CHAPTER

8

Time and Distance

Important Formulae:

1. Speed = Distance ÷ Time
2. Distance = Time × Speed
3. Time = Distance ÷ Speed
4. x km/hr = $\left(x \times \frac{5}{18}\right)$ m/sec
5. x metres/sec = $\left(x \times \frac{18}{5}\right)$ km/hr.
6. If the speed of a body is changed in the ratio $m : n$, then the ratio of the time taken changes in the ratio $n : m$.
7. When a man covers a certain distance with a speed of x km/h and another equal distance at the rate of y km/h, then for the whole journey, the average speed is given by

   Average speed = $\frac{2xy}{x+y}$ km/h.

EXERCISE

1. A car moving at 48 km/hr completes a journey in 10 hours. By how much the speed of this car should be increased so as to do this journey in 8 hours?
A. 8 km/hr. B. 12 km/hr
C. 10 km/hr D. 15 km/hr

2. Starting from a point at a speed of 4 km/hr a man reaches at a cerain place and returns back to the point from where he had started journey on bicycle at the speed of 16 km/hr. His average speed during the entire journey will be:
A. 6.4 km/h B. 8.4 km/h
C. 5.4 km/h D. 10 km/h

3. A motorist covers a certain distance at a average speed of 48 km/h in 45 minutes. What speed in km/h he must maintain to cover the same distance in 30 minutes?
A. 66 km/h B. 79 km/h
C. 80 km/h D. 72 km/h

4. Two points A and B are 150 km apart. A man completes his onward journey from A to B in 3 hours 20 minutes and return journey from B to A in 4 hours 10 minutes. His average speed during the entire journey will be less than his average speed during the journey from A to B by:
A. 5 km/h B. 7.5 km/h
C. 9 km/h D. 3 km/h

5. A policeman saw a thief at a distance of 200 m. The policeman and the thief started running at the same time. If the policeman runs at a speed of $4\frac{1}{6}$ m per second and the thief at a speed of $3\frac{1}{3}$m per second, after what time the policeman will catch the thief?
A. 12 min B. 10 min
C. 9 min D. 4 min

6. Kanchan walks from her home at 4 kms per hour and reaches her school 5 minutes late. If she walks at 5 kms per hour, she reaches the school 2½ minutes earlier. How far is the school from her home?
A. 3.5 kms B. 2.5 kms
C. 2.75 kms D. 3.2 kms

7. A monkey wants to climb up a glazed pole. He climbs 12 metres in 1 minute and then he slips back 3 metres in the next minute. If the pole is 63 metre high, how long does he take to climb at the top of the pole?
A. $11\frac{1}{4}$min B. $12\frac{1}{2}$min
C. $12\frac{3}{4}$min D. $14\frac{3}{4}$min

8. A and B start walking at the same time on a circular path with circumference 35 metre. If they walk in the same direction at 4 km/hr and 5 km/hr respectively, after what time will they meet together?

A. 35 hours B. 27 hours
C. 24 hours D. 40 hours

9. While walking at $\frac{3}{5}$ of his usual speed Kamalkant reaches at his destination late by 30 minutes. His usual time consumed in reaching to his destination is:
A. 32 min B. 40 min
C. 45 min D. 42 min

10. The distance between two stations A and B is 300 km. A train leaves the station A with a speed of 40 km/hr. At the same time another train departs from the station B with a speed of 50 km/hr. How much time will these two trains take to cross each other?
A. 3 hrs 40 min B. 3 hrs 20 min
C. 2 hrs 20 min D. 3 hrs 45 min

11. Gulshan starts from a place P at 2 p.m. and walks to Q at 5 km per hour. Tarun starts from P at 3 p.m. and follows Gulshan on bicycle at 10 km per hour. By when Tarun will catch Gulshan?
A. At 5.30 p.m. B. At 4.00 p.m.
C. At 4.30 p.m. D. At 6.00 p.m.

