5 SPEED AND DISTANCE

1. The length of two trains are 140 m and 160 m respectively. If they run at the speed of 60 km/h and 40 km/h respectively in opposite directions on parallel tracks, then find the time in which they will cross each other.
   (a) 10 sec
   (b) 10.8 sec
   (c) 9 sec
   (d) 9.6 sec
   [RRB JE 2014 RED SHIFT]

2. Ravi runs 200 metres in 24 seconds. Find his average speed :
   (a) 20 km/h
   (b) 24 km/h
   (c) 28.5 km/h
   (d) 30 km/h
   [RRB JE 2014 RED SHIFT]

3. A man completes 30 km of a journey at 6 km/hr and the remaining 40 km of the journey in 5 hours His average speed for the whole journey is :
   (a) $6\dfrac{4}{11}$ km/hr
   (b) 7 km/hr
   (c) $7\dfrac{1}{2}$ km/hr
   (d) 8 km/hr
   [RRB JE 2014 YELLOW SHIFT]

4. A train with a speed of 60 kmph crosses a pole in 30 seconds. The length of the train is
   (a) 500 m
   (b) 750 m
   (c) 900 m
   (d) 1000 m
   [RRB JE 2014 YELLOW SHIFT]

5. Speed of a boat in still water is 3 km/hr. the speed of the stream is 2 km/hr. The time taken to go 4 km downstream in minutes is
   (a) 120
   (b) 96
   (c) 80
   (d) 48
   [RRB JE 2015 26ᵗʰ AUG 1ˢᵗ SHIFT]

6. A train 100 m long is moving at 58 km/h. The time in seconds, it will take to pass another train 150 m long which is moving at 50 km/h in the same direction from the moment they meet is
   (a) 20
   (b) 30
   (c) 50
   (d) 70
   [RRB JE 2015 26ᵗʰ AUG 1ˢᵗ SHIFT]

7. Speed of a boat in still water is 3 km/hr. the speed of the stream is 1 km/hr. The time taken to go 4 km upstream in minutes is
   (a) 48
   (b) 60
   (c) 96
   (d) 120
   [RRB JE 2015 26ᵗʰ AUG 2ⁿᵈ SHIFT]

8. A train 100 m long is moving at 40 km/h. The time in seconds, it will take to pass another train 150 m long which is moving at 50 km/h in the opposite direction from the moment they meet is
   (a) 6
   (b) 8
   (c) 10
   (d) 15
   [RRB JE 2015 26ᵗʰ AUG 2ⁿᵈ SHIFT]

9. The speed of a boat m still water is 15 km/hr. The speed of the stream is 3 km/hr. The time taken to go 12 km downstream in minutes is
   (a) 40
   (b) 45
   (c) 50
   (d) 55
   [RRB JE 2015 26ᵗʰ AUG 3ʳᵈ SHIFT]

10. A train 200 m long is moving at 40 km/hr . The time in seconds, it will take to pass another train 150 long which is moving at 50 km/h in the opposite direction from the moment they meet is
    (a) 8
    (b) 12
    (c) 14
    (d) 117
    [RRB JE 2015 26ᵗʰ AUG 3ʳᵈ SHIFT]

11. A person cycles from one place to another in 100 minutes. If his speed is 18 km/h, the distance between two places is
    (a) 20 km
    (b) 30 km
    (c) 15 km
    (d) 25 km
    [RRB JE 2015 27ᵗʰ AUG 1ˢᵗ SHIFT]

12. A train 200 m long is moving at 68 km/h. The time in seconds, it will take to pass another train 150 m long which is moving at 50 km/h in the same direction from the moment they meet is
    (a) 40
    (b) 50
    (c) 60
    (d) 70
    [RRB JE 2015 27ᵗʰ AUG 1ˢᵗ SHIFT]

13. Speed of a boat in still water is 15 km/h. the speed of the stream is 3 km/h. The time taken to go 6 km upstream in minutes is
    (a) 20   (b) 30
    (c) 24   (d) 25

    [RRB JE 2015 27ᵗʰ AUG 2ⁿᵈ SHIFT]

14. A train 120 in long is moving at 40 km/h. The time in seconds, it will take to pass another train 100 m long which is moving at 32 km/h in the opposite direction horn the moment they meet is
    (a) 11   (b) 22
    (c) 44   (d) 88

    [RRB JE 2015 27ᵗʰ AUG 2ⁿᵈ SHIFT]

15. The speed of a car is 72 km/h. The time taken by it to cover a distance of 500 m in seconds is
    (a) 20   (b) 25
    (c) 30   (d) 40

