Escalator Questions for CAT

Instructions
For the following questions answer them individually

Question 1

A and B are walking up an escalator with A takes 3 steps for every step B takes. A gets to the top after taking 40 steps while B takes only 20 steps to reach the top. If there was no escalator, how many steps would each of to take to reach the top?

A 60

B 80

C 100

D 120

Answer: B

Explanation:
For every step B takes A takes 3 steps.
Time take by A to reach the top = $\frac{40}{3}$
Let the speed of escalator be e.
In this time escalator would have moved = $\frac{40e}{3}$ steps
Thus, the number of stairs = $\frac{40e}{3} + 40$
Also, Time take by B to reach the top = $20/1 = 20$
In this time escalator would have moved = $20e$ steps
Thus, $\frac{40e}{3} + 40 = 20e + 204$
Thus, $e = 80$
Hence, option B is the correct answer.

Question 2

A, B and C are climbing up an escalator and for every step C takes, A and B take 2 and 4 steps respectively. If A reaches the top after taking 30 steps and C reaches the top by taking 20 steps, how many steps did B take to reach the top?

A 35

B 40

C 50

D Can't be determined

Answer: B

Explanation:
Suppose the number of steps that need to be taken without the escalator is S.

As the speed of C is half that of A, the number of steps C takes by the time A reaches the top is 15.

While someone is going up an escalator which is also going up, the person covers some steps and the escalator covers some steps. The sum of these both is equal to the total number of steps on the escalator.

Let us say that the escalator covered 'x' steps when A covered 30 steps.

So total number of steps on the escalator = S = 30+x.

As the escalator covers x steps when A takes 30 steps,it must cover x steps when C takes 15 steps and it must cover 4x/3 steps when C takes 20 steps.

So, 30+x = 20+4x/3

=> x = 30.

Thus the total number of steps on the escalator is 60.

When A takes 30 steps the escalator also takes 30 steps. This means that the speed of the escalator is the same as the speed of A.

But the speed of B is twice that of A.

So B must take twice the number of steps as the escalator to go to the top.

So, 2y+y=60 => y=20 => 2y = 40.

Thus, number of steps B took to reach the top is 40.

Question 3

A kid can run up a moving "up" escalator in 30 second. The same kid can run down this moving "up" escalator in 90 seconds. Assume his running speed is same upwards & downwards. How much time he will take to walk up the escalator when escalator is not moving, if he walks twice as slowly as he runs?

A 30

B 45

C 90

D 60

Answer: C

Explanation:
Let the running speed of the kid be S. Let the speed of the accelerator be E. Let the total distance be D.

D/(S+E) = 30. -----(1)

D/(S-E) = 90. ------(2)

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

30(S+E) = 90(S-E) => 120E = 60S => S = 2E ------(3)

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

=> D/(S+E) = D/3E = 30 => D/E = 90.

Now when the kid is walking on a stationary escalator, time required = D/(S/2) = 2*D/S = 2*D/(2E) = 90.

Question 4

Due to a technical glitch, the escalator in a shopping mall moves two steps upward and one step downward. Rahul, who is in a hurry to meet his friend, doesn't wait for the escalator to take him upstairs but instead walks on it. If he covers 60 steps in total and he takes 15 seconds for it, find the number of steps he would have covered had the escalator been functioning properly.

A 45

B 30

C 40

D Can't be determined

Answer: D

Explanation:
There are 3 unknowns - Rahul's speed, escalator's speed and the total number of steps in the escalator. From the given data, we can find only Rahul's speed, which is 40/15 = 4 steps/second. But the data is insufficient to find the other two variables. Hence, the answer cannot be determined.

Question 5

A man takes 20 seconds to go up an ascending escalator. If the speeds of the man and the escalator are in the ratio 3:2, find the time taken by the man to go up a descending escalator.

A 100s

B 80s

C 60s

D 120s

Answer: A

Explanation:
Let the speeds of the man and the escalator be 3x and 2x respectively.

Let the length of the escalator be d.

So, time required by the man to go up a moving escalator = d/(3x+2x) = 20s => d/x = 100

When the man is going down the escalator, effective speed = 3x - 2x = x

Time to go up a descending escalator = d/(3x-2x) = d/x = 100 s

Question 6

A man walks up an ascending escalator at a speed of 3 steps per second and reaches the top in 30 steps. If he walks up the ascending escalator at 6 steps per second, he reaches the top in 45 steps. Find the number of steps on the stationary escalator.

