8. TIME, SPEED AND DISTANCE

Solutions Exercise – Easy

1. (b) :

|  |  |  |  |
| --- | --- | --- | --- |
|  | Ram |  | Lakhan |
| Speed | 40 | : | 60 |
|  | 2 | : | 3 |
|  Time | 3 | : | 2 |

**Alternate Method:**

Time taken =  = 3 : 2

2. (d) : Ratio of speeds = 2 : 3 : 4

 Ratio of times = 

3. (a) : We are given:

Total distance = *d*1 + *d*2 = 170 km

Total time = *t*1 + *t*2 = 2 hours

*S*1 = 100 km/hr2

*S*2 = 50 km/hr

Now we have:

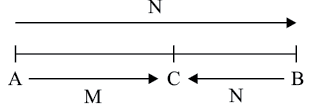
*t*1 + *t*2 =   

(Assume *y* = distance covered at 100 km/hr )

Solving we get *y* = 140.

Hence, Rajat travelled 140 km at the speed of 100 km/hr.

4. (d) : When *N* meets *M* at *C*, *N* has walked the distance *AB* + *BC* and *M* has walked the distance *AC*. Let us represent it in a diagram.



So, both *M* and *N* have walked together a distance = 2 × *AB* = 2 × 39 = 78 km

The ratio of the speeds of *M* and *N* is 3 : 3.5 *i.e*. 6/7 .

Hence, the distance travelled by *M = AC*



Hence , the required distance form *A* to *C* is 36 km.

5. (c) : Since, Taran now walks at 5/7 of his usual speed, so he will take 7/5 of his usual time.

 extra time =× usual time = 8 minutes

 × usual time = 8

 usual time = = 20 minutes

Hence, usually Taran takes 20 minutes to reach his school.

6. (c) : Let '*t*' be the time required to reach on time, then

= 

4*t* + 16 = 5*t* − 10

 *t* = 26 min.

So, it takes (26 + 4) min. at 20 kmph.

 Distance Total = Speed × Time

= 

**Alternate Method:**

Increase in speed = 5 km/hr

Decrease in time = 6 min. (4 + 2)

By product constancy:

|  |  |  |
| --- | --- | --- |
| **Speed** | **Time** |  |
|  |  | = 6 minutes |

It means original time = 30 min.



 Total distance = Original speed × Original time

= 

7. (d) : Let the normal speed of *x* km/hr, then



 *x*2 + 4*x* − 320 = 0

 *x*(*x* + 20) − 16 (*x* + 20) = 0

(*x* + 20)(*x* − 16) = 0

*x* = 16 km/hr

 (*x* + 4) = 20 km/hr

Therefore increased speed = 20 km/hr

8. (b) : We have

*S* × 8 = (*S* + 5) ×

(*A* + (*S* + 5) time is 6 + )

 24 *S* = (*S* + 5) × 20

 24 *S* − 20 *S* = 100

 *S* = = 25 km/hr

Hence, the slower speed of the car is 25 km/hr.

9. (c) : Since distance (*D*) is constant.

Therefore, *D* = *S*1 × *t*1 = *S*2 × *t*2

*i.e*. 

= 

 *t* = 5 hours

 Distance = *t*1 × *S*1

= 5 × 24 = 120 km

10. (b) : To meet each other they will take equal time since they start their journey simultaneously.

11. (c) : To reach their destination the time taken by *A* and *B* is equal to the ratio of reciprocal to their speeds. Since when distance is constant time is inversely proportional to the respective speeds.

Hence, time taken by *A* and *B* = = 25 : 16

12. (c) : Using the formula,



we get,





=  = 63.94 km/hr.

Hence, the average speed of the car during the whole journey is approx. 64 km/hr.

13. (b) : Here distance and speed are known, therefore we use the relation, average speed = 

Thus , we have average speed

= 

= 

= 

Hence, the required average speed is  km/hr.

14. (b) : Here, distance and time are known, therefore average speed = 

Hence, required average speed of the car is 50 km/hr.

15. (a) : Distance between *A* and *B* = 120 × 3 = 360 km

Let the speed of *Q* be *SQ*, then

Time = 

2 = 

*SQ* = 60 km/hr

Here, *P* and *Q* are moving towards each other. So, the relative speed will be the sum of the speeds of *P* and *Q* both.

Therefore, ratio of speeds of *P* : *Q* = 2 : 1

16. (c) : Distance = 3 × 150 = 450 km

Time = 

5 =  *SR* → Speed of Rita

 *SR* = 60 km/hr

17. (b) : 

Speed of car starting from *A* = *x* kmph

Speed of car starting from *B* = *y* kmph

**Case I:**

When cars meet at *P*,

7*x = AP = AB + BP* = 70 + 7*y*

 7*x* = 7*y* = 70

 *x − y* = 10 ..... (1)

**Case II:**

When cars meet at *Q*,

*x + y* = 70 ..... (2)

On adding these equations,

*x* = 40 kmph

Putting the value of *x* in equation (1),

*y* = 40 − 10 = 30 kmph

18. (d) : Distance covered by *A* in 4 hours = 4 × 4 = 16 km

Relative speed of *B* with respect to *A* = 10 − 4 = 6 km/hr

 Time taken to catch *A*

= 

 Required distance = 

19. (c) : Speed of the train *St* = 54 km/hr

= m/s

Let '*L'* be the length of the platform in metres.

Using the basic formula

= 

A train passes a platform in 35 seconds and a man in 20 seconds.

 *Lt* = *St* × 20

= 15 × 20 = 300 m

Now, 35 = 

525 = 300 + *L*

 *L* = 225 m

20. (b) : Let *Lt* and *St* be the length and the speed of the train. Using the basic formula



*St* = 

Also, *St* = 

Using both,

 *Lt* = 150 m

*St* = 

= *St* =  = 15 m/s

Hence, speed of the train is 15 m/sec.

 *Lt* = 15 × 10 = 150 m

Hence, length of the train is 150 m.

21. (a) : Distance = Length of train = Speed of train × Time

150 = Speed × 15

 Speed = 10 m/s

Speed = 

22. (b) : Length of train = Time × Relative speed

= 7.5 × (10 + 20) = 7.5 × 30 = 225 m

23. (c) : (Length of train + Length of bridge)

= Speed of train × Time

(250 + 150) = 40 × Speed

Speed =  = 10 m/s = 36 km/hr

24. (d) : Speed of first train = 36 km/hr = 10 m/s

Now, Time = 

10 = 

 *x* = 20 m/s = 72 km/hr

25. (b) : Time = 

20 = 

 *x* = 100 m

**Note:** Relative speed = (72 − 27) = 45 ,s

= 

26. (c) : Distance travelled by train in 4 hours = 45 × 4 = 180 km

Number of telegraph pole = 

27. (c) : Let the length of the train = *x* metre

When a train crosses a platform the distance covered = Length of (train + Platform)

According to the question,

Speed of train = 

 25*x* = 10*x* + 3000

 15*x* = 3000

 *x* = 

 Length of train = 200 metre

Speed of train = = 20 m/sec.

 Time taken in crossing a 200 m long platform

= 

28. (b) : Speed of man in still water = 

= 

29. (a) : Upstream speed =  = 5 km/hr

Downstream speed =  = 7 km/hr

Speed in still water =  = 6 km/hr.

30. (d) : 

31. (b) : Let *x* be upstream speed, then the downstream speed will be (*x* + 3).

 

 *x*2 + *x* − 3 = 0

 



 (*x* + 3) = 4.3 km/hr

32. (a) : Speed of water current

= 

33. (b) : Upstream speed of first boat = 16 km/hr

Upstream speed of second boat = 8 km/hr

 Relative speed = 8 km/hr (16 − 8)

 Required time =  = 2.5 hr

34. (d) :    

*DT* and *UT* are the downstream and upstream times and *SD* and *SU* are the downstream and upstream speeds. Here we can use componendoand dividendo.

