MBA PIONEER 2024

QUANTITATIVE APTITUDE

DPP: 18

Distance Time and Speed - 4

Q1 In a race, A beats B by $100m$, B beats C by $200m$ and A beats C by $290m$. In the same racing track P beats Q by $200m$, Q beats R by $150m$, then by what distance (in metres) P will beat R ?

Q2 In a race, A beats B by $100m$, B beats C by $200m$ and A beats C by $290m$. In the same racing track P beats Q by $200m$, Q beats R by $200m$, if P beats R by 19 s then Q will beat R by how many seconds?

Q3 In a race, A beats B by $200m$, B beats C by $200m$ and A beats C by $360m$. In the same racing track P beats Q by $200m$, Q beats R by $100m$. How many meters of head start needs to be given to R so that he can finish the race with P ?

Q4 In a race, A beats B by $200m$, B beats C by $200m$ and A beats C by $360m$. In the same racing track P beats Q by $200m$, Q beats R by $100m$. If C's speed is half of Q's speed, then by what distance (in m) P will beat A in the same track ?

Q5 In a race, A beats B by $200m$, B beats C by $200m$ and A beats C by $360m$. In the same racing track P beats Q by $200m$, Q beats R by $100m$. If C's speed is same as that of half of Q's speed, then how much head start approximately (in m) needs to be given to B so that he finishes with R ?

(A) 375 (B) 305.6

(C) $2500/9$ (D) 275

Q6 In an army recruitment rally, candidate X beats candidate Y by $45m$, candidate Y beats candidate Z by $50m$, and candidate X beats candidate Z by 90 m. What is the length of the racecourse (in metres)?

(A) 420 (B) 435

(C) 450 (D) 475

Q7 Ravi, Biju and Krishna are climbing up from the ground floor to the 1st floor of a shopping mall using an escalator and for every step Krishna takes, Ravi and Biju take 2 and 4 steps respectively. If Ravi reaches the top after taking 30 steps and Krishna reaches the top by taking 20 steps, how many steps did Biju take to reach the top?

Q8 Two children Dholu and Bholu start descending on an escalator which is going down. Bholu is 4 times as fast as Dholu. By the time they reach the bottom, Dholu individually descends 30 steps while Bholu individually descends 40 steps. How many steps are visible on the escalator?

Q9 Mr. Gupta is moving on an escalator with a constant speed of 4 steps/second. Karan moves at a constant speed of 2 steps/second. When the escalator is moving downward, Mr. Gupta takes 160 steps and Karan takes 100 steps to reach the bottom from the top of the

escalator. How many steps are there if the escalator becomes stationary?

(A) 420 (B) 480

(C) 460 (D) 400

Q10 Two persons Pathan and Sultan are walking up on an escalator that is also going up. Pathan takes 8 steps to reach the top whereas Sultan takes 14 steps to reach the top. If the speeds of Pathan and Sultan are 3 steps per second and 7 steps per second respectively, find the total number of steps on the escalator when it is stationary.

Q11 Pietro needs one minute and ten seconds to descend an escalator by walking 36 steps. Pietro now uses the escalator to run downwards, in this case, he takes 63 steps which takes 35 seconds. How many steps does the escalator have if it is given that the escalator is always moving down?

Q12 Train A & B started at the same point and are moving in a straight line but in opposite directions. Train C, which is standing at a station in the same straight line as the line of motion of A & B, blew two horns at an interval of $10s$. Train A & B heard the horns at an interval of 9 sec & 12 sec respectively. Find the ratio of speed of Train A & B if it is given that the speed of sound is $330m/s$ and the initial distance between Train A and C is $3300m$.

(A) $3:4$ (B) $1:1$

(C) $2:3$ (D) $10:11$

Q13 A train 1140 meters long crosses a platform whose length is 460 meters in 40 seconds. If a dog is running at a speed of $3m/s$ in the same direction as that of the train and train is 444 meters away from the dog, then in how much time will the train catch the dog?

(A) 35 seconds (B) 12 seconds

(C) 25 seconds (D) 18 seconds

Q14 Two trains X and Y have started from Delhi simultaneously in the same direction. Train X travels at $64km/h$ while the speed of train Y is 12.5% less than that of the speed of train X. Thirty minutes later, a third train Z starts from Delhi in the same direction as that of X and Y. It overtook train X 50 minutes later than it overtook train Y, then the speed of the train Z would be.

(A) $80km/h$ (B) $72km/h$

(C) $88km/h$ (D) $96km/h$

Q15 A train is travelling from Durgapur to Kolkata at a speed of $50kmph$ and travels back at the same speed. If the train travels at a speed of $70kmph$ from Durgapur to Kolkata, and returns back at a speed of $30kmph$, then it would have taken 4 more hours. If a super-fast train travels at a speed of 105 kmph on an average, then how much time it would have taken to reach Kolkata from Durgapur?

(A) 4 hours (B) 5 hours

(C) 6 hours (D) 10 hours

Q16 Two trains T1 and T2 simultaneously start towards each other at speeds of 40 km/hr and 60 km/hr respectively. An eagle is sitting on the engine of train T1. The moment the trains start, the eagle starts flying towards the second train. Immediately, on reaching the second train, the eagle heads back towards the first train. Immediately on reaching the first train, the eagle reverses the direction and starts flying towards the second train. This process continues till the two trains meet. If the distance between the trains is 200 km and the speed of the eagle is 80 km/hr, what is the total distance

travelled by the eagle in the forward direction (i.e., in the direction towards the second train)?