A 80 steps

B 90 steps

C 75 steps

D 60 steps

Answer: B

Explanation:
Let the speed of the escalator be s. The time taken by man when his speed is 3 steps/sec = 10 sec. Distance covered by escalator = 10s. Total length of the escalator (total distance) = 10s + 30. In the second case, time taken by man = 45/6 sec. Distance covered by escalator = 45s/6. Total length of escalator = 45s/6 + 45.

10s+30 = 45s/6 + 45 => s = 6. Total length of the escalator = 10s + 30 = 90 steps.

Question 7

Shyama and Vyom walk up an escalator (moving stairway). The escalator moves at a constant speed. Shyama takes three steps for every two of Vyom's steps. Shyama gets to the top of the escalator after having taken 25 steps, while Vyom (because his slower pace lets the escalator do a little more of the work) takes only 20 steps to reach the top. If the escalator were turned off, how many steps would they have to take to walk up?

A 40

B 50

C 60

D 80

Answer: B

Explanation:
Let the number of steps on the escalator be x.

So, by the time Shyama covered 25 steps, the escalator moved 'x-25' steps.

Hence, the ratio of speeds of Shyama and escalator = 25:(x-25)

Similarly, the ratio of speeds of Vyom and escalator = 20:(x-20)

But the ratio is 3:2

Ratio of speeds of Shyama and Vyom = 25(x-20)/20*(x-25) = 3/2

=> 10(x-20) = 12(x-25)

=> 2x = 100 => x = 50

Question 8

Shyama and Vyom walk up an escalator (moving stairway). The escalator moves at a constant speed. Shyama takes three steps for every two of Vyom's steps. Shyama gets to the top of the escalator after having taken 25 steps, while Vyom (because his slower pace lets the escalator do a little more of the work) takes only 20 steps to reach the top. If the escalator were turned off, how many steps would they have to take to walk up?

[CAT 2001]

A 40

B 50

C 60

D 80

Answer: B

Explanation:
Let the number of steps be x.

Ratio of speeds of Shyama and escalator = 25:(x-25)

Ratio of speeds of Vyom and escalator = 20:(x-20)

Ratio of speeds of Shyama and Vyom = 25(x-20)/20*(x-25) = 3/2 => 10(x-20) = 12(x-25) => 2x = 100 => x = 50

Question 9

Two persons A and B start descending on an escalator which is going down. B is thrice as fast as A. By the time they reach the bottom, A descends 20 steps while B decends 30 steps. How many steps are visible on the escalator?

A 60

B 40

C 20

D 50

Answer: B

Explanation:
Let the escalator takes m steps when A descends 20 steps. Since B is thrice as fast as A, A would have taken 10 steps by the time B takes 30 steps. The escalator would have taken m/2 steps because it takes m steps when A takes 20.
$20+m=30+\frac{m}{2}$
m=20
Steps Visible=20+m=20+20=40

Question 10

An escalator is moving down. A climbs down from this escalator by taking 20 steps. B climbs down from this escalator by taking 40 steps. If the ratio of speed of A and B is 1:4, find the number of visible steps on an escalator.

A 40

B 20

C 60

D 80

Answer: C

Explanation:
Let the speed of A= v
Speed of B = 4v
Steps taken by A in 1st case = 20
Let steps taken by escalator be x
Speed of escalator = x/(20/v)= vx/20
Steps taken by B = 40
Steps taken by escalator = 40/4v*vx/20 = x/2
20 + x = 40 + x/2
x = 40
Steps visible = 20+40 = 60

Question 11

A is climbing an escalator that is going up. He takes 30 steps and reaches up. On the other hand B moves down on the same escalator. Speed of A and B are in 1:2 ratio. If they take the same time to reach the other end, find the number of steps visible.

A 15

B 45

C 60

D 70

Answer: B

Explanation:
Since time taken is same and Speed of A and B are in ratio 1:2
When A takes 30 steps, B has taken 60 steps and the steps taken by an escalator is same
30+x = 60-x
x = 15
Steps visible = 30 +15 = 45

Question 12

A starts climbing up an escalator that is going up. At the same time, B starts climbing down the same escalator. A takes 30 steps and reaches top while B takes 60 steps and reaches down. How many steps would the escalator have taken when they meet each other if both of them reach other end at the same time?

