Time and Distance

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INTRODUCTION

The terms 'Times' and 'Distance' are related to the speed of moving objects.

Speed: We define the speed of an object as the distance covered by it in a unit time interval. It is obtained by dividing the distance covered by the object, by the time it has taken to cover that distance.

Thus, $\text{Speed} = \dfrac{\text{Distance travelled}}{\text{Time taken}}$.

Notes:

1. If the time taken is constant, the distance travelled is proportional to the speed, that is, more the speed; more the distance travelled at the same time.
2. If the speed is constant, the distance travelled is proportional to the time taken, that is, more the distance travelled; more the time taken at the same speed.
3. If the distance travelled is constant, the speed is inversely proportional to the time taken, that is, more the speed; less the time taken for the same distance travelled.

SOME BASIC FORMULAE

1. $\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$
2. $\text{Distance} = \text{Speed} \times \text{Time}$
3. $\text{Time} = \dfrac{\text{Distance}}{\text{Speed}}$

Units of Measurement

Generally, if the distance is measured in kilometre, we measure time in hours and speed in kilometre per hour and is written as Km/h and if the distance is measured in metre, then time is taken in second and speed in metre per second and is written as m/s.

Conversion of Units

$1 \text{ kilometre/hour} = \dfrac{1000 \text{ metre}}{60 \times 60 \text{ seconds}} = \dfrac{5}{18}$ m/s.

$\therefore$ One metre/second $= \dfrac{18}{5}$ Km/h.

Thus, x Km/h $= \left(x \times \dfrac{5}{18}\right)$ m/s.

and, x m/s. $= \left(x \times \dfrac{18}{5}\right)$ Km/h

Illustration 1: Calculate the speed of a train which covers a distance of 150 Km in 3 hours.

Solution: $\text{Speed} = \dfrac{\text{Distance covered}}{\text{Time taken}} = \dfrac{150}{3} = 50$ Km/h.

Illustration 2: How long does a 100 metres long train running at the rate of 40 Km/h take to cross a telegraphic pole?

Solution: In crossing the pole, the train must travel its own length.

$\therefore$ Distance travelled is 100 metres.

Speed = 40 Km/h. $= \dfrac{40 \times 1000}{60 \times 60} = \dfrac{100}{9}$ m/s.

$\therefore$ Time taken to cross the pole $= \dfrac{100}{100/9}$

$= 9$ seconds.

Illustration 3: A train running at a speed of 90 Km/h passes a pole on the platform in 20 seconds. Find the length of the train in metres.

Solution: Speed of the train = 90 Km/h

$$= 90 \times \frac{5}{18} = 15 \text{ m/s.}$$

$\therefore$ Length of the train = Speed of the train × time taken in crossing the pole

$= 25 \times 20 = 500$ metre.

SOME USEFUL SHORT CUT METHODS

1. (a) If A covers a distance d_1 Km at s_1 Km/h and, then d_2 Km at s_2 Km/h, then the average speed during the whole journey is given by

$$\text{Average speed} = \frac{s_1 s_2 (d_1 + d_2)}{s_1 d_2 + s_2 d_1} \text{ Km/h.}$$

(b) If A goes from X to Y at s_1 Km/h and comes back from Y to X at s_2 Km/h, then the average speed during the whole journey is given by

$$\text{Average speed} = \frac{2 s_1 s_2}{s_1 + s_2}$$

Explanation

(a) Time taken to travel d_1 Km at s_1 Km/h is

$$t_1 = \frac{d_1}{s_1} \text{ hours.}$$

Time taken to travel d_2 Km at s_2 Km/h is

$$t_2 = \frac{d_2}{s_2} \text{ hours.}$$

$$\text{Total time taken} = t_1 + t_2 = \left(\frac{d_1}{s_1} + \frac{d_2}{s_2}\right) \text{hours.}$$

$$= \left(\frac{s_1 d_2 + s_2 d_1}{s_1 s_2}\right) \text{hours.}$$

Total distance covered = $(d_1 + d_2)$ Km. Therefore,

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

$$= \frac{s_1 s_2 (d_1 + d_2)}{(s_1 d_2 + s_2 d_1)} \text{ Km/h.} \quad \cdots(1)$$

(b) Let, the distance from X to Y be d Km.

Take $d_1 = d_2 = d$ Eqution in (1), we get

$$\text{Average speed} = \frac{2 d s_1 s_2}{d(s_1 + s_2)} = \frac{2 s_1 s_2}{s_1 + s_2}$$

Illustration 4: A ship sails to a certain city at the speed of 15 knots/h, and sails back to the same point at the rate of 30 knots/h. What is the average speed for the whole journey?

Solution: Here, $s_1 = 15$ and $s_2 = 30$.

$$\therefore \text{ Average speed} = \frac{2 s_1 s_2}{s_1 + s_2} = \frac{2 \times 15 \times 30}{15 + 30} = 20 \text{ knots/h.}$$

2. A person goes certain distance (A to B) at a speed of s_1 Km/h and returns back (B to A) at a speed of s_2 Km/h. If he takes T hours in all, the distance between A and B is

$$T\left(\frac{s_1 s_2}{s_1 + s_2}\right).$$

Explanation

Let, the distance between A and B be d Km.

$$\text{Time taken during onward journey} = t_1 = \frac{d}{s_1} \text{ hours.}$$

$$\text{Time taken during return journey} = t_2 = \frac{d}{s_2} \text{ hours.}$$

$\therefore$ Total time taken during the entire journey is

$$T = t_1 + t_2 = \frac{d}{s_1} + \frac{d}{s_2} = \frac{d(s_1 + s_2)}{s_1 s_2}$$

$$\therefore \quad d = T\left(\frac{s_1 s_2}{s_1 + s_2}\right).$$

Thus, the distance between A and B is

$$= T\left(\frac{s_1 s_2}{s_1 + s_2}\right)$$

$$= \text{Total time taken} \times \frac{\text{Product of two speeds}}{\text{Sum of two speeds}}.$$

Illustration 5: A boy goes to school at the speed of 3 Km/h and returns with a speed of 2 Km/h. If he takes 5 hours in all, find out the distance in Km between the village and the school.

Solution: Here, $s_1 = 3$, $s_2 = 2$ and $T = 5$.

$\therefore$ The distance between the village and the school

$$= T\left(\frac{s_1 s_2}{s_1 + s_2}\right) = 5\left(\frac{3 \times 2}{3 + 2}\right) = 6 \text{ Km.}$$

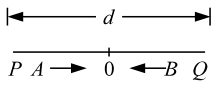
3. If two persons, A and B, start at the same time from two points P and Q towards each other, and after crossing they take T_1 and T_2 hours in reaching Q and P respectively, then

$$\frac{\text{A's speed}}{\text{B's speed}} = \frac{\sqrt{T_2}}{\sqrt{T_1}}.$$

Explanation

Let, the total distance between P and Q be d Km.

Let, the speed of A be s_1 Km/h and that of B be s_2 Km/h.



Since they are moving in opposite directions, their relative speed is $(s_1 + s_2)$ Km/h.

They will meet after $\left(\frac{d}{s_1 + s_2}\right)$ hours.

Distance travelled by A in $\left(\frac{d}{s_1 + s_2}\right)$ hours.

$$= PO = \left(\frac{ds_1}{s_1 + s_2}\right) \text{ Km.}$$

Distance travelled by B in $\left(\frac{d}{s_1 + s_2}\right)$ hours.

$$= QO = \left(\frac{ds_2}{s_1 + s_2}\right) \text{ Km.}$$

Time taken by A to travel QO

$$= \frac{\left(\frac{ds_2}{s_1 + s_2}\right)}{s_1}$$

$$= T_1 \text{ (given).} \qquad \cdots(1)$$

Time taken by B to travel PO

$$= \frac{\left(\frac{ds_1}{s_1 + s_2}\right)}{s_2}$$

$$= T_2 \text{ (given)} \qquad \cdots(2)$$

Dividing Equation (2) by Equation (1), we get

$$\frac{s_1/s_2}{s_2/s_1} = \frac{T_2}{T_1}$$

or, $$\left(\frac{s_1}{s_2}\right)^2 = \frac{T_2}{T_1}$$

or, $$\frac{s_1}{s_2} = \sqrt{\frac{T_2}{T_1}}.$$

$$\therefore \quad \frac{\text{A's speed}}{\text{B's speed}} = \sqrt{\frac{T_2}{T_1}}.$$

Illustration 6: Nikita starts her journey from Delhi to Bhopal and simultaneously Nishita starts from Bhopal to Delhi. After crossing each other, they finish their remaining journey in $5\frac{4}{9}$ hours and 9 hours, respectively. What is Nishita's speed if Nikita's speed is 36 Km/h?

Solution: $$\frac{\text{Nikita's speed}}{\text{Nishita's speed}} = \sqrt{\frac{T_2}{T_1}} = \frac{\sqrt{9}}{\sqrt{5\frac{4}{9}}} = \frac{\sqrt{9}}{\sqrt{\frac{49}{9}}}$$

$$= \sqrt{\frac{81}{49}} = \frac{9}{7}.$$

$\therefore$ Nishita's speed $= \frac{7}{9}$ Nikita's speed

$$= \frac{7}{9} \times 36 = 28 \text{ Km/h.}$$

4. If a body travels d_1, d_2, d_3, ... , d_n metres with different speeds s_1, s_2, s_3, ... , s_n m/s in time T_1, T_2, T_3, ... , T_n seconds respectively, then the average speed of the body throughout the journey is given by

$$V_a = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

$$= \frac{d_1 + d_2 + d_3 + \cdots + d_n}{T_1 + T_2 + T_3 + \cdots + T_n}$$

[If d_1, d_2, ..., d_n and T_1, T_2, ..., T_n are known]

and, $$V_a = \frac{s_1T_1 + s_2T_2 + s_3T_3 + \cdots + s_nT_n}{T_1 + T_2 + T_3 + \cdots T_n}$$

[If d_1, d_2, ..., d_n and s_1, s_2, ..., s_n are known]

Illustration 7: A car, during its journey, travels 40 minutes at a speed of 30 Km/h, another 50 minutes at a speed of 60 Km/h and 1 hour at a speed of 30 Km/h. Find out the average speed of the car.

Solution: Here, $T_1 = \frac{40}{60}$, $T_2 = \frac{50}{60}$, $T_3 = 1$, $s_1 = 30$, $s_2 = 60$, $s_3 = 30$.

$\therefore$ Average speed of the car

$$= \frac{s_1T_1 + s_2T_2 + s_3T_3}{T_1 + T_2 + T_3} = \frac{30 \times \frac{40}{60} + 60 \times \frac{50}{60} + 30 \times 1}{\frac{40}{60} + \frac{50}{60} + 1}$$

$$= 40 \text{ Km/h}$$

5. If the new speed is $\frac{a}{b}$ of the original speed, then the change in time taken to cover the same distance is given by:

   Change in time = $\left(\frac{b}{a}-1\right)$ × original time.

Illustration 8: By walking at $\frac{4}{5}$ of his usual speed, Mohan is 6 minutes late to his office. Find out his usual time to cover the distance.

Solution: Here, change in time = 6 and $\frac{a}{b} = \frac{4}{5}$.

We have, change in time = $\left(\frac{b}{a}-1\right)$ × original time

$$\Rightarrow \text{ original time} = \frac{\text{change in time}}{\left(\frac{b}{a}-1\right)}$$

$$= \frac{6}{\left(\frac{5}{4}-1\right)} = 24 \text{ minutes.}$$

6. A body covers a distance d in time T_1 with speed s_1, but when it travels with speed s_2 covers the same distance in time T_2.

   The following relations hold

$$\frac{\text{Product of speed}}{d} = \frac{s_1}{T_2} = \frac{s_2}{T_1} = \frac{\text{Difference of speed}}{\text{Difference of time}}$$

   Equating any two of the above, we can find the unknowns as per the given question.

Illustration 9: Two bicyclists do the same journey by travelling 9 Km and 10 Km/h. Find out the length of the journey when one takes 32 minutes longer than the other.

Solution: Here, change in speed = 10 − 9 = 1; product of speed = 9 × 10 = 90 and difference of time = $\frac{32}{60}$.

We have, $\frac{\text{Product of speed}}{d} = \frac{\text{Difference of speed}}{\text{Difference of time}}$

$$\Rightarrow d = \text{Product of speed} \times \left(\frac{\text{Difference of time}}{\text{Difference of speed}}\right)$$

$$= 90 \times \frac{32}{60} = 48 \text{ Km.}$$

7. A train travels a certain distance at a speed of s_1 Km/h without stoppages and with stoppages. It covers the same distance at a speed of s_2 Km/h. The stoppage time per hour is given by

   $\left(\frac{s_1 - s_2}{s_1}\right)$ hour or, $\left(\frac{\text{Difference of speed}}{\text{Speed without stoppages}}\right)$

Explanation

Let, the distance travelled be d Km.

∴ Time taken by the train without stopping anywhere

$$= \frac{d}{s_1} \text{ hour}$$

Also, time taken by the train with stoppages

$$= \frac{d}{s_2} \text{ hour}$$

$$\text{Total stoppage time} = \frac{d}{s_2} - \frac{d}{s_1} = \left(\frac{s_1 - s_2}{s_1 s_2}\right) d \text{ hour}$$

$$\therefore \text{ Stoppage time per hour} = \frac{\left(\frac{s_1 - s_2}{s_1 s_2}\right) d}{\frac{d}{s_2}}$$

$$= \left(\frac{s_1 - s_2}{s_1}\right) \text{ hour}$$

Illustration 10: Without stoppages, a train travels certain distance with an average speed of 80 Km/h and with stoppages, it covers the same distance with an average speed of 60 Km/h. How many minutes per hour the train stops?

Solution: Here, $s_1 = 80$ and $s_2 = 60$

∴ Stoppage time/h.

$$= \frac{s_1 - s_2}{s_1} = \frac{80 - 60}{80} = \frac{1}{4} \text{ hour} = 15 \text{ minutes.}$$

8. (a) If a train overtakes a pole or a man or a milestone, then the distance covered in overtaking is equal to the length of the train.

   (b) If a train overtakes a bridge or a tunnel or a platform or another train, then the distance covered is equal to the sum of the two lengths.

Illustration 11: A train 600 m long crosses a pole in 9 seconds. What is the speed of the train in Km/h?

Solution: Speed of the train

$$= \frac{\text{Length of the train}}{\text{time taken in crossing the pole}}$$

$$= \frac{600}{9}\text{ m/s} = \frac{600}{9}\times\frac{18}{5} = 240\text{ Km/h.}$$

Illustration 12: A train 130 m long passes a bridge in 21 seconds moving at a speed of 90 Km/h. Find out the length of the bridge.

Solution: We have, speed of the train

$$= \frac{\text{length of the train + length of the bridge}}{\text{time taken in crossing the bridge}}$$

$$\Rightarrow \quad \frac{5}{18}\times 90 = \frac{130 + \text{length of the bridge}}{21}$$

$\therefore$ Length of the bridge = 525 − 130 = 395 m.

9. **Relative Speed**

(a) If two trains of lengths L_1 Km and L_2 Km, respectively are travelling in the same direction at s_1 Km/h and s_2 Km/h respectively, such that $s_1 > s_2$, then $s_1 - s_2$ is called their relative speed and the time taken by the faster train to cross the slower train is given by

$$\left(\frac{L_1 + L_2}{s_1 - s_2}\right) \text{ hour.}$$

(b) If two trains of length L_1 Km and L_2 Km, respectively, are travelling in the opposite directions at s_1 Km/h and s_2 Km/h, then $s_1 + s_2$ is called their relative speed and the time taken by the trains to cross each other is given by

$$\left(\frac{L_1 + L_2}{s_1 + s_2}\right) \text{ hour.}$$

Illustrations 13: A train 135 metres long is running with a speed of 49 Km/h. In what time will it pass a man who is walking at 5 Km/h in the direction opposite to that of the train?

