

## MBA PIONEER 2024

## QUANTITATIVE APTITUDE

DPP: 17

## Distance Time and Speed - 3

- Q1** I leave my house for the airport at an average speed of 90 km/hr. However, due to traffic on the route, the average speed for the trip was reduced to 60 km/hr. Find the travel time per hour.
- (A) 45 mins (B) 48 mins  
(C) 36 mins (D) 40 mins.
- Q2** Directions: In each of the following questions, read the given statement and compare Quantity I and Quantity II on their basis.
- Quantity I: A 720 meters long train can cross an 800 meters long platform in 160 seconds; what is the speed of the train?
- Quantity II: A bike goes 54 km and comes back to the starting point in 4 hours; what is the average speed of the bike?
- (A) Quantity: I  $\geq$  Quantity: II  
(B) Quantity: I  $>$  Quantity: II  
(C) Quantity: I  $<$  Quantity: II  
(D) Quantity: I  $\leq$  Quantity: II
- Q3** A boat can cover 232 km upstream in 23.2 hours. If the speed of the stream is increased/decreased by \_\_\_\_\_%, then it will take \_\_\_\_\_ hours to cover the distance of 182 km downstream. The Sum of the speed of the boat in still water and the speed of the stream is 26 km/h.
- Which of the following option will satisfy the blanks in the same order?
- I). 25% increase, 6.5 hours  
II). 50% increase, 6.0667 hours (approx.)  
III). 37.5% decrease, 7.91 hours (approx.)
- (A) I only  
(B) II and III only  
(C) I, II and III  
(D) I and II only
- Q4** Two businessmen, Peyush and Ashneer walk up a moving up escalator at constant speeds. For every 6 steps that Peyush takes Ashneer takes 5 steps. How many steps would each have to climb when the escalator is turned off, given that Peyush takes 60 and Ashneer takes 55 steps to climb up the moving up escalator respectively?
- (A) 80 (B) 90  
(C) 100 (D) 110
- Q5** In a metro station, Mr. Stanley takes 13 steps to reach the top of an escalator in 28 seconds. Mr. Tom walks on the same escalator and takes 37 steps in 16 sec to reach the top. How many steps are visible on the escalator when it is not moving? (Assume that the motion of the escalator is upwards in both the cases)
- (A) 63 (B) 69  
(C) 72 (D) 75
- Q6** Firoz and Mansoor are on an escalator that moves downwards at a constant speed. Firoz moves at a speed of 4 steps/second while Mansoor moves at a speed of 3 steps/second. When they reach the bottom of the escalator, Firoz has taken 120 steps and Mansoor has taken 108 steps. What is the total number of



steps in the escalator visible when it is not moving?

- (A) 120 (B) 150  
(C) 160 (D) 180

**Q7** Trisha and Bhavna jog in a circular track of length 40m every day with a speed greater than 0. They started from the same starting point at the same time and met for the first time after 20 seconds. Even if they jog for all day long, they will meet with each other at the same exact point. Bhavna's speed is 20% more than that of Trisha.

Find the amount of time taken by Trisha to complete 1 round of the track (in sec).

- (A) 2 (B) 3  
(C) 4 (D) 5

**Q8** Trisha and Bhavna jog in a circular track of length 40m every day with a speed greater than 0. They started from the same starting point at the same time and met for the first time after 8 seconds while running in the opposite directions, at speeds in the ratio of 3 : 2 respectively. Find the time from the start (in seconds) when they will meet for the 10th time had they moved in the same direction instead?

- (A) 350 (B) 400  
(C) 450 (D) 500

**Q9** If Indole walks in the same direction as the escalator, he takes 45 seconds to ride it at his normal speed, but only 15 seconds if he walks 4 times his normal speed. If Indole chooses not to walk and simply stands on the escalator, how long will it take (in seconds) him to ride it to the end in the same direction?

- (A) 130 (B) 135  
(C) 140 (D) 145

**Q10**

Karan can climb a moving escalator going up in 40 seconds, while it takes him 120 seconds to run down the same moving escalator. Karan's speed is constant when running in either direction. If Karan walks at half the speed of his running speed, how long (in seconds) will it take for him to climb the same escalator when it is not moving?

- (A) 60 (B) 108  
(C) 90 (D) 120

**Q11** Mr. Grylls and Mr. Jackie are walking up a moving escalator that is traveling upwards at a constant speed. Mr. Grylls takes 3 steps for every 8 steps of Mr. Jackie, and Mr. Grylls reaches the top of the escalator after taking 24 steps, while Mr. Jackie takes 32 steps due to her faster pace. If the escalator were not moving, how many steps would Mr. Grylls or Mr. Jackie need to take to reach the top?