  



 Speed of stream = 6 km/hr

35. (b) : Distance travelled = 

 Speed =  = 314.29 ≈ 314 m/min.

36. (c) : Time = 

= = 60 s

Actually *A* (faster one) has to make a lead of 600 m because when *A* will be 600 m ahead (or extra distance) of *B*, they will be together again as a person when completes the total length (or circumference) it starts retracing the same path and thus *A* and *B* can be together again.

Since, they make a difference (or *A* makes a lead) of 10 m in 1 second. So, he will create 600 m difference in 60 second.

37. (b) : Time = 

=  = 12 s (30 + 20 = 50)

38. (b) : Time taken by *A* to complete one round

=  = 20 s

= = 30 s

Hence, after every 20 seconds, *A* would be at the starting point and after every 30 second, *B* would be at the starting point. Thus the time taken by both to be at the starting point again for the first time = LCM of 20 and 30 = 60 s

Thus, every 60 seconds they would be together at the starting point.

39.

I. (a)

*C* meets *A* after every =  = 40 s

*C* meets *B* after =  = 60 s

Therefore, all of the three would meet after every 120 seconds. *i.e*.

LCM of 40 and 60.

Hence, they would all meet for the first time after 120 seconds.

II. (c)

*A* takes  = 24 s to complete one round

*B* takes  = 20 s to complete one round

*C* takes  = 15 s to complete one round

LCM of 24, 20 and 15.

Hence, they would meet for the first time at the starting point after 120 seconds.

40. (a) : To meet for the second time they have to cover = 300 + 600 = 900 m

Their relative speed = 30 + 20 = 50 m/s (since direction is opposite)

 Time taken to meet for the second time =  = 18 s

41. (d) : Time takne to complete a revolution:

*A*  

*B*  

*C*  

Required time

= LCM of 3, 4 and 8 hours

= 24 hours

42. (d) : Between 5 a.m. and 7 a.m. (5 p.m. and 7 p.m.) this happens only once. Leaving the 2 hours between 5 and 7, they make 180° once every hour. That is way they make 180° angle only 11 times in 12 hours. So, 22 times in a day.

43. (d) : Since between 2 − 4 O'clock and 8 − 10 O'clock two hands of a clock make 90° angle only 3 times while in rest of the hours two hands make 90° angle 2 times every one hour.

Hence, they meet 22 times in 12 hours and 44 times in 24 hours.

44. (c) : At exactly 1 O'clock, the hour hand makes 30° with the vertical.

In 30 minutes, minute hand travels 6° × 30 = 180°

In the same time, hour hand travels ° × 30 = 15°

 The angle between the two hands = 180° − (30° + 15°) = 135°

45. (c) : At exactly 9 O'clock, the hour hand makes 90° with the vertical.

In 20 minutes, minute hand travels 6° × 20 = 120°

In the same time, hour hand travels ° × 20 = 10°

 The angle between the two hands = 120° + (90° − 10°) = 200° or 160°.

46. (d) : At 3 O'clock, the minute hand is travels 3 × 30° = 90° behind the hour hand.

In the relative speed between the two hands is 

 The time is takes to travel 90° = 

= minutes after 3.

*i.e*. they will coincide at 3:16:22.

47. (d) : Time required to make 40° angle after 4 =

= 

= 



 Time is 4:14:32.

48. (a) : At 8 O'clock, the angle between the two hands is 360° − (4 × 30°) = 240°

The time taken to cover 240° is 

= 

The time they will meet is 8:43:38

49. (b) : Time to cover 5 km



In this, first 25 min. of walking will have four rest periods between them.

Hence, Riya will take 50 minutes to cover a distance of 5 km.

(4 rest period will account for 4 5 = 20 min.)

50. (c) : Let the speed of Ravi be *x* kmph.

 Ajay's speed = (*x* + 4) kmph

Distance covered by Ajay = 60 + 12 = 72 km

Distance covered by Ravi = 60 − 12 = 48 km

According to the question,



 

 3*x* = 2*x* + 8

 *x* = 8 kmph

Solutions Exercise – Medium

1. (a) : Speed difference, = *S*2 – *S*1 = 15 km/hr

Total time = *t*1 + *t*2 = 11 hours

First part of journey = *d*1 = 100 km

Second part of journey = *d*2 = 280 km

Assume that *t*2 = *q*, therefore, *t*1 = 11 − *q*

Now we have:

*S*2 − *S*1 = 

= 

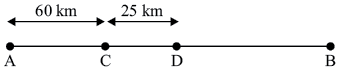
 

Solving we get *q* = 7 .

Hence, Archit took 7 hours to travel 280 km.

2. (b) : By travelling at 3/4 of his original speed, Ruchika would take 4/3 of the original time required to cover the distance. Thus, Ruchika takes 1/3 of original time more.

Let us represent the given information through a diagram.



When the accident takes place at *C*, then after the accident, distance covered = *CB*

As per question, *CB* – *DB* (25 km) = *CD* and 1/3 of usual time to cover *CD* = 10 minutes (because Ruchika reaches 10 minutes sooner for not covering *CD* in second case).

Thus, usual time to cover *CD* = 10 × 3 = 30 minutes.

In 30 minutes, Ruchika covers *CD* = 25 km

 Speed km/hr

Now, 1/3 of usual time to cover *CB* = 40 minutes.

 Usual time to cover *CB* = 40 × 3 = 120 minutes = 2 hours

 Distance *CB* = Speed × time = 50 × 2 = 100 km.

Total distance, *AB* = *AC* + *CB* = 60 + 100 = 160 km.

Hence, required speed = 50 km /hr

Distance= 160 km

3. (c) : When speed goes down to three fourth (*i.e*., 75%), time will go up to 4/3rd (*i.e*., 133.33%) of the original time. Since, the extra time required is 16 minutes, it should be equated to 1/3rd of the normal time. Hence, the usual time required will be 48 minutes.

**Alternate Method:**

Since distance is constant.

Let *t* = usual time taken, *s* = usual speed

= 

3*t* + 48 = 4*t*

 *t* = 48 min.

4. (a) : Speed of Ramesh = 3*x*

Speed of Suresh = 4*x*

Let the distance = *D*



 

 *D* = 6*x*

Time of Ramesh = 

Time of Suresh = 

5. (a) : Let '*t*' & '*s*' be the usual time speed.

Then, 

 *t* = 60 min.

Hence, when he walks at  of usual speed .

 *tn* = 48 min.

Therefore he will be 15 + 12 = 27 minutes early in comparison to the previous day.

6. (d) : Let the original speed be *s* km/hr and scheduled time = *t* hours.

and total distance = *D* km

then *s* × *t* =  ..... (1)

and *s* × (*t* + 3) = *D*  ..... (2)

From equation (1) and (2), we get,

  *t* = 9 h

and let *s* = 1 km/hr, then *D* = 12 km

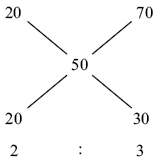
Again, since he doubles his speed after *k* hours then,

*s*1 *t*1 + *s*2 *t*2 = *D*

1 × *k* + 2 × (9 − *k*) = 12

 *k* = 6 h

7. (a) : By alligation rule



Ratio of time = 2 : 3

 Ratio of distance = 2 × 20 : 3 × 70 = 4 : 21

**Alternate Method:**

= 

 

 42*x* = 8*y*  

8. (b) : Distance (*D*) = Speed (*S*) × Time (*T*)

 *D* = 4 × 

 *D* = 4*T* + 1 ..... (1)

and *D* = 6

D = 6*T* − 1 ..... (2)

Solving equation (1) and (2),

*T* = 1 h

*D* = 4 × 1 + 1 = 5 km

9. (a) : Let the speed of Scooty be *x* km/hr.

time taken by Scooty (*t*) =  ..... (1)

Time taken by Auto

 ..... (2)

From equation (1) and (2),



 

 *x*(*x* + 10) = 2000

 *x* = 40 km/hr

10. (b) : Let the original time = *T* h

Let the original speed = *x* km/hr

  = *T* ..... (1)

and  ..... (2)

Solving equation (1) and (2),

*x*(*x* + 250) = 750 × 1000

Speed of plane = *x* = 250 − 1000

 *x* = 750 km/hr

11. (c) : Time taken by moter cyclist = 



Time taken by car = 6 − (2.5 + 0.5) = 3 h

Ratio of the speeds of motor cycle : car

= 3 : 6 = 1 : 2

12. (c) : Let the distance travelled at the speed of 50 km/hr be *x* km and (170 − *x*) km at the speed of 100 km/hr.