Solution: Here, $L_1 = 135$, $L_2 = 0$, $s_1 = 49$ Km/h, $s_2 = 5$ Km/h.

$\therefore \quad s_1 + s_2 = 49 + 5 = 54$ Km/h. $= 54 \times \frac{5}{18}$ m/s.

$\therefore$ The time taken $= \frac{L_1 + L_2}{s_1 + s_2}3 = \frac{135}{54\times\frac{5}{18}}$

$$= \frac{135\times 18}{54\times 5} = 9 \text{ seconds.}$$

Illustration 14: Two trains of length 110 metres and 90 metres are running on parallel lines in the same direction with a speed of 35 Km/h and 40 Km/h, respectively. In what time will they pass each other.

Solution: Here, $L_1 = 110$ m, $L_2 = 90$ m, $s_1 = 35$ Km/h and $s_2 = 40$ Km/h

$\therefore \quad s_2 - s_1 = 40 - 35 = 5$ Km/h $= 5 \times \frac{5}{18}$ m/s

$\therefore$ Time taken $= \frac{L_1 + L_2}{s_2 - s_1}$

$$= \frac{110 + 90}{5\times\frac{5}{18}} = \frac{200\times 18}{5\times 5} = 144 \text{ seconds.}$$

10. Two trains of lengths L_1 m and L_2 m run on parallel tracks. When running in the same direction, the faster train passes the slower one in T_1 seconds, but when they are running in opposite directions with the same speeds as earlier, they pass each other in T_2 seconds.

Then, the speed of the faster train

$$= \frac{L_1 + L_2}{2}\left(\frac{1}{T_1} + \frac{1}{T_2}\right) \text{ m/s}$$

and, the speed of the slower train

$$= \frac{L_1 + L_2}{2}\left(\frac{1}{T_1} - \frac{1}{T_2}\right) \text{ m/s.}$$

Explanation

Let the speed of the faster train be s_1 m/s and that of the slower train be s_2 m/s.

Total distance covered when the two trains cross each other = $L_1 + L_2$.

When the two trains are running is the same direction, their relative speed = $(s_1 - s_2)$ m/s.

$$\therefore \qquad (s_1 - s_2) = \frac{L_1 + L_2}{T_1} \quad \ldots(1)$$

When the two trains are running in the opposite directions, their relative speed = $(s_1 + s_2)$ m/s.

$$\therefore \qquad s_1 + s_2 = \frac{L_1 + L_2}{T_2} \quad \ldots(2)$$

Adding Equation (1) and (2), we get

$$2s_1 = \frac{L_1 + L_2}{T_1} + \frac{L_1 + L_2}{T_2} = (L_1 + L_2)\left(\frac{1}{T_1} + \frac{1}{T_2}\right)$$

or, $$s_1 = \left(\frac{L_1 + L_2}{2}\right)\left(\frac{T_1 + T_2}{T_1 T_2}\right).$$

On subtracting Equation (1) from Equation (2), we get

$$2s_2 = (L_1 + L_2)\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

or, $$s_2 = \left(\frac{L_1 + L_2}{2}\right)\left(\frac{T_1 - T_2}{T_1T_2}\right) \text{m/s.}$$

Therefore,

speed of the faster train

$$= \left(\frac{L_1 + L_2}{2}\right)\left(\frac{T_1 + T_2}{T_1T_2}\right) \text{m/s.}$$

speed of the slower train

$$= \left(\frac{L_1 + L_2}{2}\right)\left(\frac{T_1 - T_2}{T_1T_2}\right) \text{m/s.}$$

Note:

If the two trains are of equal length, that is, $L_1 = L_2 = L$ (say), then

$$s_1 = L\left(\frac{T_1 + T_2}{T_1T_2}\right) \text{m/s and, } s_2 = L\left(\frac{T_1 - T_2}{T_1T_2}\right) \text{m/s.}$$

Illustration 15: Two trains of lengths 200 metres and 175 metres run on parallel tracks. When running in the same direction the faster train crosses the slower one in $37\frac{1}{2}$ seconds. When running in opposite directions at speeds same as their earlier speeds, they pass each other completely in $7\frac{1}{2}$ seconds. Find out the speed of each train.

Solution: We have, $L_1 = 200$, $L_2 = 175$, $T_1 = \frac{75}{2}$ and $T_2 = \frac{15}{2}$.

Therefore, speed of the faster train

$$= \left(\frac{L_1 + L_2}{2}\right)\left(\frac{T_1 + T_2}{T_1T_2}\right) = \left(\frac{200 + 175}{2}\right)\left(\frac{\frac{75}{2} + \frac{15}{2}}{\frac{75}{2} \times \frac{15}{2}}\right)$$

$$= \frac{375}{2} \times \frac{45 \times 4}{75 \times 15} = 30 \text{ m/s.}$$

Speed of slower train

$$= \left(\frac{L_1 + L_2}{2}\right)\left(\frac{T_1 - T_2}{T_1T_2}\right) = \left(\frac{200 + 175}{2}\right)\left(\frac{\frac{75}{2} - \frac{15}{2}}{\frac{75}{2} \times \frac{15}{2}}\right)$$

$$= \frac{375}{2} \times \frac{30 \times 4}{75 \times 15} = 20 \text{ m/s.}$$

11. (a) A train starts from a place at s_1 Km/h and another fast train starts from the same place after T hours at s_2 Km/h in the same direction. Then, the distance from the starting place at which both the trains will meet is given by

$$\left(\frac{s_1 \times s_2 \times T}{s_2 - s_1}\right) \text{ Km.}$$

Also, the time after which the two trains will meet is given by

$$\left(\frac{s_1 T}{s_2 - s_1}\right) \text{ hours.}$$

(b) The distance between two stations A and B is d Km. A train starts from A to B at s_1 Km/h. T hours later another train starts from B to A at s_2 Km/h. Then, the distance from A, at which both the trains will meet is given by

$$s_1\left(\frac{d + s_2T}{s_1 + s_2}\right) \text{ Km.}$$

Also, the time after which the two trains will meet is given by

$$\left(\frac{d + s_2T}{s_1 + s_2}\right) \text{ hours.}$$

Illustration 16: A train starts from Mumbai at 10 am with a speed of 25 Km/h and another train starts from there on the same day at 3 pm in the same direction with a speed of 35 Km/h. Find out at what distance from Mumbai both the trains will meet and also the time of their meeting.

Solution: Time from 10 am to 3 pm = 5 hours.

Distance of meeting point from Mumbai

$$= \left(\frac{s_1 \times s_2 \times T}{s_2 - s_1}\right) \text{ Km.}$$

$$= \left(\frac{25 \times 35 \times 5}{35 - 25}\right) \text{ Km} = 437\frac{1}{2} \text{Km.}$$

Also, time of their meeting

$$= \left(\frac{s_1 T}{s_2 - s_1}\right) \text{ hours} = \left(\frac{25 \times 5}{35 - 25}\right) \text{ hours}$$

$$= \frac{125}{10} = 12\frac{1}{2} \text{hours after 3 pm}$$

That is, 3:30 am next day.

Illustration 17: Chennai is at a distance of 560 Km from Mumbai. A train starts from Mumbai to Chennai at 6 am with a speed of 40 Km/h. Another train starts from Chennai to Mumbai at 7 am with a speed of 60 Km/h. At what distance from Mumbai and at what time will the two trains be at the point of crossing?

Solution: Time from 6 am to 7 am = 1 hour.

Therefore, distance of meeting point from Mumbai

$$= s_1\left(\frac{d+s_2T}{s_1+s_2}\right) \text{ Km.}$$

$$= 40\left(\frac{560+60\times1}{40+60}\right) = 248 \text{ Km.}$$

Also, time of their meeting

$$= \left(\frac{d+s_2T}{s_1+s_2}\right) \text{ hours}$$

$$= \left(\frac{560+60\times1}{40+60}\right) = \frac{31}{5} \text{ hours}$$

= 6 hours 12 minutes. after 6 am

That is, at 12.12 noon.

12. Two trains start simultaneously from stations A and B towards each other with speeds s_1 Km/h and s_2 Km/h, respectively. When they meet it is found that the second train had travelled d Km more than the first. Then the distance between the two stations is given by

$$d\left(\frac{s_1+s_2}{s_2-s_1}\right) \text{ Km.}$$

Explanation

Let, the distance between the two stations be x Km. If the first train travels y Km, then the second travels $y + d$ Km.

$\therefore \quad x = y + y + d = 2y + d.$

Since the time taken by both the trains is same

$$\therefore \quad \frac{y+d}{s_2} = \frac{y}{s_1}$$

$$\Rightarrow \quad s_1 y + s_1 d = s_2 y$$

$$\Rightarrow \quad (s_2 - s_1)y = s_1 d \text{ or, } y = \frac{s_1 d}{s_2 - s_1}.$$

$$\therefore \quad x = 2\left(\frac{s_1 d}{s_2 - s_1}\right) + d = \frac{d(s_1+s_2)}{(s_2-s_1)} \text{ Km.}$$

Illustration 18: Two trains start at the same time from Delhi and Rohtak and proceed towards each other at the rate of 75 Km and 65 Km per hour, respectively. When they meet, it is found that one train has travelled 10 Km more than the other. Find out the distance between Delhi and Rohtak.

Solution: Distance between Delhi and Rohtak

$$= d\left(\frac{s_1+s_2}{s_1-s_2}\right) \text{Km.}$$

$$= 10\left(\frac{75+65}{75-65}\right) \text{Km}$$

= 140 Km

EXERCISE-I

1. Ramesh crosses a 600 m long street in 5 minutes. His speed in Km/h is:

(a) 8.2 (b) 7.2
(c) 9.2 (d) None of these

2. Compare the speed of two trains, one moving at the speed of 80 Km/h and the other at 10 m/s.

(a) 30:9 (b) 40:9
(c) 20:9 (d) None of these

3. Mohan covers 10.2 Km in 3 hours, the distance covered by him in 5 hours is:

(a) 15 Km (b) 17 Km
(c) 19 Km (d) None of these

4. A 100 metres long train passes a bridge at the rate of 72 Km/h in 25 seconds. What is the length of the bridge?

(a) 400 m (b) 17 m
(c) 600 m (d) None of these

5. A train passes a 150 m long railway bridge in 18 seconds. If the train is running at a speed of 60 Km/h., then the length of the train in metres is:

(a) 160 m (b) 150 m
(c) 180 m (d) None of these

6. Sound travels 330 metres a second. If the sound of a thunder cloud follows the flash after 10 seconds, the thunder cloud is at a distance of:

(a) 3.7 Km (b) 3.5 Km
(c) 3.3 Km (d) None of these

7. A train travels 92.4 Km/h. How many metres will it travel in 10 minutes?

(a) 14500 m (b) 15400 m
(c) 15200 m (d) None of these

8. The distance of the sun from the earth is one hundred and $\frac{4}{3}$ million four hundred thousand kilometres and light travels from the former to the later in 7 minutes and 58 seconds. The velocity of light per second is:

(a) 3×10^5 Km/sec (b) 0.3×10^5 Km/sec
(c) 30×10^5 Km/sec (d) None of these

9. A train covers a distance in 50 minutes if it runs at a speed of 48 Km/h. The speed at which the train must run to reduce the time of journey to 40 minutes, will be:

(a) 70 Km/h (b) 80 Km/h
(c) 60 Km/h (d) None of these

10. The wheel of an engine is $3\frac{3}{4}$ metres in circumference and makes 4 revolutions in 2 seconds. The speed of the train is:

(a) 27 Km/h (b) 31 Km/h
(c) 35 Km/h (d) None of these

11. A person covers half of his journey at 30 Km/h and the remaining half at 20 Km/h. The average speed for the whole journey is:

(a) 25 Km/h (b) 28 Km/h
(c) 32 Km/h (d) None of these

12. Rajesh covers a certain distance by bus at 16 Km/h and returns at the starting point on a cycle at 9 Km/h. His average speed for the whole journey is:

(a) 13.54 Km/h (b) 11.52 Km/h
(c) 15.52 Km/h (d) None of these

13. A and B are two towns. A car goes from A to B at a speed of 64 Km/h and returns to A at a slower speed. If its average speed for the whole journey is 56 Km/h, it returned with speed:

(a) 52.54 Km/h (b) 47.74 Km/h
(c) 49.78 Km/h (d) None of these

14. A bicycle rider covers his onward journey from A to B at 10 Km/h and during the return journey from B to A he covers the same distance at 8 Km/h. If he finishes the onward and return journey in $4\frac{1}{2}$ hours, then the total distance covered by him during the entire journey is:

(a) 30 Km (b) 40 Km
(c) 50 Km (d) None of these

15. On a tour, a man travels at the rate of 64 Km an hour for the first 150 Km, then travels the next 160 Km at the rate of 80 Km an hour. The average speed in Km per hour for the first 320 Km of the tour is:

(a) 81.03 Km/h (b) 73.11 Km/h
(c) 71.11 Km/h (d) None of these

16. A car completes a journey in 6 hours. It covers half the distance at 50 Km/h and the rest at 70 Km/h The length of the journey is:

(a) 165 Km (b) 175 Km
(c) 185 Km (d) None of these

17. Rakesh sets out to cycle from Delhi to Mathura and at the same time Suresh starts from Mathura to Delhi. After passing each other, they complete their journeys in 9 and 16 hours, respectively. At what speed does Suresh cycle if Rakesh cycles at 16 Km per hour?

(a) 12 Km/h (b) 16 Km/h
(c) 14 Km/h (d) None of these

18. A train travels 225 Km in 3·5 hours and 370 Km in 5 hours. Find out the average speed of train.

(a) 80 Km/h (b) 60 Km/h
(c) 70 Km/h (d) None of these

19. A man walks 6 Km at a speed of $1\frac{1}{2}$ Km/h, runs 8 Km at a speed of 2 Km/h and goes by bus another 32 Km. Speed of the bus is 8 Km/h. If the speed of the bus is considered as the speed of the man, find the average speed of the man.

(a) $4\frac{5}{6}$ Km/h (b) $3\frac{5}{6}$ Km/h
(c) $5\frac{7}{6}$ Km/h (d) None of these

20. A car during its journey travels 30 minutes at a speed of 40 Km/h, another 45 minutes at a speed of 60 Km/h, and 2 hours at a speed of 70 Km/h. The average speed of the car is:

(a) 63 Km/h (b) 65 Km/h
(c) 70 Km/h (d) None of these

21. By walking at $\frac{3}{4}$ of his usual speed, a man reaches office 20 minutes later than usual. His usual time is:

(a) 65 minutes (b) 60 minutes
(c) 70 minutes (d) None of these

22. Two men start together to walk a certain distance, one at 4 Km/h and another at 3 Km/h. The former arrives half an hour before the latter. Find out the distance.

(a) 6 Km (b) 9 Km
(c) 8 Km (d) None of these

23. A car starts from A for B travelling 20 Km an hour. $1\frac{1}{2}$ hours later another car starts from A and travelling at the rate of 30 Km an hour reaches B $2\frac{1}{2}$ hours before the first car. Find the distance from A to B.