- (A) 30 (B) 40  
(C) 50 (D) 60

**Q12** A & B are running along a circular track X in the opposite directions not necessarily starting from the same points. If they meet at only 2 distinct points along the circular track. If A can complete one round of the circle in 10 s, then find how much time (in seconds) B will take to complete one round in a circular track having twice the radius of the circular track X.

- (A) 20 (B) 21  
(C) 22 (D) 23

**Q13** A boatman is travelling in the river at 15 km/hr against the flow of the river which is flowing at 5 km/hr. If the total time needed to go and reach back to its starting point is 2.4 hrs, then what is the total distance travelled by the boatman?

- (A) 18 km (B) 25 Km



(C) 36 Km

(D) 45 Km

**Q14** An escalator moves from the ground floor to the 1st floor of a shopping mall at a constant speed. Raghu takes 60 seconds to come down to the ground floor from the first floor and 12 seconds to go up to the 1<sup>st</sup> floor from the ground floor. Pratim who takes 10s to go up to the first floor takes \_\_\_\_\_ seconds to come down from the first floor to the ground floor. (Assume that the direction & speed of the escalator does not change in any of these cases.)

**Q15** Captain Damera with his boat is sailing in the river with the upstream speed of 18 km/hr against the flow of the river which is flowing at 6 km/hr. If it takes 1.6 hr to go and reach back to its starting point then find the distance between the starting and ending point of a one-time journey by Captain Damera's boat.

(A) 12 km

(B) 18 km

(C) 24 km

(D) 36 km

**Q16** Train A is crossing a platform in 10 seconds and a pole in 4 seconds. Train B having  $\frac{9}{4}$  times the length of Train A crosses the pole in 7.2 seconds. Find the time taken by train B to cross train A if they are moving in the same direction.

(A) 13/9 seconds

(B) 13 seconds

(C) 52 seconds

(D) Either option A or C

**Q17** A faulty escalator moves 12 steps upward in the first 1 min and 7 steps downward in second minute. If Rohit has to go from ground floor to first floor taking the escalator only, then find the time taken by him to reach to the first floor. It is given that there are 60 steps between the

ground and the first floor whereas Rohit does not move at all.

(A) 16 Min 20 Sec

(B) 20 Min 40 Sec

(C) 24 Min 55 Sec

(D) None of these

**Q18** Mr. Artist uses an upward-moving escalator and takes 80 steps to reach the first floor from the ground. The time taken for him to reach the first floor is  $\frac{1}{3}^{\text{rd}}$  the time he takes to reach the ground floor from the first floor while using the same upward-moving escalator. What is the number of steps on the escalator between the ground floor and the first floor?

**Q19** Time taken by a boat to go 168 m downstream is 4 seconds less than that taken by boat to come back and while coming back speed of stream is decreased to 75%. If speed of stream had not decreased while coming back, the difference between downstream and upstream speed of the boat would be 8 m/s. Find the total time taken by boat during the whole journey?

(A) 16 seconds

(B) 18 seconds

(C) 22 seconds

(D) 20 seconds

**Q20** Trayvon and Ferdinand start running simultaneously but in the opposite directions on a circular track of length 140 metre from the same position on the track with speeds 6 m/s and 4m/s respectively. Every time they meet, they exchange their respective speeds. Find the distance in metres from the starting point (measured in anti-clockwise direction) of their 25th meeting if it is known that Trayvon is moving in an anti-clockwise direction.

(A) 81

(B) 82

(C) 83

(D) 84

**Q21** In a 14.4 km cycle race around a circular stadium having a circumference of 2.4 Km, the



fastest runner and the slowest runner reach the same point at the end of the 8th minute, for the first time after the start of the race. All runners have the same starting point and time and all of them run in the same direction. Further, each runner maintains a uniform speed throughout the race. If the fastest runner runs at thrice the speed of the slowest runner, what is the time (in minutes) taken by the fastest runner to finish the race?

- (A) 11 (B) 14  
(C) 15 (D) 16

**Q22** Mohan and Sohan climb up or down at the same speed. Mohan takes 8 seconds to go up a certain escalator that is going up, while Sohan takes 12 seconds to go down the same escalator. If Sohan takes 3 steps for every 2 steps that Mohan takes, how long would Sohan take to go up the same escalator?

- (A) 2.4 seconds (B) 4 seconds  
(C) 4.8 seconds (D) 6 seconds

**Q23** Timon and Pumba are located at the same point on a circular track of 6 kilometres. When they start running in the same direction, Pumba completes 5 more rounds than Timon in 50 minutes. If they run in opposite directions, Timon covers 1 kilometre less than Pumba on their first meeting. Find the speeds of Timon and Pumba.

