17. TIME AND DISTANCE

IMPORTANT FACTS AND FORMULAE

1. Speed $= \left(\frac{\text{Distance}}{\text{Time}}\right)$, Time $= \left(\frac{\text{Distance}}{\text{Speed}}\right)$, Distance $=$ (Speed $\times$ Time)
2. x km/hr $= \left(x \times \frac{5}{18}\right)$ m/sec
3. x m/sec $= \left(x \times \frac{18}{5}\right)$ km/hr
4. If the ratio of the speeds of A and B is $a : b$, then the ratio of the times taken by them to cover the same distance is $\frac{1}{a} : \frac{1}{b}$ or $b : a$.
5. Suppose a man covers a certain distance at x km/hr and an equal distance at y km/hr. Then, the average speed during the whole journey is $\left(\frac{2xy}{x+y}\right)$ km/hr.

SOLVED EXAMPLES

Ex. 1. ***How many minutes does Aditya take to cover a distance of 400 m, if he runs at a speed of 20 km/hr ?*** **(Bank P.O. 2000)**

Sol. Aditya's speed $= 20$ km/hr $= \left(20 \times \frac{5}{18}\right)$ m/sec $= \frac{50}{9}$ m/sec.

$\therefore$ Time taken to cover 400 m $= \left(400 \times \frac{9}{50}\right)$ sec $= 72$ sec $= 1\frac{12}{60}$ min $= 1\frac{1}{5}$ min.

Ex. 2. ***A cyclist covers a distance of 750 m in 2 min 30 sec. What is the speed in km/hr of the cyclist ?*** **(R.R.B. 2002)**

Sol. Speed $= \left(\frac{750}{150}\right)$ m/sec $= 5$m/sec $= \left(5 \times \frac{18}{5}\right)$ km/hr $= 18$ km/hr.

Ex. 3. ***A dog takes 4 leaps for every 5 leaps of a hare but 3 leaps of a dog are equal to 4 leaps of the hare. Compare their speeds.***

Sol. Let the distance covered in 1 leap of the dog be x and that covered in 1 leap of the hare be y.

Then, $3x = 4y \Rightarrow x = \frac{4}{3}y \Rightarrow 4x = \frac{16}{3}y$.

$\therefore$ Ratio of speeds of dog and hare = Ratio of distances covered by them in the same time

$= 4x : 5y = \frac{16}{3}y : 5y = \frac{16}{3} : 5 = 16 : 15.$

Ex. 4. ***While covering a distance of 24 km, a man noticed that after walking for 1 hour and 40 minutes, the distance covered by him was $\frac{5}{7}$ of the remaining distance. What was his speed in metres per second ?*** **(R.R.B. 2002)**

Sol. Let the speed be x km/hr.

Then, distance covered in 1 hr. 40 min. *i.e.*, $1\frac{2}{3}$ hrs $= \frac{5x}{3}$ km.

Remaining distance $= \left(24 - \frac{5x}{3}\right)$ km.

$\therefore \quad \frac{5x}{3} = \frac{5}{7}\left(24 - \frac{5x}{3}\right) \Leftrightarrow \frac{5x}{3} = \frac{5}{7}\left(\frac{72 - 5x}{3}\right) \Leftrightarrow 7x = 72 - 5x$

$\Leftrightarrow 12x = 72 \Leftrightarrow x = 6$

Hence, speed $= 6 \text{ km/hr} = \left(6 \times \frac{5}{18}\right) \text{ m/sec} = \frac{5}{3} \text{ m/sec} = 1\frac{2}{3} \text{ m/sec.}$

Ex. 5. ***Peter can cover a certain distance in 1 hr. 24 min. by covering two-third of the distance at 4 kmph and the rest at 5 kmph. Find the total distance.***

Sol. Let the total distance be x km. Then,

$$\frac{\frac{2}{3}x}{4} + \frac{\frac{1}{3}x}{5} = \frac{7}{5} \Leftrightarrow \frac{x}{6} + \frac{x}{15} = \frac{7}{5} \Leftrightarrow 7x = 42 \Leftrightarrow x = 6.$$

$\therefore$ Total distance $= 6$ km.

Ex. 6. ***A man travelled from the village to the post-office at the rate of 25 kmph and walked back at the rate of 4 kmph. If the whole journey took 5 hours 48 minutes, find the distance of the post-office from the village.*** (S.S.C. 2004)

Sol. Average speed $= \left(\frac{2xy}{x+y}\right) \text{ km/hr} = \left(\frac{2 \times 25 \times 4}{25 + 4}\right) \text{ km/hr} = \frac{200}{29} \text{ km/hr.}$

Distance travelled in 5 hours 48 minutes *i.e.*, $5\frac{4}{5}$ hrs $= \left(\frac{200}{29} \times \frac{29}{5}\right)$ km $= 40$ km.

$\therefore$ Distance of the post-office from the village $= \left(\frac{40}{2}\right) = 20$ km.

Ex. 7. ***An aeroplane flies along the four sides of a square at the speeds of 200, 400, 600 and 800 km/hr. Find the average speed of the plane around the field.***

Sol. Let each side of the square be x km and let the average speed of the plane around the field be y km/hr. Then,

$$\frac{x}{200} + \frac{x}{400} + \frac{x}{600} + \frac{x}{800} = \frac{4x}{y} \Leftrightarrow \frac{25x}{2400} = \frac{4x}{y} \Leftrightarrow y = \left(\frac{2400 \times 4}{25}\right) = 384.$$

$\therefore$ Average speed $= 384$ km/hr.

Ex. 8. ***Walking at $\frac{5}{6}$ of its usual speed, a train is 10 minutes too late. Find its usual time to cover the journey.***

Sol. New speed $= \frac{5}{6}$ of the usual speed

$\therefore$ New time taken $= \frac{6}{5}$ of the usual time

So, $\left(\frac{6}{5} \text{ of the usual time}\right) - (\text{usual time}) = 10$ min.

$\Rightarrow \frac{1}{5}$ of the usual time $= 10$ min $\Rightarrow$ usual time $= 50$ min.

Ex. 9. ***If a man walks at the rate of 5 kmph, he misses a train by 7 minutes. However, if he walks at the rate of 6 kmph, he reaches the station 5 minutes before the arrival of the train. Find the distance covered by him to reach the station.***

Sol. Let the required distance be x km.

Difference in the times taken at two speeds $= 12$ min $= \frac{1}{5}$ hr.

$\therefore \quad \frac{x}{5} - \frac{x}{6} = \frac{1}{5} \Leftrightarrow 6x - 5x = 6 \Leftrightarrow x = 6.$

Hence, the required distance is 6 km.

Ex. 10. ***A and B are two stations 390 km apart. A train starts from A at 10 a.m. and travels towards B at 65 kmph. Another train starts from B at 11 a.m. and travels towards A at 35 kmph. At what time do they meet ?***

Sol. Suppose they meet x hours after 10 a.m. Then,

(Distance moved by first in x hrs) + [Distance moved by second in $(x-1)$ hrs] = 390.

$\therefore \quad 65x + 35(x-1) = 390 \Rightarrow 100x = 425 \Rightarrow x = 4\frac{1}{4}.$

So, they meet 4 hrs. 15 min. after 10 a.m. *i.e.*, at 2.15 p.m.

Ex. 11. ***A goods train leaves a station at a certain time and at a fixed speed. After 6 hours, an express train leaves the same station and moves in the same direction at a uniform speed of 90 kmph. This train catches up the goods train in 4 hours. Find the speed of the goods train.***

Sol. Let the speed of the goods train be x kmph.

Distance covered by goods train in 10 hours

= Distance covered by express train in 4 hours

$\therefore \quad 10x = 4 \times 90$ or $x = 36$.

So, speed of goods train = 36 kmph.

Ex. 12. ***A thief is spotted by a policeman from a distance of 100 metres. When the policeman starts the chase, the thief also starts running. If the speed of the thief be 8 km/hr and that of the policeman 10 km/hr, how far the thief will have run before he is overtaken ?***

Sol. Relative speed of the policeman = (10 − 8) km/hr = 2 km/hr.

