Time and Work Questions for CAT

Questions

Instructions
For the following questions answer them individually

Question 1

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

Video Solution

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 2

There's a lot of work in preparing a birthday dinner. Even after the turkey is in the oven, there's still the potatoes and gravy, yams, salad, and cranberries, not to mention setting the table.

Three friends — Asit, Arnold and Afzal — work together to get all of these chores done. The time it takes them to do the work together is 6 hr less than Asit would have taken working alone, 1 hr less than Arnold would have taken alone, and half the time Afzal would have taken working alone. How long did it take them to do these chores working together?

A 20 min

B 30 min

C 40 min

D 50 min

Answer: C

Video Solution

Explanation:
Let the time taken working together be t.
Time taken by Arnold = t+1
Time taken by Asit = t+6
Time taken by Afzal = 2t

Work done by each person in one day = $\frac{1}{(t+1)} + \frac{1}{(t+6)} + \frac{1}{2t}$

Total portion of workdone in one day $= \frac{1}{t}$

$\frac{1}{(t+1)} + \frac{1}{(t+6)} + \frac{1}{2t} = \frac{1}{t}$

$\frac{1}{(t+1)} + \frac{1}{(t+6)} = \frac{2-1}{2t}$

$2t + 7 = \frac{(t+1)\cdot(t+6)}{2t}$

$3t^2 - 7t + 6 = 0 \longrightarrow t = \frac{2}{3}$ or $t = -3$

Therefore total time = $\frac{2}{3}$ hours = 40mins

Alternatively,

$\frac{1}{(t+1)} + \frac{1}{(t+6)} + \frac{1}{2t} = \frac{1}{t}$

From the options, if time $= 40$ min, that is, $t = \frac{2}{3}$

LHS = $\frac{3}{5} + \frac{3}{20} + \frac{3}{4} = \frac{(12+3+15)}{20} = \frac{30}{20} = \frac{3}{2}$

RHS = $\frac{1}{t} = \frac{3}{2}$

The equation is satisfied only in case of option C

Hence, C is correct

Question 3

Three wheels can complete 60, 36 and 24 revolutions per minute. There is a red spot on each wheel that touches the ground at time zero. After how much time, all these spots will simultaneously touch the ground again?

A $\frac{5}{2}$ s

B $\frac{5}{3}$ s

C 5 s

D 7.5 s

Answer: C

Video Solution

Explanation:

The first wheel completes a revolution in $\frac{60}{60} = 1$ second

The second wheel completes a revolution in $\frac{60}{36} = 1\frac{2}{3}$ second

The third wheel completes a revolution in $\frac{60}{24} = 2\frac{1}{2}$ second

The three wheels touch the ground simultaneously at time which are multiples of the above three times.

Hence, the required number is $LCM(1, \frac{5}{3}, \frac{5}{2}) = 5$ seconds.

So, the correct option is option (c)

Question 4

Navjivan Express from Ahmedabad to Chennai leaves Ahmedabad at 6:30 am and travels at 50km per hour towards Baroda situated 100 kms away. At 7:00 am Howrah - Ahmedabad express leaves Baroda towards Ahmedabad and travels at 40 km per hour. At 7:30 Mr. Shah, the traffic controller at Baroda realises that both the trains are running on the same track. How much time does he have to avert a head-on collision between the two trains?

A 15 minutes

B 20 minutes

C 25 minutes

D 30 minutes

Answer: B

Video Solution

Explanation:
The distance between Ahmedabad and Baroda is 100 Km
Navjivan express starts at 6:30 am at 50 Km/hr and Howrah expresses starts at 7:00 am at 40 Km/hr.
Distance covered by Navjivan express in 30 minutes (by 7 am) is 25 Km/hr.

So, at 7 am, the distance between the two trains is 75 Kms and they are travelling towards each other a relative speed of 50+40=90 Km/hr.

So, time taken them to meet is 75/90*60 = 50 minutes.

As, Mr. Shah realizes the problem after thirty minutes, time left to avoid collision is 50-30 = 20 minutes

Question 5

A person can complete a job in 120 days. He works alone on Day 1. On Day 2, he is joined by another person who also can complete the job in exactly 120 days. On Day 3, they are joined by another person of equal efficiency. Like this, everyday a new person with the same efficiency joins the work. How many days are required to complete the job?

Answer:15

Video Solution

Explanation:
Let the rate of work of a person be x units/day. Hence, the total work = 120x.

It is given that one first day, one person works, on the second day two people work and so on.

Hence, the work done on day 1, day 2,... will be x, 2x, 3x, ... respectively.

The sum should be equal to 120x.

$$120x = x * \frac{n(n+1)}{2}$$

$$n^2 + n - 240 = 0$$

n = 15 is the only positive solution.

Hence, it takes 15 days to complete the work.

Question 6

Train T leaves station X for station Y at 3 pm. Train S, traveling at three quarters of the speed of T, leaves Y for X at 4 pm. The two trains pass each other at a station Z, where the distance between X and Z is three-fifths of that between X and Y. How many hours does train T take for its journey from X to Y?

Answer:15

Video Solution

Explanation:
Train T starts at 3 PM and train S starts at 4 PM.
Let the speed of train T be t.
=> Speed of train S = 0.75t.

When the trains meet, train t would have traveled for one more hour than train S.
Let us assume that the 2 trains meet x hours after 3 PM. Trains S would have traveled for x-1 hours.