(a) 280 Km (b) 260 Km
(c) 240 Km (d) None of these

24. Mohan walks from Tilak Nagar to Moti Nagar and back in a certain time at the rate of $3\frac{1}{2}$ Km/h. But, if he had walked from Tilak Nagar to Moti Nager at the rate of 3 Km/h and back from Moti Nagar to Tilak Nagar at the rate of 4 Km/h., he would have taken 10 minutes longer. The distance between Tilak Nagar and Moti Nagar is:

(a) 28 Km (b) 32 Km
(c) 24 Km (d) None of these

25. A train does a non-stop journey for 8 hours. If it had travelled 5 Km an hour faster, it would have done the journey in 6 hours 40 min. What is its lowest speed?

(a) 35 Km/h (b) 25 Km/h
(c) 40 Km/h (d) None of these

26. Without any stoppage, a person travels a certain distance at an average speed of 42 Km/h and with stoppages he covers the same distance at an average speed of 28 Km/h. How many minutes per hour does he stop?

(a) 25 minutes (b) 30 minutes
(c) 20 minutes (d) None of these

27. A train is running at a uniform speed of 60 Km/h. It passes a railway platform in 15 seconds. If the length of the platform is 130 m, then the length of the train is:

(a) 160 m (b) 120 m
(c) 140 m (d) None of these

28. A train passes through a telegraph post in 9 seconds moving at a speed of 54 Km per hour. The length of the train is:

(a) 135 metres (b) 145 metres
(c) 125 metres (d) None of these

29. A 135 m long train is running with a speed of 54 Km per hour. In what time will it pass a telegraph post?

(a) 11 seconds (b) 9 seconds
(c) 7 seconds (d) None of these

30. A train 160 metres long passes a standing man in 18 seconds. The speed of the train is:

(a) 35 Km/h (b) 45 Km/h
(c) 32 Km/h (d) None of these

31. A 280 m long train is moving at a speed of 60 Km/h. The time taken by the train to cross a platform 220 m long is:

(a) 30 seconds (b) 40 seconds
(c) 60 seconds (d) 20 seconds

32. A train 50 m long passes a platform 100 m long in 10 seconds. The speed of the train in m/s is:

(a) 25 seconds (b) 15 seconds
(c) 35 seconds (d) None of these

33. A train 300 metres long is running at a speed of 90 Km/h. How many seconds will it take cross a 200 metres long train running in the opposite direction at a speed of 60 Km/h?

(a) 70 seconds (b) 60 seconds
(c) 50 seconds (d) None of these

34. Two trains are running in opposite directions with the same speed. If the length of each train is 135 metres and they cross each other in 18 seconds, the speed of each train is:

(a) 29 Km/h (b) 35 Km/h
(c) 27 Km/h (d) None of these

35. A train 150 m long is running at 95 Km/h. How much time will it take to pass a man moving in the same direction at 5 Km/h?

(a) 9 seconds (b) 6 seconds
(c) 7 seconds (d) None of these

36. A train 100 metres long takes $3\frac{3}{5}$ seconds to cross a man walking at the rate of 6 Km/h in a direction opposite to that of the train. Find the speed of the train.

(a) 76 Km/h (b) 94 Km/h
(c) 86 Km/h (d) None of these

37. Two trains are moving in the same direction at 50 Km/h and 30 Km/h. The faster train crosses a man in the slower train in 18 seconds. Find the length of the faster train.

(a) 120 m (b) 110 m
(c) 100 m (d) None of these

38. Two trains, 130 m and 110 m long, while going in the same direction, the faster train takes one minute to pass the other completely. If they are moving in opposite direction, they pass each other completely in 3 seconds. Find the speed of each train.

(a) 42 m/s 38 m/s (b) 38 m/s 36 m/s
(c) 36 m/s 42 m/s (d) None of these

39. Two trains, each of length 90 metres, run on parallel tracks. When running in the same direction, the faster train passes the slower train completely in 18 seconds, but when they are running in opposite directions approaching each other at the same speeds as before they cross each other in 9 seconds. Find the speed of each train.

(a) 9 m/s 15 m/s (b) 7 m/s 5 m/s
(c) 15 m/s 5 m/s (d) None of these

40. A train leaves the station at 5 am at 60 Km/h. Another train leaves the same station at 6.30 am at 75 Km/h and travels in the direction of the first train. At what time and at what distance from the station will they meet?

(a) 12.30. am 450 Km (b) 1.30 pm 375 Km
(c) 11.30 am 425 Km (d) None of these

41. Two stations A and B are 100 Km apart on a straight line. One train starts from A at 7 am and travels towards B at 20 Km/h speed. Another train starts from B at 8 am and travels towards A at 25 Km/h speed. At what time will they meet?

(a) 10.30 am (b) 11 am
(c) 10 am (d) None of these

42. A train starts from station A at 9 am travels at 50 Km/h towards station B, 210 Km away. Another train starts from station B at 11 am and travels at 60 Km/h towards station A. At what distance from A, will they meet?

(a) 150 Km (b) 200 Km
(c) 250 Km (d) None of these

43. Two trains start at the same time from Mumbai and Pune and proceed towards each other at the rate of 60 Km and 40 Km per hour, respectively. When they meet, it is found that one train has travelled 20 Km more than the other. Find the distance between Mumbai and Pune.

(a) 150 Km (b) 100 Km
(c) 120 Km (d) None of these

44. A car covers four successive three Km stretches at speed of 10 Km/h, 20 Km/h, 30 Km/h and 60 Km/h. respectively. Its average speed over this distance is:

(a) 10 Km/h (b) 20 Km/h
(c) 30 Km/h (d) 25 Km/h

45. Two men A and B walk from P to Q at a distance of 21 Km at rates 3 and 4 Km an hour, respectively. B reaches Q and returns immediately and meets A at R. The distance from P to R is:

(a) 14 Km (b) 20 Km
(c) 16 Km (d) 18 Km

46. A boy takes as much time in running 12 metres as a car takes in covering 36 metres. The ratio of the speeds of the boy and the car is:

(a) 1:3 (b) 1:2
(c) 2:3 (d) 2:5

47. A and B are two stations. A train goes from A to B at 64 Km/h and returns to A at a slower speed. If its average speed for the whole journey is 56 Km/h, at what speed did it return?

(a) 48 Km/h (b) 49.77 Km/h
(c) 30 Km/h (d) 47.46 Km/h

48. Excluding stoppages, the speed of a bus is 54 Km/h and including stoppages, it is 45 Km/h. For how many minutes does the bus stop per hour?

(a) 9 (b) 10
(c) 12 (d) 20

49. Two boys jointly begin to write a booklet containing 817 lines. The first boy starts with the first line, he writes 200 lines an hour. The starts with the last line, then writes line 816 and so on, backwards proceeding at the rate of 150 lines an hour. They will meet on:

(a) 467th line (b) 466th line
(c) 460th line (d) 472th line

50. Ramesh sees a train passing over a 1 Km long bridge. The length of the train is half that of the bridge. If the train passes the bridge in 2 minutes, the speed of the train is:

(a) 45 Km/h (b) 43 Km/h
(c) 50 Km/h (d) None of these

51. A bullock cart has to cover a distance of 80 Km in 10 hours. If it covers half of the journey in $\frac{3}{5}$ the time, what should be its speed to cover the remaining distance in the time left?

(a) 8 Km/h (b) 20 Km/h
(c) 6.4 Km/h (d) 10 Km/h

52. Amit started cycling along the boundaries of a square field from cover point A. After half an hour, he reached the corner point C, diagonally opposite to A. If his speed was 8 Km/h, what is the area of the field in square Km?

(a) 64 (b) 8
(c) 4 (d) Cannot be determined

53. A 100 metres long train completely passes a man walking in the same direction at 6 Km/h in 5 seconds and also a car travelling in the same direction in 6 seconds. At what speed was the car travelling?

(a) 18 Km/h (b) 48 Km/h
(c) 24 Km/h (d) 30 Km/h

54. A motor cyclist travels from Mumbai to Pune, a distance of 192 Kms, at an average speed of 32 Km/h Another man starts from Mumbai by travelling in a car, $2\frac{1}{2}$ hours after the cyclist and reaches Pune half an hour earlier. What is the ratio of the speeds of the motor cycle and the car?

(a) 1:2 (b) 1:3
(c) 10:27 (d) 5:4

55. Two trains are running in opposite directions with speed of 62 Km/h and 40 Km/h, respectively. If the length of one train is 250 metres and they cross each other in 18 seconds,then the length of the other train is:

(a) 145 m (b) 230 m
(c) 260 m (d) Cannot be determined

56. A train speeds past a pole in 15 seconds and speeds past a 100 metres long platform in 25 seconds. Its length in metres is:

(a) 200 (b) 150
(c) 50 (d) Data inadequate

57. A 150 metres long train takes 10 seconds to pass over another 100 metres long train coming from the opposite direction. If the speed of the first train is 30 Km/h, the speed of the second train is:

(a) 54 Km/h (b) 60 Km/h
(c) 72 Km/h (d) 36 Km/h

58. A person sets to cover a distance of 12 Km in 45 minutes. If he covers $\frac{3}{4}$ of the distance in $\frac{2}{3}$ time, what should be his speed to cover the remaining distance in the remaining time?

(a) 16 Km/h (b) 8 Km/h
(c) 12 Km/h (d) 14 Km/h

59. A 110 metres long train passes a man walking at the speed of 6 Km/h, against it in 6 seconds. The speed of the train in Km/h is:

(a) 60 Km/h (b) 45 Km/h
(c) 50 Km/h (d) 55 Km/h

60. If a 110 metres long train passes a man walking at a speed of 6 Km/h against it in 6 seconds, it will pass another man walking at the same speed in the same direction in time of:

(a) $9\frac{1}{3}$ seconds (b) $10\frac{2}{3}$ seconds
(c) 8 seconds (d) $7\frac{1}{3}$ seconds

61. A man performs $\frac{2}{15}$ of the total journey by rail, $\frac{9}{20}$ by tonga and the remaining 10 Km on foot. The total journey is:

(a) 15.6 Km (b) 12.8 Km
(c) 16.4 Km (d) 24 Km

EXERCISE-2
(BASED ON MEMORY)

1. Raman drove from home to a neighbouring town at the speed of 50 Km/h and on his returning journey. He drove at the speed of 45 Km/h and, also took an hour longer to reach home. What distance did he cover each way?

(a) 450 Km (b) 225 Km
(c) 900 Km (d) 500 Km
(e) None of these

[SBI PO Examination, 2008]

2. Pratibha covers a distance of 24 Km at the speed of 8 Km/h and a distance of 18 Km at the speed of 9 Km/h. Further, she coveres a distance of 12 Km at the speed of 3 Km/h. What is her average speed in covering the whole distance?

(a) 8 Km/h (b) 5.5 Km/h
(c) 3 Km/h (d) 6 Km/h
(e) None of these

[NABARD PO Examination, 2008]

3. A man walks at the speed of 5 Km/h and runs at the speed of 10 Km/h. How much time will the man require to cover the distance of 28 Km, if he coveres half (first 14 Km) of his journey walking and half his journey running?

(a) 8.4 hours (b) 6 hours
(c) 5 hours (d) 4.2 hours
(e) None of these

[Allahabad Bank SO Examination, 2007]

4. A car covers the first 35 Km of its journey in 45 minutes and the remaining 69 Km in 75 minutes. What is the average speed of the car?

(a) 42 Km/h (b) 50 Km/h
(c) 52 Km/h (d) 60 Km/h
(e) None of these

[Bank of Baroda PO Examination, 2007]

5. Milind takes as much time in running 15 metres as a car takes in covering 40 metres. What will be the distance covered by Milind during the time the car covers 2 Km?

(a) 1000 metres (b) 600 metres
(c) 650 metres (d) 750 metres
(e) None of these

[OBC PO Examination, 2007]

6. A 180 metre long train crosses a platform of equal length in 18 seconds. What is the speed of the train?

(a) 22 m/s (b) 10 m/s
(c) 15 m/s (d) 18 m/s
(e) None of these

[CBI PO Examination, 2007]

7. A car covers the first 30 Km of its journey in 45 minutes and the remaining 25 Km in 35 minutes. What is the average speed of the car?

(a) 40 Km/h (b) 64 Km/h
(c) 49 Km/h (d) 48 Km/h
(e) None of these

[Andhra Bank PO Examination, 2006]

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

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

[SSC (GL) Prel. Examination, 2005]

9. A train running at $\frac{7}{11}$ of its normal speed reached a place in 22 hours. How much time could be saved if the train would have run at its normal speed?

(a) 14 hours (b) 7 hours
(c) 8 hours (d) 16 hours

[SSC (GL) Prel. Examination, 2005]

10. A train, 150 m long, takes 30 seconds to cross a bridge 500 m long. How much time will the train take to cross a platform 370 m long?

(a) 36 seconds (b) 30 seconds
(c) 24 seconds (d) 18 seconds

[SSC (GL) Prel. Examination, 2005]

11. If a train, with a speed of 60 Km/h, crosses a pole in 30 seconds, then the length of the train (in metres) is:

(a) 1000 (b) 900
(c) 750 (d) 500

[SSC (GL) Prel. Examination, 2005]

12. A 120 metre long train is running at a speed of 90 Km/h. It will cross a 230 m long railway platform in:

(a) $4\frac{4}{5}$ seconds (b) $9\frac{1}{5}$ seconds
(c) 7 seconds (d) 14 seconds

[SSC (GL) Prel. Examination, 2005]

13. A train is moving at a speed of 180 Km/h. Its speed (in metres per second) is:

(a) 5 (b) 40
(c) 30 (d) 50

[SSC (GL) Prel. Examination, 2005]

14. A car travels 10 metres in a second. Find its speed in Km/h.

(a) 40 (b) 32
(c) 48 (d) 36

[SSC (GL) Prel. Examination, 2002]

15. A man can reach a certain place in 30 hours. If he reduces his speed by $\frac{1}{15}$, he goes 10 Km less in that time. Find his speed per hour.

(a) 6 Km/h (b) $5\frac{1}{2}$ Km/h
(c) 4 Km/h (d) 5 Km/h

[SSC (GL) Prep. Examination, 2002]

16. A 120 m long train takes 10 seconds to cross a man standing on a platform. What is the speed of the train?

(a) 12 m/s (b) 10 m/s
(c) 15 m/s (d) 20 m/s

[SSC (GL) Prel. Examination, 2002]

17. 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 m (b) 176 m
(c) 175 m (d) 96 m

[SSC (GL) Prel. Examination, 2002]

18. A train moves at a of 180 Km/h. Its speed (in metre per second) is:

(a) 5 m/s (b) 40 m/s
(c) 30 m/s (d) 50 m/s

[SSC (GL) Prel. Examination, 2002]

19. A car travelling at $\frac{5}{7}$ of its actual speed covers 42 Km is 1 hour 40 minutes 48 second. Find out the actual speed of the car.

(a) $17\frac{6}{7}$ Km/h (b) 35 Km/h
(c) 25 Km/h (d) 30 Km/h

[SSC (GL) Prel. Examination, 2002]

20. A train, 120 metres long, passes a telegraph post in 6 seconds. Find out the speed of the train.

(a) 60 Km/h (b) 72.5 Km/h
(c) 80 Km/h (d) 72 Km/h

[SSC Prel. (GL) Examination, 2002]

21. A trains passes a telegraph post in 8 seconds and a 264 m long bridge in 20 seconds. What is the length of the train?