A 7

B 8

C 7.5

D 8.5

Answer: C

Explanation:

Since time taken is same and Speed of A and B are in ratio 1:2
When A takes 30 steps, B has taken 60 steps and the steps taken by an escalator is same
30+x = 60-x
x = 15
Escalator takes 15 steps during complete journey.
As time taken in both the case is same,
A and B will meet at mid-point.
Escalator would have taken 7.5 steps.

Question 13

An escalator is moving up at a speed of 2 steps/second. If a man walks up on the escalator at a speed of 3 steps/second, he reaches the top in 10 seconds. How long will he take to reach the bottom of the same escalator if he starts at the top?

A 40 seconds

B 50 seconds

C 60 seconds

D 30 seconds

E He will never reach the bottom

Answer: B

Explanation:
The concept of escalators is similar to the concept of boats and streams.
When the person is moving in the same direction as that of the escalator, it is downstream motion and when the person is moving in the direction opposite to that of the escalator, it is upstream motion.
Let the number of steps on the escalator be N
N/(3+2) = 10 => N = 50 steps
Required time = 50/(3-2) = 50/1 = 50 seconds

Question 14

In a descending escalator that has 250 steps, Ravi is running upwards and Ramu is running downwards at different speeds. The speed of the escalator is the difference of twice the speed of Ravi and five times the speed of Ramu. Given that the ratio of speeds of Ravi and Ramu is 4:1, find the step of the escalator from top on which Ravi and Ramu meet.

A 160

B 200

C 180

D 175

Answer: B

Explanation:
Let Ravi's speed and Ramu's speed be 4x and x respectively => Speed of escalator = 8x - 5x = 3x.
Ravi's effective speed upwards = 4x - 3x = x
Ramu's effective speed downards = x + 3x = 4x

Hence, the distance covered by them when they meet will be in the ratio of their speeds i.e. 1:4

Let Ravi cover a steps, hence Ramu will have covered 4a steps. Total steps = a + 4a = 250. Hence, a = 50

Hence, the two meet at the 50th step from bottom or the 250 - 50 =200th step from the top.

Question 15

A person "A" is travelling from first floor to the ground floor on the descending escalator and takes 10 steps to reach the ground floor. As soon as he reaches the ground floor, he turns back and runs on the same escalator with the speed 5 times the previous speed and takes 25 steps to reach the top. As soon as he reaches top, his friend B arrives at that place. Now B and A start moving on the same escalator, with B moving towards the first floor and A moving towards the ground floor. They reach their destination at the same time. Find the steps taken by B.

A 30

B 45

C 20

D 25

Answer: A

Explanation:
When A is travelling from the first floor to the ground floor he takes 10 steps.
Let the steps taken by escalator be x.
Total steps = 10+x
When A is travelling from the ground floor to first floor, he takes 25 steps at 5 times his usual speed.
This means that he would have taken 5 steps at usual speed and the escalator had taken x/2 steps.
Total steps = 25- x/2
10+x = 25-x/2
x = 10
Total steps = 10+10 = 20
When B starts he reaches first floor at the same time as A. The escalator would have covered 10 steps in that time.
Let B take m steps.
m-10 = 20
m = 30 steps.
Hence B takes 30 steps on the escalators.

Question 16

A man wants to go to the first floor of the building. He can either go from an escalator which is going up to the first floor or from an escalator which is coming down from the first floor. He takes 40 steps if he goes up with an escalaor going up and 160 steps if he goes up with an escalator coming down.The speed of both the escalators is same. Find out the number of steps on an escalator.

A 60

B 56

C 64

D 58

Answer: C

Explanation:
Let the number of steps taken by the escalator when he is on the escalator going up is x
The speeds of the person and escalators are always constant.
When he takes 40 steps in an escalator going up the escalator takes x steps.So proportionally when he takes 160 steps on the escalator going down, the number of steps taken by the escalator will be 4x.
In both the cases, the relative distance covered by him is the same. So equating them we get,
40+x = 160-4x
5x = 120
x = 24
Number of steps visible = 40+x = 40+24 = 64

Question 17

Sam takes 52 steps to walk down an escalator and this takes him 1 minute. Now, Sam runs down on the escalator and this takes him 36 seconds. He covers 68 steps in the process. How many steps are there on the escalator?

