20 Problems on Trains

IMPORTANT FACTS AND FORMULAE

I. a km/hr $= \left(a \times \frac{5}{18}\right)$ m/s. **II.** $\boxed{a \text{ m/s} = \left(a \times \frac{18}{5}\right) \text{km/hr.}}$

III. Time taken by a train of length l metres to pass a pole or a standing man or a signal post is equal to the time taken by the train to cover l metres.

IV. Time taken by a train of length l metres to pass a stationary object of length b metres is the time taken by the train to cover $(l + b)$ metres.

V. Suppose two trains or two bodies are moving in the same direction at u m/s and v m/s, where $u > v$, then their relative speed = $(u - v)$ m/s.

VI. Suppose two trains or two bodies are moving in opposite directions at u m/s and v m/s, then their relative speed = $(u + v)$ m/s.

VII. If two trains of length a metres and b metres are moving in opposite directions at u m/s and v m/s, then time taken by the trains to cross each other $= \frac{(a+b)}{(u+v)}$ sec.

VIII. If two trains of length a metres and b metres are moving in the same direction at u m/s and v m/s, then the time taken by the faster train to cross the slower train $= \frac{(a+b)}{(u-v)}$ sec.

IX. If two trains (or bodies) start at the same time from points A and B towards each other and after crossing they take a and b sec in reaching B and A respectively, then **(*A's speed*) : (*B's speed*) = $(\sqrt{b} : \sqrt{a})$.**

SOLVED EXAMPLES

Ex. 1. ***A 100-m long train is running at the speed of 30 km/hr. Find the time taken by it to pass a man standing near the railway line.***

Sol. Speed of the train $= \left(30 \times \frac{5}{18}\right)$ m/sec $= \left(\frac{25}{3}\right)$ m/sec.

Distance moved in passing the standing man = 100 m.

Required time taken $= \frac{100}{\left(\frac{25}{3}\right)} = \left(100 \times \frac{3}{25}\right)$ sec $= 12$ sec.

Ex. 2. ***A train is moving at a speed of 132 km/hr. If the length of the train is 110-m, how long will it take to cross a railway platform 165-m long?***

Sol. Speed of train $= \left(132 \times \frac{5}{18}\right)$ m/sec $= \left(\frac{110}{3}\right)$ m/sec.

Distance covered in passing the platform = (110 + 165) m = 275 m.

$\therefore$ Time taken $= \left(275 \times \frac{3}{110}\right)$ sec $= \frac{15}{2}$ sec $= 7\frac{1}{2}$ sec.

Ex. 3. ***A 160-m long train crosses a 160-m long platform in 16 seconds. Find the speed of the train.*** **(R.R.B., 2009)**

Sol. Distance covered in passing the platform = (160 + 160) m = 320 m.

$\therefore$ Speed of train $= \left(\frac{320}{16}\right)\text{m/sec} = 20\text{ m/sec} = \left(20 \times \frac{18}{5}\right)\text{km/hr} = 72\text{ km/hr}.$

Ex. 4. ***A person standing on a railway platform noticed that a train took 21 seconds to completely pass through the platform which was 84 m long and it took 9 seconds in passing him. Find the speed of the train in km/hr.***

(C.P.O., 2006)

Sol. Let the length of the train be x metres.

Then, the train covers x metres in 9 seconds and $(x + 84)$ metres in 21 seconds.

So, length of the train = 63 m.

$$\text{Speed of the train} = \left(\frac{63}{9}\right)\text{m/sec} = 7\text{m/sec} = \left(7 \times \frac{18}{5}\right)\text{km/hr} = \left(\frac{126}{5}\right)\text{km/hr} = 25.2\text{ km/hr}.$$

Ex. 5. ***A train travelling with constant speed crosses a 90 m long platform in 12 seconds and a 120 m long platform in 15 seconds. Find the length of the train and its speed.*** **(P.C.S., 2009)**

Sol. Let the length of the train be x metres.

Then, $\frac{x+90}{12} = \frac{x+120}{15} \Leftrightarrow 15(x+90) = 12(x+120)$

$\Leftrightarrow 15x + 1350 = 12x + 1440$

$\Leftrightarrow 3x = 90 \Leftrightarrow x = 30.$

Speed of the train $= \left(\frac{30+90}{12}\right)\text{m/sec} = 10\text{ m/sec} = \left(10 \times \frac{18}{5}\right)\text{ km/hr} = 36\text{ km/hr}.$

Hence, lenght of train = 30 m, speed of train = 36 km/hr.

Ex. 6. ***A 150-m long train is running with a speed of 68 kmph. In what time will it pass a man who is running at 8 kmph in the same direction in which the train is going?***

Sol. Speed of the train relative to man = (68 – 8) kmph

$$= \left(60 \times \frac{5}{18}\right)\text{m/sec} = \left(\frac{50}{3}\right)\text{m/sec}.$$

Time taken by the train to cross the man

$$= \text{Time taken by it to cover 150 m at } \left(\frac{50}{3}\right)\text{m/sec} = \left(150 \times \frac{3}{50}\right)\text{sec} = 9\text{ sec}.$$

Ex. 7. ***A 220-m long train is running with a speed of 59 kmph. In what time will it pass a man who is running at 7 kmph in the direction opposite to that in which the train is going?***

Sol. Speed of the train relative to man = (59 + 7) kmph

$$= \left(66 \times \frac{5}{18}\right)\text{m/sec} = \left(\frac{55}{3}\right)\text{m/sec}.$$

Time taken by the train to cross the man

$$= \text{Time taken by it to cover 220 m at } \left(\frac{55}{3}\right)\text{m/sec} = \left(220 \times \frac{3}{55}\right)\text{sec} = 12\text{ sec}.$$

Ex. 8. ***Two trains 240 metres and 270 metres in length are running towards each other on parallel lines, one at the rate of 60 kmph and another at 48 kmph. How much time will they take to cross each other?***

(S.B.I.P.O., 2009)

Sol. Relative speed of the two trains

= (60 + 48) kmph

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

Time taken by the trains to pass each other

$$= \text{Time taken to cover (240 + 270) m at 30 m/sec} = \left(\frac{510}{3}\right)\text{sec} = 17\text{ sec}.$$

Ex. 9 ***A 300-m long train passed a man walking along the line in the same direction at the rate of 3 km/hr in 33 seconds. Find the speed of the train in km/hr.*** **(S.S.C., 2010)**

Sol. Speed of the train relative to man $= \left(\frac{300}{33}\right)\text{m/s} = \left(\frac{100}{11}\right)\text{m/sec}$

$= \left(\frac{100}{11}\times\frac{18}{5}\right)\text{km/hr} = \left(\frac{360}{11}\right)\text{km/hr}.$

Let the speed of the train be x km/hr. Then, relative speed = $(x - 3)$ km/hr.

$\therefore \quad x - 3 = \frac{360}{11} \Leftrightarrow x = \frac{360}{11} + 3 = \frac{393}{11} = 35\frac{8}{11}.$

Hence, speed of train $= 35\frac{8}{11}$ km/hr.

Ex. 10. ***Two trains 100 metres and 120 metres long are running in the same direction with speeds of 72 km/hr and 54 km/hr. In how much time will the first train cross the second?***

Sol. Relative speed of the trains = (72 – 54)km/hr = 18 km/hr $= \left(18\times\frac{5}{18}\right)\text{m/sec} = 5\text{ m/sec}.$

Time taken by the trains to pass each other

= Time taken to cover (100 + 120) m at 5 m/sec $= \left(\frac{220}{5}\right)\text{sec} = 44\text{ sec}.$

Ex. 11. ***A 100 m long train, takes $7\frac{1}{5}$ seconds to cross a man walking at the rate of 5 km/hr in the direction opposite to that of the train. What is the speed of the train?*** **(Section Officers', 2005)**

Sol. Let the speed of the train be x km/hr.

Speed of the train relative to man = $(x + 5)$ km/hr $= \left[(x+5)\times\frac{5}{18}\right]$

$\therefore \quad \frac{100}{(x+5)\times\frac{5}{18}} = \frac{36}{5} \Leftrightarrow 10x + 50 = 500 \Leftrightarrow 10x = 450 \Leftrightarrow x = 45.$

Hence, speed of the train = 45 km/hr.

Ex. 12. ***A train 100 m long travelling at 60 km/hr passes another train, twice as fast as this train and travelling in opposite direction, in 10 seconds. Find the length of the seocnd train.*** **(S.S.C., 2008)**

Sol. Relative speed = (60 + 120) km/hr $= \left(180\times\frac{5}{18}\right)\text{m/sec} = 50\text{ m/sec}.$

Let the length of the second train be x metres.

Then, $\frac{x+100}{10} = 50 \Rightarrow x + 100 = 500 \Rightarrow x = 400.$

Hence, length of second train = 400 m.

Ex. 13. ***A train running at 54 kmph takes 20 seconds to pass a platform. Next it takes 12 seconds to pass a man walking at 6 kmph in the same direction in which the train is going. Find the length of the train and the length of the platform.***

Sol. Let the length of train be x metres and the length of platform be y metres.

Speed of the train relative to man = (54 – 6) kmph = 48 kmph

$= \left(48\times\frac{5}{18}\right)\text{m/sec} = \frac{40}{3}\text{ m/sec}.$

In passing a man, the train covers its own length with relative speed.

$\therefore$ Length of train = (Relative speed × Time) $= \left(\frac{40}{3}\times 12\right)\text{m} = 160\text{ m}.$

Also, speed of the train $= \left(54\times\frac{5}{18}\right)$ m/sec = 15 m/sec.

$\therefore \quad \frac{x+y}{15} = 20 \Leftrightarrow x + y = 300 \Leftrightarrow y = (300 - 160)\text{ m} = 140\text{ m}.$

Ex. 14. ***A moving train, 66 metres long, overtakes another train 88 metres long, moving in the same direction, in 0.168 minutes. If the second train is moving at 30 km per hour, at what speed is the first train moving?***

(C.P.O., 2003)

Sol. Let the speed of the first train be x km/hr.

Then, sum of lengths of trains = (66 + 88) m = 154 m.

Relative speed of two trains = $(x - 30)$ kmph = $\left[(x-30)\times\frac{5}{18}\right]$ m/sec.

$\therefore \quad \frac{154}{(x-30)\times\frac{5}{18}} = 0.168\times 60 \Leftrightarrow 5(x-30) = \frac{154\times 18}{10.08} = 275 \Leftrightarrow x - 30 = 55 \Leftrightarrow x = 85.$

Hence, speed of the first train = 85 km/hr.