12. Nilesh goes to school from his village at the speed of 4 km/hr and returns from school to village at the speed of 2 km/hr. If he takes 6 hours in all, then what is the distance between the village and the school?
A. 8 km B. 6 km
C. 5 km D. 4 km

13. A school bus covers a distance from a village to school at the speed of 12 km/hr and reaches the school 8 minute late. The next day the bus covers the same distance at the speed of 20 km/hr and reaches the school 10 minutes early. What is the distance between village and the school?
A. 6 km B. 9 km
C. 12 km D. 15 km

14. By increasing the speed of the bus by 10 km/hr the time of journey for 72 km is reduced by 36 minutes. What was the original speed of the bus?
A. 30 km/hr B. 35 km/hr
C. 40 km/hr D. 45 km/hr

15. A car completes a fixed journey in 8 hours. It covers half distance at the speed of 40 km/hr and rest at the 60 km/hr, the distance of the journey is:
A. 400 km B. 420 km
C. 384 km D. 350 km

16. A car covers four consecutive extensions of 3 km each at the speeds of 10 km/hr, 20 km/hr, 30 km/hr and 60 km/hr. Its average speed of journey is:
A. 30 km/hr B. 25 km/hr
C. 20 km/hr D. 10 km/hr

17. A girl rides her bicycle 10 km at an average speed of 12 km/hr and another 12 km at an average speed of 10 km/hr. Her average speed for the entire journey is approximately:
A. 12.2 km/hr B. 11.2 km/hr
C. 10.8 km/hr D. 10.4 km/hr

18. Raman drove from home to a neighbouring town at the speed of 50 km/hr and on his returning journey, he drove at the speed of 45 km/hr and also took an hour longer to reach home. What distance did he cover each way?
A. 900 km B. 500 km
C. 450 km D. 225 km

19. A man takes 6 hours 35 minutes in walking to a certain place and riding back. He would have taken 2 hours less by riding both ways. What would be the time he would take to walk both ways?
A. 10 hours B. 8 hours 35 minutes
C. 8 hours 25 minutes D. 8 hrs

20. A man covers a distance of 6 km at the rate of 4 km/hr and other 4 km at 3 km/hr this average speed is
A. $3\frac{5}{9}$ km/hr B. $3\frac{9}{17}$ km/hr
C. $5\frac{9}{17}$ km/hr D. $9\frac{3}{17}$ km/hr

ANSWERS

1	2	3	4	5	6	7	8	9	10
B	A	D	A	D	B	C	A	C	B
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
B	A	B	A	C	C	C	C	B	B

EXPLANATORY ANSWERS

1. Let he has to increase his speed by x km/hr for given condition; then,
$(48 + x) \times 8 = 48 \times 10$
$\Rightarrow \quad 48 + x = 60 \ \therefore \ x = 12$ km/hr

2. Average speed during the entire journey
$= \frac{2xy}{x+y} = \frac{2\times4\times16}{4+16} = \frac{8\times16}{20} = 6.4$ km/hr.

3. Let required speed be x km/hr; then
$x \times \frac{1}{2} = 48 \times \frac{3}{4} \ \therefore \ x = 48 \times \frac{3}{4} \times 2 = 72$ km/hr

4. During onward journey from A to B:
Average speed $= \frac{150}{10/3} = \frac{150\times3}{10} = 45$ km/hr.

During entire jouney:

Average speed $= \dfrac{300}{\frac{10}{3}+\frac{25}{6}} = \dfrac{300\times 6}{45}$ = 40 km/hr.

Hence, difference of average speed
= 45 – 40 = 5 km/hr.

5. Suppose the policeman will catch the thief after t sec

then, $\left(\dfrac{25}{6}-\dfrac{10}{3}\right)t = 200 \Rightarrow \dfrac{5}{6}t = 200$

$\therefore\ t = \dfrac{200\times 6}{5}$ = 240 sec = 4 min.

6. Suppose the distance between her house to the school = x km

Difference of time $= \dfrac{5}{2} - (-5) = \dfrac{15}{2}$ min $= \dfrac{1}{8}$ hr.

$\dfrac{x}{4}-\dfrac{x}{5}=\dfrac{1}{8} \Rightarrow \dfrac{x}{20}=\dfrac{1}{8} \therefore x = \dfrac{20}{8}$ = 2.5 km

7. The monkey climbs 12 metres in 1 minute and then he slips back 3 metres in the next minute

$\therefore$ The monkey climbs in the first 2 minutes = 12 – 3 = 9 metres

$\therefore$ In the first 12 minutes the monkey climbs = 9 × 6 = 54 metres

Remaining height of the pole to be covered by the monkey = 63 – 54 = 9 metre

$\therefore$ The monkey will climb the height of 9 metres in the 13th minute

$\because$ The monkey climbs 12 metres in 1 minute

$\therefore$ The monkey will climb 9 metres in

$\dfrac{1}{12}\times 9 = \dfrac{3}{4}$ minute

$\therefore$ Time spent in climbing at the top of the pole

$= \left(12+\dfrac{3}{4}\right)$ minutes $= 12\dfrac{3}{4}$ minutes

8. The two persons walk in the same direction

$\therefore$ Their relative speed = 5 – 4 = 1 km/hr

Distance covered in 1 round on the circular path = 35 km

$\therefore$ They will meet after $\dfrac{35}{1}$ = 35 hours.

