moves with 4/5 of its original speed and arrives at the destination 45 minute late. Had the accident occurred 18 kms farther, it would have reached 9 minute earlier. Find the distance of the journey and original speed of the train.

(a) 120 km, 25kmph (b) 125km, 25kmph

(c) 130km, 30kmph (d) 120km, 30kmph

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Ans. (d)

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Q16. A train starts from Delhi at 8:00 am. After 6 Hrs. there was a breakdown in the train, due to which it travels 2/3 of its normal speed and hence becomes 40 mins late. If the breakdown occurred 200 Km farther then it would have reached its destination 30 min late. Find the distance covered by the train ?

(a) 2800 km
(b) 3600 km
(c) 4400 km
(d) 5200 km

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Ans. (c)

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Practice Questions

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1. A train 280 m long is moving at a speed of 60 kmph. What is the time taken by the train to cross a platform 220 m long?

(a) 45 sec
(b) 40 sec
(c) 35 sec
(d) 30 sec

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Ans. (d)

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2. A 225 m long train is running at a speed of 30 km/hour. How much time does it take to cross a man running at 3 km/hours in the same direction?

(a) 40 seconds (b) 30 seconds

(c) 25 seconds (d) 15 seconds

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Ans. (b)

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3. **If a train crosses a km-stone in 12 seconds, how long will it take to cross 91 km-stones completely if its speed is 60 km/hr?**

(a) 1 hr 30 min **(b) 1 hr 30 min 12 sec**

(c) 1 hr 51 min **(d) 1 hr 1 min 3 sec**

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Ans. (b)

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4. Two trains are moving in the same direction at 1.5 km/minute and 60 km/hour respectively. A man in the faster train observes that it takes 27 seconds to cross the slower train. The length of the slower train is

(a) 225 m (b) 230 m

(c) 240 m (d) 250 m

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Ans. (a)

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5. **Two trains, one is of 121 m in length at the speed of 40 km/hour and the other is of 99 m in length at the speed of 32 km/hour are running in opposite directions. In how much time will they be completely clear from each other from the moment they meet?**

(a) 10 sec **(b) 11 sec**

(c) 16 sec **(d) 21 sec**

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Ans. (b)

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6. **Two trains A and B of same length running in the opposite direction toward each other. Both trains A and B crossed a mobile tower in 18 seconds and 12 seconds respectively. They crossed each other in:**

(a) 14 seconds **(b) 14.4 seconds**

(c) 14.5 seconds **(d) 15 seconds**

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Ans. (b)

7. A man starts from his home to his office with a certain speed but after 1 hr., meets with an accident & resumes his journey after 1 Hr and becomes 1 Hr 36 min late due to reducing his speed to 5/6. If the accident had occurred after 50 Km then he will be late by 1 Hr 20 min. Find the distance from home to office?

(a) 112.5 km (b) 150 km

(c) 187.5 km (d) 225 km

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Ans. (a)

8. A train X departs from station A at 11.00 am for station B, which is 180 km away. Another train Y departs from station B at 11.00 am for station A. Train X travels at an average speed of 70 km/hr and does not stop anywhere until it arrives at station B. Train Y travels at an average speed of 50 km/hr, but has to stop for 15 minutes at station C, which is 60 km away from station B on route to station A. Ignoring the lengths of the trains, what is the distance, to the nearest km, from station A to point where the trains cross other?

(a) 112 (b) 118 (c) 120 (d) None of these

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Ans. (a)

Q9. Rajdhani express running at the speed of 180 km/hr passed a pole in 6 seconds, also passed a goods train in 60 seconds and Shatabdi express in 7.2 seconds, while goods train is moving in the same direction that of Rajdhani express. If speed of goods train and Shatabdi express is 150 km/hr and 120 km/hr respectively. Then in how much time the goods train will pass Shatabdi express, when both running in the opposite direction?

(a) 5.55 seconds
(b) 6.66 seconds
(c) 7.77 seconds
(d) 8.88 seconds

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Ans. (b)

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Q10. Two trains A and B of same length running in the opposite direction toward each other. Both trains A and B crossed a mobile tower in 18 seconds and 12 seconds respectively. They crossed each other in:

(a) 14 seconds **(b) 14.4 seconds**

(c) 14.5 seconds **(d) 15 seconds**

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Ans. (b)

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Q11. A car moving in the morning fog passes a man walking at 4 km/hr in the same direction. The man can see the car for 3 minutes and visibility is upto a distance of 130 m. The speed of the car is :

(a) $7\frac{3}{5}$ **km/hr**

(b) $6\frac{3}{5}$ **km/hr**

(c) 7 km/hr

(d) 5 km/hr

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Ans. (b)

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Q12. After travelling a distance of 50 km train meets with an accident and its speed becomes 3/4th of its actual speed and reaches 35 minutes late. If this accident had occurred after travelling 24 km more train would have reached the station 25 minutes late. Find out the distance and speed of train.

(a) 134 km, 60 km/h
(b) 144 km, 48 km/h
(c) 134 km, 48 km/h
(d) 144 km, 60 km/h

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Ans. (c)

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Q13. **The Sabarmati Express left Ahmadabad for Mumbai. Having travelled 300 km, which constitutes $66\frac{2}{3}\%$ of the distance between Ahmadabad and Mumbai, the train was stopped by a red signal. Half an hour later, the track was cleared and the engine driver, having increased the speed by 15 km per hour, arrived at Mumbai on time. Find the initial speed of the Sabarmati Express.**

(a) 60 km/h **(b) 48 km/h**

(c) 72 km/h **(d) 120 km/h**

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Ans. (a)

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Q14. Speed of a faster train is 100 km/hr and it takes 3 minutes rest after covering each 75 km distance while the slower train is running at the speed of 50 km/hr and it takes 1 minute rest after covering each 25 km distance. Find the distance travelled by the slower train when the faster train travel 600 km distance?

(a) 305 km
(b) 307.5 km
(c) 310 km
(d) None of these

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Ans. (b)

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Q15. **Two trains start from the same point simultaneously and in the same direction. The first train travels at 40 km/h, and the speed of the second train is 25 percent more than the speed of the first train. Thirty minutes later, a third train starts from the same point and in the same direction. It overtakes the second train 90 minutes later than it overtook the first train. What is the speed of the third train?**

(a) 55 km/hr **(b) 60 km/hr**

(c) 80 km/hr **(d) 100 km/hr**

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Ans. (b)

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Q16. Two trains start simultaneously from two tunnels towards each other. The first train covers 8% of the distance between the two tunnels in 3 hours, the second train covered 7/120 of the distance in 2 hours 30 minutes. Find the speed (feet/h) of the second train. If the first train travelled 800 feet to the meeting point:

(a) 28 feet/hr
(b) 35 feet/hr
(c) 42 feet/hr
(d) None of these

gradeup

Ans. (b)

L_T = 200 m

(i) Pole D = 200 m

(ii) Platform 1300 m D = 1500 m

Train L_T' = 300 m

D = 500 m

eg 1

	T_1	T_2
	200 m	300 m
→		
→	72 Km/H	54 Km/H

eg A person sitting in T_1 crosses Train T_2

→ D = 300 m

→ S = 18 Km/H

eg Train 1 crosses a person sitting in T_2

→ D = 200 m

→ S = 18 Km/H