(A) 140 km (B) 130 km
(C) 120 km (D) 110 km

Q17 Two trains T1 and T2 simultaneously start towards each other at speeds of 40 km/hr and 60 km/hr respectively. An eagle is sitting on the engine of train T1. The moment the trains start, the eagle starts flying towards the second train. Immediately, on reaching the second train, the eagle heads back towards the first train. Immediately on reaching the first train, the eagle reverses the direction and starts flying towards the second train. This process continues till the two trains meet. If the distance between the trains is 200 km and the speed of the eagle is 80 km/hr, what is the total distance travelled by the eagle in the backward direction (i.e., in the direction towards the first train)?

(A) 40 km (B) 30 km
(C) 20 km (D) 10 km

Q18 A boat can travel $120km$ downstream in 2 hours. If speed of the current is $1/3rd$ of the speed of the boat downstream, then how much time (in hrs) will the boat take to travel $240km$ upstream?

Q19 In still water, a ship can be driven at speed of 20 km/h. It travels $145km$ downstream and then returns back to the starting point again. If this whole trip takes a total of 18 hours, what is the speed (km/h) of the flow of river?

(A) $\frac{5\sqrt{7}}{2}$
(B) $\frac{10\sqrt{7}}{3}$
(C) $\frac{15\sqrt{7}}{4}$
(D) $\frac{20\sqrt{5}}{9}$

Q20 In a descending escalator that has 224 steps, Pratap starts running upwards and Bhanu starts running downwards at different speeds at the same time. The speed of the escalator is the difference of thrice the speed of Pratap and six times the speed of Bhanu. Given that the ratio of speeds of Pratap and Bhanu is $5:2$, find the step of the escalator from the top on which Pratap and Bhanu meet.

Q21 The distance between Dakhhineshwar and Babughat is $90km$. A boat while going downstream takes 3 hours to complete this distance. Bulbul a passenger in a boat dropped a polythene when she was at Dakhhineshwar. After reaching Babughat, she realized that the polythene was dropped. She immediately took the boat and started going upstream. After how much time (in hours), after the polythene was dropped, will she be able to find the polythene if the speed of the boat is 20 $kmph$ in still water.

Q22 What is the minimum time required for a boat to travel downstream from Cochin to Mumbai, if it takes 4 hours to travel the same distance upstream and the time taken to cover the same distance in still water is 40 minutes more than the time taken to travel downstream?

(A) 1.25 hours (B) 1.33 hours
(C) 3 hours (D) 2.5 hours

Q23 Sahev rows a boat upstream in a Darakeswar river from Arambag to Ghatal in 5 hours. Had the river been still, he could have completed the journey in 4 hours. How much time will it take for Sahev to row the boat from Ghatal to Arambag?

(A) 2 hour 24 minutes
(B) 3 hours 20 minutes

(C) 2 hour 48 minutes
(D) 2 hour 12 minutes

Q24 Sounak, Niraj and SK need to reach the lecture hall on time which is $15km$ away from their current location. They had only one bike which can accommodate maximum 2 persons at a time. Sounak came up with an idea where all of them can reach at the same time. He took SK with him on bike and asked Niraj to walk until he picks him up. Sounak dropped SK at a point and moved back to pick Niraj, SK walked the remaining distance. If both SK and Niraj walk at a speed of $10kmph$ and Sounak drove at a constant speed of $30kmph$ then find how much time (in minutes) they took to reach the Lecture Hall.

Q25 Mr. Wangdu used to pick up his wife Mrs. Wangdu from college every day at 4 p.m. One day, Mrs. Wangdu's classes got over at 3 p.m. and she started walking towards home. Mr. Wangdu met her on the way and returned home 20 minutes earlier. How long (in minutes) did she walk?
(A) 25 (B) 30
(C) 45 (D) 50

Q26 The distance between Vaibhav's school and his home is Xkm. One fine day, Vaibhav is cycling at a speed of $28km/hr$ reaches his school $14min$ late. Next day, he increases his cycling speed by $7kmph$ but finds that he is still late by $5min$. Find the time taken by Varun to cover $3Xkm$ at a cycling speed of $10m/sec$.
(A) $1hr45min$
(B) $1hr50min$
(C) $1hr40min$
(D) $1hr48min$

Q27 Two small boats, A and B, having the same dimensions, started from the ends X and Y, respectively, of a long raft XY. This long raft XY is floating in a river in the direction of the flow. Boat A moved in the direction from X to Y and boat B moved from Y to X. The raft is moving in the same direction as that of boat A. The ratio of times taken by boats A and B to completely pass the raft is $1:2$. Starting from the tail of boat B and rowing in the same direction as boat B (given that boat B is moving against the direction of flow of the river), if boat A completely passes boat B in 25 seconds, then in how much time (in seconds) will the two boats pass each other if they row in opposite directions starting head to head, given that boat A is moving in the direction of flow of the river?
(A) 8.33 (B) 12.5
(C) 50 (D) 2.5