9. Suppose usual speed of Kamalkant is v km/hr and his destination is at a distance of x kms; then usual time taken $= \dfrac{x}{v}$ hours.

$\dfrac{x}{3v/5}-\dfrac{x}{v}=\dfrac{1}{2} \Rightarrow \dfrac{2x}{3v}=\dfrac{1}{2} \therefore \dfrac{x}{v}=\dfrac{3}{4}$ hour = 45 min.

10. The two trains are moving in the opposite directions

$\therefore$ Relative speed = 40 + 50 = 90 km/hr.

$\therefore$ Time taken to cross each other

$= \dfrac{300}{90} = 3\dfrac{1}{3}$ hours or, 3 hours 20 minutes.

11. Let Tarun will catch Gulshan after t hours the starting of Tarun; then, $10t = 5(t + 1)$

$\Rightarrow 5t = 5 \therefore t = 1$ hr

Hence, required time = 3 p.m. + 1 hr. = 4 p.m.

12. Let x km be the distance between village and the school; then

$\dfrac{x}{4}+\dfrac{x}{2}=6 \Rightarrow \dfrac{3x}{4}=6 \therefore x = \dfrac{6\times 4}{3}$ = 8 km

13. Let x km be the distance from village to school, then

$\dfrac{x}{12}-\dfrac{x}{20} = [8-(-10)] \times \dfrac{1}{60}$

$\Rightarrow \dfrac{x}{30}=\dfrac{18}{60} \therefore x = \dfrac{18}{60}\times 30$ = 9 km

14. Let original speed of the bus be x km/hr; then

$\dfrac{72}{x}-\dfrac{72}{x+10}=\dfrac{36}{60} \Rightarrow \dfrac{72(x+10-x)}{x^2+10x}=\dfrac{3}{5}$

$\Rightarrow 1200 = x^2 + 10x$

$\Rightarrow x^2 + 10x - 1200 = 0$

$\Rightarrow (x + 40)(x - 30) = 0$

$\therefore\ x = 30$ or $x = -40$

Taking positive value only, so speed of the bus = 30 km/hr.

15. Let the distance of the journey be x km, then,

$\dfrac{x}{2\times 40}+\dfrac{x}{2\times 60} = 8 \Rightarrow \dfrac{5x}{240}=8$

$\therefore\ x = 8 \times 48 = 384$ km

16. Total distance of the journey = 4 × 3 km = 12 km

Total time taken $= \dfrac{3}{10}+\dfrac{3}{20}+\dfrac{3}{30}+\dfrac{3}{60}=\dfrac{36}{60}=\dfrac{3}{5}$ hr.

Hence, average speed $= \dfrac{12}{3/5}=\dfrac{12\times 5}{3}$ = 20 km/hr.

17. Average speed

$= \dfrac{10+12}{\frac{10}{12}+\frac{12}{10}}=\dfrac{22}{61/30}=\dfrac{22\times 30}{61}=\dfrac{660}{61}$ = 10.8 km/hr

18. Let his distance of journey of each way be x km; then

$\dfrac{x}{45}-\dfrac{x}{50}=1 \Rightarrow \dfrac{x}{450}$ = 1

$\therefore\ x = 450$ km

19. Here, Walking to a certain place + riding back = 6 hrs 35 min. ...*(i)*

2 × riding the same distance = 4 hrs 35 min. ...*(ii)*

Multiplying equation *(i)* × 2 and subtracting *(ii)* we get

Time taken in walking both ways = 13 hrs 70 min – 4 hrs. 35 min = 8 hrs. 35 min.

20. His average speed $= \dfrac{6+4}{\frac{6}{4}+\frac{4}{3}}=\dfrac{10}{17/6}=\dfrac{60}{17}=3\dfrac{9}{17}$ km/hr