Ex. 15. ***A man sitting in a train which is travelling at 50 kmph observes that a goods train, travelling in opposite direction, takes 9 seconds to pass him. If the goods train is 280 m long, find its speed.***

Sol. Relative speed = $\left(\frac{280}{9}\right)$ m/sec = $\left(\frac{280}{9}\times\frac{18}{5}\right)$ kmph = 112 kmph.

$\therefore$ Speed of goods train = (112 – 50) kmph = 62 kmph.

EXERCISE

(OBJECTIVE TYPE QUESTIONS)

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

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

(*a*) 10.8 m/sec. (*b*) 18 m/sec.
(*c*) 30 m/sec. (*d*) 38.8 m/sec.

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. A man sitting in a train is counting the pillars of electricity. The distance between two pillars is 60 metres, and the speed of the train is 42 km/hr. In 5 hours, how many pillars will he count?

(R.R.B., 2009)

(*a*) 3501 (*b*) 3600
(*c*) 3800 (*d*) None of these

4. In what time will a train 100 metres long cross an electric pole, if its speed be144 km / hr?

(*a*) 2.5 seconds (*b*) 4.25 seconds
(*c*) 5 seconds (*d*) 12.5 seconds

5. 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

6. A 100 m long train is going at a speed of 60 km/hr. It will cross a 140 m long railway bridge in **(G.I.C., 2009)**

(*a*) 3.6 sec (*b*) 7.2 sec
(*c*) 14.4 sec (*d*) 21.6 sec

7. A 120 metre long train is running at a speed of 90 km/ hr. It will cross a railway platform 230 m long in

(S.S.C., 2005)

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

8. 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

9. 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 (*e*) None of these

10. 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

11. 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

12. 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

13. A 50-metre long train passes over a bridge at the speed of 30 km per hour. If it takes 36 seconds to cross the brige, what is the length of the bridge? **(P.C.S., 2009)**
(*a*) 200 metres (*b*) 250 metres
(*c*) 300 metres (*d*) 350 metres

14. A train takes 5 minutes to cross a telegraphic post. Then the time taken by another train whose length is just double of the first train and moving with same speed to cross a platform of its own length is **(Hotel Management, 2007)**
(*a*) 10 minutes (*b*) 15 minutes]
(*c*) 20 minutes (*d*) Data inadequate

15. 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

16. 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

17. A train running at the speed of 60 kmph crosses a 200 m long platform in 27 seconds. What is the length of the train? **(Bank Recruitment, 2009)**
(*a*) 200 metres (*b*) 240 metres
(*c*) 250 metres (*d*) 450 metres
(*e*) None of these

18. A train running at a speed of 90 km/hr crosses a platform double its length in 36 seconds. What is the length of the platform in metres? **(Bank Recruitment, 2007)**
(*a*) 200 (*b*) 300
(*c*) 450
(*d*) Cannot be determined (*e*) None of these

19. 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

20. A 280-metre long train crosses a platform thrice its length in 50 seconds. What is the speed of the train in km/hr? **(M.B.A.–C.E.T., 2008)**
(*a*) 60.48 (*b*) 64.86
(*c*) 80.64 (*d*) 82.38
(*e*) None of these

21. 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? **(M.A.T., 2008)**
(*a*) 225 m (*b*) 240 m
(*c*) 230 m (*d*) 235 m

22. 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*? **(Bank. P.O., 2010)**
(*a*) 260 metres (*b*) 300 metres
(*c*) 360 metres
(*d*) Cannot be determined (*e*) None of these

23. A train speeds past a pole in 20 seconds and speeds past a platform 100 metres in length in 30 seconds. What is the length of the train? **(Bank P.O., 2010)**
(*a*) 100 m (*b*) 150 m
(*c*) 180 m (*d*) 200 m
(*e*) None of these

24. 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

25. 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? **(S.S.C., 2007)**
(*a*) 18 sec (*b*) 24 sec
(*c*) 30 sec (*d*) 36 sec

26. A train passes a platform 90 m long in 30 seconds and a man standing on the platform in 15 seconds. The speed of the train is **(C.P.O., 2007)**
(*a*) 12.4 km/hr (*b*) 14.6 km/hr
(*c*) 18.4 km/hr (*d*) 21.6 km/hr

27. A train running at a certain speed takes 20 seconds to cross a signal post and 50 seconds to cross a bridge. Which of the following statements is correct about the length of the bridge?
(*a*) 1.5 times the length of the train
(*b*) 2.5 times the length of the train
(*c*) 30 metres more than the length of the train
(*d*) Cannot be determined

28. A train travelling with a constant speed crosses a 96-metre long platform in 12 seconds and another 141-metre long platform in 15 seconds. The length of the train and its speed are **(R.R.B., 2006)**
(*a*) 84 metres and 54 km/hr
(*b*) 64 metres and 44 km/hr
(*c*) 64 metres and 54 km/hr
(*d*) 84 metres and 60 km/hr

29. The time taken by a train 180 m long, travelling at 42 kmph, in passing a person walking in the same direction at 6 kmph, will be **(S.S.C., 2005)**

(*a*) 18 sec (*b*) 21 sec
(*c*) 24 sec (*d*) 25 sec

30. A train with 90 km/hr crosses a bridge in 36 seconds. Another train 100 metres shorter crosses the same bridge at 45 km/hr. What is the time taken by the second train to cross the bridge? **(M.A.T., 2006)**

(*a*) 61 seconds (*b*) 62 seconds
(*c*) 63 seconds (*d*) 64 seconds

31. 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

32. 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? **(M.A.T., 2002)**

(*a*) 5 sec (*b*) 6 sec
(*c*) 7 sec (*d*) 10 sec

33. Two trains 200 metres and 150 metres long are running on parallel rails in the same direction at speeds of 40 km/hr and 45 km/hr respectively. Time taken by the faster train to cross the slowed train will be **(P.C.S., 2009)**

(*a*) 72 seconds (*b*) 132 seconds
(*c*) 192 seconds (*d*) 252 seconds

34. Two trains A and B start running together from the same point in the same direction, at the speeds of 60 kmph and 72 kmph respectively. If the length of each of the trains is 240 metres, how long will it take for train B to cross train A? **(Bank P.O., 2005)**

(*a*) 1 min 12 secs (*b*) 1 min 24 secs
(*c*) 2 min 12 secs (*d*) 2 min 24 secs

35. 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 **(M.B.A., 2002)**

(*a*) 36 (*b*) 45
(*c*) 48 (*d*) 49

36. Two trains of lengths 120 m and 90 m are running with speeds of 80 km/hr and 55 km/hr respectively towards each other on parallel lines. If they are 90 m apart, after how many seconds they will cross each other? **(Hotel Management, 2010)**

(*a*) 5.6 sec. (*b*) 7.2 sec.
(*c*) 8 sec. (*d*) 9 sec.

37. Two trains are coming from opposite directions with speeds of 75 km/hr and 100 km/hr on two parallel tracks. At some moment the distance between them is 100 km. After T hours, distance between them is again 100 km. T is equal to **(I.A.M., 2007)**

(*a*) 1 hr (*b*) $1\frac{1}{7}$ hr
(*c*) $1\frac{1}{2}$ hr (*d*) 2 hrs

38. A train 125 m long passes a man, running at 5 kmph in the same direction in which the train is going, in 10 seconds. The speed of the train is: **(A.A.O. Exam., 2003)**

(*a*) 45 km / hr (*b*) 50 km / hr
(*c*) 54 km / hr (*d*) 55 km / hr

39. A train 400 m long overtook a man walking along the line in the same direction as the train, at the rate of 5 kmph and passed him in 40 seconds. The train reached the station in 20 minutes after passing the man. In what time did the man reach the station?

(*a*) 2 hr 24 min (*b*) 2 hr 30 min 40 sec
(*c*) 2 hr 36 min 48 sec (*d*) 2 hr 48 min 48 sec

40. A train, 240 m long, crosses a man walking along the line in opposite direction at the rate of 3 kmph in 10 seconds. The speed of the train is **(S.S.C., 2010)**

(*a*) 63 kmph (*b*) 75 kmph
(*c*) 83.4 kmph (*d*) 86.4 kmph

41. A train 75 m long overtook a person who was walking at the rate of 6 km/hr in the same direction and passed him in $7\frac{1}{2}$ seconds. Subsequently, it overtook a second person and passed him in $6\frac{3}{4}$ seconds. At what rate was the second person travelling? **(M.A.T., 2008)**

(*a*) 1 km/hr (*b*) 2 km/hr
(*c*) 4 km/hr (*d*) 5 km/hr

42. If a train takes 1.75 sec to cross a telegraphic post and 1.5 sec to overtake a cyclist racing along a road parallel to the track @ 10 metres per second, then the length of the train is

(*a*) 105 m (*b*) 115 m
(*c*) 125 m (*d*) 135 m

43. Two trains of equal length are running on parallel lines in the same direction at 46 km / hr and 36 km / hr. The faster train passes the slower train in 36 seconds. The length of each train is **(M.A.T., 2003)**

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

44. A 270 m 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
(*e*) None of these

45. 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 **(S.S.C., 2003)**
(*a*) 10 (*b*) 18
(*c*) 36 (*d*) 72

46. A 180-metre long train crosses another 270-metre long train running in the opposite direction in 10.8 seconds. If the speed of the first train is 60 kmph, what is the speed of the second train in kmph? **(Bank P.O., 2010)**
(*a*) 80 (*b*) 90
(*c*) 150
(*d*) Cannot be determined
(*e*) None of these

47. 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? **(S.S.C., 2004)**
(*a*) 10 (*b*) 12
(*c*) 15 (*d*) 20

48. 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 **(M.A.T., 2005, SNAP, 2010)**
(*a*) 48 km/hr (*b*) 54 km/hr
(*c*) 66 km/hr (*d*) 82 km/hr

49. A train B speeding with 120 kmph crosses another train C running in the same direction, in 2 minutes. If the lengths of the trains B and C be 100 m and 200 m respectively, what is the speed (in kmph) of the train C? **(L.I.C.A.A.O., 2007)**
(*a*) 111 km (*b*) 123 km
(*c*) 127 km (*d*) 129 km

50. One local and another express train were proceeding in the same direction on parallel tracks at 29 km/ hr and 65 km/hr respectively. The driver of the farmer noticed that it took exactly 16 seconds for the faster train to pass by him. What is the length of the faster train?
(*a*) 60 m (*b*) 120 m
(*c*) 160 m (*d*) 240 m

51. Two trains travel in opposite directions at 36 kmph and 45 kmph and a man sitting 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

52. A train overtakes two persons who are walking in the same direction in which the train is going, at the rate of 2 kmph and 4 kmph and passes them completely in 9 and 10 seconds respectively. The length of the train is :
(*a*) 45 m (*b*) 50 m
(*c*) 54 m (*d*) 72 m