Q28 Two friends simultaneously start swimming towards each other from two edges exactly opposite each other of a pond. They meet at a distance of $320m$ from one of the edges and continue swimming further till they reach the opposite edges respectively. They take rest for 1 minute each and reach back by taking the same path. Now they meet at a distance of $140m$ from the other edge. Find the distance (in m) between the two edges of the pond.
(A) 800 (B) 810
(C) 820 (D) 830

Q29 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 all day long, they will meet with each other at the

same exact point. Bhavna's speed is 20% more than that of Trisha. Virat, Bhavna's rival, started jogging at the same time at the farthest point on the circular track from Bhavna. Virat jogged for 40 seconds and left the premise to attend a meeting. During his jogging, he never met or passed Bhavna even once. Let v be the minimum possible speed of Virat where 4v is an integer. Then find the value of 4v?

(A) 47 (B) 44

(C) 43 (D) 42

Q30

Tavsal and Jaigad cities are very well connected to each other by waterways. It takes 2 hours for a ferry to travel from Jaigad to Tavsal or from Tavsal to Jaigad. Ferry services start from both Tavsal and Jaigad docks at 5:30 am every morning, and there is a new ferry leaving either station at 10-minute intervals. Snehal starts from Jaigad to Tavsal by ferry at 7:00 am. How many ferries traveling from the opposite direction does he see (including the ones at either of the docks)?

(A) 12 (B) 6

(C) 15 (D) None of these

Answer Key

Q1	335
Q2	10
Q3	280
Q4	375
Q5	(B)
Q6	(C)
Q7	40
Q8	45
Q9	(D)
Q10	32
Q11	90
Q12	(C)
Q13	(B)
Q14	(A)
Q15	(B)
Q16	(C)
Q17	(A)
Q18	12
Q19	(B)
Q20	160
Q21	6
Q22	(B)
Q23	(B)
Q24	50
Q25	(D)
Q26	(A)
Q27	(A)
Q28	(C)
Q29	(A)
Q30	(D)

Hints & Solutions

Q1 Text Solution:

Topic - Time, Speed and Distance

Let A beat B by 'a', here a = 100

B beat C by 'b', here b = 200

A beat C by 'c', here c = 290

the total distance is given by = $\frac{ab}{a+b-c}$

Thus, total distance = $\frac{200\times100}{10}$ = 2000

Thus, the length of the track is $2000m$ In the same racing track P beats Q by $200m$, Q beats R by $150m$ Let, P beats R by $kmetre$

So,

$$k = 200 + 150 - \frac{(200 \times 150)}{2000}$$
$$\Rightarrow k = 350 - 15 = 335$$

Thus, the distance by which P will beat R is $335m$.

Q2 Text Solution:

Let's assume the length of the track is dm. Let A beats B by xm, B beats C by y m and A beats C by z m.

So,

$$\frac{\text{A's speed}}{\text{B's speed}} = \frac{d}{(d-x)}$$
$$\frac{C'\text{'s speed}}{\text{A's speed}} = \frac{(d-z)}{d}$$

Multiplying (i) \& (ii) we get -

$$\frac{\text{B's speed}}{\text{C's speed}'} = \frac{(d-x)}{(d-z)} = \frac{d}{(d-y)}$$
$$\Rightarrow (d-x)(d-y) = d(d-z)$$
$$\Rightarrow d^2 - d(x+y) + xy = d^2 - zd$$
$$\Rightarrow z = (x+y) - \frac{xy}{d}$$

We will be using this as a shortcut to answer the race problems quickly

So, the length of the track $= d$

$$290 = 300 - \frac{20000}{d}$$
$$\Rightarrow 10d = 20000$$
$$\Rightarrow d = 2000$$

Thus, the length of the track is $2000m$ In the same racing track P beats Q by $200m$, Q beats R by $200m$

Let, P beats R by k metres

So,

$$k = 200 + 200 - \frac{(200 \times 200)}{2000}$$
$$\Rightarrow k = 400 - 20 = 380$$

Thus, the distance by which P will beat R is $380m$. So the ratio of the speed of $P, Q \& R$ are 2000 :

$(2000 - 200) : (2000 - 380) = 100 : 90 : 81$

Hence, the ratio of time taken by $P \& R$ to finish the race will be $81 : 100$

Let, P finishes the race in $81j$ seconds and R finishes in $100j$ seconds

$$\text{So, } (100j - 81j) = 19$$
$$\Rightarrow j = 1$$

So, P takes 81 seconds to finish the race. R takes 100 seconds to finish the race and Q takes 90 seconds to finish the race.

So, Q will beat R by $(100-90)$ seconds $=10$ seconds.

Q3 **Text Solution:**

Let's assume the length of the track is dm. Let A beats B by xm, B beats C by y m and A beats C by zm.