- (A) 54 kmph, 90 kmph  
(B) 90 kmph, 54 kmph  
(C) 90 kmph, 126 kmph  
(D) 144 kmph, 108 kmph

**Q24** Speeds of Boat X and Y are 45km/h and 75 km/h, respectively. Both Boat X and Boat Y start at the same time along the stream from point A and run towards B. If, after 5 hours of travel, there is a technical problem, so the

speed of boat X in still water is reduced by 30%. The distance between boat X and Y is \_\_\_\_\_km when Y reaches point B. Speed of the stream is 5 km/h, and the distance between A and B is 640 km.

- (A) 305.5 km (B) 315.5 km  
(C) 280.5 km (D) 325.5 km

**Q25** Time taken by a boat to cover 'D' km upstream is 6 hours, and the boat covers 'D+12' km Downstream in 3 hours. The boat takes 13 hours to cover '(0.75D+4) km' downstream and return '2D-8'km upstream. Find the distance covered by the boat in 3 hours downstream.

- (A) 60 km (B) 54 km  
(C) 48 km (D) 57 km

**Q26** Boats A and B started traveling simultaneously upstream from the same point, with their speeds in still water being 50 km/h and 35 km/h, respectively. After traveling for 40 minutes, an item fell from the faster boat, and the item started floating with the stream flow of speed 5 km/h. Find the approximate distance between both boats when the slower boat catches the item.

- (A) 18.7 km (B) 11.2 km  
(C) 16.5 km (D) 14.3 km

**Q27** Speed of a boat in still water is 800% more than that of the speed of the stream. Time taken by boat to travel  $2(P + 15)$  km downstream is 50% more than the time taken by boat to travel  $(P + 31)$  km upstream. Find P% of 500.

- (A) 1125 (B) 1225  
(C) 1275 (D) 1175

**Q28** Time taken by boat P to travel from Point M to point N is 24 hours, and returning to point M is 32 hours. If the speed of boat Q in still water is half of that of boat P, and the speed of the



stream in which boat Q is traveling is twice that of boat P, then find how much time it will take for boat Q to cover 77 km downstream. Distance between M and N is 768 km.

- (A) 3.5 hours                      (B) 2.5 hours  
(C) 4.5 hours                      (D) 1.5 hours

**Q29** A train crosses a tunnel in 30 seconds, and the tunnel length is twice that of the train. If the train's speed were 5 m/s more and the length of the train was 20% more, it would take  $26\frac{2}{3}$  seconds to cross the tunnel. If a man is walking inside the train at the speed of 5 m/s and covers the length of the train in 't' seconds, then find the distance covered by the train in 't' seconds?

- (A) 1050 m.                      (B) 1250 m  
(C) 1000 m                      (D) 1650 m

**Q30** In a circular track, Abhik, Bibek & Chandan are running at a speed of 12 m/s, 15 m/s & 20 m/s respectively. If they move in the same directions, they will meet with each other for the first time in 60 Seconds. Had they run in directions which are not all the same along the circular track, then after how many seconds will they meet for the 3<sup>rd</sup> time at the starting point?

- (A) 150                              (B) 160  
(C) 170                              (D) 180



## Answer Key

Q1 (D)  
Q2 (B)  
Q3 (C)  
Q4 (D)  
Q5 (B)  
Q6 (D)  
Q7 (C)  
Q8 (B)  
Q9 (B)  
Q10 (D)  
Q11 (B)  
Q12 (A)  
Q13 (D)  
Q14 30  
Q15 (B)

Q16 (C)  
Q17 (D)  
Q18 120  
Q19 (D)  
Q20 (D)  
Q21 (D)  
Q22 (D)  
Q23 (C)  
Q24 (C)  
Q25 (A)  
Q26 (D)  
Q27 (A)  
Q28 (A)  
Q29 (B)  
Q30 (D)



## Hints & Solutions

### Q1 Text Solution:

Suppose that the distance between the house to the airport is LCM (60, 90) = 180 Km

Time taken without traffic =  $180/90 = 2$  hours.

Time taken with traffic =  $180/60 = 3$  hours.

So out of 3 hours journey time in the second case, only 2 hours was the travel time. i.e. .

Hence, in one hour too, the travel time will be  $2/3 \times 60 = 40$  mins

Hence, option D is the correct answer.

### Q2 Text Solution:

**We know Distance = Speed  $\times$  Time**

Quantity I:

$$\text{Speed of the train} = \frac{(720+800)}{160} = 9.50 \text{ m/s}$$

Quantity II:

$$\text{Speed of the bike} = \frac{54 \times 2}{4} = 27 \text{ km/hr}$$

$$\frac{27 \times 5}{18} = 7.50 \text{ m/s}$$

Quantity I > Quantity II

Hence, option B is the correct answer.

### Q3 Text Solution:

Let the speed of the boat in still water =  $a$  km/h

Speed of stream =  $26 - a$

According to question

$$232 = [a - (26 - a)] \times 23.2$$

$$2a - 26 = 10$$

$$\text{So, } a = 36/2 = 18 \text{ km/h}$$

Speed of stream =  $26 - 18 = 8$  km/h

Statement I.