Time taken by policeman to cover 100 m $= \left(\frac{100}{1000} \times \frac{1}{2}\right)$ hr $= \frac{1}{20}$ hr.

In $\frac{1}{20}$ hrs, the thief covers a distance of $\left(8 \times \frac{1}{20}\right)$ km $= \frac{2}{5}$ km = 400 m.

Ex. 13. ***I walk a certain distance and ride back taking a total time of 37 minutes. I could walk both ways in 55 minutes. How long would it take me to ride both ways?***

Sol. Let the distance be x km. Then,

(Time taken to walk x km) + (Time taken to ride x km) = 37 min.

$\Rightarrow$ (Time taken to walk $2x$ km) + (Time taken to ride $2x$ km) = 74 min.

But, time taken to walk $2x$ km = 55 min.

$\therefore$ Time taken to ride $2x$ km = (74 − 55) min = 19 min.

EXERCISE 17

(OBJECTIVE TYPE QUESTIONS)

Directions : ***Mark (✓) against the correct answer :***

1. A car moves at the speed of 80 km/hr. What is the speed of the car in metres per second ? **(Hotel Management, 2002)**

(*a*) 8 m/sec (*b*) $20\frac{1}{9}$ m/sec (*c*) $22\frac{2}{9}$ m/sec (*d*) None of these

2. An athlete runs 200 metres race in 24 seconds. His speed is : **(S.S.C. 2002)**

(*a*) 20 km/hr (*b*) 24 km/hr (*c*) 28.5 km/hr (*d*) 30 km/hr

3. Which of the following trains is the fastest ?
(a) 25 m / sec (b) 1500 m / min (c) 90 km / hr (d) None of these

4. A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour ?
(a) 3.6 (b) 7.2 (c) 8.4 (d) 10
(R.R.B. 2003)

5. A man walking at the rate of 5 km / hr crosses a bridge in 15 minutes. The length of the bridge (in metres) is : (S.S.C. 2000)
(a) 600 (b) 750 (c) 1000 (d) 1250

6. How long will a boy take to run round a square field of side 35 metres, if he runs at the rate of 9 km / hr ? (S.S.C. 1999)
(a) 50 sec (b) 52 sec (c) 54 sec (d) 56 sec

7. A car is running at a speed of 108 kmph. What distance will it cover in 15 seconds ?
(a) 45 metres (b) 55 metres (c) 450 metres
(d) Cannot be determined (e) None of these (R.B.I. 2003)

8. One of the two buses completes a journey of 300 km in $7\frac{1}{2}$ hours and the other a journey of 450 km in 9 hours. The ratio of their average speeds is : (R.R.B. 2001)
(a) 2 : 3 (b) 3 : 4 (c) 4 : 5 (d) 8 : 9

9. A truck covers a distance of 550 metres in 1 minute whereas a bus covers a distance of 33 kms in 45 minutes. The ratio of their speeds is : (S.S.C. 2004)
(a) 3 : 4 (b) 4 : 3 (c) 3 : 5 (d) 50 : 3

10. The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 kms in 4 hours, then the speed of the first train is : (I.M.T. 2002)
(a) 70 km / hr (b) 75 km / hr (c) 84 km / hr (d) 87.5 km / hr

11. A train travels at an average of 50 miles per hour for $2\frac{1}{2}$ hours and then travels at a speed of 70 miles per hour for $1\frac{1}{2}$ hours. How far did the train travel in the entire 4 hours ? (IGNOU, 2003)
(a) 120 miles (b) 150 miles (c) 200 miles (d) 230 miles

12. A man in a train notices that he can count 21 telephone posts in one minute. If they are known to be 50 metres apart, then at what speed is the train travelling ?
(a) 55 km / hr (b) 57 km / hr (c) 60 km / hr (d) 63 km / hr

13. Sound is said to travel in air at about 1100 feet per second. A man hears the axe striking the tree, $\frac{11}{5}$ seconds after he sees it strike the tree. How far is the man from the wood chopper ? (M.B.A. 2002)
(a) 2197 ft (b) 2420 ft (c) 2500 ft (d) 2629 ft

14. An express train travelled at an average speed of 100 km / hr, stopping for 3 minutes after every 75 km. How long did it take to reach its destination 600 km from the starting point ? (M.A.T. 2003)
(a) 6 hrs 21 min (b) 6 hrs 24 min (c) 6 hrs 27 min (d) 6 hrs 30 min

15. 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 : 2 (b) 2 : 1 (c) 1 : 4 (d) 4 : 1

16. A motor car starts with the speed of 70 km / hr with its speed increasing every two hours by 10 kmph. In how many hours will it cover 345 kms ? (Bank P.O. 2003)
(a) $2\frac{1}{4}$ hrs (b) 4 hrs 5 min (c) $4\frac{1}{2}$ hrs
(d) Cannot be determined (e) None of these

17. The speed of a car increases by 2 kms after every one hour. If the distance travelled in the first one hour was 35 kms, what was the total distance travelled in 12 hours?
(a) 456 kms (b) 482 kms (c) 552 kms
(d) 556 kms (e) None of these **(Bank P.O. 2003)**

18. A train covers a distance of 10 km in 12 minutes. If its speed is decreased by 5 km / hr, the time taken by it to cover the same distance will be : **(S.S.C. 1999)**
(a) 10 min (b) 11 min 20 sec (c) 13 min (d) 13 min 20 sec

19. Anna left for city A from city B at 5.20 a.m. She travelled at the speed of 80 km / hr for 2 hours 15 minutes. After that the speed was reduced to 60 km / hr. If the distance between two cities is 350 kms, at what time did Anna reach city A ?
(a) 9.20 a.m. (b) 9.25 a.m. (c) 9.35 a.m.
(d) 10.05 a.m. (e) None of these **(Bank P.O. 1999)**

20. An aeroplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in $1\frac{2}{3}$ hours, it must travel at a speed of : **(S.S.C. 2000)**
(a) 300 kmph (b) 360 kmph (c) 600 kmph (d) 720 kmph

21. A salesman travels a distance of 50 km in 2 hours and 30 minutes. How much faster, in kilometres per hour, on an average, must he travel to make such a trip in $\frac{5}{6}$ hour less time ? **(Hotel Management, 2002)**
(a) 10 (b) 20 (c) 30 (d) None of these

22. A person has to cover a distance of 6 km in 45 minutes. If he covers one-half of the distance in two-thirds of the total time; to cover the remaining distance in the remaining time, his speed (in km / hr) must be : **(S.S.C. 1999)**
(a) 6 (b) 8 (c) 12 (d) 15

23. A man performs $\frac{3}{5}$ of the total journey by rail, $\frac{17}{20}$ by bus and the remaining 6.5 km on foot. His total journey is :
(a) 65 km (b) 100 km (c) 120 km (d) 130 km

24. A can complete a journey in 10 hours. He travels first half of the journey at the rate of 21 km / hr and second half at the rate of 24 km / hr. Find the total journey in km.
(a) 220 km (b) 224 km (c) 230 km (d) 234 km
(Assistant Grade, 1997)

25. A person travels equal distances with speeds of 3 km / hr, 4 km / hr and 5 km / hr and takes a total time of 47 minutes. The total distance (in km) is : **(R.R.B. 2001)**
(a) 2 (b) 3 (c) 4 (d) 5

26. A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot @ 4 km / hr and partly on bicycle @ 9 km / hr. The distance travelled on foot is :
(a) 14 km (b) 15 km (c) 16 km (d) 17 km
(U.P.S.C. 2002)

27. A is faster than B. A and B each walk 24 km. The sum of their speeds is 7 km / hr and the sum of times taken by them is 14 hours. Then, A's speed is equal to :
(a) 3 km / hr (b) 4 km / hr (c) 5 km / hr (d) 7 km / hr
(I.A.F. 2002)