    [RRB JE 2015 27ᵗʰ AUG 3ʳᵈ SHIFT]

16. A train 80 m long is moving with the speed of 45 km/h. The time taken by it in seconds to pass a bridge 120 m long is
    (a) 8   (b) 10
    (c) 16   (d) 20

    [RRB JE 2015 27ᵗʰ AUG 3ʳᵈ SHIFT]

17. The speed of a car is 90 km/h. The time taken by it in seconds to cover a distance of 700m is
    (a) 20   (b) 25
    (c) 28   (d) 35

    [RRB JE 2015 28ᵗʰ AUG 1ˢᵗ SHIFT]

18. A train 120 m long is moving with the speed of 72 km/h. The time taken in seconds, to cross a stationary train 100 m long is
    (a) 5   (a) 6
    (b) 11   (c) 15

    [RRB JE 2015 28ᵗʰ AUG 1ˢᵗ SHIFT]

19. A person cycles at the speed of 36 km/h. The time taken by him in seconds, to cover a distance of 1500 m is
    (a) 160   (b) 150
    (c) 120   (d) 90

    [RRB JE 2015 28ᵗʰ AUG 2ⁿᵈ SHIFT]

20. A train is moving at a speed of 72 km/h. In 5 seconds it will cover a distance of
    (a) 60 m
    (b) 80 m
    (c) 100 m
    (d) 120 m

    [RRB JE 2015 28ᵗʰ AUG 2ⁿᵈ SHIFT]

21. The speed of a car is 54 km/h. The time taken by it in seconds, to cover a distance of 240 m is
    (a) 12   (b) 15
    (c) 16   (d) 18

    [RRB JE 2015 28ᵗʰ AUG 3ʳᵈ SHIFT]

22. A train is moving at a speed of 72 km/h. In 40 seconds it will cover a distance of
    (a) 900 m   (b) 800 m
    (c) 600 m   (d) 550 m

    [RRB JE 2015 28ᵗʰ AUG 3ʳᵈ SHIFT]

23. A boat moves down stream at the rat of 1 km in $7\frac{1}{2}$ minutes and upstream at die rate of 5 km an hour. The speed of the boat (in km hour) in still water is

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

    (c) 5   (d) $6\frac{1}{2}$

    [RRB JE 2015 29ᵗʰ AUG 1ˢᵗ SHIFT]

24. A man takes 6 hours 15 minutes in walking to a certain place and riding back. He would have gamed 2 hours 40 minutes by riding both ways. How long would he take to walk both ways?
    (a) 8 hours 35 minutes
    (b) 8 hours 55 minutes
    (c) 9 hours 55 minutes
    (d) 10 hours 35 minutes

    [RRB JE 2015 29ᵗʰ AUG 1ˢᵗ SHIFT]

25. A Scooterist travels for 10 hours, the first half distance at 21 km/hour and the rest at 24 km/hour. The distance (in km) travelled is
    (a) 225
    (b) 224
    (c) 220
    (d) 180

    [RRB JE 2015 29ᵗʰ AUG 2ⁿᵈ SHIFT]

26. A man rows upstream 13 km and downstream 28 km taking 5 hours each time. The speed (in km per hour) of the current is

    (a) $1\frac{1}{4}$ (b) $1\frac{1}{2}$

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

    [RRB JE 2015 29ᵗʰ AUG 2ⁿᵈ SHIFT]

27. A steamer goes downstream and covers the distance between two ports in 4 hours while it covers the same distance upstream is 5 hours. If the speed of the stream is 2 km/hour, the speed of the steamer in still water, in km/h , is

(a) 16   (b) 18

(c) 20   (d) 22

28. A person has to cover a distance of 160 km in 8 hours. If he covers half of the journey in $\frac{3}{4}$ of the time, what must be hi speed (km/hour) to cover the remaining distance in the remaining time?

(a) 30

(b) 35

(c) 40

(d) 42

29. Two trains, Kolkata Mail and Patna Mail, start at the same time from stations Kolkata and Patna respectively towards each other. After passing each other, they take 12 hours and 3 hours to reach Patna and Kolkata respectively. If the Kolkata Mail is moving at the speed of 48 km/h. the speed of the Patna Mail is

(a) 24 km/h

(b) 22 km/h

(c) 21 km/h

(d) 96 km/h

30. Abhishek is travelling on his cycle and has calculated to reach point A at 2 pm if he travels at 10 km/h; he will reach there at 12 noon if he travels at 15 km/h. At what speed must he travel to reach A at 1 pm

(a) 8 km/h   (b) 11 km/h

(c) 12 km/h   (d) 14 km/h

31. A motorcycle travels 20 km an hour faster than a cycle over a journey of 600 km. The cycle takes 50 hours more than the motorcycle. Find their speed (in km/h)

(a) 40, 60   (b) 20, 60

(c) 20, 40   (d) 45, 100

32. A thief is spotted by a policeman from a distance of 200 metres. When the policeman started to catch the thief he also started running. Assume the speed of the thief to be 10 km/h and that of a policeman 12 km/h, how far will the thief run before he is overtaken by the policeman.