So,

$$\frac{\text{A's speed}}{\text{B's speed}}=\frac{d}{(d-x)}$$

$$\frac{\text{C's speed}}{\text{A's speed}}=\frac{(d-z)}{d}$$

Multiplying (i) \& (ii) we get -

$$\frac{\text{B's speed}}{\text{C's speed}}=\frac{(d-x)}{(d-z)}=\frac{d}{(d-y)}$$
$$\Rightarrow (d-x)(d-y)=d(d-z)$$
$$\Rightarrow d^2-d(x+y)+xy=d^2-zd$$
$$\Rightarrow z=(x+y)-\frac{xy}{d}$$

We will be using this as a shortcut to answer the race problems quickly

So, the length of the track $=d$

$$360=400-\frac{40000}{d}$$
$$\Rightarrow 10d=10000$$
$$\Rightarrow d=1000$$

Thus, the length of the track is $1000m$ In the same racing track P beats Q by $200m$, Q beats R by $100m$ Let, P beats R by km

so

$$k=200+100-\frac{(200\times 100)}{1000}$$
$$\Rightarrow k=300-20=280$$

Thus, the distance by which P will beat R is $280m$ assuming no head start.

So, by the time R will reach $(1000-280)m=720\ m$, P will reach $1000m$

So, a $280m$ head start is needed so that P and R reaches together.

Q4 **Text Solution:**

Let's assume the length of the track is dm.

Let A beats B by xm, B beats C by ym and A beats C by zm.

So,

$$\frac{\text{A's speed}}{\text{B's speed}}=\frac{d}{(d-x)}\ldots..(i)$$
$$\frac{C'\text{'s speed}}{\text{A's speed}}=\frac{(d-z)}{d}\ldots..(\text{i}$$

Multiplying (i) \& (ii) we get :

$$\frac{\text{B's speed}}{C'\text{ s speed}}=\frac{(d-x)}{(d-z)}=\frac{d}{(d-y)}$$
$$\Rightarrow (d-x)(d-y)=d(d-z)$$

$$\Rightarrow d^2-d(x+y)+xy=d^2-zd$$
$$\Rightarrow z=(x+y)-\frac{xy}{d}$$

We will be using this as a shortcut to answer the race problems quickly

So, the length of the track $=d$

$$360 = 400 - \frac{40000}{d}$$
$$\Rightarrow 10d = 10000$$
$$\Rightarrow d = 1000$$

Thus, the length of the track is $1000m$ In the same racing track P beats Q by $200m$, Q beats R by $100m$
Let, P beats R by km
So,

$$k = 200 + 100 - \frac{(200 \times 100)}{1000}$$

$$\Rightarrow k = 300 - 20 = 280$$

Thus, the distance by which P will beat R is $280m$. Now the ratio of speed of $A, B\&C$ is

$$1000 : 800 : 640 = 25 : 20 : 16$$

The ratio of speed of $P, Q\&R$ is

$$1000 : 800 : 720 = 25 : 20 : 18$$

As, C's speed is same as half of Q's speed

$$16h = \frac{1}{2} \text{ of } 20i$$

Here we have the relation between h and $i \Rightarrow h : i$

$$= 5 : 8$$

Speed of $A = 25h = 25 \times 5 = 125$ units m/sec

Speed of $P = 25i = 25 \times 8 = 200$ units m/sec
Time taken by P to cover $1000m = 5sec/$ units.
Distance travelled by A in $5sec/$ units

$$= 5 \times 125 = 625m.$$

Hence, P will be able to beat A by

$$1000 - 625 = 375m.$$

Q5 **Text Solution:**
Let's assume the length of the track is dm.
Let A beats B by xm, B beats C by ym and A beats C by z m.
So,

$$\frac{\text{A's speed}}{\text{B's speed}} = \frac{d}{(d-x)} \ldots\ldots \text{(i)}$$
$$\frac{C' \text{'s speed}}{\text{A's speed}} = \frac{(d-z)}{d} \ldots\ldots \text{(ii)}$$

Multiplying (i) \& (ii) we get -

$$\frac{\text{B's speed}}{\text{C's speed}'} = \frac{(d-x)}{(d-z)} = \frac{d}{(d-y)}$$
$$\Rightarrow (d-x)(d-y) = d(d-z)$$
$$\Rightarrow d^2 - d(x+y) + xy = d^2 - zd$$
$$\Rightarrow z = (x+y) - \frac{xy}{d}$$

We will be using this as a shortcut to answer the race problems quickly
So, the length of the track $= d$

$$360 = 400 - \frac{40000}{d}$$
$$\Rightarrow 10d = 10000$$
$$\Rightarrow d = 1000$$

Thus, the length of the track is $1000m$
In the same racing track P beats Q by $200m, Q$ beats R by $100m$
Let, P beats R by km
So,

$$k = 200 + 100 - \frac{(200 \times 100)}{1000}$$
$$\Rightarrow k = 300 - 20 = 280$$

Thus, the distance by which P will beat R is $280m$. Now the ratio of speed of A, B \& C is
$1000 : 800 : 640 = 25 : 20 : 16$
The ratio of speed of $P, Q \& R$ is
$1000 : 800 : 720$ = 25:20:18
As, C's speed is same as half of Q's speed
$16h = 1/2$ of $20i$
Here we have the relation between h and $i \Rightarrow h : i = 5 : 8$
Speed of $R = 18i = 18 \times 8 = 144$ units m/sec Time taken by R to cover $1000m$

$$= \frac{1000}{144} = 6.944 sec/\text{ units}$$

Speed of $B = 20h = 20 \times 5 = 100$ units m/sec Distance travelled by B in $6.944 sec/$ units $= 6.944 \times 100 = 694.4m$
R beats B by $1000 - 694.4 = 305.6m$
Hence, we can say that B needs a head start of $305.6m$ so both can reach at the same time.