(a) 180 m (b) 176 m
(c) 164 m (d) 158 m

[SSC (GL) Prel. Examination, 2002]

22. A 800 metres long train is running at a speed of 78 Km/h. If it crosses a tunnel in 1 minute, then the length of the tunnel (in metres) is:

(a) 700 m (b) 500 m
(c) 400 m (d) 600 m

[SSC (GL) Prel. Examination, 2003]

23. A man covered a certain distance at some speed. Had he moved 3 Km/h faster, he would have taken 40 minutes less. If he had moved 2 Km/h slower, he would have taken 40 minutes more. The distance (in Km) is:

(a) 20 Km (b) 35 Km
(c) $36\frac{2}{3}$ Km (d) 40 Km

[SSC (GL) Prel. Examination, 2003]

24. Two trains, one 160 m and other 140 m long, are running in opposite directions on parallel rails. The first train at 77 Km/h and the other train at 67 Km. How long will they take to cross each other.

(a) 7 seconds (b) $7\frac{1}{2}$ seconds
(c) 6 seconds (d) 10 seconds

[SSC (GL) Prel. Examination, 2003]

25. Two trains are running in opposite directions with same speed. If the length of each train is 120 metres and they cross each other in 12 seconds, the speed of each train (in Km/h) is:

(a) 72 Km/h (b) 10 Km/h
(c) 36 Km/h (d) 18 Km/h

[SSC (GL) Prel. Examination, 2003]

26. In what time a 100 metres long train will cross an electric pole if its speed be 144 Km/h?

(a) 2.5 seconds (b) 5 seconds
(c) 12.5 seconds (d) $3\frac{5}{4}$ seconds

[SSC (GL) Prel. Examination, 2003]

27. A car travelling at speed of 40 Km/h can complete a journey in 9 hours. How long will it take to travel the same distance with a speed of 60 Km/h?

(a) 6 hours (b) 3 hours
(c) 4 hours (d) $4\frac{1}{2}$ hours

[SSC (GL) Prel. Examination, 2003]

28. A train running at speed of 120 Km/h crosses a signal post in 15 seconds. What is the length of the train in metres?
(a) 300 m (b) 200 m
(c) 500 m (d) Cannot be determined
(e) None of these
[BSRB Bhopal PO Examination, 2000]

29. A car finishes a journey in 10 hours at the speed of 80 Km/h. If the same distance is to be covered in 8 hours, then how much speed would the train gather?
(a) 8 Km/h (b) 10 Km/h
(c) 12 Km/h (d) 16 Km/h
(e) None of these
[BSRB Delhi PO Examination, 2000]

30. Train 'A' leaves Mumbai Central for Lucknow at 11:00 am, running at the speed of 60 Km/h. Train 'B' leaves Mumbai Central for Lucknow by the same route at 2:00 pm on the same day, running at the speed of 72 Km/h. At what time will the two trains meet each other?
(a) 2 am on the next day
(b) 5 am on the next day
(c) 5 pm on the next day
(d) 2 pm on the next day
(e) None of these
[BSRB Patna PO Examination, 2001]

31. Trains, A and B are travelling on the same route heading towards the same destination. Train B has already covered a distance of 220 Km before train A started. The two trains meet each other 1 hours after the start of train A. Had the trains been travelling towards each other (from a distance of 220 Km), they would have met after one hour. What is the speed of train B in Km/h?
(a) 100 Km/h (b) 180 Km/h
(c) 116 Km/h (d) Data inadequate
(e) None of these
[SBI PO Examination, 2001]

32. The speed of a car increases by 2 Km after every hour. If the distance travelled in the first hour was 35 Km, then what was the total distance travelled in 12 hours?
(a) 522 Km (b) 456 Km
(c) 556 Km (d) 482 Km
(e) None of these
[Bank of Maharashtra PO Examination, 2003]

33. To get to a business meeting, John drove m miles in hours, and arrived 1/2 hour early. At what rate should he have driven to arrive exactly on time?
(a) $\frac{m}{2h}$ (b) $\frac{2m}{2h+1}$
(c) $\frac{2m}{2h-1}$ (d) $\frac{2m-h}{2h}$

34. A train, 300 m long, passed a man, walking along the line in the same direction at the rate of 3 Km/h in 33 s. The speed of the train is:
(a) 30 Km/h (b) 32 Km/h
(c) $32\frac{8}{11}$ Km/h (d) $35\frac{8}{11}$ Km/h
[SSC (GL) Examination, 2010]

35. Buses start from a bus terminal with a speed of 20 Km/h at an intervals of 10 mins. What is the speed of a man coming from the opposite direction towards the bus terminal if he meets the buses at an intervals of 8 mins?
(a) 3 Km/h (b) 4 Km/h
(c) 5 Km/h (d) 7 Km/h
[SSC (GL) Examination, 2010]

36. A 180 m long train crosses another 270 m long train running in the opposite direction in 10.8 seconds. If the speed of the first train is 60 Km/h, what is the speed of the second train in Km/h?
(a) 80 (b) 90
(c) 150 (d) Cannot be determined
[Gramin Bank U.P. (SO) Examination, 2012]

37. Paschim Express left Delhi for Mumbai at 14:30 hours travelling at a speed of 60 Km/h. August Kranti Express left Delhi for Mumbai on the same day at 16:30 hours travelling at a speed of 80 Km/h. How far away from Delhi will the two trains meet (stop-pages excluded)?
(a) 500 Km (b) 480 Km
(c) 360 Km (d) 240 Km
[UPPCS Examination, 2012]

38. A man starts from his home and walks 10 m towards South. Then he turns right and walks 6 Km, again he turns right and goes 10 Km. Finally, he turns right and walks 5 Km. At what distance is he from his starting point?
(a) 31 Km (b) $2\sqrt{101}$ Km
(c) 1 Km (d) $\sqrt{125}+\sqrt{136}$ Km
[UPPCS Examination, 2012]

39. Car A runs at the speed of 65 Km/h and reaches its destination in 8 hours. Car B runs at the speed of 70 Km/h and reaches its destination in 4 hours. What is the respective ratio of distances covered by Car A and Car B?
(a) 11:7 (b) 7:13
(c) 13:7 (d) 7:11
[Syndicate Bank PO Examination, 2010]

40. Deepa drives a bike at an average speed of 30 Km/h and reach her destination in 6 hours. Hema covers that distance in 4 hours. If Deepa increases her average speed by 10 Km/h and Hema increases her average speed by 5 Km/h, then what will be the difference in time taken by them to reach their destination?

(a) 54 minutes (b) 1 hour
(c) 40 minutes (d) 45 minutes

[Syndicate Bank PO Examination, 2010]

41. The ratio between the speed of a train and a car is 16:15. Also, a bus covered a distance of 480 Km in 8 hours. The speed of the bus is $\frac{3}{4}$ the speed of the train. How much distance will the car cover in 6 hours?

(a) 450 Km (b) 480 Km
(c) 360 Km (d) Cannot be determined

[Bank of Baroda PO Examination, 2010]

42. A 320 m long train moving at an average speed of 120 Km/h crosses a platform in 24 seconds. A man crosses the same platform in 4 minutes. What is the speed of man in m/s?

(a) 2.4 (b) 1.5
(c) 1.6 (d) 2.0

[Bank of Baroda PO Examination, 2011]

43. The average speed of a car is $1\frac{4}{5}$ times the average speed of a bus. A tractor covers 575 Km in 23 hours. How much distance will the car cover in 4 hours if the speed of the bus is twice speed of the tractor?

(a) 340 Km (b) 480 Km
(c) 360 Km (d) 450 Km

[Corporation Bank PO Examination, 2011]

44. Train A crosses a pole in 25 seconds and another Train B crosses a pole in 1 minute and 15 seconds. Length of Train A is half the length of Train B. What is the respective ratio between the speeds of Train A and Train B?

(a) 3:2 (b) 3:4
(c) 4:3 (d) Cannot be determined

[Union Bank of India PO Examination, 2011]

45. A 240 m long train takes 40 seconds longer to cross a platform twice its length than the time it takes to cross a pole at the same speed. What is the speed of the train?

(a) 6 m/s (b) 24 m/s
(c) 48 m/s (d) 12 m/s

[Dena Bank PO Examination, 2008]

46. A 200 m long train crosses a platform of double its length in 36 seconds. What is the speed of the train in Km/h?

(a) 60 Km/h (b) 48 Km/h
(c) 64 km/h (d) 66 Km/h

[SBI PO Examination, 2008]

47. A man walked at a speed of 4 Km/h from point A to B and come back from point B to A at the speed of 6 Km/h. What would be the ratio between the time taken by man in walking from point A to B to point B to A?

(a) 5:3 (b) 2:3
(c) 2:1 (d) 4:3

[Corporation Bank PO Examination, 2009]

48. A bus started its journey from Ramgarh and reached Devgarh in 44 minutes with its average speed of 50 Km/h. If the average speed of the bus is increased by 5 Km/h, then much time will it take to cover the same distance?

(a) 40 minutes (b) 38 minutes
(c) 36 minutes (d) 31 minutes

[Corporation Bank PO Examination, 2009]

49. The bus fare for one person is ₹420 from Agra to Aligarh and train fare between the same places for one person is equal to $\frac{3}{4}$ the bus fare for two persons between the same places. What is the total fare paid by 2 persons traveling by bus and 4 persons traveling by train between the two places?

(a) ₹3360 (b) ₹3460
(c) ₹3440 (d) ₹3406

[CBI (PO) Examination, 2010]

50. Train A crosses a stationary Train B in 50 s and a pole in 20 s with the same speed. The length of Train A is 240 metre. What is the length of the stationary Train B?

(a) 360 m (b) 260 m
(c) 300 m (d) Cannot be determined

[CBI (PO) Examination, 2010]

51. A bike covers a certain distance at the speed of 64 Km/h in 8 hours. If the bike was to cover the same distance in approximately 6 hours, at what approximate speed should the bike travel?

(a) 80 Km/h (b) 85 Km/h
(c) 90 Km/h (d) 75 Km/h

[Punjab National Bank PO Examination, 2010]

52. If a distance of 50 m is covered in 1 minute, 90 m in 2 minutes and 130 m in 3 minutes find the distance covered in 15 minutes.

(a) 610 m (b) 750 m
(c) 1000 m (d) 650 m

[SSC Examination, 2014]

53. Three men step off together from the same spot. Their steps measure 63 cm, 70 cm and 77 cm, respectively. The minimum distance each should cover so that all can cover the distance in complete steps is:

(a) 9630 cm (b) 9360 cm
(c) 6930 cm (d) 6950 cm

[SSC Examination, 2014]

54. A man travelled a distance of 80 Km in 7 hours partly on foot at the rate of 8 Km/h and partly on bicycle at 16 Km/h. The distance travelled on the foot is:

(a) 32 Km (b) 48 Km
(c) 36 Km (d) 44 Km

[SSC Examination, 2014]

55. Two trains of equal length are running on parallel lines in the same direction at the rate of 46 Km/h and 36 Km/h. The faster train passes the slower train in 36 seconds. The length of each train is:

(a) 50 m (b) 72 m
(c) 80 m (d) 82 m

[SSC Examination, 2014]

56. A car driver leaves Bangalore at 8:30 am and expects to reach a place 300 Km from Bangalore at 12:30 pm. At 10:30 he finds that he has covered only 40% of the distance. By how much he has to increase the speed of the car in order to keep up his schedule?

(a) 45 Km/h (b) 40 Km/h
(c) 35 Km/h (d) 30 Km/h

[SSC Examination, 2014]

57. A train 300 m long is running with a speed of 54 Km/h. In what time will it cross a telephone pole?

(a) 20 seconds (b) 15 seconds
(c) 17 seconds (d) 18 seconds

[SSC Examination, 2014]

58. A man is walking at a speed of 10 Km/h. After every Km, he takes a rest for 5 minutes. How much time will he take to cover a distance of 5 Km?

(a) 60 minutes (b) 50 minutes
(c) 40 minutes (d) 70 minutes

[SSC Examination, 2014]

59. A train goes from Ballygunge to Sealdah at an average speed of 20 Km/h and comes back at an average speed of 30 Km/h. The average speed of the train for the whole journey is:

(a) 27 Km/h (b) 26 Km/h
(c) 25 Km/h (d) 24 Km/h

[SSC Examination, 2013]

60. A certain distance is covered by a cyclist at a certain speed. If a jogger covers half the distance in double the time, the ratio of the speed of the jogger to that of the cyclist is:

(a) 1:4 (b) 4:1
(c) 1:2 (d) 2:1

[SSC Examination, 2013]

61. The distance between places A and B is 999 Km. An express train leaves place A at 6:00 am and runs at a speed of 55.5 Km/h. The train stops on the way for 1 hour 20 minutes. It reaches B at:

(a) 1:20 am (b) 12:00 pm
(c) 5:00 pm (d) 11:00 pm

[SSC Examination, 2013]

62. If a boy walks from his house to school at the rate of 4 Km/h, he reaches the school 10 minutes earlier than the scheduled time. However, if he walks at the rate of 3 Km/h, he reaches 10 minutes late. Find the distance of the school from his house.

(a) 5 Km (b) 4 Km
(c) 6 Km (d) 4.5 Km

[SSC Examination, 2013]

63. Two trains are running at a speed of 40 Km/h and 20 Km/h, respectively in the same direction. The fast train completely passes a man sitting in the slow train in 5 seconds. The length of the fast train is:

(a) $23\frac{2}{9}$ m (b) 27 m

(c) $27\frac{7}{9}$ m (d) 23 m

[SSC Examination, 2013]

64. A boy started from his house by bicycle at 10:00 am at a speed of 12 Km/h. His elder brother started after 1 hour 15 minutes by scooter along the same path and caught him at 1:30 pm. The speed of the scooter was (in Km/h)

(a) 4.5 (b) 36

(c) $18\frac{2}{3}$ (d) 9

[SSC Assistant Grade III Examination, 2013]

65. If a train runs at 40 Km/h, it reaches its destination late by 11 minutes, but if it runs at 50 Km/h, it is late by 5 minutes only. Find, the correct time for the train to complete its journey.

(a) 19 minutes (b) 20 minutes
(c) 21 minutes (d) 18 minutes

[SSC Assistant Grade III Examination, 2012]

66. P and Q are 27 Km away. Two trains with speeds of 24 Km/h and 18 Km/h respectively start simultaneously from P and Q and travel in the same direction. They meet at a point R beyond Q. Distance QR is:

(a) 126 Km (b) 81 Km
(c) 48 Km (d) 36 Km

[SSC Examination, 2012]

67. Two trains, A and B, start from stations X and Y towards Y and X respectively. After passing each other, they take 4 hours 48 minutes and 3 hours 20 minutes to reach Y and X respectively. If train A is moving at 45 Km/h, then the speed of the train B is:

(a) 60 Km/h (b) 64.8 Km/h
(c) 54 Km/h (d) 37.5 Km/h

[SSC Examination, 2012]

68. A train covers a distance between station A and station B in 45 minutes. If the speed of the train is reduced by 5 Km/h, then the same distance is covered in 48 minutes. The distance between stations A and B is:

(a) 60 Km (b) 64 Km
(c) 80 Km (d) 55 Km

[SSC Examination, 2012]

69. A car covers $\frac{1}{5}$ of the distance from A to B at the speed of 8 Km/h, $\frac{1}{10}$ of the distance at 25 Km/h and the remaining at the speed of 20 Km/h. Find the average speed of the whole journey.