Then, 

 2*x* + 170 − *x* = 200

 *x* = 30 km

13. (c) : Let he walked for *x* hours,

5*x* + 25 (10 − *x*) = 17 × 10

*x* = 4

10 − *x* = 6 hours travelled by auto.

Hence, distance travelled by auto = 25 × 6 = 150 km.

14. (a) : Since, the distance to be covered is constant, we have;

Stoppage time/hour = 

hours

 hour = 15 minutes

Hence, Shyam stops 15 minutes per hours.

**Alternate Method:**

Without stoppages, Shyam can cover 60 km at 80 km/h in = 

So, he stops 15 minutes per hour.

15. (b) : If there is no stoppage the bus would have covered 40 km in

= .

Hence bus stopped for 12 minutes per hour.

16. (a) : Let the average speed be *x* km/hr.

Time taken by aircraft (*t*) =  ..... (1)

 ..... (2)

From equation (1) and (2),



 

 *x*(*x* + 40) = 48000

 *x* = 200 km/hr

17. (c) : Average speed of car = 

= 

18. (d) : If the speed of faster horse be *fs* and that of slower horse be *ss*, then

*fs + ss* =  = 50

and 

Now, you can go through the options or solve the two equations.

The speed of slower horse is 20 km/hr.

Since, 20 + 30 = 50

and 

19. (c) : The distance *D* covered by the sound in 28 seconds is same as the distance covered by in 332 seconds.

= 

20. (d) : Here there is a gap of half an hour, as the theft is discovered at 2 p.m.

Distance covered by the thief in 1/2 hour

= 

This distance has to be covered by the owner but since the thief is also running away we have to find relative speed, which is 50 – 45 = 5 km /hr , since relative speed in same direction is the difference in speed.

Hence time taken



Hence, the owner will meet the thief after 4.5 hours, i.e., 2 p.m. + 4.5 hours = 6.30 p.m.

21. (c) : Distance travelled by the thief in 15 minutes.

= 

Hence, distance between police and thief when police started to chase = 15 km.

Relative speed = (65 − 60) = 5 km/hr

Hence, time taken by police to catch the thief = 15 = 3 hr

Hence, required time

= (12 h + 15 min. + 3 h) = 3:15 p.m.

22. (b) : Since, the speed of the another policeman is same as that of thief. Hence, distance between thief and him will be 15 km. And this is the required distance.

23. (a) : Speed of car *A* = 120 km/hr

Speed of car *B* = 120 × 0.85 = 102 km/hr

Distance travelled by car *A* in 

= 120 ×  = 180 km

As the cars are travelling towards each other.

So, required time = = 2 h 12 min.

24. (b) : Time = 

=   *x* = 6 km/hr

Relative speed = Speed of truck − Speed of man 6 = *x* − 6

 *x* = 12 km/hr

25. (d) : Let the speed of car be *x* km/hr.

As the pedestrain is walking in the same direction.

 (*x* − 2) = 

 *x* = 6 + 2 = 8 km/hr

26. (c) : Mohan can reach the middle in 12.5 minute.

Puran can reach the middle in 25 minutes.

So, required time = 25 − 12.5 = 12.5 minutes

27. (c) : Since, 1 km/hr = m/sec

 speed of the train(*St*) = 60 km/hr m/sec



I. Since, another train is moving in the opposite direction, so we have



Hence, S = 80 km/hr and L = 170 metres.

 

Hence, the train will take 7.2 seconds to cross another train which is moving in the opposite direction.

II. Since, the platform is stationary, so we have 

Here, length of the another train L = 170 metres.

 

Hence, the train will take 16. 8 seconds to cross another stationary train .

28. (b) : Let *t* be the time taken by the second train to cross the bridge.

Using the basic formula



Now, for the first train,

Distance covered = length of the train + length of the bridge





Distance covered = 36 × 25 = 900 m

[Now second train is 100 metres short. So, distance covered must be 100 metres less.]

So, *t* =  = 64 seconds

Hence, the second train will take 64 seconds to cross the bridge.

29. (a) : Let *S*1 be the speed of the train and *S*2 be the speed of the second person.

*S*2m/sec, and *t* = 18 second

Using the basic formula of relative speed,



 m/sec.

For the second person, again, we will use relative speed,



 

 m/sec

  km /hr.

Hence, the speed of the second person is 3 km/hr.

30. (b) : The train can cover (200 + 350) meters distance in five seconds which means the speed of the train is 110 m/sec. Since = 110 m/s. Relative speed of man and train is 114m/sec. To cover the distance of 100 meters, it will take less than one second.

31. (a) :

I. Relative speed = 60 + 6 = 66 km /hr

= 

 Required time = 

II. Relative speed = 60 − 6 = 54 km/hr = 15 m/sec.

 Required time = seconds.

32. (d) : Let the speed of faster train be *x* m/sec. and that of slower train be *y* m/sec.

When they are moving in te same direction, relative speed = (*x* − *y*) m/sec.

 

  ..... (1)

When they are moving in the opposite directions, relatives speed = (*x + y* ) = m/sec.

  ..... (2)

Adding (1) and (2) we get for

= 

m/sec.

From (1) we get



Hence, the speed of the faster train is 28 m/sec.

33. (b) :

I.

**Case I:** Since the speed is decreased by 1/6. So, the time will be increased by 1/5, which is equal to 1 hour 12 minutes.

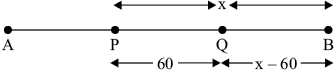
It means the normal time required for this remaining part (*x*) of the journey is 5 × 72 min. = 360 min. = 6 hr.

( 1 hr 12 min. = 72 min.)



*P* is the place of accident.

**Case II:** When accident is supposed to be happened at *Q*.



Since, the speed is decreased by 1/6, hence, the time will increased by 1/5, which is equal to 1 hour, hence the normal item required for this remaining part (*x* − 60) of journey = 5 × 1 = 5 hours.

Thus, it is clear that when the train runs 60 km of its normal speed it takes 1 hour less, which implies that in 1 hour the train can run 60 km with its normal speed. Thus, the normal speed of the train is 60 km/hr.

II. Since the train requires 6 hours at its normal speed of 60 km/hr for the *x* km.

Hence, x = 6 × 60 = 360 km

Thus, the total distance = Distance travelled before accident + Distance travelled after accident = 60 × 1 + 60 × 6 = 420 km

34. (b) : Let the speed of train be *u* and the speed of cat be *v* and train whistles at a point *T*, *x* km away from *A*, then

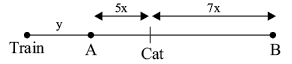
= 

 7*x* = 5 (*x* + 12*k*)

 

 

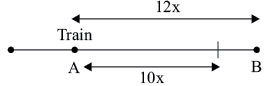
**Alternate Method:**



Let the train be a distance *y* from *A*.

Let Tunnel length = 12*x*

Now, when train reaches at *A*, cat would reach at 10*x* far from *A*. In the time cat runs 2*x* distance and train runs 12*x*. So, speed would be ratio of distance travelled 12*x* : 2*x* = 6 : 1



35. (c) : In each hour they will be 720 km apart.

(Since in opposite direction speeds are added)

36. (d) : *S*1 + *S*2 =  = 60

*S*1 − *S*2 =  = 20

 *S*1 = 40 m/s and *S*2 = 20 m/s

 *S*1 = 40 × = 144 km/hr

37. (c) : The train saves 16 minutes by travelling faster over a section of 80 km.