28. A person travels from P to Q at a speed of 40 kmph and returns by increasing his speed by 50%. What is his average speed for both the trips ? **(M.B.A. 2003)**
(a) 36 kmph (b) 45 kmph (c) 48 kmph (d) 50 kmph

29. A car driver travels from the plains to the hill station, which are 200 km apart at an average speed of 40 km / hr. In the return trip, he covers the same distance at an average speed of 20 km / hr. The average speed of the car over the entire distance of 400 km is :

(*a*) 25 km / hr (*b*) 26.67 km / hr (*c*) 28.56 km / hr (*d*) 30 km / hr

30. Mac travels from A to B a distance of 250 miles in $5\frac{1}{2}$ hours. He returns to A in 4 hours 30 minutes. His average speed is :

(*a*) 44 mph (*b*) 46 mph (*c*) 48 mph (*d*) 50 mph

31. A boy goes to his school from his house at a speed of 3 km / hr and returns at a speed of 2 km / hr. If he takes 5 hours in going and coming, the distance between his house and school is : **(S.S.C. 2004)**

(*a*) 5 km (*b*) 5.5 km (*c*) 6 km (*d*) 6.5 km

32. The average speed of a train in the onward journey is 25% more than that in the return journey. The train halts for one hour on reaching the destination. The total time taken for the complete to and fro journey is 17 hours, covering a distance of 800 km. The speed of the train in the onward journey is :

(*a*) 45 km / hr (*b*) 47.5 km / hr (*c*) 52 km / hr (*d*) 56.25 km / hr

33. I started on my bicycle at 7 a.m. to reach a certain place. After going a certain distance, my bicycle went out of order. Consequently, I rested for 35 minutes and came back to my house walking all the way. I reached my house at 1 p.m. If my cycling speed is 10 kmph and my walking speed is 1 kmph, then on my bicycle I covered a distance of :

(*a*) $4\frac{61}{66}$ km (*b*) $13\frac{4}{9}$ km (*c*) $14\frac{3}{8}$ km (*d*) $15\frac{10}{21}$ km

34. A, B and C are on a trip by a car. A drives during the first hour at an average speed of 50 km / hr. B drives during the next 2 hours at an average speed of 48 km / hr. C drives for the next 3 hours at an average speed of 52 km / hr. They reached their destination after exactly 6 hours. Their mean speed was :

(*a*) 50 km / hr (*b*) $50\frac{1}{3}$ km / hr (*c*) $51\frac{1}{3}$ km / hr (*d*) 52 km / hr

35. A man on tour travels first 160 km at 64 km / hr and the next 160 km at 80 km / hr. The average speed for the first 320 km of the tour is : **(R.R.B. 2003)**

(*a*) 35.55 km / hr (*b*) 36 km / hr (*c*) 71.11 km / hr (*d*) 71 km / hr

36. A boy rides his bicycle 10 km at an average speed of 12 km / hr and again travels 12 km at an average speed of 10 km / hr. His average speed for the entire trip is approximately : **(S.S.C. 1999)**

(*a*) 10.4 km / hr (*b*) 10.8 km / hr (*c*) 11 km / hr (*d*) 12.2 km / hr

37. A man travels 600 km by train at 80 km / hr, 800 km by ship at 40 km / hr, 500 km by aeroplane at 400 km / hr and 100 km by car at 50 km / hr. What is the average speed for the entire distance ? **(S.S.C. 2000)**

(*a*) 60 km / hr (*b*) $60\frac{5}{123}$ km / hr (*c*) 62 km / hr (*d*) $65\frac{5}{123}$ km / hr

38. A car travels the first one-third of a certain distance with a speed of 10 km / hr, the next one-third distance with a speed of 20 km / hr, and the last one-third distance with a speed of 60 km / hr. The average speed of the car for the whole journey is :

(*a*) 18 km / hr (*b*) 24 km / hr (*c*) 30 km / hr (*d*) 36 km / hr

(Civil Services, 2003)

39. A motorist covers a distance of 39 km in 45 minutes by moving at a speed of x kmph for the first 15 minutes, then moving at double the speed for the next 20 minutes and then again moving at his original speed for the rest of the journey. Then, x is equal to :

(a) 31.2 (b) 36 (c) 40 (d) 52

40. Mary jogs 9 km at a speed of 6 km per hour. At what speed would she need to jog during the next 1.5 hours to have an average of 9 km per hour for the entire jogging session ?

(a) 9 kmph (b) 10 kmph (c) 12 kmph (d) 14 kmph

41. A car travelling with $\frac{5}{7}$ of its actual speed covers 42 km in 1 hr 40 min 48 sec. Find the actual speed of the car. **(S.S.C. 2002)**

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

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

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

43. A man can reach a certain place in 30 hours. If he reduces his speed by $\frac{1}{15}$ th, he goes 10 km less in that time. Find his speed. **(S.S.C. 2002)**

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

44. Walking $\frac{6}{7}$ th of his usual speed, a man is 12 minutes too late. The usual time taken by him to cover that distance is : **(R.R.B. 2001)**

(a) 1 hour (b) 1 hr 12 min. (c) 1 hr 15 min. (d) 1 hr 20 min

45. Starting from his house one day, a student walks at a speed of $2\frac{1}{2}$ kmph and reaches his school 6 minutes late. Next day he increases his speed by 1 kmph and reaches the school 6 minutes early. How far is the school from his house ? **(S.S.C. 2004)**

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

46. A train when moves at an average speed of 40 kmph, reaches its destination on time. When its average speed becomes 35 kmph, then it reaches its destination 15 minutes late. Find the length of journey. **(Bank P.O. 2003)**

(a) 30 km (b) 40 km (c) 70 km (d) 80 km

47. Robert is travelling on his cycle and has calculated to reach point A at 2 P.M. if he travels at 10 kmph; he will reach there at 12 noon if he travels at 15 kmph. At what speed must he travel to reach A at 1 P.M. ? **(D.M.R.C. 2003)**

(a) 8 kmph (b) 11 kmph (c) 12 kmph (d) 14 kmph

48. If a train runs at 40 kmph, it reaches its destination late by 11 minutes but if it runs at 50 kmph, it is late by 5 minutes only. The correct time for the train to complete its journey is :

(a) 13 min. (b) 15 min. (c) 19 min. (d) 21 min

49. A man covered a certain distance at some speed. Had he moved 3 kmph faster, he would have taken 40 minutes less. If he had moved 2 kmph slower, he would have taken 40 minutes more. The distance (in km) is : **(S.S.C. 2003)**

(a) 35 (b) $36\frac{2}{3}$ (c) $37\frac{1}{2}$ (d) 40

50. A car travels from P to Q at a constant speed. If its speed were increased by 10 km / hr, it would have taken one hour lesser to cover the distance. It would have taken further 45 minutes lesser if the speed was further increased by 10 km / hr. What is the distance between the two cities ?

(*a*) 420 km (*b*) 540 km (*c*) 600 km (*d*) 650 km

51. A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. The speed of the car is :

(*a*) 100 kmph (*b*) 110 kmph (*c*) 120 kmph (*d*) 130 kmph

(M.A.T. 2003)

52. Excluding stoppages, the speed of a bus is 54 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour ? **(N.I.F.T. 2002)**

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

53. A car covers a distance of 715 km at a constant speed. If the speed of the car would have been 10 km / hr more, then it would have taken 2 hours less to cover the same distance. What is the original speed of the car ?