53. A train overtakes two persons walking along a railway track. The first one walks at 4.5 km / hr. The other one walks at 5.4 km / hr. The train needs 8.4 and 8.5 seconds respectively to overtake them. What is the speed of the train if both the persons are walking in the same direction as the train?
(*a*) 66 km / hr (*b*) 72 km / hr
(*c*) 78 km / hr (*d*) 81 km / hr

54. Two men are running in the same direction with speeds of 6 km per hour and $7\frac{1}{2}$ km per respectively. A train running in the same direction crosses them in 5 sec and $5\frac{1}{2}$ sec respectively. The length and the speed of the train are respectively.
(*a*) 22.92 m (approximately) and 22 km per hour
(*b*) 22 m (approximately) and 22.5 km per hour
(*c*) 22.90 m (approximately) and 20.5 km per hour
(*d*) 22.92 m (approximately) and 22.5 km per hour

55. What is the speed of a train if it overtakes two persons who are walking in the same direction at the rate of a m/s and $(a + 1)$ m/s and passes them completely in b seconds and $(b + 1)$ seconds respectively? **(C.D.S., 2004)**
(*a*) $(a + b)$ m/s (*b*) $(a + b + 1)$ m/s
(*c*) $(2a + 1)$ m/s (*d*) $\frac{(2a+1)}{2}$ m/s

56. Two trains, each 100 m long, moving in opposite directions, cross each other in 8 seconds. If one is moving twice as fast the other, then the speed of the faster train is :
(*a*) 30 km / hr (*b*) 45 km / hr
(*c*) 60 km / hr (*d*) 75 km / hr

57. A 150 m long train crosses a milestone in 15 seconds and a train of same length coming from the opposite direction in 12 seconds. The speed of the othe train is **(R.R.B., 2006)**
(*a*) 36 kmph (*b*) 45 kmph
(*c*) 50 kmph (*d*) 54 kmph

58. A train moving at 15 m/sec takes 20 seconds to pass a cyclist moving in the same direction as that of the train. How much time will the train need to pass the cyclist, if the cyclist moves in a direction opposite to that of the train and if the speed of the cyclist is 5 m/sec and the length of the cycle is 1 m?

(*a*) 9.95 sec (*b*) 10 sec
(*c*) 10.05 sec (*d*) 12 sec

59. A man standing on a platform finds that a train takes 3 seconds to pass him and another train of the same length moving in the opposite direction takes 4 seconds. The time taken by the trains to pass each other will be **(C.P.O., 2006)**

(*a*) $2\frac{3}{7}$ seconds (*b*) $3\frac{3}{7}$ seconds
(*c*) $4\frac{3}{7}$ seconds (*d*) $5\frac{3}{7}$ seconds

60. A train travelling at 48 kmph completely crosses another train having half its length and travelling in opposite direction at 42 kmph, in 12 seconds. It also passes a railway platform in 45 seconds. The length of the platform is

(*a*) 400 m (*b*) 450 m
(*c*) 560 m (*d*) 600 m

61. Two trains running in opposite directions cross a man standing on the platform in 27 seconds and 17 seconds respectively and they cross each other in 23 seconds. The ratio of their speeds is :

(*a*) 1 : 3 (*b*) 3 : 2
(*c*) 3 : 4 (*d*) None of these

62. Two trains, 130 and 110 metres long, are going in the same direction. The faster train takes one minute to pass the other completely. If they are moving in opposite directions, they pass each other completely in 3 seconds. Find the speed of the faster train. **(M.A.T., 2008)**

(*a*) 38 m/sec (*b*) 42 m/sec
(*c*) 46 m/sec (*d*) 50 m/sec

63. Two identical trains A and B running in opposite directions at same speed take 2 minutes to cross each other completely. The number of bogies of A are increased from 12 to 16. How much more time would they now require to cross each other? **(SNAP, 2007)**

(*a*) 20 sec (*b*) 40 sec
(*c*) 50 sec (*d*) 60 sec

64. Two stations A and B are 110 km apart on a straight line. One train starts from A at 7 a.m. and travels towards B at 20 kmph. Another train starts from B at 8 a.m. and travels towards A at a speed of 25 kmph. At what time will they meet?

(*a*) 9 a.m. (*b*) 10 a.m.
(*c*) 10.30 a.m. (*d*) 11 a.m.

65. A train X starts from Meerut at 4 p.m. and reaches Ghaziabad at 5 p.m. while another train Y starts from Ghaziabad at 4 p.m. and reaches Meerut at 5.30 p.m. The two trains will cross each other at

(*a*) 4.36 p.m. (*b*) 4.42 p.m.
(*c*) 4.48 p.m. (*d*) 4.50 p.m.

66. The Ghaziabad-Hapur-Meerut EMU and the Meerut-Hapur-Ghaziabad EMU start at the same time from Ghaziabad and Meerut and proceed towards each other at 16 km/hr and 21 km/hr respectively. When they meet, it is found that one train has travelled 60 km more than the other. The distance between two stations is **(I.I.F.T., 2007)**

(*a*) 440 km (*b*) 444 km
(*c*) 445 km (*d*) 450 km

67. Two trains, one from Howrah to Patna and the other from Patna to Howrah, start simultaneously. After they meet, the trains reach their destinations after 9 hours and 16 hours respectively. The ratio of their speeds is :

(*a*) 2 : 3 (*b*) 4 : 3
(*c*) 6 : 7 (*d*) 9 : 16

68. Two trains start simultaneously (with uniform speeds) from two stations 270 km apart, each to the opposite station; they reach their destinations in $6\frac{1}{4}$ hours and 4 hours after they meet. The rate at which the slower train travels is **(ATMA, 2005)**

(*a*) 16 km/hr. (*b*) 24 km/hr.
(*c*) 25 km/hr. (*d*) 30 km/hr.

69. A train which is moving at an average speed of 40km/h reaches its destination on time. When its average speed reduces to 35 km/h, then it reaches its destination 15 minutes late. The distance travelled by the train, is **[CLAT Exam, 2016]**

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

70. A train takes 9 sec to cross a pole: If the speed of the train is 48 kmph, then length of the train is **[Indian Railway Group 'D' Exam, 2014]**

(*a*) 150 m (*b*) 120 m
(*c*) 90 m (*d*) 80 m

71. Two trains start at the same time form A and B and proceed toward each other at the speed of 75 km/hr and 50 km/hr respectively. when both meet at a point in between, one train was found to have travelled 175 km more than the other. Find the distance between A and B. **[SSC—CHSL (10+2) Exam, 2015]**

(a) 875 km (b) 785 km
(c) 758 km (d) 857 km

72. A train passes two bridges of lengths 500 m and 250 m in 100 seconds and 60 seconds respectively. The length of the train is **[SSC—CHSL (10+2) Exam, 2015]**

(a) 152 m (b) 125 m
(c) 250 m (d) 120 m

73. Train A passes a lamp post in 9 seconds and 700 meter long platform in 30 seconds. How much time will the same train take to cross a platform which is 800 meters long? (in seconds)

[United India Insurance Co. Ltd. (UIICL) Assistant (Online) Exam, 2015]

(a) 32 (b) 31
(c) 33 (d) 30

74. Train A travelling at 63 kmph can cross a platform 199.5 m long in 21 seconds. How much time would train A take to completely cross (from the moment they meet) train B, 157m long and travelling at 54 kmph in opposite direction which train A is travelling? (in seconds)

[IBPS—RRB Office Assistant (Online) Exam, 2015]

(a) 16 (b) 18
(c) 12 (d) 10

ANSWERS

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

SOLUTIONS

1. 108 kmph $= \left(108 \times \frac{5}{18}\right)$ m / sec $= 30$ m / sec.

2. 14 m/s sec $= \left(14 \times \frac{18}{5}\right)$ km / hr $= 50.4$ km/hr.

3. Distance covered by the train in 5 hours
$= (42 \times 5)$ km $= 210$ km $= 210000$ m.
$\therefore$ Number of pillars counted by the man
$= \left(\frac{210000}{60} + 1\right) = (3500 + 1) = 3501.$

4. Speed $= \left(144 \times \frac{5}{18}\right)$ m/sec $= 40$ m/sec.

Time taken $= \left(\frac{100}{40}\right)$ sec $= 2.5$ sec.

5. Speed $= \left(63 \times \frac{5}{18}\right)$ m/sec $= \frac{35}{2}$ m/sec.

Time taken $= \left(280 \times \frac{2}{35}\right)$ sec $= 16$ sec.

6. Speed $= \left(60 \times \frac{5}{18}\right)$ m/sec $= \frac{50}{3}$ m/sec.

Total distance covered $= (100 + 140)$ m $= 240$ m.

$\therefore$ Required time $= \left(240 \times \frac{3}{50}\right)$ sec $= \frac{72}{5}$ sec $= 14.4$ sec.

7. Speed $= \left(90 \times \frac{5}{18}\right)$ m/sec $= 25$ m/sec.

Total distance covered $= (120 + 230)$ m $= 350$ m.

$\therefore$ Required time $= \left(\frac{350}{25}\right)$ sec $= 14$ sec.

8. Total distance covered $= \left(\frac{7}{2} + \frac{1}{4}\right)$ miles $= \frac{15}{4}$ miles.

$\therefore$ Time taken $= \left(\frac{15}{4 \times 75}\right)$ hrs $= \frac{1}{20}$ hrs

$= \left(\frac{1}{20} \times 60\right)$ min. $= 3$ min.

9. Speed $= \left(60 \times \frac{5}{18}\right)$ m/sec $= \left(\frac{50}{3}\right)$ m/sec.

Length of the train = (Speed × Time) $= \left(\frac{50}{3} \times 9\right)$ m $= 150$ m.

10. Speed $= \left(\frac{132}{6}\right)$ m/sec $= \left(22 \times \frac{18}{5}\right)$ km/hr $= 79.2$ km/hr.

11. Speed $= \left(\frac{12}{10} \times 60\right)$ km/hr $= \left(72 \times \frac{5}{18}\right)$ m/sec $= 20$ m/sec.

Length of the train = (Speed × Time)
$= (20 \times 6)$ m $= 120$ m.

12. Speed $= \left(\frac{240}{24}\right)$ m/sec $= 10$ m/sec.

$\therefore$ Required time $= \left(\frac{240 + 650}{10}\right)$ sec $= 89$ sec.

13. Speed $= \left(30 \times \frac{5}{18}\right)$ m/sec $= \left(\frac{25}{3}\right)$ m/sec.

Time = 36 sec.

Let the length of the bridge be x metres.

Then, $\frac{50+x}{36}=\frac{25}{3} \Leftrightarrow 3\,(50+x)=900$

$\Leftrightarrow 50+x=300 \Leftrightarrow x=250$ m.