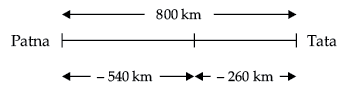
Thus, 

= 

 *S* = 50 km/hr

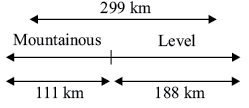
38. (d) : Till 4 a.m. Patna Express wouild have covered 540 km (60 × 9). So, remaining distance is covered in

= = 1.73 hours *i.e*. 104 minutes (*i.e*. 5.44 a.m.)



39. (b) : After 1.73 hours, the two trains meet at 644 km (540 + 1.73 × 60) from Patna. So, the trains meet at 156 km from Tata.

40. (c) : Let the speed of train on level terrain = *x* km/hr



Then, the speed of train through mountainous = (*x* − 10) km/hr

According to the question,



 

 7*x*2 − 369*x* + 1880 = 0

 *x* = 47 km/hr

41. (a) : Distance travelled by *X* in 1 hour = 50 km

Distance travelled by *Y* in = 20 km



At 6:30, distance between 2 trains = 30 km

Time taken to travel this 30 km

= 

= 

42. (d) : Let the speed of train be *x* km/hr.

As both the person are walking in the same direction of train.

So, (*x* − 4.5) × 8.4 = (*x* − 5.4) × 8.5

 0.1 *x* = 8.1

 *x* = 81 km/hr

43. (a) : Let the length of platform be *x* m, length of first train be *y* m an length of second train be . As both trains are travelling in opposite direction.

So, 

 

 y = 200 m

Now, *y* + *x* = 

 *x* = 600 − 200 = 400 m

44. (a) : Let the normal speed of train = *x* km/hr

Let the normal time of train = *T* h

Then 

and 

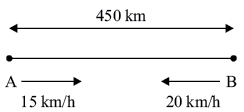
Solving equation (1) and (2),

*x* = 25 or (−30)

Discarding the negative value,

Speed of train = 25 km/hr

45. (a) : Let the time of meet = *t* h





 *t* = 13 h

Distance from *A* = 

46. (d) : Train with a speed of 54 km/hr passes the man in 20 s.

 Length of the train = 

Let the length of platform be *x* m.

Then, (300 + *x*) = 

 *x* = 540 − 300 = 240 m

47. (a) : Let the speeds of two trains be x & *y* km/hr respectively. So, if trains are travelling in opposite direction

21 =   *x* + *y* = 20 ..... (1)

If they are travelling in same direction

 42 =   *x* − *y* = 10 ..... (2)

Solving these 2, we get

*x* = 15 km/hr and

*y* = 5 km/hr

So, 

48. (a) : Let the distance covered by first train be *x* km.

Then, the distance covered by second train = (*x* + 120) km

As both trains have travelled for same time.

 

 60*x* = 50*x* + 6000

 *x* = 600

 Total distance = *x* + (*x* + 120) = 1320 km

49. (b) : Actual time to reach that place

= 

So, total time saved = 22 − 14 = 8 h.

50. (a) : Length of train

= 40 × (100 − 64) × = 400 m

**Note:** In the question, it is given that train overtakes the motorbike. So, both are travelling in same direction.

51. (b) : Let the speed of train be *x* km/hr.

The, = 

 *x*(*x* + 5) = 750 = 25 × 30

 *x* = 25 km/hr

52. (c) : Length of bridge = 1000 m

Length of train = 500 m

Total length = 1000 + 500 = 1500 m

speed of train = 

53. (b) : Time takne to cover 25 km = 

 Required speed = 

= 

54. (b) : Let the speed of train on onward journey be *x* km/h.

Then, the speed of train on return journey = 0.8*x* km/h

Total time = 

 

 

55. (a) : Let the speed of goods train be *x* km/h.

As the trains are running in opposite direction.

187.5 = (50 + *x*) × × 9

 50 + *x* = 75

 *x* = 25 km/h

56. (c) : Let the trains will meet *x* hours after the train from station *B* started.



 48*x* + 36 + 50*x* = 232

 *x* = 2 hours

Distance travelled by the train starting from station *A* at the meeting point = 

57. (d) : Let *B* be the speed of boat in still water

**= **

 *R* = 2.5 km/h;

R = Speed of river

Again **(***B* **+** *R***) =  =** 6 = downstream speed

 **(***B* **+** 2.5) = 6

 *B* = 3.5 km/hr

58. (a) : Let Amit's rowing speed instill water = *x* km/hr

 

Solving for *x*, we get

6*x*2 − 18*x* − 24 = 0

*x* = 4, −1

*x* = 4 km/hr

Alternate Method:

We can put the value of *x* from the options & check.

59. (b) : Upstream speed = 2 km/hr

Downstream speed = 

 Speed in stationary water = 

 Required time =  = 1 h 15 min.

60. (d) : Let the man went up the stream for *x* km. Then, he turned back for (*x* − 2) km.

 

 

 3*x* − 2 = 13

 *x* = 5 km

61. (a) : Let the speed in upstream be *SU* & the speed in downstream by *SD*.

Then,  ..... (1)

and  ..... (2)

Let *x* =  & *y* = 

So, 30*x* + 44*y* = 10

Now by solving these equations we get

*SU* = 5 & *SD* = 11

Speed of current 

= 

62. (c) : 

 

*B* = Speed of boat in still water

*R* = Speed of current

 Put *B* = 9

   *R* = 4.5 km/hr

63. (c) : Let the place be *x* km.

Then, 

 

 

64. (a) : Let the man was swimming at the rate of *x* km/h and he can swim *D* km upstream.

 

 

 

65. (c) : Time taken by first cyclist to complete a track = 

Time taken by second cyclist to complete a track = 

 Required time = LCM of  and = 300 s.

66. (d) : The ratio of speed of Ritu and Neha = 35 : 40 = 7 : 8

So, if they are running in the opposite direction, they will meet at 15 different points.

Now, for them to meet at a diametrically opposite point, there should be altleast two meeting points or the number of meeting points should be a multiple of 2.

Since, they would meet either at 1 point or at 15 different points, depending on the direction of their movement, they will, therefore, not meet at a diametrically opposite point.

67. (b) : Since, hands are interchanging their position, minutes hand has taken the place of hour hand & hour hand has taken the place of minute hand. So, sum of the angles formed by hour and minute hand = 360°

Let us assume that Seema was out of house for t minutes.

So, the angle formed by minute hand = 6 × *t* and by hour hand = 0.5 × *t*.

 0.5 × *t* + 6 × *t* = 360

6.5 *t* = 360

*t* min

Hence, Seema was out of her house for 55.38 minutes.

68. (b) : The table clock gains 6 minutes in 36 hours, while the wall clock loses 2 minutes in 36 hours. Hence, time differential in 36 hours = 8 minutes. For them to show the same time again, a total time differential of 12 hours is required, *i.e*., the two clocks would show the same time when the gap would be exactly 12 hour or 720 minutes.

The number of 36 hour time frames required to create this gap 

Total time = 90 × 36 = 3240 hours. Since, this is divisible by 24, the clocks would show 12 noon.

69. (b) : To show the same time together the difference between two watches must be 12 hours.

Now, since they create 3 minutes difference in 1 hour.

So, they will create 12 hours difference in

= 

*i.e*. 

= 10 days later

70. (d) : To show the correct time again, watch must create 24 hours difference. (Since in one round hour-hand covers 24 hours.)

So, the required time = 

71. (b) : Actually the watch gains (12 + 16) = 28 minutes in 7 × 24 × 60 minutes

Thus, it gains 1 minute in 360 minutes.

Therefore, it will gain (12 + 8) minutes in 20 × 360 = 7200 min.

*i.e*.  days

= 5 days *i.e*. Friday noon.

72. (d) : The clock starts by showing correct time and after every 24 hours and hence (*n* + 1) times in *n* days.

So, it will show correct time 8 times in 7 days.

73. (a) : In 72 hours my watch gains (8 + 7) = 15 minutes. To show the correct time watch must gain 8 minutes.

