SPEED AND TIME

Similar to the concept of speed, distance and time, train problems are specifically based on evaluating the speed, distance covered and time is taken by a train under different conditions.

Given below are the type of questions which may be asked from the train-based problems:

1. **Time Taken by Train to Cross any stationary Body or Platform –** Question may be asked where the candidate has to calculate the time taken by a train to cross a stationary body like a pole or a standing man or a platform/ bridge
2. **Time Taken by 2 trains to cross each other –** Another question that may be asked is the time two trains might take to cross each other
3. **Train Problems based on Equations –** Two cases may be given in the question and the candidates will have to form equations based on the condition given

Important Formulas

To solve any numerical ability, question a candidate needs to memorise the related formulas to be able to answer the questions easily and efficiently.

Given below are the important train-based questions formulas which shall help candidates answer the questions based on this topic:

- **Speed of the Train = Total distance covered by the train / Time taken**
- If the length of two trains is given, say a and b, and the trains are moving in **opposite directions** with speeds of x and y respectively, then the **time taken by trains to cross each other = {(a + b) / (x + y)}**
- If the length of two trains is given, say a and b, and they are moving in the **same direction**, with speeds x and y respectively, then the **time is taken to cross each other = {(a + b) / (x - y)}**
- When the **starting time of two trains is the same from x and y towards each other** and after crossing each other, they took t_1 and t_2 time in reaching y and x respectively, then the **ratio between the speed of two trains = $\sqrt{t_1} : \sqrt{t_2}$**
- If two trains leave x and y stations at time t_1 and t_2 respectively and travel with speed L and M respectively, then distanced from x, where two trains meet is = $(t_2 - t_1) \times$ {(product of speed) / (difference in speed)}
- The average speed of a train without any stoppage is x, and with the stoppage, it covers the same distance at an average speed of y, then **Rest Time per hour = (Difference in average speed) / (Speed without stoppage)**
- If two trains of equal lengths and different speeds take t_1 and t_2 time to cross a pole, then the **time taken by them to cross each other if the train is moving in opposite direction = $(2 \times t_1 \times t_2) / (t_2 + t_1)$**
- If two trains of equal lengths and different speeds take t1 and t2 time to cross a pole, then the **time taken by them to cross each other if the train is moving in the same direction = $(2 \times t_1 \times t_2) / (t_2 - t_1)$**

1. A train running at the speed of 56 km/hr crosses a pole in 18 seconds. What is the length of the train?

1. 200m
2. 250m
3. 325m
4. 280m
5. 140m

Answer: (4) 280m

Solution: Speed = {56 × (5/18)} m/sec = (140/9) m/sec

Length of the train (Distance) = Speed × Time = {(140/9) × 18} = 280 m

2. Time is taken by two trains running in opposite directions to cross a man standing on the platform in 28 seconds and 18 seconds respectively. It took 26 seconds for the trains to cross each other. What is the ratio of their speeds?