New stream speed =  $8 \times 1.25 = 10$

Required time =  $182/28 = 6.5$  hours

This statement is true

Statement II. New stream speed =  $8 \times 1.5 = 12$

Required time =  $182/30$

= 6.06 hours approx.

This statement is true

Statement III. The new speed of stream =  $8 \times 62.5\% = 5$  km/h

Required time =  $182/23$

= 7.91 hrs approx

Hence, option c is the correct option.

### Q4 Text Solution:

Both the person and the escalator are moving in the same direction. In this case, the relative speed would be Speed of (Man + Stairs).

Assume that the speed of the escalator to be  $x$ .

Now, both for Peyush and Ashneer the length of the escalator should be same; and Peyush's speed is 6 steps/sec (say) and Ashneer's is 5 steps/sec.

Peyush is walking 60 steps and he does it in 10 sec, but in these 10 secs, even the escalator must have moved with speed " $x$ ". The length moved by it would be  $10x$ .

So, we can say the total length is  $60 + 10x$  (Steps moved by Peyush and the escalator helps Peyush in reaching the top.)

Similarly, for Ashneer we can write  $55 + 55/5 \times x$

Both lengths must be same, so -

$$60 + 10x = 55 + 55x/5$$

$$\text{So, } x = 5$$

So, total length is  $60 + 10x = 110$

i.e., each has to climb 110 steps when the escalator is switched off.

Option (D) is correct.

### Q5 Text Solution:

Let the speed of the escalator be  $x$  steps/sec.

It is given that Mr. Stanley covers 13 steps in 28 sec.





So, in these 28 seconds, the escalator will cover  $28x$  steps.

Therefore, the total number of steps on the escalator =  $13 + 28x$ . .....(i)

Similarly, Mr. Tom takes 16 sec and covers 37 steps.

So, in these 16 seconds, the escalator will cover  $16x$  steps.

Therefore, total steps on the escalator must be  $37 + 16x$ . ....(ii)

Solving (i) and (ii) we get;

$$13 + 28x = 37 + 16x$$

$$\Rightarrow x = 2$$

Hence, total number of steps =  $13 + 28(2) = 69$  steps.

Hence, option (B) is correct.

#### Q6 Text Solution:

Let the speed of the escalator be  $s$  steps/second.

Since Firoz moves at 4 steps/sec, he will take  $\frac{120}{4} = 30$  seconds to reach the bottom; and in 30 seconds the escalator will take  $30s$  steps.

So the total number of steps in the escalator =  $120 + 30s$ .

Since Mansoor moves at 3 steps/sec, she will take  $\frac{180}{3} = 36$  seconds to reach the bottom; and in 36 seconds the escalator will take  $36s$  steps.

So the total number of steps in the escalator =  $108 + 36s$ .

$$\text{So, } 120 + 30s = 108 + 36s$$

$$\text{Hence, } s = 2.$$

So the number of steps shown in the escalator is =  $(120 + 30 \times 2) = 180$

#### Q7 Text Solution:

In a circular track, if two people met at the same point every time they pass each other, then that point has to be their starting point. If

they meet at any other point other than the starting point, there will be at least 2 different meeting points.

As they are meeting at the starting point for every time and each of the joggers have a speed greater than 0, they should be jogging in the same direction. If they jog in the opposite directions then they should meet each other at a point which is different from the starting point which is not possible.

So, Trisha & Bhavna can only jog in the same direction. As they meet at the starting point in every 20 s, the relative speed is  $\frac{40m}{20s} = 2 \text{ m/s}$ .

Now let's assume that Trisha's speed is  $10x \text{ m/s}$

$$\text{So, } 2x = 2$$

$$\bullet \quad x = 1$$

Hence, Trisha's speed is  $10 \text{ m/s}$ .

So, she will be able to complete 1 round of the track in  $\frac{40 \text{ m}}{10 \text{ m/s}} = 4 \text{ s}$ .

#### Q8 Text Solution:

As the two people are moving in the opposite directions, the relative speed will be the sum of the speeds of the two people.

Let's assume that Bhavna's speed is  $2v \text{ m/s}$

So, Trisha's speed will be  $3v \text{ m/s}$

Hence,

$$5v = 40/8 = 5$$

$$\Rightarrow v = 1$$

So, Trisha's speed is  $3 \text{ m/s}$  and Bhavna's speed is  $2 \text{ m/s}$ .

Had they moved in the same directions, their relative speed will be  $1 \text{ m/s}$

So, they will meet in every 40 s. Thus, they will meet for the 10th time after 400 s.

#### Q9 Text Solution:

Let the speed of Indole be ' $x$ ' steps/sec and that of the escalator be ' $y$ ' steps/sec.