Since the watch gains 15 minutes in 72 × 60 minutes

Therefore, the watch will gain 8 minutes in



=  = 38 hours 24 minutes.

So, the watch will show correct time on Tuesday at 10:24 a.m.

74. (a) : You must know that a correct watch coincide just after  min.

Therefore in every  hours the watch gains .

Hence, in 24 hours it will gain



75. (b) : At 4 O'clock, the angle between the two hands is 120°.

1st time when 40° angle is made = 

*i.e*. at 4:14:33.

2nd time = 

*i.e*. at 4:29:05.

76. (c) : When two wheels work together, as below, then number of rotation of smaller wheel will be more.

It means if 27 cogged wheel make one rotation, then 16 cogged wheel will make  rotation.

Given, 27 cogged wheel make 80 turns in 45 s.

 16 cogged wheel make  turns in 45 s.

 In 8 s, it will make 

77. (c) : From the question it is clear that Bindu runs 25 metres in 5 seconds.

 Bindu's time to cover 1000 m

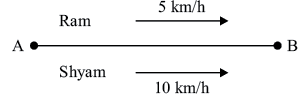
= 

 Ajay's time to cover 1000 m

= 200 – 5 = 195 sec.

= 3 min. 15 sec.

78. (b) : In 1 hour Ram is at *B*, in that time Shyam covers



=  = 2.5 km

Remaining distance = 2.5 km

Time = 

Therefore, they meet first time at 10:10 a.m.

79. (b) : At the time when Shyam overtakes Ram, let Ram travels for *t* minutes, Shyam till that time travels for (*t* − 45) minutes and both travel same distance.

 5 × *t* = 10 (*t* − 45)

 *t* = 90 min.

*i.e*. at 10:30 a.m.

80. (d) : In the first race when Karan runs 100 m, Arjun runs only 90 m. Hence the ratio of speeds of Arjun and Karan is 90 : 100 = 9 : 10. In the second race, Karan has to run 110 m. When he finished the race, Arjun would have run  (*i.e*., 1 m less than 100 m).

Hence Karan beats Arjun by 1 m.

81. (a) : In the time when *A* runs 200 m, *S* runs 180 m and *N* runs 160 m. In other words, in the time when *S* runs 180 m, *N* runs 160 m.

Therefore, when *S* runs 100 m, *N* will runs

= 

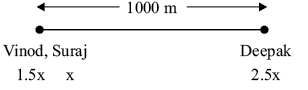
Hence, in a 100 m race, *S* will beat *N* by

(100 − 88 ∙ 89) = 11 ∙ 11 m.

82. (c) : Let the speed of Suraj be *x* m/s

then speed of Vinod will be = 1.5*x* m/s

speed of Deepak will be = 2.5*x* m/s



So, 25 = 

*x* = 10 m/s

So, Suraj will meet Deepak in

= 



83. (b) : Q runs around the track in 10 minutes.

*i.e*., Speed of *Q* = 1 round / 10 minutes

 *P* beats *Q* by 1 round

Time taken by *P* to complete 4 rounds

= Time taken by *Q* to compete 3 rounds

= 30 minutes

 *P*'s speed =  minutes per round

= 7.5 minutes per round

84. (a) : The ratio of speeds of *X, Y* and *Z* = 

Hence, *X* is the fastest.

85. (d) : Time taken by them to meet for the first time

= 

Time taken to meet 5th time = 2 × 60 = 120 sec.

Distance travelled by from in 120 seconds

= 120 × 30 = 3600 m

86. (b) :



Since, either *Q* has the startup of 30 m or 10 seconds. It means *Q* runs 30 m in 10 seconds. Hence, the speed of *Q* is 3 m/s.

87. (c)

In 600 m race, Ratio of distances,

|  |  |  |
| --- | --- | --- |
| ***A*** | ***:*** | ***B*** |
| 600 | : | 540 |
| 10 | : | 9 |

In 500 m race, Ratio of distances,

|  |  |  |
| --- | --- | --- |
| ***B*** | ***:*** | ***C*** |
| 500 | : | 475 |
| 20 | : | 19 |

*A* : *B* : *C* = (10 × 20) : (9 × 20) : (19 × 9)

= 200 : 180 : 171

so, when *A* runs 200 m → *C* runs 

When *A* runs 400 m → *C* runs 

*A* can beat *C* by = 400 − 342 = 58 m

88. (b) : In a 400 m race, Ratio of distances,

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***A*** | ***:*** | ***B*** | ***:*** | ***C*** |
| 400 | : | 380 | : | 361 |

So, when *B* runs 380 m → *C* runs 361 m

When *B* runs 400 m → *C* runs 

The start *B* can give *C* = 400 − 380 = 20 m

89. (d) : Speed of *X* = 

Distance before catching = *D* m





 *D* = 600 m

Total distance = 600 + 300 = 900 m

90. (d) : When Bhairav covers 1600 m,

Akshay covers (1600 − 128) m. So, when Bhairav covers = 100 m,

Akshay covers = 8 m less.

When, Bhairav covers 100 m, Chinmay covers

(100 − 4) = 96 m.

Thus, the ratio in which Akshay and Chinmay cover distances is 92 : 96. In 96 m, Chinmay gains (96 − 92) = 4 m over Akshay. So, in 1 ∙ 5 miles,

Chinmay gains 100 m = miles over Akshay.

= 

91. (b) : *W + R* = 4 h 20 min.

*W + W* = 5 h 20 min.

 *R + R* = 3 h 20 min.

92. (b) : Fuel consumption is given in litre per hour. It is therefore, clear from the graph that in travelling 60 km fuel consumption is 4 *L*. Hence, in travelling 200 km fuel consumption will be = 

93. (b) : At a speed of 40 km/hr, 60 km/hr and 80 km/hr distance travelled in 1 *L* of petrol.

= respectively.

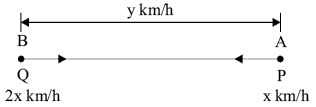
Hence, at lower speed fuel consumption is less.

Hence, in order to minimize the fuel consumption, the speed should be decreased.

94. (a) : Let the distance between *A* and *B* be *y* km and speed of *P* and *Q* be *x* km/hr and 2*x* km/hr respectively.

  = 1  *y* = 12 *x*

Now, after 1 hour both *P* and Q will be in motion for the



First time they meet with distance between them

= (12*x* − *x*) = 11*x* km and with relative speed

= (2*x* + *x*) = 3*x* km/hr. Hence, time taken by *Q* in meeting = 

Hence, distance travelled by *Q* = 2*x* ×  = 7.33 km.

So, both *P* and *Q* will meet closer to *A*.

95. (d) : Time taken by *P* to reach *B* = 

96. (c) : Since, speed of *Q* is double the speed of *P* hence will take half time *i.e*., 6 h.

97. (c) : Time taken by cycle = *x* minutes

Time taken by scooter = *y* minutes

So, *x + y* = 390 ...... (1)

and 2*x* = 520 ...... (2)

Solving equations (1) and (2),

*y* = 130 minutes

Moving both ways by scooter = 2 × 130 = 260 minutes

= 4 hours 20 minutes

98. (b) : Time taken by car for one way

= 

Time taken in walking to go one way

= 

= 

 Time taken in walking to go both ways

= 

= 8 hours and 45 minutes

99. (d) : Suppose time taken while walking = *x* hours

And, time taken on riding = *y* hours

 According to question

*x + y* =  ..... (1)

Then, 2*y* = 3 hours

*y* = 

From equation (1)

*x* = 

Time required to walk both ways = 6 hours.

100. (c) : Time for walking both ways − time by mixed (*i.e*., walking + riding ) = time gained

 Time for walking both ways = 

 Time for walking both ways = 

= hours

Hence , Rohan take  hours to cover the same distance if he walks both ways.