(a) 12.625 Km/h (b) 13.625 Km/h
(c) 14.625 Km/h (d) 15.625 Km/h

[SSC Examination, 2011]

70. Walking at 3 Km/h, Pintu reaches his school 5 minutes late. If he walks at 4 Km/h he will be 5 minutes early. The distance of Pintu's school from his house is:

(a) $1\frac{1}{2}$ Km (b) 2 Km
(c) $2\frac{1}{2}$ Km (d) 5 Km

[SSC Examination, 2011]

71. A man driving at $\frac{3}{4}$ of his original speed reaches his destination 20 minutes later than the usual time. Then the usual time is:

(a) 45 minutes (b) 60 minutes
(c) 75 minutes (d) 120 minutes

[SSC Examination, 2011]

72. If A travels to his school from his house at the speed of 3 Km/h, then he reaches the school 5 minutes late. If he travels at the speed of 4 Km/h, he reaches the school 5 minutes earlier than school time. The distance of his school from his house is:

(a) 1 Km (b) 2 Km
(c) 3 Km (d) 4 Km

[SSC Examination, 2010]

73. Two places A and B are 100 Km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at a constant speed, they meet in 5 hours. If the cars travel towards each other, they meet in 1 hour. What is the speed of the car running faster?

(a) 60 Km/h (b) 50 Km/h
(c) 40 Km/h (d) 32 Km/h

[SSC Examination, 2010]

74. A train travelling with a speed of 60 Km/h catches another train travelling in the same direction and then leaves it 120 m behind in 18 seconds. The speed of the second train is:

(a) 26 Km/h (b) 35 Km/h
(c) 36 Km/h (d) 63 Km/h

[SSC Examination, 2010]

75. It takes 24 seconds for a train travelling at 93 Km/h to cross entirely another train half its length travelling in opposite direction at 51 Km/h. It passes a bridge in 66 seconds. What is the length of the bridge? (in metres)

(a) 1065 (b) 1600
(c) 1705 (d) 1580
(e) None of these

[IBPS PO/MT Examination, 2014]

76. A person travels from P to Q at a speed of 40 Km/h and returns to Q by increasing his speed by 50%. What is his average speed for both the trips?

(a) 36 Km/h (b) 45 Km/h
(c) 48 Km/h (d) 50 Km/h
(e) None of these

[IBPS PO/MT Examination, 2013]

77. The fare of a bus is ₹X for the first five kilometres and ₹13 per kilometre thereafter. If a passenger pays ₹2402 for a journey of 187 kilometres, what is the value of X?

(a) ₹29 (b) ₹39
(c) ₹36 (d) ₹31
(e) None of these

[IBPS PO/MT Examination, 2012]

78. What is the speed of the train in Km/h?

Statements:

I. The train crosses an 'x' meter-long platform in 'n' seconds.
II. The length of the train is 'y' meters.
III. The train crosses a signal pole in 'm' seconds.

(a) Any two of the three
(b) Only II and III
(c) Only I and III
(d) All I, II and III
(e) Question cannot be answered even with information in all three statements.

[SBI Associates Banks PO Examination, 2011]

79. The average speed of a train is $1\frac{3}{7}$ times the average speed of a car. The car covers a distance of 588 Km in 6 hours. How much distance will the train cover in 13 hours?

(a) 1750 Km (b) 1760 Km
(c) 1720 Km (d) 1850 Km
(e) None of these

[IOB PO Examination, 2011]

80. A car covers first 39 Km of its journey in 45 minutes and the remaining 25 Km in 35 minutes. What is the averagespeed of the car?

(a) 40 Km/h (b) 64 Km/h
(c) 49 Km/h (d) 48 Km/h
(e) None of these

[Andhra Bank PO Examination, 2011]

81. The ratio of the speed of a bus to that of a train is 15:27. Also, a car covered a distance of 720 Km in 9 hours. The speed of the bus is 3/4 the speed of the car. How much distance will the train cover in 7 hours?

(a) 760 Km (b) 756 Km
(c) 740 Km (d) Cannot be determined
(e) None of these

[Allahabad Bank PO Examination, 2011]

82. The call rate of a SIM of Company A is one paisa forevery three seconds. Another SIM of Company B charges 45 paisa per minute. A man talked for 591 secondsfrom the SIM of Company A and 780 seconds from the SIM of Company B. What would be the total amount hespent?

(a) ₹7.80 (b) ₹7.40
(c) ₹7.46 (d) ₹7.82
(e) ₹8.46

[Allahabad Bank PO Examination, 2011]

83. A 280-metre-long train moving with an average speed of 108 Km/h crosses a platform in 12 seconds. A man crosses the same platform in 10 seconds. What is the speed ofthe man?

(a) 5 m/s (b) 8 m/s
(c) 12 m/s (d) Cannot be determined
(e) None of these

[Allahabad Bank PO Examination, 2011]

84. The average speed of a car is $1\frac{4}{5}$ times the average speed of a bus. A tractor covers 575 Km in 23 hours. How much distance will the car cover in 4 hours if the speed of the bus is twice the speed of the tractor?

(a) 340 Km (b) 480 Km
(c) 360 Km (d) 450 Km
(e) None of these

[Corporation Bank PO Examination, 2011]

85. A car covers the first 39 Km of its journey in 45 minutes and the remaining 25 Km in 35 minutes. What is the average speed of the car?

(a) 40 Km/h (b) 64 Km/h
(c) 49 Km/h (d) 48 Km/h
(e) None of these

[Punjab and Sind Bank PO Examination, 2011]

86. A man crosses a stationary bus in 18 seconds. The same bus crosses a pole in 4 seconds. What is the ratio of the speed of the bus to the speed of the man?

(a) 9:2 (b) 9:4
(c) 18:5 (d) Cannot be determined
(e) None of these

[Syndicate Bank PO Examination, 2010]

87. Train A crosses a stationary Train B in 50 seconds and a pole in 20 seconds with the same speed. The length of the Train A is 240 metres. What is the length of the stationary Train B?

(a) 360 metres (b) 260 metres
(c) 300 metres (d) Cannot be determined
(e) None of these

[CBI PO Examination, 2010]

88. The ratio of the speeds of a car, a jeep and a tractor is 3:5:2. The speed of the jeep is 250 percent the speed of the tractor, which covers 360 Km in 12 hours. What is the average speed of car and jeep together?

(a) 60 Km/h (b) 75 Km/h
(c) 40 Km/h (d) Cannot be determined
(e) None of these

[CBI PO Examination, 2010]

89. The ratio of the speeds of a car, a train and a bus is 5:9:4. The average speed of the car, the bus and the train is 72 Km/h together. What is the average speed of the car and the train together?

(a) 82 Km/h (b) 78 Km/h
(c) 84 Km/h (d) Cannot be determined
(e) None of these

[Punjab and Sind Bank PO Examination, 2010]

90. A 180-meter-long train crosses another 270-meter long train running from the opposite direction in 10.8 seconds. If the speed of the first train is 60 Km/h, what is the speed of the second train in Km/h?

(a) 80 (b) 90
(c) 150 (d) Cannot be determined
(e) None of these

[Allahabad Bank PO Examination, 2010]

91. Three friends A, B and C start running around a circular stadium and complete a single round in 24, 36 and 30 seconds, respectively. After how many minutes will they meet again at the starting point?

(a) 12 (b) 6
(c) 8 (d) 15
(e) 18

[IDBI Bank PO Examination, 2009]

92. A bus started its journey from Ramgarh and reached Devgarh in 44 minutes at an average speed of 50 Km/h. If the average speed of the bus is increased by 5 Km/h, how much time will it take to cover the same distance?

(a) 40 minutes (b) 38 minutes
(c) 36 minutes (d) 31 minutes
(e) 49 minutes

[Corporation Bank PO Examination, 2009]

93. A man walked at a speed of 4 Km/h from point A to B and came back from point B to A at the speed of 6 Km/h. What would be the ratio of the time taken by the man in walking from point A to B to that from point B to A?

(a) 5:3 (b) 2:3
(c) 2:1 (d) 4:3
(e) 3:2

[Corporation Bank PO Examination, 2009]

ANSWER KEYS

Exercise-1

1. (b)	**2.** (c)	**3.** (b)	**4.** (a)	**5.** (b)	**6.** (c)	**7.** (b)	**8.** (a)	**9.** (c)	**10.** (a)	**11.** (a)	**12.** (b)	**13.** (c)
14. (b)	**15.** (c)	**16.** (b)	**17.** (a)	**18.** (c)	**19.** (b)	**20.** (a)	**21.** (b)	**22.** (a)	**23.** (c)	**24.** (a)	**25.** (b)	**26.** (c)
27. (b)	**28.** (a)	**29.** (b)	**30.** (c)	**31.** (a)	**32.** (b)	**33.** (b)	**34.** (c)	**35.** (c)	**36.** (b)	**37.** (c)	**38.** (a)	**39.** (c)
40. (a)	**41.** (c)	**42.** (a)	**43.** (b)	**44.** (b)	**45.** (d)	**46.** (a)	**47.** (b)	**48.** (b)	**49.** (a)	**50.** (a)	**51.** (d)	**52.** (a)
53. (a)	**54.** (a)	**55.** (c)	**56.** (b)	**57.** (b)	**58.** (c)	**59.** (a)	**60.** (d)	**61.** (d)				

Exercise-2

1. (a)	**2.** (d)	**3.** (d)	**4.** (c)	**5.** (d)	**6.** (e)	**7.** (e)	**8.** (c)	**9.** (c)	**10.** (c)	**11.** (d)	**12.** (d)	**13.** (d)
14. (d)	**15.** (d)	**16.** (a)	**17.** (b)	**18.** (d)	**19.** (b)	**20.** (d)	**21.** (b)	**22.** (b)	**23.** (d)	**24.** (b)	**25.** (c)	**26.** (a)
27. (a)	**28.** (c)	**29.** (e)	**30.** (b)	**31.** (a)	**32.** (e)	**33.** (c)	**34.** (d)	**35.** (c)	**36.** (b)	**37.** (b)	**38.** (c)	**39.** (c)
40. (a)	**41.** (a)	**42.** (d)	**43.** (c)	**44.** (a)	**45.** (d)	**46.** (a)	**47.** (b)	**48.** (a)	**49.** (a)	**50.** (a)	**51.** (b)	**52.** (a)
53. (c)	**54.** (a)	**55.** (a)	**56.** (d)	**57.** (a)	**58.** (b)	**59.** (d)	**60.** (a)	**61.** (a)	**62.** (b)	**63.** (c)	**64.** (c)	**65.** (a)
66. (b)	**67.** (c)	**68.** (a)	**69.** (d)	**70.** (b)	**71.** (b)	**72.** (b)	**73.** (a)	**74.** (c)	**75.** (a)	**76.** (c)	**77.** (c)	**78.** (e)
79. (e)	**80.** (d)	**81.** (b)	**82.** (d)	**83.** (b)	**84.** (c)	**85.** (d)	**86.** (a)	**87.** (a)	**88.** (a)	**89.** (c)	**90.** (b)	**91.** (b)
92. (a)	**93.** (e)											

EXPLANATORY ANSWERS

EXERCISE-I

1. (b) Speed = $\frac{\text{Distance travelled}}{\text{Time taken}}$

$= \left(\frac{600}{5\times 60}\right)$ m/s

$= \left(\frac{600}{5\times 60}\times\frac{18}{5}\right)$ Km/h

$= 7.2$ Km/h.

2. (c) 80 Km/h means $\left(80\times\frac{5}{18}\right)$ m/s.

$\therefore$ Required comparison is $80\times\frac{5}{18}$:10 or, 20:9.

3. (b) Mohan's speed = $\left(\frac{10.2}{3}\right)$ Km/h = 3.4 Km/h

$\therefore$ Distance covered by him in 5 hours

$= (3.4\times 5)$ Km = 17 Km.

4. (a) Distance travelled by the train in 25 seconds at 72 Km/h.

$= 72\times\frac{5}{18}\times 25 = 500$ m.

$\therefore$ Length of the Bridge = 500 – length of train

$= 500 - 100 = 400$ m.

5. (b) Let, the length of the train be x m.

$\therefore$ Total distance covered by the train = $(x + 150)$ m.

Speed of the train = 60 Km/h = $60\times\frac{5}{18}=\frac{50}{3}$ m/s.

Since, Distance = Speed × time

$\therefore\ x + 150 = \frac{50}{3}\times 18 = 300$

or, $x = 300 - 150 = 150$ m.

$\therefore$ Length of the train = 150 m.

6. (c) Distance of thunder cloud

= distance travelled by sound in 10 seconds

$= (330\times 10)$ metres = 3.3 Km.

7. (b) Speed of the train = 92.4 Km/h

$= \left(92.4\times\frac{5}{18}\right)$ m/s

$= \frac{77}{3}$ m/s.

Distance covered in 10 minutes or 10×60 (= 600) seconds

$= \frac{77}{3}\times 600 = 15400$ m.

8. (a) Distance of the sun from the earth

$= (143\times 10^6 + 400\times 10^3)$ Km

$= 1434\times 10^5$ Km.

Time taken by light to travel from the sun to the earth

$= 7\times 60 + 58 = 478$ seconds.

$\therefore$ Velocity of light = $\frac{1434\times 10^5}{478}$

$= 3\times 10^5$ Km/s.

9. (c) Distance travelled = Speed × Time = $\left(48\times\frac{50}{60}\right)$

= 40 Km.

$\therefore$ Speed = $\frac{\text{Distance}}{\text{Time}}=\left(\frac{40\times 60}{40}\right)$ Km/h

= 60 Km/h.

10. (a) Distance covered in 2 seconds = $\frac{15}{4}\times 4$

= 15 m.

$\therefore$ Speed = $\frac{\text{Distance}}{\text{Time}}=\frac{15}{2}$ m/s.

$= \left(\frac{15}{2}\times\frac{18}{5}\right)$ Km/h = 27 Km/h.

11. (a) Here, $s_1 = 30$ and $s_2 = 20$.

$\therefore$ Average speed = $\frac{2s_1s_2}{s_1+s_2}$

$= \frac{2\times 30\times 20}{30+20} = 25$ Km/h.

12. (b) Here, $s_1 = 16$ and $s_2 = 9$.

$\therefore$ Average speed = $\frac{2s_1s_2}{s_1+s_2}=\frac{2\times 16\times 9}{16+9} = 11.52$ Km/h.

13. (c) Let, the speed on the return journey be x Km/h.

Then, $56 = \frac{2s_1s_1}{s_1+s_2}=\frac{2\times 64\times x}{64+x}$

$\Rightarrow\ 7(64 + x) = 16x$ or, $9x = 448$

$\therefore\ x = \frac{448}{9} = 49.78$ Km/h.

14. (b) Here, $s_1 = 10$ and, $s_2 = 8$.

$\therefore$ Average speed = $\frac{2s_1s_2}{s_1+s_2}=\frac{2\times 10\times 8}{10+8} = \frac{80}{9}$ Km/h.

Total time taken for the entire journey = $\frac{9}{2}$ hours.

$\therefore$ Total distance covered

= Average speed × total time taken

$= \frac{80}{9}\times\frac{9}{2} = 40$ Km.

15. (c) Here, $s_1 = 64$ and $s_2 = 80$.

$\therefore$ Average speed = $\frac{2s_1s_2}{s_1+s_2}=\frac{2\times 64\times 80}{64+80}$

= 71.11 Km/h.

16. (b) Here, $s_1 = 50$, $s_2 = 70$ and $T = 6$.