In 45 seconds, Indole will finish riding the escalator when going in the same direction.

Thus, total steps =  $45(x+y)$

If Indole's speed becomes 4 times, the time becomes 15 seconds.

Thus, total steps =  $15(4x+y)$

- $45x + 45y = 60x + 15y$
- $15x = 30y$
- $x = 2y$

So, total steps =  $15(4 \times 2y + y) = 135y$

Time taken by only escalator =  $135y/y = 135s$ .

#### Q10 Text Solution:

Let the running speed of Karan be S.

Let the speed of the escalator be E.

Let the total distance be D.

$$D/S+E = 40 \quad \dots(1)$$

$$D/S-E = 120 \quad \dots(2)$$

Equating the values of D obtained from equation (1) and equation (2), we get

$$40(S+E) = 120(S-E)$$

$$\Rightarrow 160E = 80S$$

$$\Rightarrow S = 2E \quad \dots(3)$$

Putting the value of equation (3) in equation (1)

$$D/S+E = D/3E = 40$$

$$D/E = 120$$

Now when Karan is walking on a stationary escalator, time required =  $D/E$

[Since,  $S = 2E$ ]

= 120 seconds.

#### Q11 Text Solution:

The ratio of speed of Mr. Grylls and that of Mr. Jackie is 3 : 8.

When the escalator is turned off, let the number of steps visible be x.

Given that, Mr. Grylls takes 24 steps to reach the top and Mr. Jackie takes 32 steps to reach the top.

The ratio of speed of Mr. Grylls to that of escalator

$$= \frac{24}{x-24} \quad \dots(i)$$

The ratio of speed of Mr. Jackie to that of escalator

$$= \frac{32}{x-32} \quad \dots(ii)$$

Dividing Equation (i) by (ii)  $\rightarrow$

The ratio of speed of Mr. Grylls to that of Mr. Jackie

$$= \frac{\frac{24}{x-24}}{\frac{32}{x-32}} = \frac{3}{8}$$

$$\Rightarrow \frac{24(x-32)}{32(x-24)} = \frac{3}{8}$$

$$\Rightarrow 192(x-32) = 96(x-24)$$

$$96x = 3840$$

$$x = 40$$

#### Q12 Text Solution:

As the two people are moving in the opposite directions and meeting in 2 different points, then they should have the same speed, else they will meet at more than 2 points.

So, A's speed = B's speed

So, B will take 20s to complete 1 round.

#### Q13 Text Solution:

Given that,

Speed of upstream = 15 km/hr

Speed of flow of river = 5 km/hr

We know that,

Downstream Speed = Speed of boatman + Speed of water

Upstream Speed = Speed of boatman - Speed of water

Let the distance from one side to another be x.

According to the formula used,

$$15 = \text{Speed of boatman} - 5$$

$$\text{Speed of boatman} = 20 \text{ km/hr}$$

$$\text{i.e., Speed of the downstream} = 20 + 5 = 25$$

According to the question,

$$x/15 + x/25 = 2.4 \text{ hr}$$



$$\Rightarrow 8x = 180$$

$$\Rightarrow x = 22.5 \text{ km}$$

So, Total distance =  $22.5 \times 2 = 45 \text{ km}$

The correct answer is option (4).

#### Q14 Text Solution:

Let's assume the escalator has a total 60 steps and the speed of the escalator is  $v$  steps/sec and that of Raghu's and Pritam's are  $r$  steps/sec &  $p$  steps/sec.

Raghu takes 60 sec to come down.

So,

$$(r-v) \times 60 = 60$$

$$\Rightarrow r - v = 1 \dots\dots\dots(i)$$

Raghu takes 12 sec to climb up. So,

$$(r + v) \times 12 = 60$$

$$\Rightarrow (r + v) = 5 \dots\dots\dots(ii)$$

Solving (i) & (ii) we get-

$$r = 3 \text{ steps/sec}$$

$$v = 2 \text{ steps/sec}$$

Pritam takes 10 sec to climb up. So,

$$(p + v) \times 10 = 60$$

$$\Rightarrow (p + 2) = 6$$

$$\Rightarrow p = 4$$

So, Pritam will take = 30s to come down.

#### Q15 Text Solution:

Given that,

Speed of upstream = 18 km/hr

Speed of flow of river = 6 km/hr

We know that,

Downstream Speed = Speed of sailor + Speed of water

Upstream Speed = Speed of sailor - Speed of water

Let the distance from one side be  $D$ .

According to the formula used,

$$18 = \text{Speed of Captain Damera's boat} - 6$$

$$\text{Speed of Captain Damera's boat} = 24 \text{ km/hr}$$

$$\text{Downstream Speed} = 24 + 6 = 30$$

According to the question

$$D/18 + D/30 = 1.6 \text{ hr}$$

$$\Rightarrow 8D = 144$$

$$\Rightarrow D = 18 \text{ km}$$

Hence, the required distance = 18 km.