Solutions Exercise – Difficult

1. (c) : Distance *AG*1 = *BG*3 = 30 × = 2.5 km

 Distance *G*1*G*3 = (20 − 2 ∙ 5 − 2 ∙ 5) = 15 km



Given *G*1*G*2 : *G*2*G*3 = 1 : 2

 *G*1*G*2 = 5m and *G*2*G*3 = 10 km

Now, time taken from reaching *A* to *G*3 and back to *A*

From, *A* to *G*1 = 5 min (given).

From *G*1 to *G*3 = 

From *G*3 to *A* = 

and time elasped for taking the patient into and out of the ambulance = 1 min.

Total time takne = (5 + 15 + 17.5 + 1) = 38.5

Remaining time = (40 − 38.5) = 1.5 min.

2. (a) :



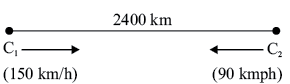
The third car reaches *C* and turns back and meets first car at a point 80 km ffrom *C*. So, the time in which first car travels (240 − 80) kms, the third car travels (240 + 80) km. Hence,

= 

Also, if second car takes *t* hours, then first car will take (*t* + 1) hours. The speed of third car is twice that of first.

So, third car will take hours.

3. (d) :



When they meet for the first time together they will cover a distance of 2400 km with a relative speed of (90 + 150) km. Now, when they reverse their direction both of them travel half then their distance means they will travell 1200 km together with speed of (90 + 150) kmph as they are going in opposite direction. Now they will come back that 120 km to meet with speed of (90 + 150) kmph. Again they will travel half the distance *i.e*. 600 km twice and will continue so on.

So, Time = 

= 10 +  [2400 + 1200 + 600 + .....]

So, we get an infinite G.P.

= 

= 10 + 10 × 2 = 30 hours.

4. (b) :



Distance from Kurla to Santacruz = *x* km.

Distance from Worli to Santacruz = *y* km.

Let speed of Anushka = *a* km/hr.

Let speed of Virat = *v* km/hr.

Given,

= ..... (1)

and  ..... (2)

From (1),

=



Now using (2),



So, Virat takes 48 minutes for journey from Worli to Santacruz.

Now, if he increase his speed to  and hence time will .

So, *t* (Santacruz to Worli) = 

Total time taken = 48 + 36 = 84 minutes.

5. (c) : 4*t*1 + 3*t*2 = 36 and

3*t*1 + 4*t*2 = 34

Solving the 2 equations, we get

12*t*1 + 9*t*2 = 108

12*t*1 + 16*t*2 = 136

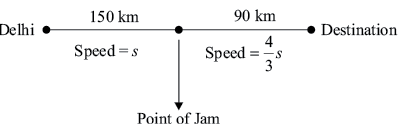
 7*t*2 = 28

*t*2 = 4 hours

and *t*1 = 6 hours

So, total time = 4 + 6 = 10 hours.

Solutions for questions 30 and 31:



So, 

 

 

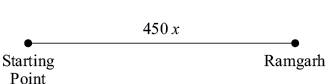
 *s* = 90 km/hr.

6. (b) : Speed (initial) = 90 km/hr

7. (c) : Average Speed = 

= 

8. (a) :



Let distance between starting point and Ramgarh = 450*x*

Kamil (time for total journey) = 

So,  = Time taken by Rahim for whole journey

As they start and stop at same time.

15*x* = 

 3*x*2 − 16*x* + 16 = 0

 *x* = , 4

So, Total time = or 15 × 4 = 20 hours or 60 hours.

Total time cannot be 20 hours as Rahim takes 35 hours for middle 600 km. So, they take 60 hours and hence will reach at 5:00 p.m. on the third day.

9. (a) : Let the usual speed of car be *x* km/hr.

Then, 

 

 *x*(*x* + 10) = 3000 = 50 × 60

 *x* = 50 km/hr

 Required time = 

10. (d) : They meet 5 hours after start *i.e*. they travel 180 km simultaneously after starting.

So, *f* + *b* =  = 36 kmph ..... (1)

where, *f* = speed of fly and *b* = speed of bee.

In 5 hours before meeting,

Fly travelled = 5*f*

Bee travelled = 180 − 5*f*

So,

= 

= 

  ..... (2)

Solving (1) and (2),

 

 

 *sf* 2 − 6480 + 180*f*

= 180*f* − *sf* 2

10*f* 2 = 6480

*f* 2 = 648

*f* = 25.45

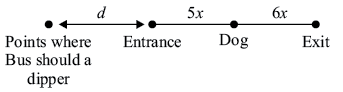
*b* = 36 − 25.45

= 10.54

= 2.5 times approx.

Solutions for questions 11 to 13:

Let us assume the length of sea link = 11*x* km



In the time dog reaches entrance, the bus reache the entrance too.

So,  ..... (1)

And in time the bus reaches exit, the dog reaches exit too.

So,

..... (2)

Solving (1) and (2),



 6*d* = 5*d* + 55*x*

 *d* = 55*x*

11. (a) : 

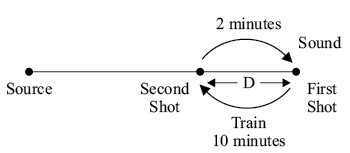
12. (b) : *d* = 55*x* and difference of dog's distance = *x*

13. (b) : Length of sea link = 11*x*

Distance of bus from entrance = 55*x*

So, ratio = 11*x* : 55*x* = 1 : 5

14. (a) :



The distance *D* is covered by the sound in 2 minutes and is covered by the person in 10 minutes.

For same distance







*Sm* = × 300 = 66 m/s

15. (d) : ; *t* = to cover remaining distance.

= 

= 

 *tMayank* = 

= 3 hours 36 minutes

16. (d) : Let the speed of the superfast train be 4 unit, hence speed of passenger train would be 1 unit.

 Average speed =.

Since, train *N* is already late by 20 min, hence available time would be (60 − 20) = 40 min or . If train has to reach the station at schedule time. Now, average speed would be 

Now, given that new speed of superfast train = 8 unit

Let new speed of passenger train be *y*, then

= = 2 ∙ 4  *y* = 1 ∙ 4

Hence, required ratio = 1 ∙ 4 : 8 = 1 : 6 (approx.).

17. (a) : Time taken by *B* to cover 60 km = h. time taken by *Y* at station *C* =

Now, distance travelled by train *X* in

= 70 ×  = 101 ∙ 5 km.

Distance between *X* and *Y* when *Y* starts from station

*C* = 180 − (101 ∙ 5 + 60) = 18 ∙ 5 km.

Hence, time taken by them in crossing one another

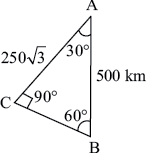
= .

Now, distance travelled by *X* in 0 ∙ 15 h

= 70 × 0 ∙ 15 = 10 ∙ 5 km.

Therefore, distance of *X* from station *A*, when they meet = 112

18. (b) :



Since, ∠*A* = 30­° and ∠*B* = 60°

 ∠*C* = 90°

 *BC* = 250 km and *AC* = 

Time taken by the train to reach from *A* to *C* = *i.e*., 5 h *i.e*., at 13:00 train can reach *C*.

Time required by Rahim to reach *C* = 

= 

Time time by which Rahim must start from

A = 13:00 − 0:15 − 6:12 = 6:33

The required answer = 6:30 a.m.

19. (b) : Let *P* be the event that train *P* is late and *Q* be the event that train *Q* is late.

*P*(*P*) = 

*P*(*Q*) = 



 

 

*P*(*PQ*) = *P*(*P*) + *P*(*Q*) − *P*(*PQ*)



Probability that neither train will be late

= 1 − *P*[*PQ*]

= 

20. (a) : Let the distance be *d* km and normal speed be *s* km/hr.

 Normal time (*t*) =  ..... (1)

  ..... (2)

and  ..... (3)

Solving equations (1), (2) and (3),

*d* = 60 km, *s* = 20 km/hr and *t* = 3 hours.

21. (b) : Let the speed of stream = *s*

*P* & *Q* takes 2 hours more than *Q* to *P*, means *P* to *Q* is upstream and *Q* to *P* is downstream.