14. Let the length of the train be x metres.

Time taken to cover x metres = 5 min

$= (5 \times 60)$ sec = 300 sec.

Speed of the train $= \left(\frac{x}{300}\right)$ m/sec.

Length of the second train = $(2x)$ metres.

Length of the platform = $(2x)$ metres.

$\therefore$ Required time $= \left[\frac{2x+2x}{\left(\frac{x}{300}\right)}\right]\text{sec}=\left(\frac{4x\times 300}{x}\right)\text{sec}$

$= 1200 \text{ sec} = \left(\frac{1200}{60}\right)\text{min} = 20 \text{ min}.$

15. Speed $= \left(45\times\frac{5}{18}\right)\text{m/sec}=\left(\frac{25}{2}\right)\text{m/sec};$ Time = 30 sec.

Let the length of bridge be x metres.

Then, $\frac{130+x}{30}=\frac{25}{2}$

$\Leftrightarrow 2\,(130+x)=750$

$\Leftrightarrow x=245$ m.

16. Speed $= \left(78\times\frac{5}{18}\right)\text{m/sec}=\left(\frac{65}{3}\right)\text{m/sec}.$

Time = 1 minute = 60 sec.

Let the length of the tunnel be x metres.

Then, $\frac{800+x}{60}=\frac{65}{3}$

$\Leftrightarrow 3\,(800+x)=3900$

$\Leftrightarrow x=500.$

17. Speed $= \left(60\times\frac{5}{18}\right)\text{m/sec}=\left(\frac{50}{3}\right)\text{m/sec}.$

Time = 27 sec.

Let the length of the train be x metres.

Then, $\frac{x+200}{27}=\frac{50}{3} \Leftrightarrow x+200=\left(\frac{50}{3}\times 27\right)=450$

$\Leftrightarrow x=250.$

18. Let the length of the train be x metres. Then, length of the platform = $(2x)$ metres.

Speed of the train $= \left(90\times\frac{5}{18}\right)\text{m/sec}=25 \text{ m/sec}.$

$\therefore \frac{x+2x}{25}=36 \Leftrightarrow 3x=900 \Leftrightarrow x=300.$

Hence, length of platform = $2x = (2 \times 300)$ m = 600 m.

19. Speed $= \left(\frac{150+300}{40.5}\right)\text{m/sec}$

$=\left(\frac{450}{40.5}\times\frac{18}{5}\right)\text{km/hr}=40 \text{ km/hr}.$

20. Length of train = 280 m. Length of platform

$= (3 \times 280)$ m = 840 m.

$\therefore$ Speed of train $= \left(\frac{280+840}{50}\right)\text{m/sec}=\frac{1120}{50}\text{ m/sec}$

$=\left(\frac{1120}{50}\times\frac{18}{5}\right)\text{km/hr}=80.64 \text{ km/hr}.$

21. Speed $= \left(54\times\frac{5}{18}\right)\text{m/sec}=15 \text{ m/sec}.$

Length of the train = (15×20) m = 300 m.

Let the length of the platform be x metres.

Then, $\frac{x+300}{36}=15 \Leftrightarrow x+300=540 \Leftrightarrow x=240$ m.

22. Speed of train A $= \left(\frac{240}{20}\right)\text{m/sec} = 12 \text{ m/sec}.$

Let the length of train B be x metres. Then, $\frac{240+x}{12}=50$

$\Leftrightarrow 240+x=600$

$\Leftrightarrow x=360$ m.

23. Let the length of the train be x metres and its speed be y m/sec. Then, $\frac{x}{y}=20 \Rightarrow y=\frac{x}{20}.$

$\therefore \frac{x+100}{30}=\frac{x}{20} \Leftrightarrow 30x=20x+2000$

$\Leftrightarrow 10x=2000 \Leftrightarrow x=200$ m.

24. Speed $= \left(45\times\frac{5}{18}\right)\text{m/sec}=\left(\frac{25}{2}\right)\text{m/sec}.$

Let the length of the train be x metres. Then, $\frac{x+100}{\left(\frac{25}{2}\right)}$

$= 60$ or $x = 650$ m.

$\therefore$ Time taken by the train to cross an electric pole

$= \left(650\times\frac{2}{25}\right)\text{sec}=52 \text{ sec}.$

25. Speed of the train $= \left(\frac{150+500}{30}\right)\text{m/sec}=\left(\frac{65}{3}\right)\text{m/sec}.$

$\therefore$ Required time $= \left[\frac{150+370}{\left(\frac{65}{3}\right)}\right]\text{sec}=\left(520\times\frac{3}{65}\right)\text{sec}$

$= 24$ sec.

26. Let the length of the train be x metres and its speed be y m/sec.

Then, $\frac{x}{y}=15 \Rightarrow x=15y$. Now, $\frac{x+90}{30}=y$

$\Leftrightarrow 15y+90=30y \Leftrightarrow 15y=90 \Leftrightarrow y=6.$

$\therefore$ Speed = 6 m/sec $= \left(6\times\frac{18}{5}\right)\text{km/hr} = 21.6 \text{ km/hr}.$

27. Let the lengths of the train and the bridge be x metres and y metres respectively.

Let the speed of the train be z m/sec.

Then, $\frac{x}{20}=z$ ...(*i*)

and $\frac{x+y}{50} = z$ ...(*ii*)

From (*i*) and (*ii*), we have: $\frac{x}{20} = \frac{x+y}{50}$

$\Leftrightarrow 50x = 20x + 20y$

$\Leftrightarrow 30x = 20y$

$\Leftrightarrow y = \frac{3}{2} = 1.5x.$

28. Let the length of the train be x metres.

$\therefore \frac{x+96}{12} = \frac{x+141}{15}$

$\Leftrightarrow 15(x + 96) = 12(x + 141)$

$\Leftrightarrow 3x = 1692 - 1440 = 252$

$\Leftrightarrow x = 84$ m.

Speed of the train $= \left(\frac{x+96}{12}\right)\text{m/sec} = \left(\frac{84+96}{12}\right)\text{m/sec}$

$= 15$ m/sec

$= \left(15 \times \frac{18}{5}\right)\text{km/hr} = 54$ km/hr.

29. Speed of train relative to man = (42 – 6) kmph = 36 kmph

$= \left(36 \times \frac{5}{18}\right)\text{m/sec} = 10$ m/sec.

$\therefore$ Time taken to pass the man $= \left(\frac{180}{10}\right)\text{sec} = 18$ sec.

30. Let the lengths of the train and the bridge be x metres and y metres respectively.

Speed of the first train = 90 km/hr $= \left(90 \times \frac{5}{18}\right)\text{m/sec}$

$= 25$ m/sec.

Speed of the second train = 45 km/hr

$= \left(45 \times \frac{5}{18}\right)\text{m/sec} = \frac{25}{2}$ m/sec.

Then, $\frac{x+y}{36} = 25 \Leftrightarrow x + y = 900$ ...(*i*)

$\therefore$ Required time $= \left[\frac{(x-100)+y}{\left(\frac{25}{2}\right)}\right]\text{sec} = \left[\frac{(x+y)-100}{\left(\frac{25}{2}\right)}\right]$

$\text{sec} = \left(800 \times \frac{2}{25}\right)\text{sec} = 64$ sec.

31. Speed of train relative to jogger = (45 – 9) km / hr = 36 km / hr $= \left(36 \times \frac{5}{18}\right)\text{m/sec} = 10$ m/sec.

Distance to be covered = (240 + 120) m = 360 m.

$\therefore$ Time taken $= \left(\frac{360}{10}\right)\text{sec} = 36$ sec.

32. Speed of train relative to man = (60 + 6) km / hr = 66 km / hr $= \left(66 \times \frac{5}{18}\right)\text{m/sec} = \left(\frac{55}{3}\right)\text{m/sec}.$

$\therefore$ Time taken to pass the man $= \left(110 \times \frac{3}{55}\right)\text{sec} = 6$ sec.

33. Relative speed = (45 – 40) km/hr = 5 km/hr

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

Total distance covered = Sum of lengths of trains = (200 + 150) m = 350 m.

$\therefore$ Time taken $= \left(350 \times \frac{18}{25}\right)\text{sec} = 252$ sec.

34. Relative speed = (72 – 60) km/hr = 12 km/hr

$= \left(12 \times \frac{5}{18}\right)\text{m/sec} = \left(\frac{10}{3}\right)\text{m/sec}.$

Total distance covered = Sum of lengths of trains = (240 + 240) m = 480 m.

$\therefore$ Time taken $= \left(480 \times \frac{3}{10}\right)\text{sec} = 144$ sec = 2 min 24 sec.

35. Relative speed = (60 + 90) km/hr

$= \left(150 \times \frac{5}{18}\right)\text{m/sec} = \left(\frac{125}{3}\right)\text{m/sec}.$

Distance covered = (1.10 + 0.9) km = 2 km = 2000 m.

Required time $= \left(2000 \times \frac{3}{125}\right)\text{sec} = 48$ sec.

36. Relative speed = (80 + 55) km/hr = 135 km/hr

$= \left(135 \times \frac{5}{18}\right)\text{m/sec} = \left(\frac{75}{2}\right)\text{m/sec}.$

Distance covered = (120 + 90 + 90) m = 300 m.

Required time $= \left(300 \times \frac{2}{75}\right)\text{sec} = 8$ sec.

37. Relative speed = (75 + 100) km/hr = 175 km/hr.

Time taken to cover 175 km at relative speed = 1 hr.

$\therefore$ T = Time taken to cover 200 km

$= \left(\frac{1}{175} \times 200\right)\text{hr} = \frac{8}{7}\text{hr} = 1\frac{1}{7}\text{hr}$

38. Speed of the train relative to man

$= \left(\frac{125}{10}\right)\text{m/sec} = \left(\frac{25}{2}\right)\text{m/sec}$

$= \left(\frac{25}{2} \times \frac{18}{5}\right)\text{km/hr} = 45$ km/hr.

Let the speed of the train be x kmph. Then, relative speed = $(x - 5)$ kmph.

$\therefore x - 5 = 45$ or $x = 50$ kmph.

39. Speed of the train relative to man

$= \left(\frac{400}{40}\right)\text{m/sec} = 10\text{ m/sec} = \left(10 \times \frac{18}{5}\right)\text{km/hr} = 36\text{ km/hr}.$

Let the speed of the train be x kmph. Then, relative speed = $(x - 5)$ kmph.

$\therefore x - 5 = 36$ or $x = 41$ kmph.