Q6 Text Solution:

Let the length of the race track be ' x ' m. By the time X finishes the race, Y lags by $45m$.
That is, in the same time, while X runs X, m runs $(x - 45)m$
Ratio of Speeds of X and $Y = \frac{X}{(x-45)}$
By the time Y finishes the race, C lags by $50m$.
That is, in the same time, while Y runs $xkms, Z$ runs $(x - 50)m$
Ratio of Speeds of Y and $Z = \frac{x}{(x-50)}$
By the time X finishes the race, Z lags by $90m$.
That is, in the same time, while X runs xm, Z runs $(x - 90)m$
Ratio of Speeds of X and $Z = \frac{X}{(x-90)}$
(Ratio of Speeds of X and $Y) \times ($ Ratio of Speeds of Y and $Z) = ($ Ratio of Speeds of X and $Z)$
$\frac{x}{(x-45)} \times \frac{x}{(x-50)} = \frac{x}{(x-90)}$
$\frac{x}{(x-45)} = \frac{(x-50)}{(x-90)}$
On solving further, we get, $x = 450$.

Q7 Text Solution:

Assume the number of steps visible when escalator is off is S.
Krishna takes 15 steps by the time Ravi reaches the top because his speed is half that of Ravi's.
Assume the escalator covered ' x ' steps while Ravi covered 30 .
As a result, the total number of escalator steps

$$= S = 30 + x.$$

The escalator must cover x steps when Ravi takes 30 steps, x steps when Krishna takes 15 steps, and $\frac{4x}{3}$ steps when Krishna takes 20 steps.
Thus, $30 + x = 20 + \frac{4x}{3}$

$$x = 30.$$

As a result, the escalator has 60 steps in total.
As Ravi takes 30 steps, the escalator takes 30 steps as well. This means that the escalator's speed is the same as Ravi's speed.
Yet, Biju's speed is twice that of Ravi.

As a result, Biju must climb twice as many steps as the escalator to reach the top.
As a result, $2y + y = 60$

$$= y = 20$$

Therefore, Biju's total number of steps taken to reach the top is 40 .

Q8 Text Solution:

Let the escalator takes m steps when Dholu descends 30 steps.
Since Bholu is 4 times as fast as Dholu, Dholu would have taken $\frac{40}{4} = 10$ steps by the time Bholu takes 40 steps.
The escalator would have taken $m/3$ steps when Dholu descends 10 steps because it takes m steps when Dholu takes 30.

$$30 + m = 40 + \frac{m}{3}$$

$$m = 15$$

$$\text{Steps Visible } = 30 + m = 30 + 15 = 45$$

Q9 Text Solution:

Let us say that the escalator moves at x steps per second.
Mr. Gupta takes 160 steps so he would have taken 40 seconds for it. In the meantime, the escalator would cover $40x$ steps.
Similarly, Karan takes 100 steps, so he will take 50 seconds. The escalator would cover $50x$ steps in that time.
Now total steps would be equal for both.
Hence, $160 + 40x = 100 + 50x$

$$\Rightarrow 10x = 60$$
$$\Rightarrow x = 6.$$

So, the number of steps visible for stationary escalator $= 160 + 40 \times 6 = 400$

Q10 Text Solution:

Let there be ' n ' steps on the escalator. In the case of Pathan, the escalator covers $n - 8$ steps and in the case of Sultan, the escalator covers n-14 steps.
Let the times taken Pathan and Sultan to reach at the top be ' a ' and ' b ' respectively.
Speed of Pathan $= \frac{8}{a}$
Speed of Sultan $= \frac{14}{b}$
Ratio of speeds $= \frac{8}{a} \times \frac{b}{14} = \frac{3}{7}$ (Given)

$$\Rightarrow \frac{a}{b} = \frac{8}{14} \times \frac{7}{3} = \frac{4}{3}$$

Speed of the escalator in the case of Pathan $= \frac{n-8}{a}$
Speed of the escalator in the case of Sultan $= \frac{n-14}{b}$
Since the speed of the escalator is the same in both the cases,

$$\frac{n-8}{a} = \frac{n-14}{b}$$
$$\Rightarrow \frac{(n-8)}{(n-14)} = \frac{a}{b} = \frac{4}{3}$$
$$\Rightarrow 3(n-8) = 4(n-14)$$
$$\Rightarrow 4n - 3n = 32$$
$$\Rightarrow n = 32.$$

Q11 Text Solution:

Let the speed of the escalator be S and the number of steps on the escalator be L.
Number of steps covered by the escalator in the first case $= L - 36$
Time taken $= 1$ minute 10 seconds $= 70$ seconds
So, speed of the escalator $= \frac{L-36}{70}$
Number of steps covered by the escalator in

the second case $= L - 63$
Time taken $= 35$ seconds
So, speed of the escalator $= \frac{L-63}{35}$
Since the speed is the same in both the cases,

$$\frac{L-36}{70} = \frac{L-63}{35}$$

Solving this, we get $L = 90$ steps.