So, 

 

 80*s* = 450 − 2*s*2

 2*s*2 + 80*s* − 450 = 0

 *s*2 + 40*s* − 225 = 0

 *s*2 + 45*s* − 5*s* − 225 = 0

 *s* = 5, − 45

So, speed of stream is 5 km/hr.

Now is 2nd case *P* to *Q* takes  hour more, so

= 

= 

= 

Putting, *s* = 5

 

 1200 = 5*B*2 − 25

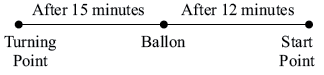
 1225 = 5*B*2

 *B*2 = 245

 *B* = 

22. (a) : The event at 1.5 kph relative to shore and speed of flow is 15 mph. Hence, we can say *b* = 16.5 mph and *s* = 15 mph.

They starting rowing and after 12 minutes the ballon fell down and they noticed it after 15 minutes.



From the drop point of hat they must have travelled a distance of 1.5 × = 0.375 km. Before turning. In 15 minutes ballon will travel with speed of river and will travel = 3.75 km.

So, the distance between raft and ballon is

3.75 + 0.375 = 4.125 km

Time taken to catch the ballon

= 

= 15 minutes

23. (b) : Let speed of Aman = *a* m/sec.

Let speed of Bunty = *b* m/sec.

Let spedd of Ganga = *s* m/sec.

Race 1:

Time taken by Aman = 200 seconds.

Time taken by Bunty = 

So, = 200  *a + s* = 8 ..... (1)

  *b + s* = 6 ..... (2)

Race 2:

*ta* =  and *tb* = 

given *tb* − *ta* = 400

 

 

 ..... (3)

Using (1) and (2),

(*a + s*) − (*b + s*) = 8 − 6

 (*a* − *b*) = 2

Also, *a* = 8 − *s*

*b* = 6 − 5 − *s*

(8 − 5 − *s*) (6 − 5 − *s*) = 8

(8 − 2*s*) (6 − 2*s*) = 8

48 − 16*s* − 12*s* + 4*s*2 = 8

*s*2 − 75 + 10 = 0

*s* = 2 m/s

24. (b) : Time taken by stream (downstream) = 40 minutes

Time taken by stream (upstream) = 60 minutes

Time taken by boat (downstrem) = 60 minutes

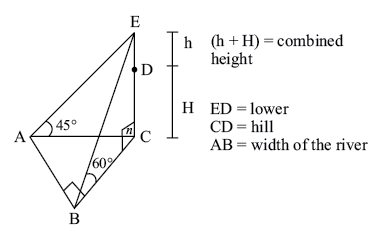
Time taken by boat (upstrem) = 90 minutes

Total time = time by stream (downstream) +  time by stream (upstream) +  time by boat (upstream)

= 

25. (c)

26. ( ) :



Water does not move in the lake.

In the right triangle *ACE*;

*∠A* = 45°  *EC = AC* = (*h + H*) = 300 ..... (1)

In the right triangle *BCE*;

*∠A* = 45°   ..... (2)

And in right triangle *ABC*, *AB*2 + *BC*2 ..... (3)

Speed of boat = 2 km/hr

Option (a): *AC* = 300 m

 *BC* = 

 

*AB* = is the breadth of the rive.

 Time taken by boat to move from *A* to *B*.



Option (a) is correct.

Option (b): The breadth of the river is ,

Option (c): incorrect, as Rajan took  minutes.

Option (d): *h + H* = 450 m

speed of boat = 1 km / hr.

As all the angles remain the same, we will get 3 new right triangles which are correspondingly similar to the earlier ones.

Breadth of the river = 

= 

 Time taken = 

 Option (d) is correct.

In all; options; (a), (b) & (d) are correct.

27. (c) : First meeting of Shyam and Babu

= 

First meeting of Babu and Ghanshyam

= 

First meeting of Shyam, Babu and Ghanshyam

= 

In one hour Shyam and Babu will meet

= 

In one hour Babu and Ghanshyam will meet

= 

Difference = 4 times

28. (b) : Number of points = | Speed of Ram − Speed of Sita |

When speeds are in lowest ratio

 8 = (60 − speed of Sita)

 8 = 60 − *x*

If *x* = 52, but then the speed are not in their lowest ratio.

 8 = 30 − 

*=* 30 −8

*x* = 44

But still speed are not in their lowest form.

 8 = 15 − 

 *x* = 28

Now, 28 and 60 their lowest ratio 7 : 15 and number of points will 8.

 8 = 10 − 

 *x* = 12

Also, 8 = 5 − 

*x =* 36

Also, 8 = 5 − 

*x* = 60

Also, 8 = 3 − 

*x* = 100

As speed of Sita is less than 100, hence possible values for speed are = 28, 12, 36 and 60.

29. (a) : Originally they took 32 sees for first meeting and than 40 seconds for first meeting so, originally they were running in opposite directions and then same directions.

So, when they run in same direction.

= 

When they run in opposite direction



Solving,



 

 5*y* − 5*x* = 4*y* + 4*x*

 *y* = 9*x*

Using 

 

 30 = 8*x*

 *x* = m/sec. = 3.75 m/sec.

So, *B*'s speed = 9*x* = 9 × 3.75 = 31.75 m/sec.

30. (c) : *A* and *B* meet = 

*B* and *C* meet = 

*A* and *C* meet = 

*A* meets *B* least frequently.

31. (b) :



For point *Q*,

Tom = 

So, he will reach at 7 a.m. for point *Q*,

Tom = 

So, he will reach at 8 a.m.

Now for Dick,

Point *PQ* = 

Point *QP* = 

Now for Harry,

Point *PQ* = 

Point *QP* = 

At point *P*,

Tom = 6 a.m., 8 a.m., 10 a.m., 12 a.m. ...... so on.

*i.e*. after every 2 hours.

Dick = 6 a.m., 7 a.m., 8 a.m., ...... so on.

*i.e*. after every 1 hour.

Harry = 6 a.m., 6:40 a.m., 7:20 a.m. ...... so on.

*i.e*. after every 40 minutes.

They will meet at *P* after LCM (120 min., 60 min., 40 min.) = 120 min. = 2 hours.

So, at *P* they will meet 

Similarly for *Q*,

Tom = 7 a.m., 9 a.m., 11 a.m., 1 p.m., 3 p.m., 5 p.m. so on.

Dick = 6:30 a.m., 7:30 a.m., 8:30 a.m. and so on.

Harry = 6:20 a.m., 7:00 a.m., 7:40 a.m. and so on.

All of them will be at *Q* for the first time at 9:00 a.m. and will meet after every 2 hours. So, at *Q* they meet 5 times (9:00 a.m., 11:00 a.m., 1:00 a.m., 3:00 a.m., 5:00 a.m.)

A total of 6 + 5 = 11 times.

32. (c) : If he travels at minimum speed over stretch *A* (*i.e*. 40 km/hr), the total time taken to cover this stretch

=

If he then travels at the fastest speed over stretch *B* (*i.e*. 50 km/hr), the total time taken to cover this stretch

=

In order to break the previous record he will have to cover the third stretch in (10 – 5.4) = 4.6 min.

To do this he will have to cover the third stretch at  = 0.434 km per minute or 26.08 km/hr. But the maximum speed over the stretch *C* is 20 km/hr. Hence, it is not possible for *C* to break the previous record.

33. (d) : The minimum speed in stretch *A* is 40 km/hr. If Mr. Hare travels the first stretch at this speed, then the time taken by him to cover this stretch = = 3 min.

Also he takes 3 min to cover stretch *B*. And he covers the entire race in (1.5 × 10) = 15 min. This means that he should have taken (15 – 3 – 3) = 9 min to cover stretch *C*. Hence, his speed over this stretch should be  = 0.22 km per minute or 13.3 km/hr.

34. (c) : Let his average speed over the last stretch be *x*.

Hence, his average speed for first two stretches = 4*x*. So total time taken to cover the three stretches = 

His average speed over the race is 20 km/hr.