$\therefore$ The length of the journey is

$= T\left(\frac{s_1s_2}{s_1+s_2}\right)=6\left(\frac{50\times 70}{50+70}\right)= 175$ Km.

17. (a) $\frac{\text{Rakesh's speed}}{\text{Suresh's speed}}=\frac{\sqrt{T_2}}{\sqrt{T_1}}=\frac{\sqrt{16}}{\sqrt{9}}=\frac{4}{3}$.

$\therefore$ Suresh's speed = $\frac{3}{4}$ Rakesh's speed

$= \frac{3}{4}\times 16 = 12$ Km/h.

18. **(c)** Here, $x_1 = 225$, $x_2 = 370$, $T_1 = 3 \cdot 5$ and $T_2 = 5$.

$\therefore$ Average speed of train $= \dfrac{x_1 + x_2}{T_1 + T_2} = \dfrac{225 + 370}{3 \cdot 5 + 5}$

$= 70$ Km/h.

19. **(b)** Here, $x_1 = 6$, $x_2 = 8$, $x_3 = 32$, $s_1 = \dfrac{3}{2}$,

$s_2 = 2$ and $s_3 = 8$.

$\therefore$ Average speed of the man

$$= \frac{x_1 + x_2 + x_3}{\frac{x_1}{s_1} + \frac{x_2}{s_2} + \frac{x_3}{s_3}} = \frac{6 + 8 + 32}{\frac{6}{3/2} + \frac{8}{2} + \frac{32}{8}}$$

$$= \frac{46}{12} = 3\frac{5}{6} \text{ Km/h.}$$

20. **(a)** Here, $T_1 = \dfrac{30}{60}$, $T_2 = \dfrac{45}{60}$,

$T_3 = 2$, $s_1 = 40$,

$s_2 = 60$ and $s_3 = 70$.

$\therefore$ The average speed of the car

$$= \frac{s_1T_1 + s_2T_2 + s_3T_3}{T_1 + T_2 + T_3}$$

$$= \frac{40 \times \frac{30}{60} + 60 \times \frac{45}{60} + 70 \times 2}{\frac{30}{60} + \frac{45}{60} + 2}$$

$= 63$ Km/h.

21. **(b)** Here, change in time = 20 and $\dfrac{a}{b} = \dfrac{3}{4}$.

We have, change in time $= \left(\dfrac{b}{a} - 1\right) \times$ original time

$$\Rightarrow \text{Original time} = \frac{\text{Change in time}}{\left(\frac{b}{a} - 1\right)}$$

$$= \frac{20}{\left(\frac{4}{3} - 1\right)} = 60 \text{ minutes.}$$

22. **(a)** Here, difference in speeds $= 4 - 3 = 1$

difference in time $= \dfrac{1}{2}$

and, product of speed $= 4 \times 3 = 12$.

We have,

$$\frac{\text{Product of speed}}{d} = \frac{\text{Difference of speed}}{\text{Difference of time}}$$

$$\Rightarrow d = \text{Product of speed} \times \left(\frac{\text{Difference of time}}{\text{Difference of speed}}\right)$$

$$= 12 \times \frac{1/2}{1} = 6 \text{ Km.}$$

23. **(c)** Here, difference in speed $= 30 - 20 = 10$.

difference in time $= 2 + 1\dfrac{1}{2} = 4$

and, product of speed $= 20 \times 30 = 600$.

We have, $\dfrac{\text{Product of speed}}{d} = \dfrac{\text{Difference of speed}}{\text{Difference of time}}$

$$\Rightarrow d = \text{Product of speed} \times \left(\frac{\text{Difference of time}}{\text{Difference of speed}}\right)$$

$$= 600 \times \frac{4}{10} = 240 \text{ Km.}$$

24. **(a)** Mohan's speed in the first case $= \dfrac{7}{2}$ Km/h.

Mohan's average speed in the second case

$$= \frac{2s_1s_2}{s_1 + s_2} = \frac{2 \times 3 \times 4}{3 + 4} = \frac{24}{7} \text{ Km/h.}$$

$\therefore$ Difference of speed $= \dfrac{7}{2} - \dfrac{24}{7} = \dfrac{1}{14}$,

Product of speed $= \dfrac{7}{2} \times \dfrac{24}{7} = 12$

and, difference of time $= \dfrac{10}{60}$.

We have,

$$d = \text{product of speed} \times \left(\frac{\text{Difference of time}}{\text{Difference of speed}}\right)$$

$$= 12 \times \frac{10/60}{1/14} = 28 \text{ Km.}$$

25. **(b)** Let, the slower speed $= s$ Km/h.

Since the distance travelled is same in both the cases, therefore:

$$\frac{s_1}{T_2} = \frac{s_2}{T_1} \qquad \Rightarrow s_1 \times T_1 = s_2 \times T_2$$

$$\Rightarrow s \times 8 = (s + 5) \times \frac{20}{3}$$

$$\Rightarrow 24s = 20(s + 5)$$

$$\Rightarrow s = 25 \text{ Km/h.}$$

26. **(c)** Here, $s_1 = 42$ and $s_2 = 28$.

$\therefore$ Stoppage time/h $= \dfrac{s_1 - s_2}{s_1} = \dfrac{42 - 28}{42}$

$= \dfrac{1}{3}$ hour $= 20$ minutes

27. **(b)** We have, speed of the train

$$= \frac{\text{Length of the train + length of the platform}}{\text{Total time taken in crossing the platform}}$$

$$\Rightarrow 60 \times \frac{5}{18} = \frac{\text{Length of the train} + 130}{15}$$

$\Rightarrow$ Length of the train $= 250 - 130 = 120$ m.

28. (a) Speed of the train

$$= \frac{\text{Length of the train}}{\text{Time taken in crossing the post}}$$

$\Rightarrow$ Length of the train = Speed of the train × Time taken in crossing the post

$$= \left(54 \times \frac{5}{18}\right) \times 9 = 135 \text{ m.}$$

29. (b) Time taken in crossing the telegraph post

$$= \frac{\text{Length of the train}}{\text{Speed of the train}}$$

$$= \frac{135}{54 \times \frac{5}{18}} = \frac{135 \times 18}{54 \times 5} = 9 \text{ seconds.}$$

30. (c) Speed of the train

$$= \frac{\text{Length of the train}}{\text{Time taken in crossing the man}}$$

$$= \frac{160}{18} \text{ or, } \frac{80}{9} \text{ m/s} = \left(\frac{80}{9} \times \frac{18}{5}\right) \text{Km/h}$$

$= 32$ Km/h.

31. (a) Time taken in crossing the platform

$$= \frac{\text{Length of the train + Length of the platform}}{\text{Speed of the train}}$$

$$= \frac{280+220}{60 \times \frac{5}{18}} = \frac{500 \times 18}{60 \times 5} = 30 \text{ seconds.}$$

32. (b) We have,

Speed of the train

$$= \frac{\text{Length of the train + Length of the platform}}{\text{Time taken in crossing the platform}}$$

$$= \frac{50 + 100}{10} = 15 \text{ seconds.}$$

33. (b) Here, $L_1 = 300$ m, $L_2 = 200$ m,

$s_1 = 90$ Km/h and $s_2 = 60$ Km/h

$\therefore \quad s_1 - s_2 = 90 - 60 = 30$ Km/h $= 30 \times \frac{5}{18}$ m/s

$\therefore$ Time taken $= \frac{L_1 + L_2}{s_1 - s_2} = \frac{300 + 200}{30 \times \frac{5}{18}}$

$$= \frac{500 \times 18}{30 \times 5} = 60 \text{ seconds.}$$

34. (c) Let, the speed of each train be x m/s.

We have, $L_1 = L_2 = 135$ m and $s_1 = s_2 = x$ m/s

Therefore, time taken $= \frac{L_1 + L_2}{s_1 + s_2}$

$$\Rightarrow \qquad 18 = \frac{135+135}{x+x} \text{ or, } x = \frac{270}{2 \times 18} \text{ m/s}$$

$$= \frac{270}{2 \times 18} \times \frac{18}{5} \text{ Km/h} = 27 \text{ Km/h.}$$

35. (c) Here, $L_1 = 150$ m, $L_2 = 0$, $s_1 = 95$ Km/h and $s_2 = 5$ Km/h.

$\therefore \quad s_1 - s_2 = 90$ Km/h $= 90 \times \frac{5}{18}$ m/s $= 25$ m/s.

$\therefore$ Time taken $= \frac{L_1 + L_2}{s_1 - s_2} = \frac{150}{25} = 6$ seconds.

36. (b) Here, $L_1 = 100$ m, $L_2 = 0$ and $s_2 = 6$ Km/h.

Let, $s_1 = x$ Km/h.

Then, $s_1 + s_2 = (x + 6)$ Km/h $= (x + 6) \frac{5}{18}$ m/sec.

$\therefore$ Time taken $= \frac{L_1 + L_2}{s_1 + s_2}$

$$\Rightarrow \qquad \frac{18}{5} = \frac{100}{(x+6)\frac{5}{18}}$$

$\therefore \quad x = 100 - 6 = 94$ Km/h.

37. (c) Relative speed $= (50 - 30)$ Km/h $= 20$ Km/h

$$= \left(20 \times \frac{5}{18}\right) = \left(\frac{50}{9}\right) \text{m/s.}$$

Distance covered in 18 sec at this speed

$$= \left(18 \times \frac{50}{9}\right) \text{m} = 100 \text{ m.}$$

$\therefore$ Length of the faster train = 100 m.

38. (a) Speed of the faster train

$$= \left(\frac{L_1 + L_2}{2}\right)\left(\frac{T_1 + T_2}{T_1 T_2}\right) = \left(\frac{130+110}{2}\right)\left(\frac{60+3}{60 \times 3}\right)$$

$= 42$ m/s.

Speed of the slower train

$$= \left(\frac{L_1 + L_2}{2}\right)\left(\frac{T_1 - T_2}{T_1 T_2}\right) = \left(\frac{130+110}{2}\right)\left(\frac{60-3}{60 \times 3}\right)$$

$= 38$ m/s.

39. (c) Speed of the faster train

$$= L\left(\frac{T_1 + T_2}{T_1 T_2}\right) = 90\left(\frac{18+9}{18 \times 9}\right)$$

$$= \frac{90 \times 27}{18 \times 9} = 15 \text{ m/s.}$$

Speed of the slower train

$$= L\left(\frac{T_1 - T_2}{T_1 T_2}\right) = 90\left(\frac{18-9}{18 \times 9}\right)$$

$$= \frac{90 \times 9}{18 \times 9} = 5 \text{ m/s.}$$

40. (a) Time from 5 am to 6.30 am $= 1\frac{1}{2}$ hours.

Therefore, distance of meeting from station

$$= \left(\frac{s_1 \times s_2 \times T}{s_2 - s_1}\right) \text{ Km}$$

$$= \left(\frac{60 \times 75 \times \frac{3}{2}}{75 - 60}\right) \text{ Km} = 450 \text{ Km}$$

Also, time of their meeting

$$= \left(\frac{s_1 T}{s_2 - s_1}\right) \text{hours}$$

$$= \left(\frac{60 \times \frac{3}{2}}{75 - 60}\right) \text{hours}$$

= 6 hours after 6.30 am

That is, 12.30 pm

41. (c) Time from 7 am to 8 am = 1 hour.

Therefore, time of their meeting

$$= \left(\frac{d + s_1 T}{s_1 + s_2}\right) \text{hours}$$

$$= \left(\frac{100 + 25 \times 1}{20 + 25}\right) \text{hours}$$

= 3 hours after 7 am.

i.e., 10 am.

42. (a) Time from 9 am to 11 am = 2 hours.

Therefore, distance of meting point from station A

$$= s_1\left(\frac{d + s_2 T}{s_1 + s_2}\right) \text{ Km}$$

$$= 50\left(\frac{210 + 60 \times 2}{50 + 60}\right) \text{ Km} = 150 \text{ Km.}$$

43. (b) Distance between Mumbai and Pune

$$= d\left(\frac{s_1 + s_2}{s_1 - s_2}\right) \text{ Km}$$

$$= 20\left(\frac{60 + 40}{60 - 40}\right) \text{ Km} = 100 \text{ Km.}$$

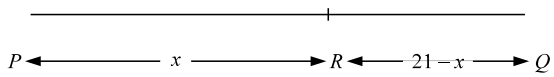
44. (b) Total time taken $= \left(\frac{3}{10} + \frac{3}{20} + \frac{3}{30} + \frac{3}{60}\right) \text{hours}$

$$= \frac{3}{5} \text{ hours}$$

$\therefore$ Average speed $= \left\{\frac{12}{3/5}\right\} \text{Km/h} = \frac{12 \times 5}{3} \text{Km/h}$

= 20 Km/h.

45. (d) Let, the distance between P to $R = x$ Km



Then, $= \frac{21}{4} + \frac{21 - x}{4}$

$\therefore$ $7x = 2 \times 3 \times 21$

$\therefore$ $x = 18.$

46. (a) Let, the speeds of the boy and the car by x Km/h and y Km/h, respectively.

Then, $\frac{12/1000}{x} = \frac{36/1000}{y}$

$\therefore$ $\frac{x}{y} = \frac{1}{3}.$

47. (b) Let, the required speed be x Km/h.

Then, $\frac{2 \times 64 \times x}{64 + x} = 56$

$\Rightarrow$ $128x = 64 \times 56 + 56x$

$\therefore$ $x = \frac{64 \times 56}{72} = 49.77$ Km/h.

48. (b) Due to stoppages, it covers 9 Km less per hour.

Time taken to cover 9 Km $= \frac{64 \times 56}{72}$ minutes

= 10 minutes.

So, the bus stops for 10 min. per hour.

49. (a) Let, the boys meet after first has written x lines

Then 2nd has written $817 - (x + 1) = 816 - x$ lines

Then, $\frac{x}{200} = \frac{816 - x}{150}$

$\therefore$ $x = 466.28$

$\therefore$ Two boys will meet on 467th line.

50. (a) Distance travelled in 2 minutes

$= \left(1 + \frac{1}{2}\right)$ Km i.e., $\frac{3}{2}$ Kms.

Distance covered in 1 h $= \left(\frac{3}{2} \times \frac{60}{2}\right)$ Km = 45 Km.

$\therefore$ Speed of the train = 45 Km/h.

53. (a) Let, x Km/h be the speed of the train

$\Rightarrow$ $(x - 6) \times \frac{5}{18} \times 5 = 100$

$\Rightarrow$ $x = 78$ Km/h.

Let, the speed of the car be y Km/h.

$\Rightarrow$ $(78 - y) \times \frac{5}{18} \times 6 = 100$ $\Rightarrow$ $y = 18.$

54. (a) Speed of the first man = 32 Km/h.

Time taken = 192 ÷ 32 = 6 hours.

Second man covers 192 Km in 3 hours.

$\therefore$ Speed of the second man = 192 ÷ 3

= 64 Km/h

Ratio = 32:64, or 1:2,

55. (c) Let, the length of another train = x m

Their relative speed = (62 + 40) Km/h

$$= \left(102 \times \frac{5}{18}\right) \text{m/s} = \frac{85}{3} \text{ m/s}$$

$$\frac{250 + x}{\frac{85}{3}} = 18 \quad \Rightarrow \quad \frac{3(250 + x)}{85} = 18$$

$\Rightarrow$ $250 + x = 510$

$\Rightarrow$ $x = 260$

$\therefore$ Length of another train = 260 m.

56. (b) Let, the length of the train be x metres and its speed by y metres/sec.