(*a*) 45 km / hr (*b*) 50 km / hr (*c*) 55 km / hr (*d*) 65 km / hr

54. In covering a certain distance, the speeds of A and B are in the ratio of 3 : 4. A takes 30 minutes more than B to reach the destination. The time taken by A to reach the destination is : **(S.S.C. 1999)**

(*a*) 1 hour (*b*) $1\frac{1}{2}$ hours (*c*) 2 hours (*d*) $2\frac{1}{2}$ hours

55. In covering a distance of 30 km, Abhay takes 2 hours more than Sameer. If Abhay doubles his speed, then he would take 1 hour less than Sameer. Abhay's speed is :

(*a*) 5 kmph (*b*) 6 kmph (*c*) 6.25 kmph (*d*) 7.5 kmph

(M.A.T. 2003)

56. Three persons are walking from a place A to another place B. Their speeds are in the ratio of 4 : 3 : 5. The time ratio to reach B by these persons will be :

(*a*) 4 : 3 : 5 (*b*) 5 : 3 : 4 (*c*) 15 : 9 : 20 (*d*) 15 : 20 : 12

57. With a uniform speed a car covers the distance in 8 hours. Had the speed been increased by 4 km / hr, the same distance could have been covered in $7\frac{1}{2}$ hours. What is the distance covered ? **(Bank P.O. 2003)**

(*a*) 420 km (*b*) 480 km (*c*) 640 km

(*d*) Cannot be determined (*e*) None of these

58. Two men start together to walk to a certain destination, one at 3 kmph and another at 3.75 kmph. The latter arrives half an hour before the former. The distance is :

(*a*) 6 km (*b*) 7.5 km (*c*) 8 km (*d*) 9.5 km

59. If a person walks at 14 km / hr instead of 10 km / hr, he would have walked 20 km more. The actual distance travelled by him is : **(R.R.B. 2000)**

(*a*) 50 km (*b*) 56 km (*c*) 70 km (*d*) 80 km

60. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km / hr and the time of flight increased by 30 minutes. The duration of the flight is : **(M.A.T. 2002)**

(*a*) 1 hour (*b*) 2 hours (*c*) 3 hours (*d*) 4 hours

61. It takes eight hours for a 600 km journey, if 120 km is done by train and the rest by car. It takes 20 minutes more, if 200 km is done by train and the rest by car. The ratio of the speed of the train to that of the car is : **(M.B.A. 2001)**

(*a*) 2 : 3 (*b*) 3 : 2 (*c*) 3 : 4 (*d*) 4 : 3

62. A is twice as fast as B and B is thrice as fast as C is. The journey covered by C in 54 minutes will be covered by B in :
(a) 18 min (b) 27 min (c) 38 min (d) 9 min

63. Two men starting from the same place walk at the rate of 5 kmph and 5.5 kmph respectively. What time will they take to be 8.5 km apart, if they walk in the same direction ?
(a) 4 hrs 15 min (b) 8 hrs 30 min (c) 16 hrs (d) 17 hrs

64. A walks around a circular field at the rate of one round per hour while B runs around it at the rate of six rounds per hour. They start in the same direction from the same point at 7.30 a.m. They shall first cross each other at : **(Civil Services, 2003)**
(a) 7.42 a.m. (b) 7.48 a.m. (c) 8.10 a.m. (d) 8.30 a.m.

65. A walks at 4 kmph and 4 hours after his start, B cycles after him at 10 kmph. How far from the start does B catch up with A ?
(a) 16.7 km (b) 18.6 km (c) 21.5 km (d) 26.7 km

66. A thief is noticed by a policeman from a distance of 200 m. The thief starts running and the policeman chases him. The thief and the policeman run at the rate of 10 km and 11 km per hour respectively. What is the distance between them after 6 minutes ?
(a) 100 m (b) 150 m (c) 190 m (d) 200 m
(S.S.C. 2000)

67. A thief steals a car at 2.30 p.m. and drives it at 60 kmph. The theft is discovered at 3 p.m. and the owner sets off in another car at 75 kmph. When will he overtake the thief ? **(R.R.B. 2002)**
(a) 4.30 p.m. (b) 4.45 p.m. (c) 5 p.m. (d) 5.15 p.m.

68. Two guns were fired from the same place at an interval of 10 minutes and 30 seconds, but a person in the train approaching the place hears the second shot 10 minutes after the first. The speed of the train (in km / hr), supposing that speed travels at 330 metres per second, is :
(a) 19.8 (b) 58.6 (c) 59.4 (d) 111.80

69. Two cyclists start from the same place in opposite directions. One goes towards north at 18 kmph and the other goes towards south at 20 kmph. What time will they take to be 47.5 km apart ?
(a) $1\frac{1}{4}$ hrs (b) $2\frac{1}{4}$ hrs (c) 2 hrs. 23 min. (d) $2\frac{1}{2}$ hrs

70. The distance between two cities A and B is 330 km. A train starts from A at 8 a.m. and travels towards B at 60 km / hr. Another train starts from B at 9 a.m. and travels towards A at 75 km / hr. At what time do they meet ? **(L.I.C.A.A.O. 2003)**
(a) 10 a.m. (b) 10.30 a.m. (c) 11 a.m. (d) 11.30 a.m.

71. The jogging track in a sports complex is 726 metres in circumference. Deepak and his wife start from the same point and walk in opposite directions at 4.5 km / hr and 3.75 km / hr respectively. They will meet for the first time in : **(M.A.T. 2003)**
(a) 4.9 min (b) 5.28 min (c) 5.5 min (d) 6 min

72. A and B walk around a circular track. They start at 8 a.m. from the same point in the opposite directions. A and B walk at a speed of 2 rounds per hour and 3 rounds per hour respectively. How many times shall they cross each other before 9.30 a.m. ?
(a) 5 (b) 6 (c) 7 (d) 8
(U.P.S.C. 2002)

73. Two cars P and Q start at the same time from A and B which are 120 km apart. If the two cars travel in opposite directions, they meet after one hour and if they travel in same direction (from A towards B), then P meets Q after 6 hours. What is the speed of car P ? **(S.B.I.P.O. 2000)**
(a) 60 kmph (b) 70 kmph (c) 120 kmph
(d) Data inadequate (e) None of these

74. Two trains starting at the same time from two stations 200 km apart and going in opposite directions cross each other at a distance of 110 km from one of the stations. What is the ratio of their speeds ?

(*a*) 9 : 20 (*b*) 11 : 9 (*c*) 11 : 20 (*d*) None of these

75. Two trains start from P and Q respectively and travel towards each other at a speed of 50 km / hr and 40 km / hr respectively. By the time they meet, the first train has travelled 100 km more than the second. The distance between P and Q is :

(*a*) 500 km (*b*) 630 km (*c*) 660 km (*d*) 900 km

(S.S.C. 2000)

76. Bombay Express left Delhi for Bombay at 14.30 hrs, travelling at a speed of 60 kmph and Rajdhani Express left Delhi for Bombay on the same day at 16.30 hrs, travelling at a speed of 80 kmph. How far away from Delhi will the two trains meet ?

(*a*) 120 km (*b*) 360 km (*c*) 480 km (*d*) 500 km

77. A train M leaves Meerut at 5 a.m. and reaches Delhi at 9 a.m. Another train leaves Delhi at 7 a.m. and reaches Meerut at 10.30 a.m. At what time do the two trains cross each other ?

(*a*) 7.36 a.m. (*b*) 7.56 a.m. (*c*) 8 a.m. (*d*) 8.26 a.m.

78. A man takes 5 hours 45 min. in walking to a certain place and riding back. He would have gained 2 hours by riding both ways. The time he would take to walk both ways, is :

(*a*) 3 hrs 45 min (*b*) 7 hrs 30 min

(*c*) 7 hrs 45 min (*d*) 11 hrs 45 min

ANSWERS

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

SOLUTIONS

1. Speed $= \left(80 \times \frac{5}{18}\right)$ m/sec $= \frac{200}{9}$ m/sec $= 22\frac{2}{9}$ m/sec.

2. Speed $= \frac{200}{24}$ m/sec $= \frac{25}{3}$ m/sec $= \left(\frac{25}{3} \times \frac{18}{5}\right)$ km/hr $= 30$ km/hr.

3. 25 m/sec $= \left(25 \times \frac{18}{5}\right)$ km/hr $= 90$ km/hr.

And, 25 m/sec $= (25 \times 60)$ m/min $= 1500$ m/min.

So, all the three speeds are equal.

4. Speed $= \left(\frac{600}{5 \times 60}\right)$ m/sec $= 2$ m/sec $= \left(2 \times \frac{18}{5}\right)$ km/hr $= 7.2$ km/hr.