Hence, time taken to complete the race = 

Hence, we have the equation 

Solving this equation, we get *x* = 10 km/hr

35. (b) : Jagdeep defeated Mandeep in a 1000 m race by 60 m or 12 sec.

This means that Mandeep would travel 60 m in 12 sec.

 Mandeep's speed = 5 m/s

 Mandeep covered 1000 m in 

 Jagdeep covered 1000 m in 200 − 12 = 188 sec.

 Jagdeep covered 250 m in 47 sec.

Hence, option (b) is right answer.

36. (a) : Tabulating the given information:

|  |  |  |
| --- | --- | --- |
| **Number of guards** | **Red** | **Green** |
| 1 | Turn right | 2 kmph |
| 2 | Turn left | 4 kmph |
| 3 | Stop | 10 kmph |

In case of kartikay:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Signal Number** | **Red Caps** | | **Green caps** | | | |
|  | **No. of guards** | **Direction** | **No. of guards** | **Speed** | **Duration** | **Distance** |
| Start | Nil | North | 1 | 2 kmph | 30 min. | 1 km |
| 1 | 2 | Turn left | 2 | 4 kmph | 15 min. | 1 km |
| 2 | 1 | Turn right | Nil | 4 kmph | 30 min. | 2 km |
| 3 | 1 | Turn right | 3 | 10 kmph | 24 min. | 4 km |
| 4 | 2 | Turn left | 2 | 4 kmph | 15 min. | 1 km |
| 5 | 3 | Stop |  |  |  |  |

Total distance travelled by Kartikay is 9 kms.

37. (a) :

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Signal Number** | **Red Caps** | | **Green caps** | | | |
|  | **No. of guards** | **Direction** | **No. of guards** | **Speed** | **Duration** | **Distance** |
| Start | 0 | South | 1 | 2 kmph | 30 min. | 1 km |
| 1 | 2 | Turn left  (East) | 2 | 4 kmph | 15 min. | 1 km |
| 2 | 1 | Turn right (South) | Nil | 4 kmph | 30 min. | 2 km |
| 3 | 1 | Turn right (West) | 3 | 10 kmph | 24 min. | 4 km |
| 4 | 2 | Turn left (South) | 2 | 4 kmph | 15 min. | 1 km |
| 5 | 3 | Stop |  |  |  |  |

 Kartikay would have travelled 1 + 2 − 1 = 2 km towards South

And he would have travelled 4 − 1 = 3 km towards West

 His final position would be 3 km towards west and 2 km towards south.

38. (c) :

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Signal Number** | **Red Caps** | | **Green caps** | | | |
|  | **No. of guards** | **Direction** | **No. of guards** | **Speed** | **Duration** | **Distance** |
| Start | 0 | South | 1 | 2 kmph | 30 min. | 1 km |
| 1 | 2 | Turn left (East) | 2 | 4 kmph | 15 min. | 1 km |
| 2 | 1 | Turn right (South) | Nil | 4 kmph | 30 min. | 2 km |
| 3 | 1 | Turn right (West) | 3 | 10 kmph | 24 min. | 4 km |
| 4 | 2 | Turn left (South) | 2 | 4 kmph | 15 min. | 1 km |
| 5 | 3 | Stop |  |  |  |  |

Thus Kartikay would have travelled 1 + 2 + 1 = 4 km towards South

And he would have travelled 4 − 1 = 3 km towards West

Thus, his final position would be 3 km towards West and 4 km towards South.

39. (b) : Let the distance of race be *x* metres which is covered by *A* in *t* seconds. Then in the same time *B* covers (*x* − 12) m and *C* covers (*x* − 18) m.

 Speed of *A* = 

Speed of *B* = 

and Speed of *C* = 

Time taken by *B* to finish the race

= 

Now, distance travelled by *C* in this time

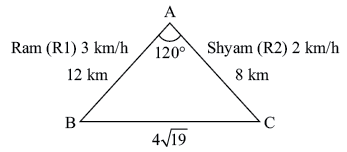
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  = *x* − 8

 *x* = 48 m

40. (b) : Applying cosine rule to find the third side

*BC*2 = *AB*2 + *AC*2 − 2*AB* ∙ *AC* cos 120°



= 144 + 64 + 2 × 12 × 8 × 

= 144 + 64 + 96

 *BC* = 

 Time taken by Ram to travel to *A*

= 

Time taken by Shyam to go to *A*

= 

 Required difference

= 

= 

41. (c) : The time taken in climbing up and coming back is same also the distance is same, hence option (a) is not true.

Likewise option (b) dis not definitely true as person kept varying his speed. However option (c) is true because of the reason that time of start from both the points is same.

42. (d) : Candle 1 burns at rate 1 cm/hr.

Candle 2 burns at rate 1.5 cm/hr.

Let us assume they are of same length after '*t*' hour.

So,

6 cm − (1 × *t*) = 8 cm − (1.5 × *t*)

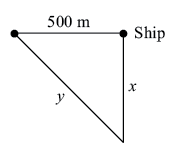
 1.5 *t* − *t* = 8 − 6

 .5 *t* = 2

 *t* = 4 hours

43. (c) : Nikhil saved 20 minutes in total, so he must have saved 10 minutes on either side of journey. Now, his children got picked 10 minutes early means at 4 p.m. − 10 minutes = 3:50 p.m. Now the school got over at 3:00 p.m., so they were walking for 50 minutes.

44. (a) :



Ship is moving at 8.33 m/s.

Time taken to go 500 m = 

In 60 seconds, Radiowave travels = 60 × 200 = 12000 m

So, *x + y* = 12000 m ..... (1)

and *y*2 = *x*2 + (500)2 ..... (2)

Sovling equation (1) and (2),

*x* = 

45. (c) : Distance between *A* and *B* = (35 × 2) + (45 × 2) = 160 km.

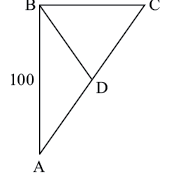
Distance covered by Aditi in each speed segment = 

Hence, total petrol consumed

= 

46. (a) : For minimum petrol consumption, Zoheb should drive at 40 kmph, petrol consumption = 

47. (b) :



Since *AD* = *DC*, the distance travelled is same for the two stretches. Hence, the average speed is given by

= 

= 

48. (a) : Now, since *X* and *Y* reach *C* at the same time,

.



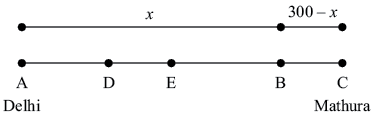
Hence, you need to take help from options. *i.e*.

If *AC* = 105, *BC*2 = *AC*2 – *AB*2 = 1052 – 1002 = 1025 or

*BC* = 32

So, 

49. (b) :



Let Mukesh take Suresh on his bike till *B* and leave him there to walk till *C* (Mathura). In the meanwhile, Dinesh keeps walking to reach *D*, Mukesh comes back picks Dinesh and then both ride to Mathura.

When Mukesh comes back, let us say he meets Dinesh at *E*.

Let *AB = x*, then *BC* = 300 – *x*

Since Dinesh walks at 15 kmph and bike’s speed is 60 kmph, we have *AD* = .

 

 

Hence, 

 

 





Hence, minimum time = 

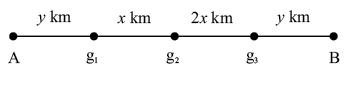
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= 

50. (c) :

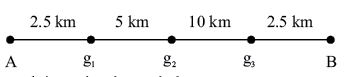


2*y* + 3*x* = 20 km

Ambulance take 5 minutes for *y* km at speed of 30 km/hr.

So, *y* = 

 *x* = 



Total time taken by Ambulance

= 

= 5 + 5 + 10 + 10 + 5 + 2.5

= 37.5 minutes

Ambulance also requires 1 minute for taking patient in and out.

Hence, total time = 38.5 minutes

Doctor is left with = 40 − 38.5 minutes = 1.5 minutes