1. 2:3
2. 3:2
3. 1:4
4. 3:1
5. 4:1

Answer: (5) 4:1

Solution: Let the speed one train be x and the speed of the second train be y

Length of the first train = Speed × Time = 28x

Length of second train = Speed × Time = 18y

So, {(28x + 18y) / (x + y)} = 26

⇒ 28x + 18y = 26x + 26y

⇒ 2x = 8y

Therefore, x : y = 4: 1

3. It takes a 360 m long train 12 seconds to pass a pole. How long will it take to pass a platform 900 m long?

1. 40 seconds
2. 32 seconds
3. 42 seconds
4. 50 seconds
5. 72 seconds

Answer: (3) 42 seconds

Solution: Speed = (360/12) m/sec = 30 m/sec

Required Time = {(360 + 900) / 30} = 1260 / 30 = 42 seconds

4. A train 300 m long is running at a speed of 54 km/hr. In what time will it pass a bridge 150 m long?

1. 32 seconds
2. 30 seconds
3. 51 seconds
4. 16 seconds
5. 10 seconds

Answer: (2) 30 seconds

Solution: Speed = {54 × (5/18)} m/sec = 15 m/sec

Total distance which needs to be covered = (300 + 150) m = 450m

Time = Distance/Speed

Required Time = 450 / 15 = 30 seconds

Exercise

1. A train moves with a speed of 108 kmph. Its speed in metres per second is :

   (A) 10.8 (B) 18

   (C) 30 (D) 38.8

2. A speed of 14 metres per second is the same as :

   (A) 28 km/hr (B) 46.6 km/hr

   (C) 50.4 km/hr (D) 70 km/hr

3. In what time will a train 100 metres long cross an electric pole, if its speed be 144 km/hr ?

   (A) 2.5 seconds (B) 4.25 seconds

   (C) 5 seconds (D) 12.5 seconds

4. A train 280 m long, running with a speed of 63 km / hr will pass a tree in :

   (A) 15 sec (B) 16 sec

   (C) 18 sec (D) 20 sec

5. How long does a train 110 metres long running at the speed of 72 km/hr take to cross a bridge 132 metres in length ?

   (A) 9.8 sec (B) 12.1 sec

   (C) 12.42 sec (D) 14.3 sec

6. A train 360 m long is running at a speed of 45 km / hr. In what time will it pass a bridge 140 m long ?

   (A) 40 sec (B) 42 sec

   (C) 45 sec (D) 48 sec

7. A train travelling at a speed of 75 mph enters a tunnel $3\frac{1}{2}$ miles long. The train is $\frac{1}{4}$ mile long. How long does it take for the train to pass through the tunnel from the moment the front enters to the moment the rear emerges ?

   (A) 2.5 min (B) 3 min

   (C) 3.2 min (D) 3.5 min

8. A train running at the speed of 60 km/hr crosses a pole in 9 seconds. What is the length of the train ?

   (A) 120 metres (B) 180 metres

   (C) 324 metres (D) Cannot be determined

9. A train 132 m long passes a telegraph pole in 6 seconds. Find the speed of the train.

   (A) 70 km/hr (B) 72 km/hr

   (C) 79.2 km/hr (D) 80 km/hr

10. A train covers a distance of 12 km in 10 minutes. If it takes 6 seconds to pass a telegraph post, then the length of the train is :

    (A) 90 m (B) 100 m

    (C) 120 m (D) 140 m

11. A train 240 m long passed a pole in 24 seconds. How long will it take to pass a platform 650 m long ?

    (A) 65 sec (B) 89 sec

    (C) 100 sec (D) 150 sec

12. The length of the bridge, which a train 130 metres long and travelling at 45 km/hr can cross in 30 seconds, is :

(A) 200 m (B) 225 m

(C) 245 m (D) 250 m

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

(A) 130 (B) 360

(C) 500 (D) 540

14. A goods train runs at the speed of 72 kmph and crosses a 250 m long platform it 26 seconds. What is the length of the goods train ?

(A) 230 m (B) 240 m

(C) 260 m (D) 270 m

15. The length of a train and that of a platform are equal. If with a speed of 90 km/hr, the train crosses the platform in one minute, then the length of the train (in metres) is :

(A) 500 (B) 600

(C) 750 (D) 900

16. A train of length 150 metres takes 40.5 seconds to cross a tunnel of length 300 metres, What is the speed of the train in km / hr ?

(A) 13.33 (B) 26.67

(C) 40 (D) 66.67

17. A train crosses a platform 100 m long in 60 seconds at a speed of 45 km / hr. The time taken by the train to cross an electric pole is :

(A) 8 sec (B) 52 sec

(C) 1 minute (D) Data inadequate

18. A train passes a station platform in 36 seconds and a man standing on the platform in 20 seconds. If the speed of the train is 54 km / hr, what is the length of the platform?

(A) 120 m (B) 240 m

(C) 300 m (D) None of these

19. A 300 metre long train crosses a platform in 39 seconds while it crosses a signal pole in 18 seconds. What is the length of the platform ?

(A) 320 m (B) 350 m

(C) 650 m (D) Data inadequate

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

(A) 50 m (B) 150 m

(C) 200 m (D) Data inadequate

21. A train moves past a telegraph post and a bridge 264 m long in 8 seconds and 20 seconds respectively. What is the speed of the train ?

(A) 69.5 km/hr (B) 70 km/hr

(C) 79 km/hr (D) 79.2 km/hr

22. A train takes 18 seconds to pass completely through a station 162 m long and 15 leconds through another station 120 m long. The length of the train is :

(A) 70 m (B) 80 m

(C) 90 m (D) 100 m

23. How many seconds will a 500 metre long train take to cross a man walking with a speed of 3 km/hr in the direction of the moving train if the speed of the train is63 km/hr?