Q12 Text Solution:

Let's assume that Train A's speed is a m/s and that of B is bm/s
Had both train A \& B stood still, they would have heard the horn after $10s$.
As it is given that the distance between train A \& C is $3300m$, by the time the first horn reached train A $\&B$, the second horn just started travelling from train C.
So,
For train A, as it is moving towards train C, it met the sound after $9s$.
So,

$$9a + 9 \times 330 = 3300$$
$$\Rightarrow a = \frac{110}{3} m/s$$

Similarly for train B,

$$12 \times 330 - 12b = 3300$$
$$\Rightarrow b = \frac{660}{12} = \frac{110}{2}$$

So, speed of A : speed of $B = \frac{110}{3} : \frac{110}{2} = 2:3$.

Q13 Text Solution:

The train can cover $(1140 + 460) = 1600m$ distance in 40 seconds which means the speed of the train $= \frac{1600}{40} = 40m/s$
Relative speed of the dog and train $= 40 - 3 = 37m/s$ To cover the distance of 444 meters, it will take $= \frac{444}{37} = 12$ seconds

Q14 Text Solution:

The speed of train $Y = 64kmph \times \left(\frac{7}{8}\right) = 56kmph$ In $30min$ the distance travelled by Y is $28km$ and that by train $X = 32km$
Let the relative speed of Z with respect to X is $a\ kmph$
As Z overtakes both the trains so the speed of train Z should be more than both the trains.
So,

$$\frac{32}{a} - \frac{28}{(a+8)} = \frac{5}{6}$$
$$>> 192(a+8) - 168a = a(a+8)5$$
$$\Rightarrow 5a^2 + 40a = 24a + 192 \times 8 = 0$$
$$=> 5a^2 + 16a - 1536 = 0$$
$$\Rightarrow a = \frac{-16 \pm \sqrt{16^2 + 4 \times 5 \times 1536}}{10}$$
$$\Rightarrow a = 16, -\frac{96}{5}$$
$$\Rightarrow a = 16(a \text{ cannot be negative})$$

So, the speed of the train
$Z = (64 + 16)kmph = 80$ kmph

Q15 Text Solution:

Let the distance between Durgapur and Kolkata is dkm.
Let the time taken be ' t ' hours in going from Durgapur to Kolkata and returning to Durgapur from Kolkata when the train travelled at $50km/hr$ Therefore,

$$\frac{d}{50} + \frac{d}{50} = t$$
$$t = \frac{d}{25}$$

Let the time taken be ' k ' hours while going from Durgapur to Kolkata at $70km/hr$ and returning to Durgapur from Kolkata at $30km/hr$.
Therefore,

$$\frac{d}{70}+\frac{d}{30}=k$$
$$k=\frac{d}{21}$$

According to the question,

$$k-t=4$$
$$\frac{d}{21}-\frac{d}{25}=4$$
$$d=525km$$

Thus, the time is taken by the super-fast train to travel $525km=\frac{525}{105}=5$ hours.

Q16 **Text Solution:**
The time taken by the two trains to meet $=\frac{200}{(40+60)}=2$ hours
The eagle continuously flies for 2 hours.
Therefore, the distance covered by the eagle $=80\times2=160\ km.$
We can say that, Distance travelled in forward + Backward $=160km.$

$$F+B=160$$

The distance travelled by the first train till the two trains meet $=40\times2=80km.$
This means that the eagle finds itself at a point 80 km away from the starting point after having flown $160km.$

$$F-B=80.$$

On solving both the equations we get,
$F=120km$ and $B=40km$
(This is possible only if the eagle travels an additional $40km$ in the forward direction and $40km$ in the backward direction)
Therefore, the total distance flew by the eagle in the forward direction $=80+40=120km$
Hence, option c is correct.

Q17 **Text Solution:**
The time taken by the two trains to meet

$$=\frac{200}{(40+60)}=2\text{ hours}$$

The eagle continuously flies for 2 hours.
Therefore, the distance covered by the eagle $=80\times2=160\ km.$
We can say that, Distance travelled in forward + Backward $=160km.$

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(This is possible only if the eagle travels an additional $40km$ in the forward direction and $40km$ in the backward direction)
Therefore, the total distance flew by the eagle in the forward direction $=80+40=120km$

Hence, the total distance flew by the eagle in the backward direction = 160 - 120 = 40 km

Q18 Text Solution:

Speed of boat downstream $= \frac{120}{2} = 60km/hr$

Speed of current $= \frac{1}{3} \times 60 = 20km/hr$

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

Speed of boat downstream = speed of boat in still water + speed of current

$$60 = x + 20$$
$$x = 40$$

Speed of boat upstream = speed of boat in still water - speed of current

$$= 40 - 20$$

$$= 20km/hr$$

Required time $= 240/20 = 12$ hours.

Q19 Text Solution:

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Let the flow of the river be $Rkmph$.