Then, $\frac{x}{y} = 15 \Rightarrow y = \frac{x}{15}$

Now, $\frac{x+100}{25} = \frac{x}{15} \Rightarrow x = 150$ m.

57. (b) Relative speed $= \left(\frac{150+100}{10}\right)$ m/s.

$= 25$ m/s.

$= \left(25 \times \frac{18}{5}\right)$ Km/h

$= 90$ Km/h

$\therefore$ Speed of second train $= (90 - 30)$ Km/h

$= 60$ Km/h.

58. (c) Distance already covered $= \frac{2}{3} \times 45 = 9$ Km

Time spent $= \frac{2}{3} \times 45$ minutes $= 30$ minutes.

Distance left $= (12 - 9)$ Km

$= 3$ Km

Time left $= (45 - 30)$ minutes $= 15$ minutes

$\therefore$ Required speed $= \frac{3}{15/60}$ Km/h $= 12$ Km/h.

59. (a) Let, the speed of the train in Km/h $= x$.

Then, relative speed $= (x + 6)$ Km/h

$= (x + 6) \times \frac{5}{18}$ m/s.

$\therefore \quad (x + 6) \times \frac{5}{18} \times 6 = 110$

$\therefore \quad x = 60$

$\therefore$ Speed of the train $= 60$ Km/h.

60. (d) Let, the speed of the train $= x$ Km/h.

Relative speed $= (x + 6)$ Km/h

$= (x + 6) \times \frac{5}{18}$ m/s.

$\therefore \quad (x + 6) \times \frac{5}{18} \times 6 = 110$

$\therefore \quad x = 60$

$\therefore$ Speed of train $= 60$ Km/h for the person,

Relative speed $= (60 - 6)$ Km/h

$= 54 \times \frac{5}{18}$ m/s $= 15$ m/s.

$\therefore$ Time taken to cross the second person

$= \frac{110}{15} = \frac{22}{3} = 7\frac{1}{3}$ seconds.

61. (d) Let, the total journey be x Km. Then,

$\frac{2}{15}x + \frac{9}{20}x + 10 = x$

$\Rightarrow \quad 8x + 27x + 600 = 60x$

$\Rightarrow \quad x = 24$

$\therefore$ Total journey $= 24$ Km.

EXERCISE-2
(BASED ON MEMORY)

1. (a) Let, the distance covered by him each way be x Km

$\frac{x}{45} - \frac{x}{50} = 1, \frac{10x - 9x}{450} = 1$; $x = 450$ Km.

2. (d) Total times taken $= \frac{24}{8} + \frac{18}{9} + \frac{2}{3} = 9$ hours.

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

$= \frac{24 + 18 + 12}{9} = 6$ Km/h.

3. (d) Total time required $= \frac{14}{5} + \frac{14}{10} = \frac{28 + 14}{10} = 4.2$ hours.

4. (c) Required average speed

$= \frac{(35 + 69)}{\frac{(45 + 75)}{60}} = \frac{104 \times 60}{120} = 52$ Km/h.

5. (d) Required distance $= 2000\left(\frac{15}{40}\right) = 750$ m

6. (e) The required speed $= \frac{180 + 180}{18} = 20$ m/s

7. (e) Average speed

$= \frac{\text{Total distance travelled}}{\text{Time taken to travel the distance}}$

$= \frac{(30 + 25)}{\frac{(45 + 35)}{60}} = \frac{55 \times 60}{80} = 41\frac{1}{4}$ Km/h.

8. (c) Let, the length of the train be x metres.

$\therefore$ The distance of $(x + 800)$ metres is covered in 100 seconds.

The distance of $(x + 400)$ metres iscovered in 60 seconds.

$\therefore \quad \frac{x + 800}{100} = \frac{x + 400}{600}$

$\Rightarrow \quad 3(x + 800) = 5(x + 400)$

$\Rightarrow \quad 2x = 400 \Rightarrow x = 200$

9. (c) Let, the normal speed of the train be x Km/h.
Let, the distance of k Km be covered by the train in 22 hours running at the speed of $\frac{7}{11}x$ Km/h.

$\therefore \quad 22\times \frac{7}{11}x = k \Rightarrow k = 14x$

$\Rightarrow$ The train would have taken 14 hours if it would have run at its normal speed.

10. (c) In 30 seconds, the train covers a distance of 150 + 500 = 650 m.

$\therefore$ To cross a platform 370 m long, the train will have to cover a distance of 370 + 150 = 520 m.
Now the distance of 650 m is covered by the train in 30 seconds.

$\therefore$ The distance of 520 metres is covered by the train in $\frac{30}{650}\times 520 = 24$ seconds.

11. (d) Distance covered in one hour = 60 Km.

$\Rightarrow$ Distance covered in 3600 seconds = 60000 m

$\Rightarrow$ Distance covered in 30 seconds $= \frac{60000}{3600}\times 30 = 500$ m.

12. (d) Distance to be covered by the train = 120 + 230 = 350 m
Distance of 90 Km is covered by the train in one hour
i.e., Distance of 90000 m is covered by the train in 3600 seconds
i.e., Distance of 350 m is covered by the train in $\frac{3600\times 350}{90000} = \frac{36\times 35}{90} = 14$ seconds

13. (d) 180 Km/h

$\Rightarrow$ 180000 m/360 seconds $\Rightarrow$ 50 m/s

14. (d) Speed in Km/h $= \frac{10\times 18}{5} = 36$ Km/h.

15. (d) $30 \times S - 30 \times \frac{14}{15} S = 10$

or, $30\left(\frac{1}{15}S\right) = 10$ or, $S = \frac{10\times 15}{30} = 5$

Hence, required speed = 5 Km/h.

16. (a) Speed of train $= \frac{120}{10} = 12$ m/s.

17. (b) Speed of train $= \frac{264}{20-8} = 22$ m/s.
Hence, length of train = 22 × 8 = 176 m.

18. (d) Speed of the train = 180 Km/h
= 180000 m/3600 sec.
= 50 m/s.

19. (b) Let, the actual speed of the car be x Km/h.
If the speed of the car is $\frac{5}{7}x$ Km/h, then running at this speed, the distance of 42 Km is covered in 1 hour 40 minutes 48 seconds, i.e., 1 hour $40\frac{4}{5}$ minutes, i.e., $\frac{126}{75}$ hours

$\therefore \quad 42 \times \frac{75}{126}$ Km/h, that is, 25 Km/h $= \frac{5x}{7}$

$\therefore \quad 25 = \frac{5x}{7} \quad \Rightarrow \quad x = 35$ Km/h.

20. (d) Speed of the train = 120 m/6 sec
= 7200 m/360 sec.
= 72000 m/3600 sec
= 72 Km/h.

21. (b) Let, the length of the train be x metres. It passes a telegraph post in 8 seconds.

$\because$ A distance of $(x + 264)$ metres is covered by the x metres long train in 20 seconds

$\therefore \quad \frac{x}{8} = \frac{x+264}{20} \quad \Rightarrow \quad x = 176$ m.

22. (b) $78 \times \frac{5}{18} = \frac{\text{Length of (train + tunnel)}}{60}$

or, $78 \times \frac{5}{18} \times 60 = 800 + x$

or, $1300 - 800 = x$ or, $x = 500$ m.

24. (b) Required time $= \frac{160+140}{(77+67)\times\frac{5}{18}} = \frac{300\times 18}{144\times 5}$
= 7.5 seconds.

25. (c) Suppose, the speed of the train is V m/s

Then, $V + V = \frac{120+120}{12} = 20$

or, $2V = 20 \times \frac{18}{5} = 72$

or, $V = 36$ Km/h.

26. (a) Required time $= \frac{100}{144\times\frac{5}{18}} = \frac{100}{40} = 2.5$ seconds.

27. (a) For same distance, we have

$V_1 t_1 = V_2 t_2$

or, $t_2 = \frac{V_1 t_1}{V_2} = \frac{40\times 9}{60} = 6$ hours.

28. (c) Length of the train $= 120 \times \frac{5}{18} \times 15$
= 500 m.

29. (e) Distance travelled by the car = 80 × 10
= 800 Km.

$\therefore$ Speed = $\frac{800}{8}$ = 100 Km/h

$\therefore$ Speed gain = 100 − 80 = 20 Km/h.

30. (b) Distance covered by train A before the train B leaves Mumbai Central = 60 × 3 = 180 Km.

$\therefore$ Time taken to cross each other

$= \frac{180}{12} = 15$ hours

$\therefore$ Required time = 2 pm + 15 hours
= 5 am on the next day.

32. (e) This is the problem of arithmetic progression with the first term $a = 35$, common difference $d = 2$, and total number of terms $(n) = 12$. The sum of this series will be the total distance travelled.

Sum $S_n = \frac{n}{2}[2a + (n-1)d] = \frac{12}{2}[70 + 11 \times 2]$

$= \frac{12 \times 92}{2} = 552$ Km.

33. (c) m miles in $h - \frac{1}{2} = \frac{2h-1}{2}$ hours

$\Rightarrow \frac{2m}{2h-1}$ miles per hour.

34. (d) Let, the speed of the train be x Km/h
Relative speed = x − 3 Km/h
Distance covered in 33 s = 300 m

$\frac{300 \times 3600}{33 \times 1000} = x - 3$

$\Rightarrow \frac{360}{11} = x - 3$

$\Rightarrow x = 32\frac{8}{11} + 3 = 35\frac{8}{11}$ Km/h

35. (c) Let, the speed of the man be x Km/h
Relative speed = 20 + x
$\Rightarrow$ Distance covered at $(20 + x)$ Km/h in 8 minutes.
= Distance covered at 20 Km/h in 10 minutes.
Solving we get x = 5 Km/h

36. (b) Let, the speed of the second train be x Km/h.

$\therefore$ Relative speed = $(x + 60)$ Km/h
and the total distance

$= \frac{180 + 270}{1000}$ Km $= \frac{450}{1000}$ Km

$\because \frac{450}{1000} = (x + 60) \times \frac{10.8}{60 \times 60}$

$\Rightarrow (x + 60) = \frac{450 \times 60 \times 60}{10.8 \times 1000} = 150$

$\therefore x = 150 - 60$
$= 90$ Km/h.

37. (b) Let, both the trains will meet at x Km far away from Delhi.
Then, as per the question:

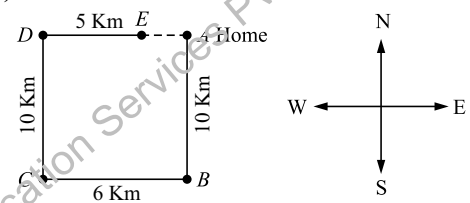
$\frac{x}{60} = \frac{x}{80} + 2$

$\Rightarrow 80x - 60x = 2 \times 80 \times 60$

$\Rightarrow 20x = 2 \times 80 \times 60$

$\therefore x = 480$ Km.

38. (c)



$\therefore AE = 1$ Km

39. (c) Distance travelled by Car A = 65 × 8 = 520 Km.
Distance travelled by Car B = 70 × 4 = 280 Km.

Ratio = $\frac{520}{280}$ = 13:7

40. (a) Distance = 30 × 6 = 180 Km

Speed of Hema = $\frac{180}{4}$ = 45 Km/h

Speed of Deepa, after increasing average speed

$= \frac{180}{30 + 10} = 4\frac{1}{2}$ h = 4 hours 30 minutes

Speed of Hema, after increasing average speed

$= \frac{180}{45 + 5} = 3\frac{3}{5}$ h = 3 hours 36 minutes

Difference = 4 hours 30 minutes − 3 hours 36 minutes = 54 minutes

41. (a) Speed of bus = $\frac{480}{8}$ = 60 Km/h

Speed of train = $\frac{60 \times 4}{3}$ = 80 Km/h

Speed of train:Speed of car = 16:15

$\therefore$ Speed of car = $\frac{80}{16} \times 15$ = 75 Km/h

Distance covered by car in 6 hours = 75 × 6 = 450 Km

42. (d) Speed of the train = 120 Km/h

$= 120 \times \frac{5}{18}$ m/s

$= \frac{100}{3}$ m/s

Suppose, the length of the platform = x m.
Then,

$$\frac{x+320}{\frac{100}{3}} = 24$$

$\Rightarrow \quad 3(x + 320) = 100 \times 24$

$\Rightarrow \quad x + 320 = 800$

$\Rightarrow \quad x = 800 - 320 = 480$ m

Hence, speed of a man

$= \frac{480}{4\times 60}$ m/s = 2 m/s

43. (c) Average speed of a tractor

$$= \frac{575}{23} = 25 \text{ Km/h}$$

The speed of a bus in an hour = $25 \times 2 = 50$ Km

The speed of a car in an hour = $50 \times \frac{9}{5} = 90$ Km

So, the distance covered by car in 4 hours is
$90 \times 4 = 360$ Km

44. (a) Let, the length of Train B = x m.

Then the length of Train A = $\frac{x}{2}$ m

Speed of Train A = $\frac{\frac{x}{2}}{25} = \frac{x}{50}$

Speed of Train B = $\frac{x}{75}$

Ratio of speed = $\frac{A}{B} = \frac{\frac{x}{50}}{\frac{x}{75}} = \frac{75}{50} = 3:2.$

45. (d) Suppose, the speed of the train = x m/s

$$\frac{240}{x} + 40 = \frac{240+480}{x}$$

$240 + 40x = 720$

$40x = 720 - 240$

$40x = 480$

$x = \frac{480}{40} = 12$ m/s

or, Distance = 2×240 m = 480 m

Time = 40 s

Speed = $\frac{480}{40} = 12$ m/s

46. (a) Speed of the train = $\frac{200+400}{36} = \frac{600}{36}$

$= \frac{50}{3}$ m/s $= \frac{50}{3}\times\frac{18}{5} = 60$ Km/h.

47. (b) From point A to B, speed = 4 Km/h.
From point B to A, speed = 6 Km/h.
Ratio of required time = 4:6 = 2:3.

48. (a) Distance between Ramgarh and Devgarh

$$= \frac{50\times 44}{60} = \frac{110}{3}$$

If average speed of the bus is increased by 5 Km/h, then the speed of the bus = 55 Km/h

$$\text{Required time} = \frac{\text{Distance}}{\text{Speed}}$$

$$= \frac{110}{3}\times\frac{60}{55} = 40 \text{ min}$$

49. (a) Bus fare = ₹420

Train fare = $420 \times 2 \times \frac{3}{4}$ = ₹630

Total fare = $2 \times 420 + 4 \times 630$
$= 840 + 2520$ = ₹3360

50. (a) If the length of train B is x m, then speed of train

$\Rightarrow \quad \frac{240+x}{50} = \frac{240}{20}$

$\frac{240+x}{50} = 12$

$240 + x = 600$

$x = 600 - 240$

$x = 360$ m

51. (b) Total distance = $64 \times 8 = 512$ Km

Now, speed = $\frac{512}{6} \approx 85$ Km/h

52. (a) Distance covered in 2nd minute = 90 − 50 = 40 metres

Distance covered in 3rd minute =130 − 90 = 40 m

$\therefore$ Required distance = $50 + 40 \times 14$
$= 50 + 560 = 610$ m

53. (c) Required distance = LCM of 63, 70 and 77 cm = 6930 cm

$$\begin{array}{c|l} 7 & 63, 70, 77 \\ \hline & 9, 10, 11 \end{array}$$

$\therefore \quad \text{LCM} = 7\times 9\times 10\times 11 = 6930$

54. (a) Let the journey on foot be x Km.