5. Speed $= \left(5 \times \frac{5}{18}\right)$ m/sec $= \frac{25}{18}$ m/sec.

Distance covered in 15 minutes $= \left(\frac{25}{18} \times 15 \times 60\right)$ m $= 1250$ m.

6. Speed $= 9$ km/hr $= \left(9 \times \frac{5}{18}\right)$ m/sec $= \frac{5}{2}$ m/sec.

Distance $= (35 \times 4)$ m $= 140$ m.

$\therefore$ Time taken $= \left(140 \times \frac{2}{5}\right)$ sec $= 56$ sec.

7. Speed $= 108$ kmph $= \left(108 \times \frac{5}{18}\right)$ m/sec $= 30$ m/sec.

$\therefore$ Distance covered in 15 sec. $= (30 \times 15)$ m $= 450$ m.

8. Ratio of speeds $= \left(300 \times \frac{2}{15}\right) : \left(\frac{450}{9}\right) = 40 : 50 = 4 : 5.$

9. Ratio of speeds $= \left(\frac{550}{60} \times \frac{18}{5}\right) : \left(\frac{33}{45} \times 60\right) = 33 : 44 = 3 : 4.$

10. Let the speeds of two trains be $7x$ and $8x$ km/hr.

Then, $8x = \frac{400}{4} = 100 \Rightarrow x = \left(\frac{100}{8}\right) = 12.5.$

$\therefore$ Speed of first train $= (7 \times 12.5)$ km/hr $= 87.5$ km/hr.

11. Total distance travelled $= \left[\left(50 \times 2\frac{1}{2}\right) + \left(70 \times 1\frac{1}{2}\right)\right]$ miles $= (125 + 105)$ miles $= 230$ miles.

12. Number of gaps between 21 telephone posts $= 20$.

Distance travelled in 1 minute $= (50 \times 20)$ m $= 1000$ m $= 1$ km.

$\therefore$ Speed $= 60$ km/hr.

13. Distance $= \left(1100 \times \frac{11}{5}\right)$ feet $= 2420$ feet.

14. Time taken to cover 600 km $= \left(\frac{600}{100}\right)$ hrs $= 6$ hrs.

Number of stoppages $= \frac{600}{75} - 1 = 7.$

Total time of stoppage $= (3 \times 7)$ min $= 21$ min.

Hence, total time taken $= 6$ hrs 21 min.

15. Let the distance covered by the cyclist be x and the time taken be y. Then,

Required ratio $= \frac{\frac{1}{2}x}{2y} : \frac{x}{y} = \frac{1}{4} : 1 = 1 : 4.$

16. Distance covered in first 2 hours $= (70 \times 2)$ km $= 140$ km.

Distance covered in next 2 hours $= (80 \times 2)$ km $= 160$ km.

Remaining distance $= 345 - (140 + 160) = 45$ km.

Speed in the fifth hour $= 90$ km/hr.

Time taken to cover 45 km $= \left(\frac{45}{90}\right)$ hr $= \frac{1}{2}$ hr.

$\therefore$ Total time taken $= \left(2 + 2 + \frac{1}{2}\right) = 4\frac{1}{2}$ hrs.

17. Total distance travelled in 12 hours = (35 + 37 + 39 + ... upto 12 terms).
This is an A.P. with first term, $a = 35$, number of terms, $n = 12$, common difference, $d = 2$.

$\therefore$ Required distance $= \frac{12}{2}[2\times 35 + (12-1)\times 2] = 6(70+22) = 552$ km.

18. Speed $= \left(10\times\frac{60}{12}\right)$ km/hr $= 50$ km/hr.

New speed $= (50-5)$ km/hr $= 45$ km/hr.

$\therefore$ Time taken $= \left(\frac{10}{45}\right)$ hr $= \left(\frac{2}{9}\times 60\right)$ min $= 13\frac{1}{3}$ min $= 13$ min 20 sec.

19. Distance covered in 2 hrs 15 min *i.e.*, $2\frac{1}{4}$ hrs $= \left(80\times\frac{9}{4}\right)$ hrs $= 180$ hrs.

Time taken to cover remaining distance $= \left(\frac{350-180}{60}\right)$ hrs $= \frac{17}{6}$ hrs

$= 2\frac{5}{6}$ hrs $= 2$ hrs 50 min.

Total time taken = (2 hrs 15 min + 2 hrs 50 min) = 5 hrs 5 min.

So, Anna reached city A at 10.25 a.m.

20. Distance = (240×5) km = 1200 km.

$\therefore$ Required speed $= \left(1200\times\frac{3}{5}\right)$ km/hr $= 720$ km/hr.

21. Time required = (2 hrs 30 min − 50 min) = 1 hr 40 min $= 1\frac{2}{3}$ hrs.

$\therefore$ Required speed $= \left(50\times\frac{3}{5}\right)$ km/hr $= 30$ km/hr.

Original speed $= \left(50\times\frac{2}{5}\right)$ km/hr $= 20$ km/hr.

$\therefore$ Difference in speed = (30 − 20) km/hr = 10 km/hr.

22. Remaining distance = 3 km and Remaining time $= \left(\frac{1}{3}\times 45\right)$ min $= 15$ min $= \frac{1}{4}$ hour.

$\therefore$ Required speed = (3×4) km/hr = 12 km/hr.

23. Let the total journey be x km.

Then, $\frac{3x}{5}+\frac{7x}{20}+6.5 = x \Leftrightarrow 12x+7x+20\times 6.5 = 20x \Leftrightarrow x = 130$ km.

24. Let the total distance be x km. Then,

$$\frac{\frac{1}{2}x}{21}+\frac{\frac{1}{2}x}{24} = 10 \Rightarrow \frac{x}{21}+\frac{x}{24} = 20$$

$$\Rightarrow 15x = 168\times 20 \Rightarrow x = \left(\frac{168\times 20}{15}\right) = 224 \text{ km.}$$

25. Let the total distance be $3x$ km.

Then, $\frac{x}{3}+\frac{x}{4}+\frac{x}{5} = \frac{47}{60} \Leftrightarrow \frac{47x}{60} = \frac{47}{60} \Leftrightarrow x = 1$.

$\therefore$ Total distance = (3×1) km = 3 km.

26. Let the distance travelled on foot be x km.

Then, distance travelled on bicycle $= (61 - x)$ km.

So, $\frac{x}{4} + \frac{(61-x)}{9} = 9 \Leftrightarrow 9x + 4(61 - x) = 9 \times 36 \Leftrightarrow 5x = 80 \Leftrightarrow x = 16$ km.

27. Let A's speed $= x$ km/hr. Then, B's speed $= (7 - x)$ km/hr.

So, $\frac{24}{x} + \frac{24}{(7-x)} = 14 \Leftrightarrow 24(7 - x) + 24x = 14x(7 - x)$

$\Leftrightarrow 14x^2 - 98x + 168 = 0 \Leftrightarrow x^2 - 7x + 12 = 0$

$\Leftrightarrow (x - 3)(x - 4) = 0 \Leftrightarrow x = 3$ or $x = 4$.

Since, A is faster than B, so A's speed $= 4$ km/hr and B's speed $= 3$ km/hr.

28. Speed on return trip $= 150\%$ of $40 = 60$ kmph.

$\therefore$ Average speed $= \left(\frac{2 \times 40 \times 60}{40 + 60}\right)$ km/hr $= \left(\frac{4800}{100}\right)$ km/hr $= 48$ km/hr.

29. Average speed $= \left(\frac{2 \times 40 \times 20}{40 + 60}\right)$ km/hr $= \left(\frac{80}{3}\right)$ km/hr $= 26.67$ km/hr.

30. Speed from A to B $= \left(250 \times \frac{2}{11}\right)$ mph $= \left(\frac{500}{11}\right)$ mph.

Speed from B to A $= \left(250 \times \frac{2}{9}\right)$ mph $= \left(\frac{500}{9}\right)$ mph.