#### Q16 Text Solution:

Let's assume that the speed of the train A is  $a$  m/s and that of train B is  $b$  m/s.

So, the length of train A is  $4a$  meters.

The length of the platforms is  $(10-4)a$  meters =  $6a$  meters

The length of train B is  $9a$  meters

Speed of the train B is  $9a/7.2 \text{ m/s} = 1.25 \text{ m/s}$

When they are moving in the same direction, the time taken to cross each other will be

$$\frac{4a+9a}{1.25a-a} \text{ seconds}$$

$$= 52 \text{ seconds.}$$

So, option c is right.

#### Q17 Text Solution:

The escalator moves 12 steps upward in the first 1 min and then moves 7 steps downward in the second 1 min.

It means the escalator actually moves upward 5 steps (i.e.,  $12-7$ ) in 2 minutes.

In the same manner the escalator will move upward every 5 steps in 2 minutes.

Similarly, in it will move 10 steps in 4 minutes, 15 steps in 6 minutes.

In this way, the escalator will move 50 steps upward in 20 minutes.

The remaining steps ( $60 - 50 = 10$  steps), the escalator will reach in  $\frac{5}{6}$  minutes, i.e., in 50 seconds.

Hence, the escalator will move 60 steps in 20 minutes 50 seconds.

Thus, Rohit with the escalator will reach the first floor in 20 minutes 50 seconds.

Option (D) is correct.



**Q18 Text Solution:**

Let the speed of Mr. Artist be  $v$  and the speed of the escalator be  $u$

$$\text{Number of steps}/u+v = 80/v$$

$$\text{Number of steps} = 80 + 80(u/v) \dots\dots\dots (1)$$

As the time taken to descend is 3 times the time taken to ascend, so effective speed while ascending is thrice the effective speed while descending.

$$\text{So, } v + u = 3(v - u)$$

- $2v = 4u$
- $u/v = 1/2$

Substituting in (1), we get

$$\text{Number of steps} = 80 + 80 \times 1/2 = 120$$

**Q19 Text Solution:**

**Let speed of boat in still water = ' $x$ ' m/s**

**And speed of stream while boat is going downstream = ' $y$ ' m/s**

So, speed of stream while boat is coming back = 75% of  $y = (3y/4)$  m/s

From the question:

$$\frac{168}{x - \frac{3y}{4}} - \frac{168}{x + y} = 4 \dots\dots\dots(1)$$

If speed of stream had not been decreased while coming back:

$$(x + y) - (x - y) = 8$$

$$y = 4 \text{ m/s}$$

From equation (1):

$$\frac{168}{x-3} - \frac{168}{x+4} = 4$$

$$168 \times \frac{(x+4-x+3)}{(x-3)(x+4)} = 4$$

$$42 \times 7 = x^2 + x - 12$$

$$x^2 + x - 306 = 0$$

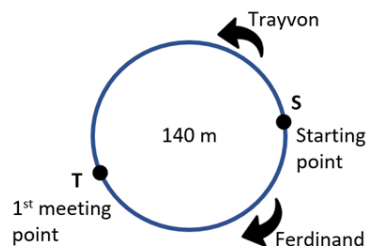
$$x^2 + 18x - 17x - 306 = 0$$

$$x = 17$$

Speed of boat in still water = 17 m/s

$$\text{So, required time} = \frac{168}{17-3} + \frac{168}{17+4} = 12 + 8 = 20 \text{ seconds}$$

**Hence, option d is the correct option.**

**Q20 Text Solution:**

$$\text{Time taken to meet for the first time} = \frac{(\text{Total track length})}{(\text{Relative Speed})} = \frac{140}{10} = 14\text{s}$$

Say they meet at point T.

$$\text{The distance ST} = \text{speed of Trayvon} \times \text{time taken} = 6 \text{ m/s} \times 14 \text{ sec} = 84 \text{ m}$$

Once they meet for the first time at T, they exchange their speed.

So, now the speed of Ferdinand becomes 6m/s and Trayvon's speed = 4m/s.

The interesting thing now is that Ferdinand with the increased speed of 6m/s will take 14 sec only to reach the starting point. Same for Trayvon he would take 14 sec to reach point S.

Once they meet again at point S after 28 sec from the time they started together, the same cycle will repeat. Hence, they would keep on meeting only at points T and S alternatively.

Hence, for the 25<sup>th</sup> Time, they will meet at point T which is 84 m ( $0.6 \times 140$ ) away from starting point.