Distance covered by the station in 20 min

$= \left(41 \times \frac{20}{60}\right)\text{km} = \frac{41}{3}\text{km}.$

Distance to be covered by the man to reach the station

$$= \left(\frac{41}{3}+\frac{400}{1000}\right)\text{km} = \left(\frac{41}{3}+\frac{2}{5}\right)\text{km} = \frac{211}{15}\text{km}.$$

$\therefore$ Required time $= \left(\frac{211}{15}\times\frac{1}{5}\times 60\right)\text{min}$

$$= \frac{844}{5}\text{min} = 168\frac{4}{5}\text{min} = 2\text{ hr }48\text{ min }48\text{ sec}.$$

40. Speed of the train relative to man $= \left(\frac{240}{10}\right)\text{m/sec} = 24$ m/sec $= \left(24\times\frac{18}{5}\right)\text{km/hr} = \frac{432}{5}\text{km/hr}.$

Let the speed of the train be x kmph. Then, relative speed $= (x + 3)$ kmph.

$\therefore x + 3 = \frac{432}{5} \Leftrightarrow x = \frac{432}{5} - 3 = \frac{417}{5} = 83.4$ kmph.

41. Speed of the train relative to first man

$$= \left(\frac{75}{7.5}\right)\text{m/sec} = 10\text{ m/sec}$$

$$= \left(10\times\frac{18}{5}\right)\text{km/hr} = 36\text{ km/hr}.$$

Let the speed of the train be x km/hr. Then, relative speed $= (x - 6)$ km/hr.

$\therefore x - 6 = 36 \Leftrightarrow x = 42$ km/hr.

Speed of the train relative to second man

$$= \left(\frac{75}{6\frac{3}{4}}\right)\text{m/sec} = \left(75\times\frac{4}{27}\right)\text{m/sec}$$

$$= \left(\frac{100}{9}\right)\text{m/sec} = \left(\frac{100}{9}\times\frac{18}{5}\right)\text{km} = 40\text{ km/hr}.$$

Let the speed of the second man be y kmph. Then, relative speed $= (42 - y)$ kmph.

$\therefore 42 - y = 40 \Leftrightarrow y = 2$ km/hr.

42. Let the length of the train be x metres and its speed be y m/sec.

Then, $\frac{x}{y} = 1.75$

$\Leftrightarrow x = 1.75\ y.$ ...(*i*)

Since the train takes less time to pass a moving object than a stationary object, it means that the cyclist is moving in a direction opposite to that of the train.

$\therefore \frac{x}{y+10} = 1.5$

$\Leftrightarrow x = 1.5\ y + 15$

$\Leftrightarrow 1.75\ y = 1.5\ y + 15$

$\Leftrightarrow 0.25\ y = 15 \Leftrightarrow y = \frac{15}{0.25} = 60.$

Length of the train $= 1.75\ y = (1.75 \times 60)$ m $= 105$ m.

43. Let the length of each train be x metres.

Then, distance covered $= 2x$ metres.

Relative speed $= (46 - 36)$ km / hr

$$= \left(10\times\frac{5}{18}\right)\text{m/sec} = \left(\frac{25}{9}\right)\text{m/sec}.$$

$\therefore \frac{2x}{36} = \frac{25}{9} \Leftrightarrow 2x = 100 \Leftrightarrow x = 50.$

44. Relative speed $= (120 + 80)$ km / hr

$$= \left(200\times\frac{5}{18}\right)\text{m/sec} = \left(\frac{500}{9}\right)\text{m/sec}.$$

Let the length of the other train be x metres.

Then, $\frac{x+270}{9} = \frac{500}{9}$

$\Leftrightarrow x + 270 = 500 \Leftrightarrow x = 230.$

45. Let the speed of each train be x m/sec. Then, relative speed of the two trains $= 2x$ m/sec.

So, $2x = \frac{(120+120)}{12} \Leftrightarrow 2x = 20 \Leftrightarrow x = 10.$

$\therefore$ Speed of each train $= 10$ m/sec

$$= \left(10\times\frac{18}{5}\right)\text{km/hr} = 36\text{ km/hr}.$$

46. Let the speed of the second train be x m/sec.

Speed of the first train $= 60$ kmph

$$= \left(60\times\frac{5}{18}\right)\text{m/sec.} = \left(\frac{50}{3}\right)\text{m/sec}.$$

Relative speed of the two trains $= \left(x + \frac{50}{3}\right)\text{m/sec}.$

$\therefore x + \frac{50}{3} = \frac{180+270}{10.8} \Leftrightarrow \frac{3x+50}{3} = \frac{4500}{108}$

$\Leftrightarrow 3x + 50 = \left(\frac{4500}{108}\times 3\right) = 125$

$\Leftrightarrow 3x = 75 \Leftrightarrow x = 25.$

Hence, speed of second train $= 25$ m/sec

$$= \left(25\times\frac{18}{5}\right)\text{kmph} = 90\text{ kmph}.$$

47. Speed of the first train $= \left(\frac{120}{10}\right)\text{m/sec} = 12\text{ m/sec}.$

Speed of the second train $= \left(\frac{120}{15}\right)\text{m/sec} = 8\text{ m/sec}.$

Relative speed $= (12 + 8)$ m / sec $= 20$ m / sec.

$\therefore$ Required time $= \frac{(120+120)}{20}\text{sec} = 12\text{ sec}.$

48. Let the speed of the second train be x km/hr.

Relative speed $= (x + 50)$ km/hr

$$= \left[(x+50)\times\frac{5}{18}\right]\text{m/sec} = \left(\frac{250+5x}{18}\right)\text{m/sec}.$$

Distance covered $= (108 + 112) = 220$ m.

$\therefore \frac{220}{\left(\frac{250+5x}{18}\right)} = 6 \Leftrightarrow 250 + 5x = 660 \Leftrightarrow x = 82$ km/hr.

49. Relative speed of the trains

$$= \left(\frac{100+200}{2\times 60}\right)\text{m/sec} = \left(\frac{5}{2}\right)\text{m/sec}.$$

Speed of train B = 120 kmph

$= \left(120 \times \frac{5}{18}\right) \text{m/sec} = \left(\frac{100}{3}\right) \text{m/sec.}$

Let the speed of second train be x m/sec.

Then, $x - \frac{100}{3} = \frac{5}{2} \Leftrightarrow x = \left(\frac{5}{2} + \frac{100}{3}\right) = \left(\frac{215}{6}\right) \text{m/sec.}$

$\therefore$ Speed of second train $= \left(\frac{215}{6} \times \frac{18}{5}\right) \text{kmph} = 129 \text{ mph.}$

50. Relative speed = (65 – 29) km/hr = 36 km/hr

$= \left(36 \times \frac{5}{18}\right) \text{m/sec} = 10 \text{ m/sec.}$

Length of faster train = (10 × 16) m = 160 m.

51. Relative speed = (36 + 45) km/hr

$= \left(81 \times \frac{5}{18}\right) \text{m/sec} = \left(\frac{45}{2}\right) \text{m/sec.}$

Length of train $= \left(\frac{45}{2} \times 8\right) \text{m} = 180 \text{ m.}$

52. 2 kmph $= \left(2 \times \frac{5}{18}\right) \text{m/sec} = \frac{5}{9} \text{m/sec}$

and $4 \text{ kmph} = \frac{10}{9} \text{ m/sec.}$

Let the length of the train be x metres and its speed be y m/sec.

Then, $\frac{x}{\left(y - \frac{5}{9}\right)} = 9$ and $\frac{x}{\left(y - \frac{10}{9}\right)} = 10.$

$\therefore 9y - 5 = x$ and $10(9y - 10) \Rightarrow 9y - x = 9x = 5$

and $90y - 9x = 100$.

On solving, we get: $x = 50$.

$\therefore$ Length of the train is 50 m.

53. $4.5 \text{ km/hr} = \left(4.5 \times \frac{5}{18}\right) \text{m/sec} = \frac{5}{4} \text{ m/sec} = 1.25 \text{ m/sec, and}$

$5.4 \text{ km/hr} = \left(5.4 \times \frac{5}{18}\right) \text{m/sec} = \frac{3}{2} \text{ m/sec} = 1.5 \text{ m/sec.}$

Let the speed of the train be x m/sec.

Then, $(x - 1.25) \times 8.4 = (x - 1.5) \times 8.5$

$\Leftrightarrow 8.4x - 10.5 = 8.5x - 12.75$

$\Leftrightarrow 0.1x = 2.25 \Leftrightarrow x = 22.5.$

$\therefore$ Speed of the train $= \left(22.5 \times \frac{18}{5}\right) \text{km/hr} = 81 \text{ km/hr.}$

54. Let the length of the train be x metres and its speed by m/sec.

Speed of first man = 6 km/hr $= \left(6 \times \frac{5}{18}\right) \text{m/sec} = \frac{5}{3} \text{ m/sec.}$

Speed of second man

$= 7\frac{1}{2} \text{ km/hr} = \left(\frac{15}{2} \times \frac{5}{18}\right) \text{m/sec} = \left(\frac{25}{12}\right) \text{m/sec.}$

Then, $\frac{x}{\left(y - \frac{5}{3}\right)} = 5$ and $\frac{x}{\left(y - \frac{25}{12}\right)} = \frac{11}{2}$

$\Leftrightarrow x = 5y - \frac{25}{3}$ and $x = \frac{11}{2}y - \frac{275}{24}$

$\Leftrightarrow 5y - \frac{25}{3} = \frac{11}{2}y - \frac{275}{24}$

$\Leftrightarrow \frac{y}{2} = \frac{275}{24} - \frac{25}{3} = \frac{75}{24} = \frac{25}{8} \Leftrightarrow y = \frac{25}{4}.$

$\therefore x = 5 \times \frac{25}{4} = \frac{25}{3} = \frac{125}{4} - \frac{25}{3} = \frac{375 - 100}{12} = \frac{275}{12}.$

Hence, length of train $= \left(\frac{275}{12}\right) \text{m} = 22.916 \text{ m.}$

Speed of train $= \left(\frac{25}{4}\right) \text{m/sec} = \left(\frac{25}{4} \times \frac{18}{5}\right) \text{km/hr}$

$= \left(\frac{45}{2}\right) \text{km/hr}$

$= 22.5 \text{ km/hr.}$

55. Let the length of the train be x metres and its speed be y m/s.

Then, $\frac{x}{y - a} = b$ and $\frac{x}{y - (a + 1)} = (b + 1)$

$\Leftrightarrow x = b(y - a)$ and $x = (b + 1)(y - a - 1)$

$\Leftrightarrow b(y - a) = (b + 1)(y - a - 1)$

$\Leftrightarrow by - ba = by - ba - b + y - a - 1$

$\Leftrightarrow y = (a + b + 1).$

56. Let the speed of the slower train be x m/sec.

Then, speed of the faster train = $2x$ m/sec.

Relative speed = $(x + 2x)$ m/sec = $3x$ m/sec.