$\therefore$ Average speed $= \left(\frac{2 \times \frac{500}{11} \times \frac{500}{9}}{\frac{500}{11} + \frac{500}{9}}\right)$ mph $= \left(\frac{500000}{4500 + 5500}\right)$ mph $= 50$ mph.

31. Average speed $= \left(\frac{2 \times 3 \times 2}{3 + 2}\right)$ km/hr $= \frac{12}{5}$ km/hr.

Distance travelled $= \left(\frac{12}{5} \times 5\right)$ km $= 12$ km.

$\therefore$ Distance between house and school $= \left(\frac{12}{2}\right)$ km $= 6$ km.

32. Let the speed in return journey be x km/hr.

Then, speed in onward journey $= \frac{125}{100}x = \left(\frac{5}{4}x\right)$ km/hr.

Average speed $= \left(\frac{2 \times \frac{5}{4}x \times x}{\frac{5}{4}x + x}\right)$ km/hr $= \frac{10x}{9}$ km/hr.

$\therefore \left(800 \times \frac{9}{10x}\right) = 16 \Leftrightarrow x = \left(\frac{800 \times 9}{16 \times 10}\right) = 45.$

So, speed in onward journey $= \left(\frac{5}{4} \times 45\right)$ km/hr $= 56.25$ km/hr.

33. Time taken $= 5$ hrs 25 min $= \frac{65}{12}$ hrs.

Let the required distance be x km.

Then, $\frac{x}{10} + \frac{x}{1} = \frac{65}{12} \Leftrightarrow 11x = \frac{650}{12} \Leftrightarrow x = \frac{325}{66} = 4\frac{61}{66}$ km.

34. Total distance travelled = $(50 \times 1 + 48 \times 2 + 52 \times 3)$ km = 302 km.
Total time taken = 6 hrs.

$\therefore$ Mean speed = $\left(\frac{302}{6}\right)$ km/hr = $50\frac{1}{3}$ km/hr.

35. Total time taken = $\left(\frac{160}{64} + \frac{160}{8}\right)$ hrs = $\frac{9}{2}$ hrs.

$\therefore$ Average speed = $\left(320 \times \frac{2}{9}\right)$ km/hr = 71.11 km/hr.

36. Total distance travelled = (10 + 12) km/hr = 22 km/hr.

Total time taken = $\left(\frac{10}{12} + \frac{12}{10}\right)$ hrs = $\frac{61}{30}$ hrs.

$\therefore$ Average speed = $\left(22 \times \frac{30}{61}\right)$ km/hr = 10.8 km/hr.

37. Total distance travelled = (600 + 800 + 500 + 100) km = 2000 km.

Total time taken = $\left(\frac{600}{80} + \frac{800}{40} + \frac{500}{400} + \frac{100}{50}\right)$ hrs = $\frac{123}{4}$ hrs.

$\therefore$ Average speed = $\left(2000 \times \frac{4}{123}\right)$ km/hr = $\left(\frac{8000}{123}\right)$ km/hr = $65\frac{5}{123}$ km/hr.

38. Let the whole distance travelled be x km and the average speed of the car for the whole journey be y km/hr.

Then, $\frac{(x/3)}{10} + \frac{(x/3)}{20} + \frac{(x/3)}{60} = \frac{x}{y} \Leftrightarrow \frac{x}{30} + \frac{x}{60} + \frac{x}{180} = \frac{x}{y}$

$\Leftrightarrow \frac{1}{18}y = 1 \Leftrightarrow y = 18$ km/hr.

39. $x \times \frac{15}{60} + 2x \times \frac{20}{60} + x \times \frac{10}{60} = 39 \Rightarrow \frac{x}{4} + \frac{2x}{3} + \frac{x}{6} = 39$

$\Rightarrow 3x + 8x + 2x = 468 \Rightarrow x = 36.$

40. Let speed of jogging be x km/hr.

Total time taken = $\left(\frac{9}{6}\text{ hrs} + 1.5\text{ hrs}\right) = 3$ hrs.

Total distance covered = $(9 + 1.5x)$ km.

$\therefore \frac{9 + 1.5x}{3} = 9 \Leftrightarrow 9 + 1.5x = 27 \Leftrightarrow \frac{3}{2}x = 18 \Leftrightarrow x = \left(18 \times \frac{2}{3}\right) = 12$ kmph.

41. Time taken = 1 hr 40 min 48 sec = 1 hr $40\frac{4}{5}$ min = $1\frac{51}{75}$ hrs = $\frac{126}{75}$ hrs.

Let the actual speed be x km/hr.

Then, $\frac{5}{7}x \times \frac{126}{75} = 42$ or $x = \left(\frac{42 \times 7 \times 75}{5 \times 126}\right) = 35$ km/hr.

42. New speed = $\frac{7}{11}$ of usual speed.

$\therefore$ New time = $\frac{11}{7}$ of usual time.

So, $\frac{11}{7}$ of usual time = 22 hrs $\Rightarrow$ usual time = $\left(\frac{22 \times 7}{11}\right) = 14$ hrs.

Hence, time saved = (22 – 14) = 8 hrs.

43. Let the speed be x km / hr. Then,

$30x - 30 \times \frac{14}{15}x = 10 \Leftrightarrow 2x = 10 \Leftrightarrow x = 5$ km / hr.

44. New speed $= \frac{6}{7}$ of usual speed.

New time $= \frac{7}{6}$ of usual time

$\therefore \left(\frac{7}{6} \text{ of usual time}\right) - (\text{usual time}) = \frac{1}{5}$ hr.

$\Rightarrow \frac{1}{6}$ of usual time $= \frac{1}{5}$ hr $\Rightarrow$ usual time $= \frac{6}{5}$ hr $= 1$ hr 12 min.

45. Let the distance be x km.

Difference in timings $= 12$ min $= \frac{12}{60}$ hr $= \frac{1}{5}$ hr.

$\therefore \frac{2x}{5} - \frac{2x}{7} = \frac{1}{5} \Leftrightarrow 14x - 10x = 7 \Leftrightarrow x = 1\frac{3}{4}$ km.

46. Difference between timings $= 15$ min $= \frac{1}{4}$ hr.

Let the length of journey be x km.

Then, $\frac{x}{35} - \frac{x}{40} = \frac{1}{4} \Leftrightarrow 8x - 7x = 70 \Leftrightarrow x = 70$ km.

47. Let the distance travelled be x km.

Then, $\frac{x}{10} - \frac{x}{15} = 2 \Leftrightarrow 3x - 2x = 60 \Leftrightarrow x = 60$ km.

Time taken to travel 60 km at 10 km / hr $= \left(\frac{60}{10}\right)$ hrs $= 6$ hrs.

So, Robert started 6 hours before 2 P.M. *i.e.*, at 8 A.M.

$\therefore$ Required speed $= \left(\frac{60}{5}\right)$ kmph $= 12$ kmph.

48. Let the correct time to complete the journey be x min.

Distance covered in $(x + 11)$ min. at 40 kmph

= Distance covered in $(x + 5)$ min. at 50 kmph

$\therefore \frac{(x+11)}{60} \times 40 = \frac{(x+5)}{60} \times 50 \Leftrightarrow x = 19$ min.

49. Let distance $= x$ km and usual rate $= y$ kmph.

$$\frac{x}{y} - \frac{x}{y+3} = \frac{40}{60} \text{ or } 2y(y+3) = 9x \quad \ldots(i)$$

And, $$\frac{x}{y-2} - \frac{x}{y} = \frac{40}{60} \text{ or } y(y-2) = 3x \quad \ldots(ii)$$

On dividing (i) by (ii), we get $x = 40$ km.

50. Let distance $= x$ km and usual rate $= y$ kmph. Then,

$$\frac{x}{y} - \frac{x}{y+10} = 1 \text{ or } y(y+10) = 10x \quad \ldots(i)$$

And, $$\frac{x}{y} - \frac{x}{y+20} = \frac{7}{4} \text{ or } y(y+20) = \frac{80x}{7} \quad \ldots(ii)$$

On dividing (i) by (ii), we get $y = 60$.