**Q21 Text Solution:**

$$\text{Circular track} = 2400 \text{ m.}$$

$$\text{race} = 14400 \text{ m.}$$

According to the question, after 8th minute both, slow and the fast runner meet at the starting point.

$$\text{Slow runner's speed} = \frac{2400}{8} = 300 \text{ m/min}$$

$$\text{Fast runner's speed} = 300 \times 3 = 900 \text{ m/min}$$

$$\text{In the 8th min., fast runner has covered} = 900 \times 8 = 7200 \text{ m.}$$



In the 8th min., slow runner has covered =  $300 \times 8$   
= 2400 m.

If it took 8 mins., to complete 7200 m., it will take  
 $8 \times 2 = 16$  mins to complete 14400 m.

Thus, total of 16 mins to finish the race.

## Q22 Text Solution:

Let the escalator speed =  $e$  steps/s.

Let Sohan's speed =  $3x$  steps/s. Let Mohan's speed =  $2x$  steps/s.

So, Mohan's speed in the up-up escalator is  $2x + e$  and Sohan's speed in down-up escalator is  $3x - e$ .

Time taken by Mohan in up-up escalator = 8 seconds. Time taken by Sohan in down-up escalator = 12 seconds.

Since ratio of time taken by Mohan to go in up-up escalator and Sohan to go in down-up escalator = 2:3

Ratio of speed of Mohan and Sohan in their respective ways = 3:2 [reciprocal of the time taken].

Therefore, ratio of speed = ratio of distance

$$\frac{2x + e}{3x - e} = \frac{3}{2}$$

$$\Rightarrow 4x + 2e = 9x - 3e$$

$$\Rightarrow 5e = 5x$$

$$\Rightarrow e = x$$

Mohan's speed in up-up escalator =  $3x$ . Sohan's speed in down-up escalator =  $2x$

Effective speed of Sohan in up-up escalator =  $3x + x = 4x$

Ratio of speed of Sohan in down-up escalator:

Ratio of speed of Sohan in up-up escalator

$$2x:4x = 1:2$$

Ratio of time taken by Sohan in down-up escalator: Ratio of time taken by Sohan in up-up escalator = 2:1

As we know that Sohan takes 12 seconds to go down-up escalator,

$$\frac{T_1}{T_2} = \frac{12}{x}$$

We know that the ratio of the time taken is 2:1 for the same, so

$$\frac{T_1}{T_2} = \frac{2}{1}$$

Hence,  $x = 6$

Thus, Sohan will take 6 seconds to go in the up-Escalator.

## Q23 Text Solution:

Let their speeds be  $T$  km/hr and  $P$  km/hr. ( $P > T$ ) because, as per the data, he crosses  $T$ )

Here, we must understand one very important concept of relative motion across circular tracks.

If two people travel in the same direction around a circular track, every time the faster person overtakes the slower person, he covers one round more than the slower one.

So here, when they start running in the same direction, Pumba completes 5 more rounds than Timon in 50 minutes.

OR Pumba would complete 1 more round than timon in  $50/5 = 10$  mins.

OR When they both travel in the same direction, the time taken to meet is 10 mins or  $1/6$  hours.

So, **Time  $\times$  relative speed = distance**

$$(1/6) \text{ hr} = 6 \text{ KM}/P-T$$

$$P - T = 36 \text{ km/hr} \text{ -----(1)}$$

Also, when they travel in the opposite directions, Timon covers 1 kilometer less than Pumba.



Let Timon cover  $a$  km, Pumba would over 1 km more i.e.  $a+1$ .

$$\text{OR } (a) + (a+1) = 6$$

$$\text{OR } 2a + 1 = 6$$

$$\text{OR } a = 2.5, a+1 = 3.5 \text{ km}$$

In the same time, the ratio of speeds = ratio of their distances

$$T : P = 2.5 : 3.5$$

$$T : P = 5 : 7$$

$T = 5x$  and  $P = 7x$ , put in (1):

$$7x - 5x = 36$$

$$\text{OR } 2x = 36$$

$$\text{OR } x = 18 \text{ km.}$$

Thus, speeds of T and P are

$$5 \times 18 = 90 \text{ km/hr}$$

$$7 \times 18 = 126 \text{ km/hr}$$

#### Q24 Text Solution:

Both boats are running along stream

$$\text{Downstream speed of boat X} = 45 + 5 = 50 \text{ km/h}$$

$$\text{Downstream speed of boat Y} = 75 + 5 = 80 \text{ km/h}$$

$$\text{Time taken by boat Y to cover distance} = 640/80 = 8 \text{ hours}$$

$$\begin{aligned} \text{In 8 hours distance travelled by boat X} &= 50 \times 8 \\ &+ (45 \times 0.7 + 5) \times 3 \\ &= 250 + 109.5 \\ &= 359.5 \text{ km} \end{aligned}$$