According to the question,

$$\left(\frac{145}{(20+R)}\right) + \left(\frac{145}{(20-R)}\right) = 18$$
$$\Rightarrow 145 \times \frac{(20+R+20-R)}{(20^2-R^2)} = 18$$
$$\Rightarrow \frac{(145 \times 40)}{(20^2-R^2)} = 18$$
$$\Rightarrow 5800 = 18\left(400 - R^2\right)$$
$$\Rightarrow R = \frac{10\sqrt{7}}{3}$$

The flow of the river is $\frac{10\sqrt{7}}{3} kmph$. Hence, option (b) is the correct answer.

Q20 Text Solution:

Let Pratap's speed and Bhanu's speed be $5x$ and $2x$ respectively.

$\Rightarrow$ Speed of escalator $= 15x - 12x = 3x$.

Pratap's effective speed upwards $= 5x - 3x = 2x$

Bhanu's effective speed downwards $= 2x + 3x = 5x$

Hence, the distance covered by them when they meet will be in the ratio of their speeds i.e., 2:5

Let Pratap cover 2a steps, hence Bhanu will have covered 5a steps.

Total steps $= 2a + 5a = 224$.

Hence, $7a = 224$

$$a = 32$$

Hence, the two meet at the 64th step from bottom or the $5 \times 32 = 160$ step from the top.

Q21 Text Solution:

Let the speed of the water $= xkmph$ The speed of the boat in still water $= 20kmph$ (Given)

Then, the upstream speed $= (20 - x)kmph$

The downstream speed $= (20 + x)kmph$
According to the given condition,
The downstream speed $= 20 + x = \frac{90}{3} = 30$

$$x = 30 - 20 = 10$$

So, the speed of the water $= 10kmph$
Upstream speed $= (20 - 10) = 10kmph$
Note that, when the polythene was dropped in the water, then the polythene was flowing at the same speed as the water.
So, the speed of the polythene $= 10kmph$
Since Bulbul travels from Dakhhineshwar to Babughat in 3 hours and she dropped the polythene at Dakhhineshwar, so at that time the polythene also travels $(3 \times 10) = 30km$.
So, the rest of the distance
$= (90 - 30)km = 60km$. This means that Bulbul will meet the polythene in

$$\frac{60}{(20-10)+10}h = 3h$$

Hence, the total time needed to find the polythene by Bulbul $= 3 + 3 = 6$ hours from the time she left for Babughat.

Q22 Text Solution:

Let the speed of the water be W and the speed of boat in still water be R.
Let the distance between Mumbai and Cochin be S.
So, $\frac{S}{R-W} = 4$ .eq. (1)
And, $\frac{S}{R} - \frac{S}{R+W} = \frac{4}{6}$
Therefore, $\frac{SW}{R(R+W)} = \frac{4}{6}$
Dividing equation (1) by equation (2), we get,

$$\frac{R(R+W)}{W(R-W)} = 6$$
$$\text{Or, } R^2 + WR = 6WR - 6W^2$$
$$=> R^2 - 5WR + 6W^2 = 0$$

Therefore, $R = 2W$ or $R = 3W$
If $R = 2W, S = 4W$ and time taken to row downstream is $\frac{4W}{2W+W} = \frac{4}{3}$ hours $= 1.33$ hours (approx.)
If $R = 3W, S = 8W$ and time taken to row downstream is $\frac{8W}{3W+W} = \frac{8}{4}$ hours $= 2$ hours.
Hence, the correct answer is 1.33 hours.

Q23 Text Solution:

Let the distance between the Arambag and Ghatal be D, the speed of Boat be r and the speed of the stream be s.

$$\frac{D}{(r-s)} = 5$$
$$D = 5r - 5s$$

Had the water been still:

$$\frac{D}{r} = 4$$
$$D = 4r$$

Substituting (2) in (1), we get,

$$4r = 5r - 5s$$
$$r = 5s$$

While moving downstream, Boat will travel at $r + s = 5s + s = 6s$
Distance to be covered $= 4r = 4 \times 5s = 20s$
Time taken $= \frac{20s}{6s} \times 60 = 200$ minutes $= 3$ hours 20 minutes.
Therefore, option b is the right answer.

Q24 Text Solution:

As the time taken by SK and Niraj are equal, who walked partly and covered the remaining distance on bike, the distance walked by them will be the same. The same can be established from the proof below-

Let's assume SK walked $xkm\&$ Niraj walked for ykm where x and y is any real number less than 15 km.

So,

SK took $\frac{x}{10}+\frac{(15-x)}{30}=\left(\frac{x}{10}-\frac{x}{30}\right)+\frac{1}{2}$ hour $=\left(\frac{x}{15}+\frac{1}{2}\right)$ hours to reach lecture hall.

Niraj took $\frac{y}{10}+\frac{(15-y)}{30}=\left(\frac{y}{10}-\frac{y}{30}\right)+\frac{1}{2}$ hour $=\left(\frac{y}{15}+\frac{1}{2}\right)$ hours to reach the lecture hall.