$\therefore$ Journey on cycle = $(80 - x)$ Km

Now, according to the question,

$\frac{x}{8} + \frac{80-x}{16} = 7$

$\Rightarrow \quad \frac{2x+80-x}{16} = 7$

$\Rightarrow \quad x + 80 = 16\times 7 = 112$

$\Rightarrow \quad x = 112 - 80 = 32$ Km

55. (a) Let, the length of each train be x metres.

Relative speed = (46 − 36) = 10 Km/h

$$= \left(10\frac{5}{10}\right) \text{m/sec} = \frac{25}{9} \text{ m/sec}$$

$\therefore$ Time taken in crossing each other

$$= \frac{\text{Length of both trains}}{\text{Relative speed}}$$

$$\Rightarrow \quad 36 = \frac{2x}{\frac{25}{9}}$$

$$\Rightarrow \quad 2x = 36 \times \frac{25}{9} = 100$$

$$\Rightarrow \quad x = \frac{100}{2} = 50 \text{ metres}$$

56. (d) Distance covered by the car in 2 hours

$$= \frac{300 \times 40}{100} = 120 \text{ Km}$$

Remaining distance = (300 − 120) = 180 Km

Remaining time = (4 − 2) = 2 hours

$$\therefore \quad \text{Required speed} = \left(\frac{180}{2}\right) = 90 \text{ Km/h}$$

$$\text{Original speed of car} = \left(\frac{120}{2}\right) = 60 \text{ Km/h}$$

$\therefore$ Required increase in speed = 90 − 60 = 30 Km/h

57. (a) Speed of the train = 54 Km/h

$$= \left(\frac{54 \times 5}{18}\right) \text{ m/sec} = 15 \text{ m/sec}$$

$$\text{Required time} = \frac{\text{Length of trains}}{\text{Speed of train}}$$

$$= \left(\frac{300}{15}\right) = 20 \text{ seconds}$$

58. (b) Time taken in covering 5 Km

$$= \frac{5}{10} = \frac{1}{2} \text{ hour} = 30 \text{ minutes}$$

That person will take rest for four times.

$\therefore$ Required time = (30 + 4 × 5) minutes = 50 minutes

59. (d) Quicker Method:

Required average speed

$$= \frac{2 \times 30 \times 20}{30 + 20} = \frac{2 \times 30 \times 20}{50} = 24 \text{ Km/h}$$

60. (a) Let, the speed of cyclist be x Km/h and time be t hours.

$$\therefore \quad \text{Required ratio} = \frac{xt}{2 \times 2t} : x = 1:4$$

61. (a) Time taken in covering 999 Km

$$= \frac{999}{55.5} = 18 \text{ hrs}$$

$\therefore$ Required time = 18 hours + 1 hour 20 minutes = 19 hours 20 minutes, i.e., 1:20 am

62. (b) Let, the distance of the school be x Km.

Now, according to the question,

$$\frac{x}{3} - \frac{x}{4} = \frac{20}{60}$$

$$\Rightarrow \quad \frac{x}{12} = \frac{1}{3} \quad \Leftrightarrow \quad x = \frac{12}{3} = 4 \text{ Km}$$

63. (c) Relative speed = (40 − 20) = 20 Km/h

$$= \frac{20 \times 5}{18} \text{ m/s.}$$

$$\therefore \text{Length of the faster train} = \frac{20 \times 5}{18} \times 5 \text{ m} = \left(\frac{250}{9}\right) = 27\frac{7}{9} \text{ m}$$

64. (c) Distance covered by cycling in $3\frac{1}{4}$ hours

= Distance covered by scooter in $2\frac{1}{4}$ hours

$$\Rightarrow \quad 12 \times \frac{7}{2} = x \times \frac{9}{4}$$

$$\Rightarrow x = \frac{12 \times 7 \times 2}{9} = \frac{56}{3} = 18\frac{2}{3} \text{ Km/h}$$

65. (a) $40 \text{ km/h} = \frac{40}{60} \text{Km/minute} = \frac{2}{3} \text{Km/minute}$

$$50 \text{ km/h} = \frac{50}{60} = \frac{5}{6} \text{ Km/minute}$$

Let, distance be x Km and the actual time be t minutes, Then, according to the question,

$$\frac{\frac{x}{2}}{3} = t + 11 \qquad \cdots(1)$$

$$\frac{\frac{x}{5}}{6} = t + 5 \qquad \cdots(2)$$

By equations (1) and (2), we have

$$\frac{3x}{2} - \frac{6x}{5} = 6$$

$$\Rightarrow \quad \frac{15x - 12x}{10} = 6$$

$$\Rightarrow \quad 3x = 60 \text{ Km}$$

$$\Rightarrow \quad x = 20 \text{ Km}$$

From equation (1),

$$\frac{3x}{2} = t + 11$$

$$\Rightarrow \quad \frac{3 \times 20}{2} = t + 11$$

$$\Rightarrow \quad t = (30 - 11) = 19 \text{ minutes}$$

66. (b)

Let the trains meet after t hours.

Now, according to the question,

$24t - 18t = 27$

$\Rightarrow \quad 6t = 27 \quad \Rightarrow \quad t = \left(\frac{27}{6}\right) = \frac{9}{2}$ hours

$\therefore \quad \text{QR} = 18t = \left(18 \times \frac{9}{2}\right) = 81$ Km

67. (c) Speed of train A = x Km/h

Speed of train B = y Km/h

$\therefore \quad \frac{x}{y}\sqrt{\frac{t_2}{t_1}}$

$\Rightarrow \quad \frac{45}{y} = \sqrt{\frac{3+\frac{1}{3}}{4+\frac{48}{60}}} = \sqrt{\frac{\frac{10}{3}}{4+\frac{4}{5}}}$

$= \sqrt{\frac{10}{3} \times \frac{5}{24}} = \sqrt{\frac{25}{36}} = \frac{5}{6}$

$\Rightarrow \quad 5y = 45 \times 6 \quad \Rightarrow \quad y = \frac{45 \times 6}{5}$

= 54 Km/h

68. (a) Let, the distance between stations be x Km.

Therefore,

$$\text{Speed of train} = \frac{x}{\frac{45}{60}} = \frac{4x}{3} \text{ Km/h}$$

Now, according to the question,

$\frac{x}{\frac{4x}{3} - 5} = \frac{48}{60}$

$\Rightarrow \quad \frac{3x}{4x-15} = \frac{4}{5} \Rightarrow \quad 16x - 60 = 15x$

$\Rightarrow \quad x = 60$ Km

69. (d) Let, the total distance be 1 Km.

$\therefore \quad \text{Total time} = \frac{1}{5 \times 8} + \frac{1}{10 \times 25} + \left(\frac{1 - \frac{1}{5} - \frac{1}{10}}{20}\right)$

$\left[\text{Time} = \frac{\text{Distance}}{\text{Speed}}\right]$

$= \frac{1}{40} + \frac{1}{250} + \left(\frac{\frac{10-2-1}{10}}{20}\right)$

$= \frac{1}{40} + \frac{1}{250} + \frac{7}{200} = \frac{25+4+35}{1000} = \frac{64}{1000}$

$= \frac{8}{125}$ hours

$\therefore \quad \text{Average speed} = \frac{\text{Total distance}}{\text{Time taken}}$

$= \frac{125}{8} = 15.625$ Km/h

70. (b) Let, the distance of school be x Km.

Then, according to the question,

$\frac{x}{3} - \frac{x}{4} = \frac{10}{60}$

$\Rightarrow \quad \frac{4x-3x}{12} = \frac{1}{6} \quad \Rightarrow \quad \frac{x}{12} = \frac{1}{6}$

$\Rightarrow \quad x = 2$ Km.

71. (b) Speed and time are inversely proportional for a fixed distance.

$\therefore \quad \frac{4}{3}$ of usual time − usual time = 20 minutes

$\Rightarrow \quad \text{Usual time} \times \frac{1}{3} = 20$

$\therefore \quad \text{Usual time} = (3 \times 20) = 60$ minutes

Alternative Method:

Let, the original speed be x Km/h and the usual time be y hours.

Now, according to the question,

$xy = \frac{3}{4}x\left(y + \frac{1}{3}\right)$

$\Rightarrow \quad 4y = 3y + 1 \quad \Rightarrow \quad 4y - 3y = 1$

$\Rightarrow \quad y = 1 = 60$ minutes

72. (b) Let, the required distance be x Km.

Time taken in travelling with the speed of 3 Km/h = $\frac{x}{3}$ hours

Now, time taken in travelling with the speed of 4 Km/h = $\frac{x}{4}$ hours

Now according to the question,

$\frac{x}{3} - 5 = \frac{x}{4} + 5$

$\Rightarrow \frac{x}{3} - \frac{x}{4} = 5 + 5 = 10$

$\Rightarrow x\left(\frac{1}{3} - \frac{1}{4}\right) = \frac{1}{6}$ hours

$\Rightarrow \frac{x}{12} = \frac{1}{6}$

$\therefore \quad x = 2$ Km.

73. **(a)** Let the speeds of the cars starting from A and B be x Km/h and y Km/h respectively. Now, according to the question,

Case I: When both the cars are running inthe same direction

Relative speed = $(x - y)$ Km/h

$\therefore \quad 5x - 5y = 100 \qquad \cdots(1)$

Case II: When both the cars are running inthe opposite directions

Relative speed = $(x + y)$ Km/h

$\therefore \quad (x + y) \times 1 = 100$

$\Rightarrow \quad x + y = 100 \qquad \cdots(2)$

Now, solving Eqn. (1) and Eqn. (2), we have

$x = 60$ and $y = 40$

Therefore, speed of the faster car is 60 Km/h

74. **(c)** Speed of train = 60 Km/h.

$= 60 \times \frac{5}{18}$ m/s $= \frac{50}{3}$ m/s

Let the speed of the second train be x m/s.

Since, both trains are going in same direction.

$\therefore \quad$ Relative speed $= \left(\frac{50}{3} - x\right)$ m/s

Now, according to the question,

$$\frac{120}{\left(\frac{50}{3} - x\right)} = 18$$

$$\Rightarrow \frac{50}{3} - x = \frac{20}{3}$$

$$\therefore x = \frac{50}{3} - \frac{20}{3} = 10 \text{ m/s} = 10 \times \frac{18}{5} = 36 \text{ Km/h}$$

75. **(a)** Relative speed $= 93 + 51 = 144 \times \frac{5}{18} = 40$ m/s

Total length of the two trains = $40 \times 24 = 960$ metres

$\therefore \quad$ Length of the first train $= 960 \times \frac{2}{3} = 640$ m

Let the length of the bridge be x m.

$\therefore \quad 640 + x = 93 \times \frac{5}{18} \times 66$

Solving, we get $x = 1065$

76. **(c)** Speed of the man from P to Q = 40 Km/h

Speed of the man from Q to P $= \frac{40 \times 150}{100} = 60$ Km/h

$\therefore \quad$ Average speed $= \frac{2 \times 40 \times 60}{40 + 60} = 48$ Km/h

77. **(c)** Let the fare of first five kilometres be ₹x.

Total distance = 187 Km

Remaining distance = 187 − 5 = 182 Km

Now, $x + 182 \times 13 = 2402$

$\therefore \quad x = 2402 - 2366 =$ ₹36

79. **(e)** Speed of the car $= \frac{588}{6} = 98$ Km/h

Speed of the train $= \frac{10}{7} \times 98 = 140$ Km/h

Distance covered by the train in 13 hours = 140×13 = 1820 Km

80. **(d)** Average speed $= \frac{\text{Total distance covered}}{\text{Total time taken}}$

$$= \frac{39 + 25}{\frac{45 + 35}{60}} = \frac{64 \times 60}{80} = 48 \text{ Km/h}$$

81. **(b)** Speed of the car $= \frac{\text{Distance covered}}{\text{Time Taken}} = \frac{720}{9}$

= 80 Km/h

Speed of the bus $= \left(\frac{3}{4} \times 80\right) = 60$ Km/h

Speed of the train $= \left(\frac{27}{15} \times 60\right) = 180$ Km/h

Distance covered by the train in 7 hours = (7×108) = 756 Km

82. **(a)** Total amount spent $= \left(\frac{591}{3} + \frac{45}{60} \times 780\right)$ paisa

= (197 + 585) paisa

= 782 paisa = ₹7.82

83. **(b)** Speed of the train = 108 Km/h $= \left(108 \times \frac{5}{18}\right)$ m/s

Let, the length of the platform be x m, then

$$\frac{x + 280}{12} = 30$$

$$\Rightarrow \quad x + 280 = 360$$

$\Rightarrow \quad x = (360 - 280) = 80$ m

$\therefore \quad$ The man's speed $= \frac{\text{Distance}}{\text{Time}} = \left(\frac{80}{10}\right) = 8$ m/s

84. **(c)** Speed of the tractor $= \frac{\text{Distance}}{\text{Time}} = \frac{575}{23} = 75$ Km/h

$\therefore \quad$ Speed of the bus = 50 Km/h

$\therefore \quad$ Speed of the car $= \frac{9}{5} \times 50 = 90$ Km/h

$\therefore \quad$ Distance covered by the car in 4 hours = 4×90 = 360 Km

85. **(d)** Average speed $= \frac{\text{total distance}}{\text{total time}}$

Total time $= \frac{45}{60} + \frac{35}{60} = \frac{3}{4}$ hours and

Total distance = 39 + 25 = 64 Km

$\therefore \quad$ Average speed $= \frac{39 + 25}{\frac{4}{3}} = \frac{64}{4} \times 3 = 48$ Km/h

86. **(a)** Let the length of the bus = l units, then

Speed of the man $= \frac{l}{18}$ unit/seconds

Speed of the bus $= \frac{l}{4}$ unit/seconds

$\therefore$ Their ratio $= \frac{l}{4} : \frac{l}{18} = 9:2$.

87. **(a)** Speed of train $A = \frac{240}{20} = 12$ m/s

In 50 seconds, the train covers $50 \times 12 = 600$ m

$\therefore$ Length of train B = 600 – 240 = 360 m

88. **(a)** Speed of the tractor $= \frac{360}{12} = 30$ Km/h

Speed of the jeep $= \frac{5}{2} \times 30 = 75$ Km/h

Speed of the car $= \frac{3}{2} \times 30 = 45$ Km/h

Required average speed of the car and the jeep

$= \frac{1}{2}(75 + 45) = \frac{1}{2} \times 120 = 60$ Km/h

89. **(c)** Let the speeds of the car, train and bus be $5x$ Km/h, $9x$ Km/h and $4x$ Km/h, respectively.

Their average speed $= \frac{5x + 9x + 4x}{3} = \frac{18x}{3} = 6x$ Km/h

Also, $6x = 72 \Rightarrow x = 12$ Km/h

Average speed of the car and the train together is

$= \frac{5x + 9x}{2} = 7x = 7 \times 12 = 84$ Km/h

90. **(b)** Relative speed of the two trains

$= \frac{180 + 270}{10.8}$ m/s $= \frac{4500}{180}$ m/s

$= \frac{4500}{108} \times \frac{18}{5}$ Km/h $= 150$ Km/h

Speed of the second train = 150 – 60 = 90 Km/h

91. **(b)** The least time interval after A, B and C can meet will be the LCM of time taken by them separately,

i.e., 360 seconds = 6 minutes.

92. **(a)** Distance $= \frac{44}{60} \times 50 = \frac{x}{60} \times 55$

$\therefore$ $x = 40$ minutes