A 84 steps

B 88 steps

C 92 steps

D 96 steps

Answer: C

Explanation:
Let us assume that the escalator is moving down. 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 - 52
Time taken = 1 minute
So, speed of the escalator = (L - 52)/60
Number of steps covered by the escalator in the second case = L - 68
Time taken = 36 seconds
So, speed of the escalator = (L - 68)/36

Since the speed is the same in both the cases, (L - 52)/60 = (L - 68)/36
Solving this, we get L = 92 steps

Question 18

Mr. Vinay walks up on a moving up escalator to save time. He takes 100 steps while going up. On one particular day, due to a power failure for 20 seconds, he took 18 seconds more than his usual time to reach the top of the escalator. How many steps are there on the escalator?

A 190 steps

B 1100 steps

C 900 steps

D 1000 steps

Answer: D

Explanation:
There is a certain amount of work to be done for the man to reach the top of the escalator. A part of this work is done by the man and the remaining part is done by the escalator.
Let the number of steps on the escalator be L.
Number of steps covered by the man = 100
So, number of steps covered by the escalator = L - 100
Let the time taken for this be t.
So, speed of the man = 100/t
Speed of the escalator = (L-100)/t

In the second case, number of steps covered by the escalator = (L-100)/t * (t - 20 + 18) = (L-100)/t * (t-2)

Number of steps covered by the man = 100/t * (t + 18) = 100 * (t + 18)/t

The sum of the numbers of steps covered by the man and escalator is L.
So, (L-100)/t * (t-2) + 100 * (t+18)/t = L

=> (Lt - 2L - 100t + 200 + 100t + 1800)/t = L
=> 2000 - 2L + Lt = Lt
=> 2L = 2000
=> L = 1000

So, the number of steps on the escalator is 1000.

Question 19

Sam takes 52 steps to walk down an escalator and this takes him 1 minute. Now, Sam runs down on the escalator and this takes him 36 seconds. He covers 68 steps in the process. How many steps are there on the escalator?

A 84 steps

B 88 steps

C 92 steps

D 96 steps

Answer: C

Explanation:
Let us assume that the escalator is moving down. 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 - 52
Time taken = 1 minute
So, speed of the escalator = (L - 52)/60
Number of steps covered by the escalator in the second case = L - 68
Time taken = 36 seconds
So, speed of the escalator = (L - 68)/36

Since the speed is the same in both the cases, (L - 52)/60 = (L - 68)/36
Solving this, we get L = 92 steps

Question 20

Sachin takes 40 seconds to walk up a moving up escalator and 80 seconds to walk down the same moving up escalator. If his walking speed is the same upwards and downwards, how much time will he take to walk up a stationary escalator?

A 140/3 seconds

B 150/3 seconds

C 160/3 seconds

D Cannot be determined

Answer: C

Explanation:
Let the length of the escalator be L and its speed by S. Let Sachin's speed by T.
Case 1: Walking up:
Relative speed = T + S
Distance = L
So, time taken = L/(T+S) = 40

Case 2: Walking down:
Relative speed = T - S
Distance = L
So, time taken = L/(T-S) = 80

From the first equation, we get, L/40 = T+S
From the second equation, we get, L/80 = T-S
Adding these two equations, 2T = L/40 + L/80 = 3L/80
=> L/T = 2*80/3 = 160/3 seconds

Question 21

Mr. Vinay walks up on a moving up escalator to save time. He takes 100 steps while going up. On one particular day, due to a power failure for 20 seconds, he took 18 seconds more than his usual time to reach the top of the escalator. How many steps are there on the escalator?

A 190 steps

B 1100 steps

C 900 steps

D 1000 steps

Answer: D

Explanation:
There is a certain amount of work to be done for the man to reach the top of the escalator. A part of this work is done by the man and the remaining part is done by the escalator.
Let the number of steps on the escalator be L.
Number of steps covered by the man = 100
So, number of steps covered by the escalator = L - 100
Let the time taken for this be t.
So, speed of the man = 100/t
Speed of the escalator = (L-100)/t

In the second case, number of steps covered by the escalator = (L-100)/t * (t - 20 + 18) = (L-100)/t * (t-2)

Number of steps covered by the man = 100/t * (t + 18) = 100 * (t + 18)/t

The sum of the numbers of steps covered by the man and escalator is L.
So, (L-100)/t * (t-2) + 100 * (t+18)/t = L

=> (Lt - 2L - 100t + 200 + 100t + 1800)/t = L
=> 2000 - 2L + Lt = Lt
=> 2L = 2000
=> L = 1000

So, the number of steps on the escalator is 1000.