(A) 25 (B) 30

(C) 40 (D) 45

24. A jogger running at 9 kmph alongside a railway track is 240 metres ahead of the engine of a 120 metre long train running at 45 kmph in the same direction. In how much time will the train pass the jogger ?

(A) 3.6 sec (B) 18 sec

(C) 36 sec (D) 72 sec

25. A train 110 metres long is running with a speed of 60 kmph. In what time will it pass a man who is running at 6 kmph in the direction opposite to that in which the train is going?

(A) 5 sec (B) 6 sec

(C) 7 sec (D) 10 sec

26. Two trains 200 m and 150 m long are running on parallel rails at the rate of 40 kmph and 45 kmph respectively. In how much time will they cross each other, if they are running in the same direction ?

(A) 72 sec (B) 132 sec

(C) 192 sec (D) 252 sec

27. Two trains 140 m and 160 m long run at the speed of 60 km / hr and 40 km / hr respectively in opposite directions on parallel tracks. The time (in seconds) which they take to cross each other, is :

(A) 9 (B) 9.6

(C) 10 (D) 10.8

28. Two trains are moving in opposite directions @ 60 km / hr and 90 km / hr. Their lengths are 1.10 km and 0.9 km respectively. The time taken by the slower train to cross the faster train in seconds is :

(A) 36 (B) 45

(C) 48 (D) 49

29. A train 125 m long passes a man, running at 5 kmph in the same direction in whichthe train is going, in 10 seconds. The speed of the train is :

(A) 45 km/hr (B) 50 km/hr

(C) 54 km/hr (D) 55 km/hr

30. A train 110 m long passes a man, running at 6 kmph in the direction opposite to that of the train, in 6 seconds. The speed of the train is :

(A) 54 km/hr (B) 60 km/hr

(C) 66 km/hr (D) 72 km/hr

31. Two goods train each 500 m long, are running in opposite directions on parallel tracks.Their speeds are 45 km / hr and 30 km / hr respectively. Find the time taken by theslower train to pass the driver of the faster one.

(A) 12 sec (B) 24 sec

(C) 48 sec (D) 60 sec

32. Two trains of equal length are running on parallel lines in the same direction at46 km / hr and 36 km / hr. 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

33. A 270 metres long train running at the speed of 120 kmph crosses another train running in opposite direction at the speed of 80 kmph in 9 seconds. What is the length of the other train ?

(A) 230 m (B) 240 m

(C) 260 m (D) 320 m

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

(A) 10 (B) 18

(C) 36 (D) 72

35. Two trains of equal lengths take 10 seconds and 15 seconds respectively to cross a telegraph post. If the length of each train be 120 metres, in what time (in seconds) will they cross each other travelling in opposite direction ?

(A) 10 (B) 12

(C) 15 (D) 20

36. A train 108 m long moving at a speed of 50 km /hr crosses a train 112 m long coming from opposite direction in 6 seconds. The speed of the second train is

(A) 48 km/hr (B) 54 km/hr

(C) 66 km/hr (D) 82 km/hr

37. A train X speeding with 120 kmph crosses another train Y, running in the same direction, in 2 minutes. If the lengths of the trains X and Y be 100 m and 200 m respectively, what is the speed of train Y ?

(A) 111 km/hr (B) 123 km/hr

(C) 127 km/hr (D) 129 km/hr

38. Two trains travel in opposite directions at 36 kmph and 45 kmph and a man sitting B in slower train passes the faster train in 8 seconds. The length of the faster train is :

(A) 80 m (B) 100 m

(C) 120 m (D) 180 m

39. Two trains are running at 40 km / hr and 20 km / hr respectively in the same direction Fast train completely passes a man sitting in the slower train in 5 seconds. What is the length of the fast train ?

(A) 23 m (B) $23\frac{2}{9}$ m

(C) 27 m (D) $27\frac{7}{9}$ m

40. A train overtakes two persons who are walking in the same direction in which the trail is going, at the rate of 2 kmph and 4 kmph and passes them completely in 9 and 1) seconds respectively. The length of the train is :

(A) 45 m (B) 50 m

(C) 54 m (D) 72 m

Answer Key

Q.No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	C	C	A	B	B	A	B	E	C	C	B	C	C	D	C	C	B	B	B	B
Q.No	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	D	C	B	C	B	D	D	C	B	B	C	A	A	C	B	D	A	D	D	B