As they took the same time, so

$$\left(\frac{x}{15}+\frac{1}{2}\right)=\left(\frac{y}{15}+\frac{1}{2}\right)$$

$$\Rightarrow x=y$$

Below is the pictorial representation-

$x \quad (15-2x)$

$A=-Starting$ Point

$F=$ Where Niraj was picked by Sounak

$R=$ Where SK was dropped

$LH=$ Lecture Hall

As the time taken by them are the sameTime Taken by SK to reach the Lecture Hall = Time Taken by Sounak to reach the Lecture Hall.

$$\Rightarrow\left(\frac{x}{15}+\frac{1}{2}\right)=\frac{(45-4x)}{30}$$

$$\Rightarrow x=5$$

Hence, total time taken by them $=\frac{5}{15}+\frac{1}{2}$ hour $=\frac{5}{6}$ Hour $=\underline{50 \text{ Minute}}$.

Q25 Text Solution:

We see that the car reduces its travel time by 20 $\min$.

So, it reduces its one-way traveling time by $\frac{20}{2}=10min$. Thus, it would have met her wife 10 min earlier, i.e., 3.50 p.m.

Now this means that she walked from 3 p.m. to 3.50 p.m., i.e., $50min$.

Q26 Text Solution:

Initial speed of Vaibhav $=28km/hr$

Increase in speed $=7km/hr$ or 25%

Speed increases by 25% so,

Initial speed: increased speed $=4:5$

Distance is same. So,

Initial time: new time $=5:4$

Since Vaibhav goes from $14min$ late to only $5min$ late, this corresponds to $9min$ drop in his time for travel.

So, 1 unit $=9min$

5 units $=45min$

Distance covered by Vaibhav $=28\times\frac{45}{60}=21km$

Varun travels $3Xkm$ or $63km$.

Speed conversion from m/sec to km/hr $1m/sec=\frac{18}{5}km/hr$

Speed of Varun $=10m/sec=10\times\frac{18}{5}=36kmph$

Required time $=\frac{63}{36}=\frac{7}{4}hr=1hr45min.$

Q27 Text Solution:

Let the length of the boats A, B be L units each and the length of the raft XY be T units.

Speed of A in still water $=V$ units $/s$, speed of B in still water $=U$ units $/s$, speed of river $=R$ units $/s$ $\therefore$ Time taken by A to pass XY

$$\frac{(L+T)}{[(V+R)-R]}$$

Time taken by B to pass XY

$$= \frac{(L+T)}{[(U-R)+R]}$$

Dividing (i) by (ii), we get,

$$\frac{U}{V} = \frac{1}{2}$$

So, time taken by A to pass B

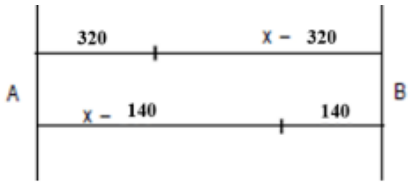
$$= \frac{2L}{[(V-R)-(U-R)]}$$

So, $\frac{2L}{(V-U)} = 25$ seconds when they row in the same direction Time taken when they row in the opposite direction $= \frac{2L}{[(V+R)+(U-R)]}$

$$= \frac{2L}{V+U}$$
$$= \frac{25(V-U)}{V+U}$$
$$= 25 \times \frac{1}{3}$$
$$= 8.33 \text{ seconds}$$

Hence, the required time is 8.33 seconds.

Q28 Text Solution:



If x is the width of the pond, then speed at which they travel is proportional to the distances they travel. Hence from the diagram, we get

$$\frac{320}{(x-320)} = \frac{(x-320+140)}{(320+x-140)}$$

Checking for the values of 'x', we get $x = 820m$ satisfies the above equation.

Q29 Text Solution:

In a circular track, if two people meet 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 $\frac{40m}{20s} = 2m/s$.

Now let's assume that Trisha's speed is 10x m/s

So, 2x = 2

⇒ x = 1

Hence, Trisha's speed is 10 m/s.

Bhavna's speed will be 12 m/s.

The initial distance between Bhavna & Virat is 20m as Virat is at the farthest point from Bhavna.

Let, Virat's speed be v m/s.

As they do not meet in 40 s it means they can not be moving in the opposite directions, else

they would have met on or before $\frac{5}{3} seconds$..
Thus, they move in the same direction.
As they never met in 40 s, so the relative speed should be less than $\frac{20}{40} m/s$.
So,

$$12 - \frac{20}{40} < v < 12 < + \frac{20}{40}$$

=> 11.5 < v < 12.5
=> 46 < 4v < 50
Thus, the minimum possible value of 4v = 47 m/s.

Q30 Text Solution:

It is a very simple question provided we use the correct approach to keep track and count the ferries. The ferry that started from Tavsal at 5.30 will reach Jaigad at 7.30 .
Hence, when Snehal leaves at $7am$, he will see this ferry somewhere in between.
Likewise, since Snehal will take 2 hours to reach Tavsal, I.e. At 9am, the last ferry he will see is the one that is just about to start at 9:00 am from Tavsal. Hence, Snehal sees all the ferries starting from 5:30 am up to 9:00 am at 10-minute intervals. 05:30, 05:40, 05:50, 06:00, ..8:40, 8:50, 9:00.
Now, an easier way to count will be 6-7; there will be 6 ferries (excluding the one at 7 o'clock) $\times 3$ for 7-8 \& 8-9 also i.e 18 ferries.
Plus 1 for the 9:00 am ferry and 3 more at 5;30, 5:40 and 5:50.
Total $= 18 + 1 + 3 = 22$ ferries.
Hence, option d is the correct answer.