Question 22

A person is walking on a moving escalator. He takes 25 seconds to reach from one end to the other. Another person, who is moving on the same escalator but in the opposite direction, takes 20 seconds to reach from one end to the other. If the speed of the first person to the second person is in the ratio 2:7, find the time taken by the first person to go from one end to the other on a stationary escalator?

A 30 seconds

B 35 seconds

C 50 seconds

D 75 seconds

Answer: C

Explanation:
Let the speed of the escalator be x and its length be d. Let the speeds of the two persons be 2s and 7s respectively.

Case 1: First person and escalator are moving in opposite directions:

Time taken by the first person = d/(2s - x) = 25
Time taken by the second person = d/(7s + x) = 20

Equating d, we get, (2s-x)25 = (7s+x)20 => 10s - 5x = 28s + 4x => 9x = -18s
Not possible.

Case 2: First person and escalator are moving in the same direction:

Time taken by the first person = d/(2s + x) = 25
Time taken by the second person = d/(7s - x) = 20

Equating d, we get (2s+x)25 = (7s-x)20 => 10s + 5x = 28s - 4x => 9x = 18s => Speed of the escalator = 2s.

So, the first person and escalator have same speeds. So, on a stationary escalator, the first person would take 25*2 = 50 seconds to reach from one end to the other.

Question 23

Two persons A and B are walking up on an escalator that is also going up. A takes 10 steps to reach the top whereas B takes 12 steps to reach the top. If the speeds of A and B are 4 steps per second and 5 steps per second, find the total number of steps on the escalator when it is stationary.

A 50 steps

B 60 steps

C 80 steps

D 40 steps

Answer: B

Explanation:
Let there be ‘n’ steps on the escalator.
In the case of A, the escalator covers n-10 steps and in the case of B, the escalator covers n-12 steps.

Let the times taken be ‘a’ and ‘b’ respectively.

Speed of A = 10/a
Speed of B = 12/b

Ratio of speeds = 10/a * b/12 = 4/5 => a/b = 25/24

Speed of the escalator in case 1 = (n-10)/a
Speed of the escalator in case 2 = (n-12)/b

Since the speed of the escalator is the same in both the cases,

(n-10)/a = (n-12)/b => 24(n-10) = 25(n-12) => n = 300 - 240 = 60 steps

Question 24

Sachin takes 40 seconds to walk up a moving up escalator and 80 seconds to walk down the same moving up escalator. If his walking speed is the same upwards and downwards, how much time will he take to walk up a stationary escalator?

A 140/3 seconds

B 150/3 seconds

C 160/3 seconds

D Cannot be determined

Answer: C

Explanation:
Let the length of the escalator be L and its speed by S. Let Sachin’s speed by T.
Case 1: Walking up:
Relative speed = T + S
Distance = L
So, time taken = L/(T+S) = 40

Case 2: Walking down:
Relative speed = T - S
Distance = L
So, time taken = L/(T-S) = 80

From the first equation, we get, L/40 = T+S
From the second equation, we get, L/80 = T-S
Adding these two equations, 2T = L/40 + L/80 = 3L/80
=> L/T = 2*80/3 = 160/3 seconds

Question 25

Madhu went to a mall. While climbing an escalator at her normal speed, she noticed that she took 25 steps and it took her 60 seconds to reach the top. In the next run, she climbed at a speed double of that of the previous time and reached the top in 45 seconds. How much time will Madhu take to reach the top of a stationary escalator if she climbs at her normal speed?

A 3 minutes

B 3 minutes 15 seconds

C 2 minutes 45 seconds

D None of these

Answer: A

Explanation:
Let us assume that there are k steps on the escalator. In the first run, she took 25 steps in 60 seconds. In the same time, the escalator also moved k-25 steps .
=> Speed of madhu=25/60=5/12 steps/sec and speed of escalator= (k-25)/60 steps/sec
When she doubles her speed, it takes her 45 seconds to reach the top.
=> Total number of steps= $= k = \frac{10}{12} \times 45 + \frac{k-25}{60} \times 45$
=> $\frac{150+3k-75}{4} = k$ => k=75.

Time taken by Madhu to reach the top on a stationary escalator = $\frac{75}{\frac{5}{12}} = 15 \times 12$= 180 seconds= 3 minutes

CAT Percentile Predictor