$$\text{Required difference} = 640 - 359.5 = 280.5 \text{ km.}$$

**Hence, the correct answer is option C.**

#### Q25 Text Solution:

Let the speed of a boat in still water =  $a$  km/hr

Speed of a current =  $b$  km/hr

$$\text{Downstream speed } a + b = (D+12)/3 \text{ kmph}$$

$$\text{Upstream speed } a - b = D/6 \text{ kmph}$$

ATQ

$$\frac{\frac{2D-8}{a-b} + \frac{0.75D+4}{a+b}}{\frac{12D-48}{D}} = 13$$

$$1.25D^2 - 48D - 576 = 0$$

$$D = \frac{60}{1.25}, \frac{-12}{1.25}$$

Distance cannot be negative

$$\text{So } D = 48 \text{ km}$$

$$\text{Downstream speed} = (48+12)/3 = 20 \text{ km/hr}$$

$$\text{Upstream speed} = 48/6 = 8 \text{ km/hr}$$

$$\text{Speed of a boat in still water} = 14 \text{ km/hr}$$

$$\text{Speed of a current} = 6 \text{ km/hr}$$

$$\text{Downstream distance} = (14+6) \times 3 = 60 \text{ km}$$

Hence, option A is the correct answer.

#### Q26 Text Solution:

$$\text{Upstream speed of faster boat} = 50 - 5 = 45 \text{ km/h}$$

$$\text{Upstream speed of slower boat} = 35 - 5 = 30 \text{ km/h}$$

$$\text{Relative speed of boats} = 45 - 30 = 15 \text{ km/h}$$

$$\text{Distance between both the boats after 40 minutes from the start} = 15 (40/60) = 10 \text{ km}$$

$$\text{Relative speed of slower boat and item fall from faster boat} = 30 + 5 = 35 \text{ km/h}$$

$$\begin{aligned} \text{Time after which slower boat catches the item} \\ \text{from the time when it falls from faster boat} &= 10/35 \end{aligned}$$

$$= 2/7 \text{ hour}$$

$$\text{Distance traveled by faster boat in}$$

$$2/7 \text{ hour} = 45 (2/7) = 90/7 \text{ km}$$

$$\begin{aligned} \text{Distance traveled by item in } 2/7 \text{ hour} &= 5 \times 2/7 \\ &= 10/7 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Distance between both the boats when slower} \\ \text{catches the item} &= (90/7) + (10/7) = 100/7 = 14.3 \end{aligned}$$



km (Approx.)

Hence, option d is the correct option.

**Q27 Text Solution:**

**Let the speed of stream = a km/h**

So, speed of the boat in still water =  $900\% \times a = 9a$  km/h

Now,

$$\frac{\frac{P+31}{9a-a}}{\frac{2(P+15)}{9a+a}} = \frac{2}{3}$$

$$\frac{P+31}{2(P+15)} = \frac{8}{15}$$

$$15P + 465 = 16P + 240$$

$$P = 225$$

Required value =  $225\%$  of  $500 = 1125$

Hence, option A.

**Q28 Text Solution:**

Downstream speed of Boat P =  $768/24 = 32$  km/h

Upstream speed of Boat P =  $768/32 = 24$  km/h

So, speed of the boat in still water of Boat P =  $(32+24)/2 = 28$  km/h

Speed of current for boat P =  $32 - 28 = 4$  km/h

Speed of boat Q in still water =  $0.5 \times 28 = 14$  km/h

Speed of current for boat Q =  $4 \times 2 = 8$  km/h

Required time taken by boat Q to travel 77 km downstream =  $77/22 = 3.5$  hours

**Hence, option A is the correct option.**

**Q29 Text Solution:**

Let the original speed of train =  $x$  m/s

And the length of train =  $d$  m

So, the length of tunnel =  $2d$  m

From the question:

$$(d + 2d) = 30x$$

$$d = 10x \text{ -----(1)}$$

If the speed of the train was  $5$  m/s more. The length of the train was  $20\%$  more then we can say,

New speed of train =  $(x + 5)$  m/s

New length of train =  $120\%$  of  $d = (6d/5)$  m

So,

$$6d/5 + 2d = (x + 5) (80/3)$$

$$16d/5 = (x + 5)(80/3)$$

From equation (1):

$$32x \times 3 = 80x + 400$$

$$x = 25, d = 250$$

Time taken by man to cover the length of train =  $250/5 = 50$  seconds

So, distance covered by train in 50 seconds =  $25 \times 50 = 1250$  m

**Q30 Text Solution:**

Let's assume the length of the track =  $L$  m

So,

$$\text{LCM}\left(\frac{L}{3}, \frac{L}{5}\right) = 60$$

$$\Rightarrow L = 60$$

So, the length of the track is  $60$  m

While finding "when the people meet at the starting points" directions do not matter until they are running along the circular tracks.

So, they will meet for the first time in the starting point after  $\text{LCM}(4, 5, 3)$  Seconds =  $60$  Seconds.

So, they will meet after  $180$  s for the  $3^{\text{rd}}$  time.