$\therefore \frac{(100 + 100)}{8} = 3x \Leftrightarrow 24x = 200 \Leftrightarrow x = \frac{25}{3}.$

So, speed of the faster train

$= \frac{50}{3} \text{ m/sec} = \left(\frac{50}{3} \times \frac{18}{5}\right) \text{km/hr} = 60 \text{ km/hr.}$

57. Speed of first train $= \left(\frac{150}{15}\right) \text{m/sec} = 10 \text{ m/sec.}$

Let the speed of second train be x m/sec.

Relative speed = $(10 + x)$ m/sec.

$\therefore \frac{300}{10 + x} = 12 \Leftrightarrow 300 = 120 + 12x$

$\Leftrightarrow 12x = 180$

$\Leftrightarrow x = \frac{180}{12} = 15 \text{ m/sec.}$

Hence, speed of other train $= \left(15 \times \frac{18}{5}\right) \text{kmph} = 54 \text{ kmph.}$

58. Let the length of the train be x metres.

Then, distance covered in passing the cyclist = $(x + 1)$ m.

$\therefore x + 1 = (15 - 5) \times 20 = 200 \Leftrightarrow x = 199$ m.

So, required time $= \left[\frac{(x + 1)}{15 + 5}\right] \text{sec} = \left(\frac{200}{20}\right) \text{sec} = 10 \text{ sec.}$

59. Let the length of each train be x metres.

Then, speed of first train $= \left(\frac{x}{3}\right) \text{m/sec.}$ Speed of second

train $= \left(\frac{x}{4}\right)$ m/sec.

$\therefore$ Required time $= \left[\frac{x+x}{\left(\frac{x}{3}+\frac{x}{4}\right)}\right]\text{sec} = \left[\frac{2x}{\left(\frac{7x}{12}\right)}\right]\text{sec}$

$= \left(2\times\frac{12}{7}\right)\text{sec} = \frac{24}{7}\text{sec} = 3\frac{3}{7}\text{sec}.$

60. Let the length of the first train be x metres.

Then, the length of second train is $\left(\frac{x}{2}\right)$ metres.

Relative speed = (48 + 42) kmph

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

$\therefore \frac{\left(x+\frac{x}{2}\right)}{25} = 12 \text{ or } \frac{3x}{2} = 300 \text{ or } x = 200.$

$\therefore$ Length of first train = 200 m.

Let the length of platform be y metres.

Speed of the first train $= \left(48\times\frac{5}{18}\right)\text{m/sec} = \frac{40}{3}\text{ m/sec}.$

$\therefore (200+y)\times\frac{3}{40} = 45$

$\Leftrightarrow 600 + 3y = 1800 \Leftrightarrow y = 400$ m.

61. Let the speed of the two trains be x m/sec and y m/sec respectively. Then, length of the first train = $27x$ metres, and length of the second train = $17y$ metres.

$\therefore \frac{27x+17y}{x+y} = 23$

$\Leftrightarrow 27x + 17y = 23x + 23y$

$\Leftrightarrow 4x = 6y \Leftrightarrow \frac{x}{y} = \frac{3}{2}.$

62. Let the speeds of the faster and slower trains be x m/sec and y m/sec respectively.

Then, $\frac{240}{x-y} = 60 \Leftrightarrow x - y = 4$ ...(*i*)

And, $\frac{240}{x+y} = 3 \Leftrightarrow x + y = 80$ ...(*ii*)

Adding (*i*) and (*ii*), we get: $2x = 84$ or $x = 42$. Putting $x = 42$ in (*i*), we get: $y = 38$.

Hence, speed of faster train = 42 m/sec.

63. Let the length of each train be x metres and let the speed of each of them by y m/sec.

Then, $\frac{2x}{2y} = 120 \Leftrightarrow \frac{x}{y} = 120$ ...(*i*)

New length of train $A = \left(\frac{16}{12}x\right)\text{m} = \left(\frac{4x}{3}\right)\text{m}.$

$\therefore$ Time taken by trains to cross each other

$= \left(\frac{x+\frac{4x}{3}}{2y}\right)\text{sec} = \frac{7x}{6y} = \frac{7}{6}\times\frac{x}{y} = \left(\frac{7}{6}\times 120\right)\text{sec} = 140\text{ sec}.$

Hence, difference in times taken

= (140 − 120) sec = 20 sec.

64. Suppose they meet x hours after 7 a.m.

Distance covered by A in x hours = $20x$ km.

Distance covered by B in $(x - 1)$ hours = $25(x - 1)$ km.

$\therefore \quad 20x + 25(x - 1) = 110 \Leftrightarrow 45x = 135 \Leftrightarrow x = 3.$

So, they meet at 10 a.m.

65. Suppose, the distance between Meerut and Ghaziabad is x km.

Time taken by X to cover x km = 1 hour.

Time taken by Y to cover x km $= \frac{3}{2}$ hours.

$\therefore \quad$ Speed of $X = x$ kmph, Speed of Y $= \left(\frac{2x}{3}\right)$ kmph.

Let them meet y hours after 4 p.m. Then,

$xy + \frac{2xy}{3} = x \Leftrightarrow y\left(1+\frac{2}{3}\right) = 1$

$\Leftrightarrow \quad y = \frac{3}{5}\text{ hours} = \left(\frac{3}{5}\times 60\right)\text{min} = 36\text{ min}.$

So, the two trains meet at 4.36 p.m.

66. At the time of meeting, let the distance travelled by the first train be x km.

Then, distance travelled by the second train is $(x + 60)$ km.

$\therefore \frac{x}{16} = \frac{x+60}{21} \Rightarrow 21x = 16x + 960$

$\Rightarrow 5x = 960 \Rightarrow x = 192.$

Hence, distance between two stations = (192 + 192 + 60) km = 444 km.

67. Let us name the trains as A and B. Then,

(A's speed) : (B's speed) $= \sqrt{b} : \sqrt{a} = \sqrt{16} : \sqrt{9} = 4 : 3.$

68. Ratio of speeds $= \sqrt{4} : \sqrt{6\frac{1}{4}} = \sqrt{4} : \sqrt{\frac{25}{4}} = 2 : \frac{5}{2} = 4 : 5.$

Let the speeds of the two trains be $4x$ and $5x$ km/hr respectively.

Then, time taken by trains to meet each other

$= \left(\frac{270}{4x+5x}\right)\text{hr} = \left(\frac{270}{9x}\right)\text{hr} = \left(\frac{30}{x}\right)\text{hr}.$

Time taken by slower train to travel 270 km $= \left(\frac{270}{4x}\right)\text{hr}.$

$\therefore \frac{270}{4x} = \frac{30}{x} + 6\frac{1}{4} \Rightarrow \frac{270}{4x} - \frac{30}{x} = \frac{25}{4} \Rightarrow \frac{150}{4x} = \frac{25}{4}$

$\Rightarrow 100x = 600 \Rightarrow x = 6.$

Hence, speed of slower train = $4x$ = 24 km/hr.

69. Average speed of train = 40 km/h

Reach at its destination at on time

New average speed of train = 35 km/h

Time = 15 minutes = $\frac{15}{60}$ hours

Then distance travelled = $\frac{40\times35}{40-35}\times\frac{15}{60}$

$= \frac{40\times35}{5}\times\frac{15}{60} = 70$ km.

70. Time taken by train to cross a pole = 9 sec.

Distance covered in crossing a pole = length of train

Speed of train = 48 km/h

$= \left(\frac{48\times5}{18}\right)$m/sec

$= \frac{40}{3}$m/sec

$\therefore$ Length of train = speed × time = $\frac{40}{3}\times9$

= 120 m

71. Let the trains meet after t hours.

Speed of train A = 75 km/hr

Speed of train B = 50 km/hr

Distance covered by train A = $75 \times t = 75t$

Distance covered by train B = $50 \times t = 50t$

Distance = Speed × Time

According to the question,

$75t - 50t = 175$

$\Rightarrow 25t = 175$

$\Rightarrow t = \frac{175}{25} = 7$ hours

$\therefore$ Distance between A and B

$= 75t + 50t = 125t$

$= 125 \times 7 = 875$ km.

72. Let the length of train x m

Speed of train = $\frac{(\text{Length of train + length of bridge})}{\text{Time taken in crossing}}$

According to information we get

$\Rightarrow \frac{x+500}{100} = \frac{x+250}{60}$

$\Rightarrow 60\ (x + 500) = 100\ (x + 250)$

$3\ (x + 500) = 5\ (x + 250)$

$\Rightarrow 5x + 1250 = 3x + 1500$

$\Rightarrow 5x - 3x = 1500 - 1250$

$\Rightarrow 2x = 250$

$\Rightarrow x = \frac{250}{2} = 125$ m

73. Let the length of train be x m.

When a train crosses a light post in 9 second the distance covered = length of train

$\Rightarrow$ speed of train = $\frac{x}{9}$

Distance covered in crossing a 700 meter platform in 30 seconds = Length of platform + length of train

speed of train = $\frac{x+700}{9}$

$= \frac{x}{9} = \frac{x+700}{30}$ $\left[\because \text{Speed} = \frac{\text{Distance}}{\text{Time}}\right]$

$\Rightarrow \frac{x}{3} = \frac{x+700}{10}$

$\Rightarrow 10x = 3x + 2100$

$\Rightarrow 10x - 3x = 2100$

$\Rightarrow 7x = 2100$

$\Rightarrow x = \frac{2100}{7} = 300$ m

When the length of the platform be 800 m, then time 'T' be taken by train to cross 800 m long platform

$\frac{x}{9} = \frac{x+800}{T}$

$\Rightarrow Tx = 9x + 7200$

$\Rightarrow 300T = 2700 + 7200$

$\Rightarrow 300T = 9900$

$\Rightarrow T = \frac{9900}{300} = 33$ seconds

74. Speed of train A = 63 kmph = $\left(\frac{63\times5}{18}\right)$m/sec.

= 17.5 m/sec

Speed of train B = 54 kmph

$= \left(\frac{54\times5}{18}\right)$m/sec = 15 m/sec

If the length of train A be x meter, then

Speed of train A

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

$\Rightarrow 17.5 = \frac{x+199.5}{21}$

$\Rightarrow 17.5\times21 = x + 199.5$

$\Rightarrow 367.5 = x + 199.5$

$\Rightarrow x = 367.5 - 199.5$

$\Rightarrow$ 168 meters

Relative speed = (Speed of train A + speed of train B)

= (17.5 + 15) m/sec.

= 32.5 m/sec.

$\therefore$ Required time

$= \frac{\text{length of trains A + Length of train B}}{\text{Relative speed}}$

$= \left(\frac{168+157}{32.5}\right)$seconds

$= \frac{325}{32.5} = 10$ seconds.