Substituting $y = 60$ in (i), we get : $x = 420$ km.

51. Let speed of the car be x kmph.

Then, speed of the train $= \frac{150}{100}x = \left(\frac{3}{2}x\right)$ kmph.

$\therefore \quad \frac{75}{x} - \frac{75}{\frac{3}{2}x} = \frac{125}{10 \times 60} \quad \Leftrightarrow \quad \frac{75}{x} - \frac{50}{x} = \frac{5}{24} \quad \Leftrightarrow \quad x = \left(\frac{25 \times 24}{5}\right) = 120$ kmph.

52. Due to stoppages, it covers 9 km less.

Time taken to cover 9 km $= \left(\frac{9}{54} \times 60\right)$ min $= 10$ min.

53. Let the original speed be x km / hr. Then,

$$\frac{715}{x} - \frac{715}{x+10} = 2 \quad \Leftrightarrow \quad 2x(x+10) = 7150 \quad \Leftrightarrow \quad x^2 + 10x - 3575 = 0$$

$$\Leftrightarrow \quad (x+65)(x-55) = 0 \quad \Leftrightarrow \quad x = 55 \text{ km / hr.}$$

54. Ratio of speeds $= 3 : 4$. Ratio of times taken $= 4 : 3$.

Suppose A takes $4x$ hrs and B takes $3x$ hrs to reach the destination. Then,

$$4x - 3x = \frac{30}{60} = \frac{1}{2} \text{ or } x = \frac{1}{2}.$$

$\therefore$ Time taken by A $= 4x$ hrs $= \left(4 \times \frac{1}{2}\right)$ hrs $= 2$ hrs.

55. Let Abhay's speed be x km / hr.

Then, $\frac{30}{x} - \frac{30}{2x} = 3 \quad \Leftrightarrow \quad 6x = 30 \quad \Leftrightarrow \quad x = 5$ km / hr.

56. Ratio of speeds $= 4 : 3 : 5$.

$\therefore$ Ratio of times taken $= \frac{1}{4} : \frac{1}{3} : \frac{1}{5} = 15 : 20 : 12$.

57. Let the distance be x km. Then,

$$\frac{x}{7\frac{1}{2}} - \frac{x}{8} = 4 \quad \Leftrightarrow \quad \frac{2x}{15} - \frac{x}{8} = 4 \quad \Leftrightarrow \quad x = 480 \text{ km.}$$

58. Let the distance be x km. Then,

$$\frac{x}{3} - \frac{x}{3.75} = \frac{1}{2} \quad \Leftrightarrow \quad 2.5x - 2x = 3.75 \quad \Leftrightarrow \quad x = \frac{3.75}{0.50} = \frac{15}{2} = 7.5 \text{ km.}$$

59. Let the actual distance travelled be x km. Then,

$$\frac{x}{10} = \frac{x+20}{14} \quad \Leftrightarrow \quad 14x = 10x + 200 \quad \Leftrightarrow \quad 4x = 200 \quad \Leftrightarrow \quad x = 50 \text{ km.}$$

60. Let the duration of the flight be x hours. Then,

$$\frac{600}{x} - \frac{600}{x + \frac{1}{2}} = 200 \quad \Leftrightarrow \quad \frac{600}{x} - \frac{1200}{2x+1} = 200 \quad \Leftrightarrow \quad x(2x+1) = 3$$

$$\Leftrightarrow \quad 2x^2 + x - 3 = 0 \quad \Leftrightarrow \quad (2x+3)(x-1) = 0$$

$$\Leftrightarrow \quad x = 1 \text{ hr.} \quad [\textit{neglecting the } -\textit{ve value of } x]$$

61. Let the speed of the train be x km / hr and that of the car be y km / hr.

Then, $\frac{120}{x} + \frac{480}{y} = 8$ or $\frac{1}{x} + \frac{4}{y} = \frac{1}{15}$ ...(i)

And, $\frac{200}{x} + \frac{400}{y} = \frac{25}{3}$ or $\frac{1}{x} + \frac{2}{y} = \frac{1}{24}$ ...(ii)

Solving (*i*) and (*ii*), we get $x = 60$ and $y = 80$.

$\therefore$ Ratio of speeds $= 60 : 80 = 3 : 4$.

62. Let C's speed $= x$ km / hr. Then, B's speed $= 3x$ km / hr and A's speed $= 6x$ km / hr.

$\therefore$ Ratio of speeds of A, B, C $= 6x : 3x : x = 6 : 3 : 1$.

Ratio of times taken $= \frac{1}{6} : \frac{1}{3} : 1 = 1 : 2 : 6$.

If C takes 6 min., then B takes 2 min.

If C takes 54 min., then B takes $\left(\frac{2}{6} \times 54\right)$ min. $= 18$ min.

63. To be 0.5 km apart, they take 1 hour.

To be 8.5 km apart, they take $\left(\frac{1}{0.5} \times 8.5\right)$ hrs $= 17$ hrs.

64. Since A and B move in the same direction along the circle, so they will first meet each other when there is a difference of one round between the two.

Relative speed of A and B $= (6 - 1) = 5$ rounds per hour.

Time taken to complete one round at this speed $= \frac{1}{5}$ hr $= 12$ min.

65. Suppose after x km from the start B catches up with A. Then, the difference in the time taken by A to cover x km and that taken by B to cover x km is 4 hours.

$\therefore \quad \frac{x}{4} - \frac{x}{10} = 4$ or $x = 26.7$ km.

66. Relative speed of the thief and p\
oliceman $= (11 - 10)$ km / hr $= 1$ km / hr.

Distance covered in 6 minutes $= \left(\frac{1}{60} \times 6\right)$ km $= \frac{1}{10}$ km $= 100$ m.

$\therefore$ Distance between the thief and policeman $= (200 - 100)$ m $= 100$ m.

67. Suppose the thief is overtaken x hrs after 2.30 p.m.

Then, distance covered by the thief in x hrs

$= $ distance covered by the owner in $\left(x - \frac{1}{2}\right)$ hrs.

$\therefore \quad 60x = 75\left(x - \frac{1}{2}\right) \Leftrightarrow 15x = \frac{75}{2} \Leftrightarrow x = \frac{5}{2}$ hrs.

So, the thief is overtaken at 5 p.m.

68. Let the speed of the train be x m / sec. Then,

Distance travelled by the train in 10 min. $=$ Distance travelled by sound in 30 sec.

$\Leftrightarrow \quad x \times 10 \times 60 = 330 \times 30 \Leftrightarrow x = 16.5$.

$\therefore$ Speed of the train $= 16.5$ m/sec $= \left(16.5 \times \frac{18}{5}\right)$ km/hr $= 59.4$ km/hr

69. To be $(18 + 20)$ km apart, they take 1 hour.

To be 47.5 km apart, they take $\left(\frac{1}{38} \times 47.5\right)$ hrs $= 1\frac{1}{4}$ hrs.

70. Suppose they meet x hrs after 8 a.m. Then,

(Distance moved by first in x hrs) + [Distance moved by second in $(x - 1)$ hrs] $= 330$

$\therefore \quad 60x + 75(x - 1) = 330 \quad \Rightarrow \quad x = 3$.

So, they meet at $(8 + 3)$, *i.e.* 11 a.m.

71. Clearly, the two will meet when they are 726 m apart.

To be (4.5 + 3.75) = 8.25 km apart, they take 1 hour.

To be 726 m apart, they take $\left(\frac{100}{825}\times\frac{726}{1000}\right)$ hrs = $\left(\frac{242}{2750}\times 60\right)$ min = 5.28 min.

72. Relative speed = (2 + 3) = 5 rounds per hour.

So, they cross each other 5 times in an hour and 2 times in half an hour.

Hence, they cross each other 7 times before 9.30 a.m.

73. Let their speeds be x kmph and y kmph respectively.

Then, $\frac{120}{x+y}=1 \Rightarrow x+y=120$ ...(*i*)

Now, when they move in same direction :

(Distance travelled by P in 6 hrs) – (Distance travelled by Q in 6 hrs) = 120 km

$\Rightarrow 6x-6y=120 \Rightarrow x-y=20$ ...(*ii*)

Solving (*i*) and (*ii*), $x = 70$, $y = 50$.