(a) 1 km   (b) 2 km

(c) 3 km   (d) 4 km

33. A person has to cover a distance of 6 km in 45 minutes. If he covers one-half of the distance in two-third of the total time, to cover the remaining distance in the remaining time, his speed (in km/h) must be

(a) 6   (b) 8

(c) 12   (d) 15

ANSWERS

1. (b)	**2.** (d)	**3.** (b)	**4.** (a)	**5.** (d)	**6.** (c)	**7.** (d)	**8.** (c)	**9.** (a)	**10.** (c)
11. (b)	**12.** (d)	**13.** (b)	**14.** (a)	**15.** (b)	**16.** (c)	**17.** (c)	**18.** (b)	**19.** (b)	**20.** (c)
21. (c)	**22.** (b)	**23.** (d)	**24.** (b)	**25.** (b)	**26.** (b)	**27.** (b)	**28.** (c)	**29.** (d)	**30.** (c)
31. (*)	**32.** (a)	**33.** (c)							

EXPLANATIONS

1. Relative speed of the two trains

$$= (60 + 40) \times \frac{5}{18} = \frac{250}{9} \text{ m/s}$$

Thus, required time $= \dfrac{140 + 160}{\frac{250}{9}} = 10.8$ sec.

2. Average speed $= \dfrac{200}{24} \times \dfrac{18}{5} = 30$ km/hr.

3. Average speed $= \dfrac{30 + 40}{\frac{30}{6} + 5} = \dfrac{70}{10} = 7$ km/hr.

4. Length of the train $= 60 \times \dfrac{5}{18} \times 30$

$$= 500 \text{ meter.}$$

5. Speed of the boat downstream = (3 + 2) km/hr

Distance to be travelled = 4 km

Hence, required time in minutes

$$= \frac{4}{5} \times 60 = 48 \text{ minutes.}$$

6. Relative speed of the two trains with respect to each other

$$= 68 - 50 = 18 \text{ km/hr or } 18 \times \frac{5}{18} = 5 \text{ m/s.}$$

Distance to be covered = 150 + 100
= 250 meters

Hence, required time $= \dfrac{250}{5} = 50$ seconds.

7. Required time $= \dfrac{4}{(3-1)} \times 60$

$$= 120 \text{ minutes.}$$

8. Relative speed $= (40 + 50) \times \dfrac{5}{18} = 25 \text{m/s}$

Hence, required time

$$= \frac{100 + 150}{25} = 10 \text{ seconds.}$$

9. Relative Speed of boat (down stream)
= 15 + 3 = 18 km/hr

Distance = 12 km

$\therefore$ Time (in minutes) $= \dfrac{12 \times 60}{18}$

= 40 min

10. Total distance covered by train of length 200 m to cross another train of length 150 m
= 350 m

Relative speed = (40 + 50) km/pr = 90 km/pr

$\therefore$ Time (in seconds) $= \dfrac{350 \times 18}{90 \times 5} = 14$ seconds

11. Time given = 100 min $= \dfrac{100}{60}$ hr.

speed = 18 km/hr

$\therefore$ Dis tan ce $= 18 \times \dfrac{100}{60} = 30$ km

12. Total distance = length of 2 trains

= 200 + 150 = 350 m

Relative speed = 68 – 50 = 18 km/hr = 5 m/s

$\therefore$ Time taken to meet $= \dfrac{\text{Dis tan ce}}{\text{speed}}$

$$= \frac{350}{5} = 70 \sec\text{onds}$$

13. Relative speed of boat (upstream) = 15 – 3

= 12 km/hr

Distance = 6 km

$\therefore$ Time (minutes) $= \dfrac{6}{12} \times 60 = 30$

14. Distance covered by train to pass = 120 + 100

= 220 m

Relative speed = 40 + 32 = 72 km/hr.