EXERCISE

(DATA SUFFICIENCY TYPE QUESTIONS)

1. A train running at a certain speed crosses a stationary engine in 20 seconds. To find out the speed of the train, which of the following information is necessary?

(*a*) Only the length of the train

(*b*) Only the length of the engine

(*c*) Either the length of the train or the length of the engine

(*d*) Both the length of the train and the length of the engine

2. A train running at a certain speed crosses another train running in the opposite direction in 4.8 seconds. To find out the speed of the first train, which of the following information *P* and *Q* is sufficient?

P : The length of the first train

Q : The length of the second train

(*a*) Only *P* is sufficient

(*b*) Only Q is sufficient

(*c*) Either *P* or *Q* is sufficient

(*d*) Both *P* and *Q* are needed

(*e*) Both *P* and *Q* are not sufficient

Directions (*Questions 3–16*) : *Each of the questions given 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 statement(s) is/are sufficient to answer the given 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;

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

3. A train crosses a signal post in *x* seconds. What is the length of the train? **(NABARD, 2002)**

I. The train crosses a platform of 100 metres in *y* seconds.

II. The train is running at the speed of 80 km / hr.

4. What was the speed of the running train? **(Bank P.O., 2000)**

I. Length of the train was 120 metres.

II. The train crossed the other stationary train whose length was 180 m in 4 seconds.

5. What is the speed of a running train which takes 9 seconds to cross a signal post?

I. The length of the train is 90 metres.

II. The train takes 27 seconds to cross a platform of 180 metres.

6. What is the speed of the running train? **(Bank P.O., 2006)**

I. The length of the train is 180 metres.

II. The train crosses another stationary train of 120 metres length in 60 seconds.

7. What is the length of a running train?

I. The train crosses a man in 9 seconds.

II. The train crosses a 240 metre long platform in 24 seconds.

8. What is the speed of the train? **(Bank P.O., 2003)**

I. 280 metres long train crosses a signal pole in 18 seconds.

II. 280 metres long train crosses a platform in 45 seconds.

9. What was the speed of a running train *X*?

I. The relative speed of train *X* and another train *Y* running in opposite direction is 160 kmph.

II. The train *Y* crosses a signal post in 9 seconds.

10. What was the length of a running train crossing another 180 metre long train running in the opposite direction?

I. The relative speed of the two trains was 150 kmph.

II. The trains took 9 seconds to cross each other.

11. A train crosses another train running in the opposite direction in *x* seconds. What is the speed of the train? **(S.B.I.P.O., 2003)**

I. Both the trains have the same length and are running at the same speed.

II. One train crosses a pole in 5 seconds.

12. A train crosses another train running in the same direction in one minute. What is the speed of the faster train? **(R.B.I., 2003)**

I. The speed of the slower train is 80 kmph.

II. The sum of the lengths of both the trains is 300 m.

13. What is the speed of a running train?

I. The train crosses a signal post in 6 seconds.

II. The train crosses another train running in the opposite direction in 15 seconds.

14. What is the relative speed of two trains with respect to each other? **(JMET, 2007)**

I. The speed of the first train is 120% more than the speed of the second train.
II. The speed of the second train is 80 km/hr.

15. A train crosses a pole in 10 seconds. What is the length of the train? **(Bank P.O., 2003)**
I. The train crosses another train running in opposite direction with a speed of 80 km/hr in 22 seconds.
II. The speed of the train is 108 km/hr.

16. What is the speed of the train whose length is 210 metres? **(Bank P.O., 2003)**
I. The train crosses another train of 300 metres length running in opposite direction in 10 seconds.
II. The train crosses another train running in the same direction at the speed of 60 km/hr in 30 seconds.

Directions (*Questions 17 to 23*) : ***Each of the questions given below consists of a question followed by three statements. You have to study the question and the statements and decide which of the statement(s) is/are necessary to answer the question.***

17. What is the speed of the train? **(S.B.I.P.O., 2002)**
I. The train crosses a tree in 13 seconds.
II. The train crosses a platform of length 250 metres in 27 seconds.
III. The train crosses another train running in the same direction in 32 seconds.
(*a*) I and II only (*b*) II and III only
(*c*) I and III only (*d*) Any two of the three
(*e*) None of these

18. What is the speed of the train? **(M.B.A., 2002)**
I. The train crosses 300 metres long platform in 21 seconds.
II. The train crosses another stationary train of equal length in $19\frac{1}{2}$ seconds.
III. The train crosses a signal pole in $9\frac{3}{4}$ seconds.
(*a*) I and II only
(*b*) I and either II or III only
(*c*) II and either I or III only
(*d*) III and either I or II only
(*e*) None of these

19. What is the speed of the train? **(Bank P.O., 2008)**
I. The train crosses a signal pole in 18 seconds.
II. The train crosses a platform of equal length in 36 seconds.
III. Length of the train is 330 metres.
(*a*) I and II only (*b*) II and III only
(*c*) I and III only
(*d*) III and either I or II only
(*e*) Any two of the three

20. What is the length of the train *X*?
I. Train *X* crosses a telegraph post in 20 seconds
II. Train *X* crosses a platform of length 800 m in 100 seconds.
III. Train *X* passes through a tunnel 400 m long in 60 seconds.
(*a*) I and either II or III only
(*b*) II and III only
(*c*) II and either I or III only
(*d*) III and either I or II only
(*e*) Any two of the three

21. What is the speed of the train?
I. The train passes a man walking at the rate of 3 kmph in 9 seconds.
II. The train passes a man walking at the rate of 6 kmph in 10 seconds.
III. The train is moving in the same direction in which the two men are moving.
(*a*) I and III only (*b*) II and III only
(*c*) I and II only (*d*) All I, II and III
(*e*) Question cannot be answered even with information in all the three statements.

22. What is the length of the train? **(Bank P.O., 2004)**
I. The train cosses a 280 m long platform in 18 sec.
II. The train crosses a man standing on the platform in 10.5 sec.
III. Speed of the train is 96 kmph.
(*a*) I and II only (*b*) I and III only
(*c*) All I, II and III
(*d*) Any two of the three (*e*) None of these

23. What is the speed of train? **(Bank P.O. 2004)**
I. The train crosses a signal post in 20 seconds.
II. The train crosses a 260 metre long platform in 33 seconds.
III. The train crosses another stationary train of same length in 40 seconds.
(*a*) Only I and II
(*b*) Any two of the three
(*c*) All I, II and III
(*d*) II and either I or III
(*e*) Even with all three statements answer cannot be given.

Directions (*Questions 24–26*): *Each of these questions is followed by three statements. You have to study the question and all the three statements given to decide whether any information provided in the statement(s) is redundant and can be dispensed with while answering the given question.*

24. How much time will the train A take to cross another train B running in opposite direction?
I. Train A crosses a signal pole in 6 seconds.
II. Ratio of the speeds of trains A and B is 3 : 2.

III. Length of the two trains together is 500 metres.

(*a*) I only (*b*) II only

(*c*) III only (*d*) I or II only

(*e*) Question cannot be answered even with the information in all the three statements.

25. What is the length of a running train *P* crossing another running train *Q*?

I. These two trains take 18 seconds to cross each other.

II. These trains are running in opposite directions.

III. The length of train Q is 180 metres.

(*a*) I only (*b*) II only

(*c*) III only

(*d*) All I, II and III are required

(*e*) Even with I, II and III, the answer cannot be obtained.

26. At what time will the train reach city *X* from city *Y*?

I. The train crosses another train of equal length of 200 metres and running in opposite direction in 15 seconds.

II. The train leaves city *Y* at 7.15 a.m. for city *X* situated at a distance of 558 km.

III. The 200 metre long train crosses a signal pole in 10 seconds.

(*a*) I only (*b*) II only

(*c*) III only (*d*) I or III only

(*e*) All I, II and III are required

ANSWERS

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

SOLUTIONS

1. Time taken by the train to cross a stationary engine

$$= \frac{\text{(Length of train + Length of engine)}}{\text{(Speed of the train)}}$$

$$\Rightarrow \frac{\text{(Length of train + Length of engine)}}{\text{(Speed of the train)}} = 20 \text{ (given)}$$

Hence, to find the speed of the train, the length of the train and the length of the engine both must be known.

$\therefore$ The correct answer is (*d*).

2. Let two trains of lengths *a* and *b* metres be moving in opposite directions at *u* m / s and *v* m / s.

Time taken by the trains to cross each other $= \frac{(a+b)}{(u+v)}$ sec.

$\therefore \frac{a+b}{u+v} = 4.8.$

In order to find *u*, we must know *a*, *b* and *v*, *i.e.*, length of first train, length of second train and the speed of the second train.

Thus, *P* and *Q* are not sufficient. $\therefore$ The correct answer is (*e*).

3. Let the length of the train be *l* metres.

Time taken to cross a signal post

$$= \frac{\text{Length of the train}}{\text{Speed of the train}} \Rightarrow x = \frac{l}{\text{Speed.}} \quad ...(i)$$

Time taken to cross the platform

$$= \frac{(l+100)}{\text{Speed}} \Rightarrow y = \frac{l+100}{\text{Speed}} \quad ...(ii)$$

Thus, from (*i*) and (*ii*), we can find *l*.

Also, II gives, speed $= \left(80 \times \frac{5}{18}\right) \text{m/s} = \frac{200}{9} \text{ m/s.}$

Thus, the data in I or II alone are sufficient to answer the question.

$\therefore$ The correct answer is (*c*).

4. Speed of the first train

$$= \frac{\text{(sum of the lengths of the two trains)}}{\text{Time taken}}$$

$$= \frac{(120+180)}{4} \text{ m/s} = 75 \text{ m/s.}$$

So, both the statements are necessary to get the answer.

$\therefore$ The correct answer is (*e*).

5. Speed of the train $= \frac{\text{Length of the train}}{\text{Time taken to cross the post}}$

$$= \frac{90}{9} \text{ m/s} = 10 \text{ m/s.}$$

Thus, I alone gives the answer.

Time taken to cross a platform

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

$\Rightarrow$ Speed $= \frac{(l+180)}{27}$.

But, *l* is not given. So, speed cannot be obtained.

So, II alone does not give the answer.

$\therefore$ The correct answer is (*a*).

6. Speed of the running train

$$= \frac{\text{Sum of the lengths of two trains}}{\text{Time taken to cross stationary train}}$$

$$= \frac{(180+120)}{60}\text{ m/s} = 5\text{ m/s}.$$

So, both the statements are necessary to get the answer.

$\therefore$ The correct answer is (*e*).