∴ P's speed = 70 kmph.

74. In the same time, they cover 110 km and 90 km respectively.

∴ Ratio of their speeds = 110 : 90 = 11 : 9.

75. At the time of meeting, let the distance travelled by the second train be x km.

Then, distance covered by the first train is $(x + 100)$ km.

∴ $\frac{x}{40}=\frac{x+100}{50} \Leftrightarrow 50x=40x+4000 \Leftrightarrow x=400$.

So, distance between P and Q = $(x + x + 100)$ km = 900 km.

76. Suppose they meet x hours after 14.30 hrs.

Then, $60x = 80(x - 2)$ or $x = 8$.

∴ Required distance = (60×8) km = 480 km.

77. Let the distance between Meerut and Delhi be x km and let the trains meet y hours after 7 a.m.

Clearly, M covers x km in 4 hrs and N covers x km in (7/2) hrs.

∴ Speed of M = $\frac{x}{4}$ kmph, Speed of N = $\frac{2x}{7}$ kmph.

Distance covered by M in $(y + 2)$ hrs + Distance covered in y hrs = x.

∴ $\frac{x}{4}(y+2)+\frac{2x}{7}\times y=x \Leftrightarrow \frac{(y+2)}{4}+\frac{2y}{7}=1$

$\Leftrightarrow y=\frac{14}{15}$ hrs = $\left(\frac{14}{15}\times 60\right)$ min. = 56 min.

Hence, the trains meet at 7.56 a.m.

78. Let the distance be x km. Then,

(Time taken to walk x km) + (Time taken to ride x km) = $\frac{23}{4}$ hrs.

$\Rightarrow$ (Time taken to walk $2x$ km) + (Time taken to ride $2x$ km) = $\frac{23}{2}$ hrs.

But, time taken to ride $2x$ km = $\frac{15}{4}$ hrs.

∴ Time taken to walk $2x$ km = $\left(\frac{23}{2}-\frac{15}{4}\right)$ hrs = $\frac{31}{4}$ hrs = 7 hrs 45 min.

EXERCISE 17B

(DATA SUFFICIENCY TYPE QUESTIONS)

Directions (*Questions 1 to 7*) : *Each of the questions below consists of a statement and/or a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statements is/are sufficient to answer the question. Read both the statements and*

Give answer (a) if the data in Statement I alone are sufficient to answer the question, while the data in Statement II alone are not sufficient to answer the question;

Give answer (b) if the data in Statement II alone are sufficient to answer the question, while the data in Statement I alone are not sufficient to answer the question;

Give answer (c) if the data either in Statement I or in Statement II alone are sufficient to answer the question;

Give answer (d) if the data even in both Statements I and II together are not sufficient to answer the question; and

Give answer (e) if the data in both Statements I and II together are necessary to answer the question.

1. How much time did X take to reach the destination ?
   I. The ratio between the speeds of X and Y is 3 : 4.
   II. Y takes 36 minutes to reach the same destination.
2. What is the usual speed of the train ? **(M.B.A. 2002)**
   I. The speed of the train is increased by 25 km / hr to reach the destination 150 km away in time.
   II. The train is late by 30 minutes.
3. Two towns are connected by railway. Can you find the distance between them ?
   I. The speed of mail train is 12 km / hr more than that of an express train.
   II. A mail train takes 40 minutes less than an express train to cover the distance. **(M.B.A. 2001)**
4. The towns A, B and C are on a straight line. Town C is between A and B. The distance from A to B is 100 km. How far is A from C ? **(M.B.A. 2003)**
   I. The distance from A to B is 25% more than the distance from C to B.
   II. The distance from A to C is $\frac{1}{4}$ of the distance from C to B.
5. What is the average speed of the car over the entire distance ?
   I. The car covers the whole distance in four equal stretches at speeds of 10 kmph, 20 kmph, 30 kmph and 60 kmph respectively.
   II. The total time taken is 36 minutes.
6. A car and a bus start from city A at the same time. How far is the city B from city A ?
   I. The car travelling at an average speed of 40 km / hr reaches city B at 4:35 p.m.
   II. The bus reaches city B at 6:15 p.m. at an average speed of 60 km / hr.
7. Two cars pass each other in opposite direction. How long would they take to be 500 km apart ? **(M.A.T. 1998)**
   I. The sum of their speeds is 135 km / hr.
   II. The difference of their speeds is 25 km / hr.

ANSWERS

1. (e) **2.** (e) **3.** (d) **4.** (c) **5.** (a) **6.** (e) **7.** (a)

SOLUTIONS

1. I. If Y takes 4 min., then X takes 3 min.

   II. If Y takes 36 min., then X takes $\left(\frac{3}{4}\times 36\right)$ min = 27 min.

   Thus, I and II together give the answer.

   ∴ Correct answer is (e).

2. Let the usual speed of the train be x kmph.

   Time taken to cover 150 km at usual speed = $\frac{150}{x}$ hrs.

   I. Time taken at increased speed = $\frac{150}{(x+25)}$ hrs.

   II. $\frac{150}{x}-\frac{150}{(x+25)}=\frac{30}{60}$

   $\Leftrightarrow \frac{1}{x}-\frac{1}{(x+25)}=\frac{1}{300} \Leftrightarrow [(x+25)-x]\times 300 = x(x+25)$

   $\Leftrightarrow x^2+25x-7500=0 \Leftrightarrow (x+100)(x-75)=0 \Leftrightarrow x=75.$

   Thus, I and II together give the answer.

   ∴ Correct answer is (e).

3. Let the distance between the two stations be x km.

   I. Let the speed of the express train be y km / hr.

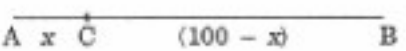
   Then, speed of the mail train = $(y+12)$ km / hr.

   II. $\frac{x}{y}-\frac{x}{(y+12)}=\frac{40}{60}$.

   Thus, even I and II together do not give x.

   ∴ Correct answer is (d).

4. Let AC = x km. Then, CB = $(100-x)$ km.

   I. AB = 125% of CB

   $\Leftrightarrow 100=\frac{125}{100}\times(100-x) \Leftrightarrow 100-x=\frac{100\times 100}{125}=80 \Leftrightarrow x=20$ km.

   ∴ AC = 20 km.

   Thus, I alone gives the answer.

   II. $AC=\frac{1}{4}CB \Leftrightarrow x=\frac{1}{4}(100-x) \Leftrightarrow 5x=100 \Leftrightarrow x=20.$

   ∴ AC = 20 km.

   Thus, II alone gives the answer.

   ∴ Correct answer is (c).

5. Let the whole distance be $4x$ km.

   I. Total time taken = $\left(\frac{x}{10}+\frac{x}{20}+\frac{x}{30}+\frac{x}{60}\right)=\frac{(6x+3x+2x+x)}{60}=\frac{12x}{60}=\frac{x}{5}$.

   ∴ Speed = $\frac{\text{Distance}}{\text{Time}}=\frac{4x}{(x/5)}$ kmph = 20 km / hr.

   ∴ I alone is sufficient to answer the question.

   II alone does not give the answer.

   ∴ Correct answer is (a).

6. Let AB = x km. From I and II, we get :

$$\frac{x}{40} - \frac{x}{60} = 1\frac{40}{60} \qquad [(6{:}15 \text{ p.m.}) - (4{:}35 \text{ p.m.}) = 1 \text{ hr } 40 \text{ min}]$$

$\Leftrightarrow \quad \frac{x}{40} - \frac{x}{60} = \frac{100}{60}$. This gives x.

$\therefore$ Correct answer is (e).

7. I gives, relative speed = 135 km/hr.

$\therefore$ Time taken = $\frac{500}{135}$ hrs.

II does not give the relative speed.

$\therefore$ I alone gives the answer and II is irrelevant.

$\therefore$ Correct answer is (a).