$\therefore$ Time (seconds) $= \dfrac{220 \times 18}{72 \times 5} = 11$

15. speed $= \left(72 \times \dfrac{5}{18}\right) \text{m/s} = 20$ m/s

$\therefore$ Time tabeu $= \dfrac{500}{20} = 25$ seconds

16. Time tabeu $= \dfrac{80 + 120}{45 \times \frac{5}{18}} = 16$ seconds

17. Time taken $= \dfrac{700}{90 \times \frac{5}{18}} = 28$ seconds.

18. Time taken $= \dfrac{120 + 100}{72 \times \dfrac{5}{18}} = 11 \text{ seconds}$

19. Time taken $= \dfrac{1500}{36 \times \dfrac{5}{18}} = 150 \text{ seconds}$

20. Distance covered $= \left(72 \times \dfrac{5}{18}\right) \times 5 = 100 \text{ m}$

21. Time $= \dfrac{\text{Distance}}{\text{speed}}$

$= \dfrac{24 \text{m}}{54 \times \dfrac{5}{18} \text{m/s}} = 16 \text{ seconds}$

22. Distance speed × time $= \left(72 \times \dfrac{5}{18}\right) \text{m/s} \times 40\text{s}$

$= 800 \text{ m}$

23. Let speed of boat in still water = V
& speed of stream = S

Speed $= \dfrac{\text{Distance}}{\text{time}}$

$\therefore$ down stream : $V + S = \dfrac{1}{\dfrac{15}{2}} \times 60$ (1)

upstream : $V - S = 5$ (2)
Solving (1) & (2)

$V = \dfrac{13}{2} = 6\dfrac{1}{2}$

24. Time taken in walking & riding
$= 6 \text{ hrs } 15 \text{ min}$ (i)
Time taken to ride both ways = 6 hrs 15 min
$= 2 \text{ hrs } 40 \text{ min}$
$= 3 \text{ hrs } 35 \text{ min}$ (ii)
Time taken to walk both ways = 2 × (1)   (ii)
$= 12 \text{ hrs } 30 \text{ min} - 3 \text{ hrs } 35 \text{ min}$
$= 8 \text{ hrs } 55 \text{ min}$

25. $t_1 = \dfrac{d}{2 \times 21}, \qquad t_2 = \dfrac{d}{2 \times 24}, \qquad t_1 + t_2 = 10$

or $\dfrac{d}{42} + \dfrac{d}{48} = 10$

or $90d = 10 \times 42 \times 48 = d = 224.$

26. $\dfrac{13}{x - y} = 5$ and $\dfrac{28}{x + y} = 5$

or $5x - 5y = 13$ and $5x + 5y = 28$

$10y = 15$ or $y = \dfrac{3}{2}.$

27. $\dfrac{x + 2}{x - 2} = \dfrac{5}{4}$, $4x + 8 = 5x - 10$

$x = 18.$

28. $80 = y \times 6 \text{ hours} \rightarrow$ First half
$80 = x \times 2 \text{ hours} \rightarrow$ Second half or x = 40.

29.

$$\begin{array}{c|c} \text{kol} \quad 48t & 12 \times 48 \\ \hline 3x & xt \end{array} \text{ Pat}$$

$48t + 12 \times 48 = 3x + xt = 12 \times 48 + 3x$
or $48t = 3x$ or $x = 16t$
$48t + 12 \times 48 = 48t + 16t^2$

$t^2 = \dfrac{12 \times 48}{16} = 36$

$t = 6$
or $x = 96.$

30. $\dfrac{d}{10} - \dfrac{d}{15} = 2$

$\dfrac{d}{30} = 2$ or $d = 60$

$s = \dfrac{60}{5} = 12 \text{ km/hr.}$

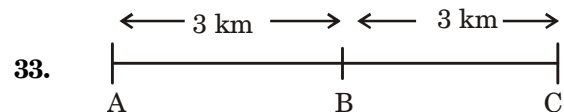**31.** Wrong.

32. Distance = 200 m = 0.2 Km
Relative speed = 12 km/hr − 10 km/hr
$= 2 \text{ km/hr.}$
$\therefore$ The policeman requires

$T = \dfrac{0.2}{2} = 0.1$ hours to catch the thief.

$\therefore$ Distance covered by thief
$= 0.1 \text{ hr.} \times 10 \text{ km/hr} = 1 \text{ km}$

33.

$$\xleftarrow{\hspace{1em}} 3 \text{ km} \xrightarrow{\hspace{1em}} \xleftarrow{\hspace{1em}} 3 \text{ km} \xrightarrow{\hspace{1em}}$$

$$\begin{array}{ccc} | & | & | \\ A & B & C \end{array}$$

Total time taken - 45 min.

As given, time to cover $AB = \dfrac{2}{3} \times 45 = 30 \text{ min}.$

Time to cover BC = 15 min

$\therefore$ His speed in $BC = \dfrac{3}{15} \times 60 = 12 \text{ km/hr}$