7. Time taken by train to cross a man

$$= \frac{\text{Length of train}}{\text{Speed of train}} \Rightarrow \text{Speed} = \frac{l}{9} \quad ...(i)$$

Time taken by train to cross a platform

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

$$\Rightarrow \text{Speed} = \frac{l+240}{24} \quad ...(ii)$$

From (*i*) and (*ii*), we get $\frac{l}{9} = \frac{l+240}{24}$.

Thus, l can be obtained. So both I and II are necessary to get the answer.

$\therefore$ The correct answer is (*e*).

8. Speed $= \frac{\text{Length of the train}}{\text{Time taken to cross the pole}} = \frac{280}{18}\text{ m/s}$

$$= \frac{140}{9}\text{ m/s}.$$

$\therefore$ *I* alone gives the answer.

$$\Rightarrow \text{Speed} = \frac{(280+p)}{45}\text{ m/s}.$$

But, p = length of platform, is not given.

$\therefore$ II is not sufficient to give the answer.

$\therefore$ The correct answer is (*a*).

9. Let the two trains of length a metres and b metres be moving in opposite directions at u m / s and v m / s. Then,

I gives, $u + v = 160$. II gives, $v = \frac{b}{9}$.

From these equations, we cannot obtain u.

$\therefore$ The correct answer is (*d*).

10. Let the two trains of length a metres and b metres be moving in opposite directions at u m / s and v m / s.

Time taken to cross each other $= \frac{(a+b)}{(u+v)}\text{ sec}.$

Now, $b = 180$, $u + v = \left(150 \times \frac{5}{18}\right)\text{m/sec} = \frac{125}{3}\text{ m/sec}$

$$\Rightarrow 9 = \frac{a+180}{(125/3)} \Rightarrow a = (375 - 180) = 195\text{ m}.$$

Thus, both I and II are necessary to get the answer.

$\therefore$ The correct answer is (*e*).

11. Let the two trains of length a metres and b metres be moving in opposite directions at u m / s and v m / s.

Time taken to cross each other

$$= \frac{(a+b)}{(u+v)}\text{ m/sec} \Rightarrow x = \frac{(a+a)}{(u+u)} = \frac{a}{u}. \quad ...(i)$$

Time taken to cross the pole

$$= \frac{\text{Length of the train}}{\text{Speed of the train}} = \frac{a}{u} \Rightarrow \frac{a}{u} = 5 \quad ...(ii)$$

From (*i*) and (*ii*) also, we cannot find u.

$\therefore$ The correct answer is (*d*).

12. Let the speed of the faster train be x m/sec.

Speed of slower train = 80 kmph

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

Time taken by the trains to cross each other

$$= \frac{\text{Sum of the lengths of trains}}{\text{Relative speed}}$$

$$\Rightarrow \frac{300}{x - \frac{200}{9}} = 60.$$

Thus, the value of x can be determined. So, both I and II together give the answer.

$\therefore$ The correct answer is (*e*).

13. Since the lengths of the trains are not given, it is not possible to determine the speed of the train from both I and II together.

$\therefore$ The correct answer is (*d*).

14. Speed of second train = 80 km/hr.

Speed of first train = (80 + 120% of 80) km/hr = 176 km/hr.

I and II give us the speeds of both the trains but to find the relative speed, we need to know whether the trains are moving in same or opposite directions, which is not given.

Thus, even both I and II together do not give the answer.

$\therefore$ The correct answer is (*d*).

15. Time taken to cross a pole

$$= \frac{\text{Length of train}}{\text{Speed of train}} \Rightarrow 10 = \frac{\text{Length of train}}{\left(108 \times \frac{5}{18}\right)}$$

$\Rightarrow$ Length of the train = 300 m.

Clearly, II is sufficient to get the answer. Also, I is not sufficient to get the answer.

$\therefore$ The correct answer is (*b*).

16. Time taken to cross the train, running in opposite directions $= \frac{(l_1 + l_2)}{(u+v)}\text{ sec}.$

$$\Rightarrow 10 = \frac{(210+300)}{(u+v)} \Rightarrow u + v = 51.$$

Time taken to cross the train, running in same direction

$$= \frac{(l_1 + l_2)}{(u-v)}\text{ sec}.$$

$$\Rightarrow 30 = \frac{(210+300)}{\left(u - 60 \times \frac{5}{18}\right)} \Rightarrow u = \left(17 + \frac{50}{3}\right)\text{m/sec}.$$

Thus, u and v can be obtained.

$\therefore$ Correct answer is (*e*).

17. Let the speed of the train be x metres / sec.

Time taken to cross a tree $= \dfrac{\text{Length of the train}}{\text{Speed of the train}}$.

Time taken to cross a platform

$$= \frac{(\text{Length of train} + \text{Length of platform})}{\text{Speed of the train}} \quad ...(ii)$$

I gives, $13 = \dfrac{1}{x} \Rightarrow l = 13x$.

II gives, 27

$$= \frac{l + 250}{x} \Rightarrow \frac{13x + 250}{x} = 24$$

$$\Rightarrow x = \frac{125}{7} \text{ m/sec.}$$

Thus I and II give the speed of the train.

$\therefore$ The correct answer is (a).

18. Let the speed of the train be x m / sec.

Time taken to cross a platform

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

Time taken by the train to cross a stationary train

$$= \frac{(\text{Sum of the lengths of the trains})}{\text{Speed of moving train}}$$

Time taken to cross a signal pole $= \dfrac{\text{Length of train}}{\text{Speed of train}}$

I gives, $21 = \dfrac{(l + 300)}{x}$; **II** gives, $\dfrac{39}{2} = \dfrac{2l}{x}$; **III** gives, $\dfrac{39}{4} = \dfrac{l}{x}$.

Thus, (I and II) or (I and III) give x.

$\therefore$ Correct answer is (b).

19. Let the speed of the train be x m / sec.

Time taken to cross a signal pole $= \dfrac{\text{Length of train}}{\text{Speed of train}}$.

Time taken to cross a platform

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

Length of train = 330 m.

I and III give, $18 = \dfrac{330}{x} \Rightarrow x = \dfrac{330}{18} \text{ m/s} = \dfrac{55}{3} \text{ m/s}.$

II and III give, $36 = \dfrac{2 \times 330}{x} \Rightarrow x = \dfrac{660}{36} \text{ m/s} = \dfrac{55}{3} \text{ m/s}.$

$\therefore$ Correct answer is (d).

20. Time taken to cross a pole

$$= \frac{\text{Length of train}}{\text{Its speed}} \Rightarrow 20 = \frac{l}{\text{speed}}$$

$$\Rightarrow \text{speed} = \frac{l}{20} \quad ...(i)$$

Time taken to cross a platform $= \dfrac{(l + 800)}{\text{speed}}$

$$\Rightarrow 100 = \frac{(l + 800)}{\text{speed}} \Rightarrow \text{speed} = \frac{(l + 800)}{100} \quad ...(ii)$$

Time taken to pass through a tunnel $= \dfrac{(l + 400)}{60}$

$$\Rightarrow 60 = \frac{(l + 400)}{\text{speed}} \Rightarrow \text{speed} = \frac{(l + 400)}{60} \quad ...(iii)$$

Equating any two out of three will give us l.

$\therefore$ Correct answer is (e).

21. Let the speed of the train be x m / sec.

III gives that the men are moving in the same direction.

I gives, time taken to pass a man

$$= \frac{l}{\left(x - 3 \times \frac{5}{18}\right)} = \left(\frac{6l}{6x - 5}\right) \text{sec.}$$

$$\therefore \quad \frac{6l}{6x - 5} = 9 \Rightarrow 54x - 6l = 45$$

$$\Rightarrow 18x - 2l = 15 \quad ...(i)$$

II gives, time taken to pass another man

$$= \frac{l}{\left(x - 6 \times \frac{5}{18}\right)} \text{sec} = \frac{3l}{(3x - 5)} \text{ sec.}$$

$$\therefore \quad \frac{3l}{(3x - 5)} = 10 \Rightarrow 30x - 3l = 50 \quad ...(ii)$$

On solving (i) and (ii), we get : $x = \dfrac{55}{6} \text{ m/sec.}$

Thus, all I, II, III are needed to get the answer.

$\therefore$ (d) is correct.

22. Let the length of the train be x metres and its speed be y m/sec.

From I, we have : $\dfrac{x + 280}{y} = 18$ ...(i) From II, we have:

$\dfrac{x}{y} = 10.5$ ...(ii)

From III, we have: $y = 96$ kmph

$$= \left(96 \times \frac{5}{18}\right) \text{m/sec} = \frac{80}{3} \text{ m/sec} \quad ...(iii)$$

Clearly, the value of x can be found by solving any two equations out of (i), (ii) and (iii) simulaneously.

So, any two of the three give the answer.

$\therefore$ The correct answer is (d).

23. Let the length of the train be x metres and its speed be y m/sec.

From I, we have: $\dfrac{x}{y} = 20$ ...(i)

From II, we have: $y = \dfrac{x + 260}{33}$ ...(ii)

From III, we have: $y = \dfrac{2x}{40}$ or $\dfrac{x}{y} = 20$ ...(iii)

Thus, the value of y can be found by solving (ii) with either (i) or (iii) simultaneously.

$\therefore$ II and either I or III together give the answer.

Hence, the correct answer is (d).

24. **II.** Let the speeds of A and B be $3x$ m / sec and $2x$ m / sec.

I. Length of train $A = (3x \times 6)$ m $= 18x$ metres.

III. Length of train B $= (500 - 18x)$ m.

Relative speed $= (3x + 2x)$ m / sec $= 5x$ m / sec.

Time taken A to cross $B = \dfrac{\text{Sum of their lengths}}{\text{Relative speed}} = \dfrac{500}{5x}$ sec.

Thus, even with the information in all the three statements, question cannot be answered.

$\therefore$ Correct answer is (*e*).

25. Let the length of train P be x metres.

II. These trains are running in opposite directions.

III. Length of train Q is 180 m.

I. Time taken by P to cross Q $= \dfrac{(180 + x)}{\text{Relative speed}}$

$\Rightarrow 18 = \dfrac{(180 + x)}{\text{Relative speed}}$.

Thus, even with I, II and III, the answer cannot be obtained.

$\therefore$ Correct answer is (*e*).

26. III. gives, speed

$$= \frac{200}{10}\text{ m/s} = 20\text{ m/s}$$

$$= \left(20 \times \frac{18}{5}\right)\text{km/hr} = 72\text{ km/hr.}$$

II. gives, time taken

$$= \left(\frac{558}{72}\right)\text{hrs} = \frac{31}{4}\text{ hrs} = 7\frac{3}{4}\text{ hrs} = 7\text{ hrs }45\text{ min.}$$

So, the train will reach city X at 3 p.m.

Hence, I is redundant.

$\therefore$ Correct answer is (*a*).