Distance traveled by train T = xt
Distance traveled by train S = (x-1)*0.75t = 0.75xt-0.75t

We know that train T has traveled three fifths of the distance. Therefore, train S should have traveled two-fifths the distance between the

2 cities.

=> (xt)/(0.75xt-0.75t) = 3/2
2xt = 2.25xt-2.25t
0.25x = 2.25
x = 9 hours.

Train T takes 9 hours to cover three-fifths the distance. Therefore, to cover the entire distance, train T will take 9*(5/3) = 15 hours. Therefore, 15 is the correct answer.

Question 7

When they work alone, B needs 25% more time to finish a job than A does. They two finish the job in 13 days in the following manner: A works alone till half the job is done, then A and B work together for four days, and finally B works alone to complete the remaining 5% of the job. In how many days can B alone finish the entire job?

A 20

B 22

C 16

D 18

Answer: A

Video Solution

Explanation:
Let us assume that A can complete 'a' units of work in a day and B can complete 'b' units of work in a day.
A works alone till half the work is completed.
A and B work together for 4 days and B works alone to complete the last 5% of the work.
=> A and B in 4 days can complete 45% of the work.

Let us assume the total amount of work to be done to be 100 units.
4a + 4b = 45 ---------(1)
B needs 25% more time than A to finish a job.
=> 1.25*b = a ----------(2)

Substituting (2) in (1), we get,
5b+4b = 45
9b = 45
b = 5 units/day

B alone can finish the job in 100/5 = 20 days.
Therefore, option A is the right answer.

Question 8

The distance from A to B is 60 km. Partha and Narayan start from A at the same time and move towards B. Partha takes four hours more than Narayan to reach B. Moreover, Partha reaches the mid-point of A and B two hours before Narayan reaches B. The speed of Partha, in km per hour, is

A 6

B 4

C 3

D 5

Answer: D

Video Solution

Explanation:
Let the time taken by Partha to cover 60 km be x hours.
Narayan will cover 60 km in x-4 hours.

Speed of Partha = $\frac{60}{x}$
Speed of Narayan = $\frac{60}{x-4}$

Partha reaches the mid-point of A and B two hours before Narayan reaches B.

=> $\frac{30}{\frac{60}{x}} + 2 = \frac{60}{\frac{60}{(x-4)}}$

$\frac{x}{2} + 2 = x - 4$
$\frac{x+4}{2} = x - 4$
$x + 4 = 2x - 8$
$x = 12$

Partha will take 12 hours to cross 60 km.
=> Speed of Partha = $\frac{60}{12} = 5$ Kmph.
Therefore, option D is the right answer.

Question 9

A tank is fitted with pipes, some filling it and the rest draining it. All filling pipes fill at the same rate, and all draining pipes drain at the same rate. The empty tank gets completely filled in 6 hours when 6 filling and 5 draining pipes are on, but this time becomes 60 hours when 5 filling and 6 draining pipes are on. In how many hours will the empty tank get completely filled when one draining and two filling pipes are on?

Answer:10

Video Solution

Explanation:
Let the efficiency of filling pipes be 'x' and the efficiency of draining pipes be '-y'.
In the first case,
Capacity of tank = (6x - 5y) * 6..........(i)
In the second case,
Capacity of tank = (5x - 6y) * 60.....(ii)
On equating (i) and (ii), we get
(6x - 5y) * 6 = (5x - 6y) * 60
or, 6x - 5y = 50x - 60y
or, 44x = 55y
or, 4x = 5y
or, x = 1.25y

Capacity of the tank = (6x - 5y) * 6 = (7.5y - 5y) * 6 = 15y
Net efficiency of 2 filling and 1 draining pipes = (2x - y) = (2.5y - y) = 1.5y
Time required = $\frac{15y}{1.5y}$ hours = 10 hours.

Hence, 10 is the correct answer.

Question 10

A water tank has inlets of two types A and B. All inlets of type A when open, bring in water at the same rate. All inlets of type B, when open, bring in water at the same rate. The empty tank is completely filled in 30 minutes if 10 inlets of type A and 45 inlets of type B are open, and in 1 hour if 8 inlets of type A and 18 inlets of type B are open. In how many minutes will the empty tank get completely filled if 7 inlets of type A and 27 inlets of type B are open?

Answer:48

Video Solution

Explanation:
Let the efficiency of type A pipe be 'a' and the efficiency of type B be 'b'.
In the first case, 10 type A and 45 type B pipes fill the tank in 30 mins.

So, the capacity of the tank = $\frac{1}{2}$(10a + 45b)........(i)

In the second case, 8 type A and 18 type B pipes fill the tank in 1 hour.
So, the capacity of the tank = (8a + 18b)..........(ii)
Equating (i) and (ii), we get
10a + 45b = 16a + 36b
=>6a = 9b
From (ii), capacity of the tank = (8a + 18b) = (8a + 12a) = 20a
In the third case, 7 type A and 27 type B pipes fill the tank.
Net efficiency = (7a + 27b) = (7a + 18a) = 25a

Time taken = $\frac{20a}{25a}$ hour = 48 minutes.

Hence, 48 is the correct answer.

Question 11

A tank is emptied everyday at a fixed time point. Immediately thereafter, either pump A or pump B or both start working until the tank is full. On Monday, A alone completed filling the tank at 8 pm. On Tuesday, B alone completed filling the tank at 6 pm. On Wednesday, A alone worked till 5 pm, and then B worked alone from 5 pm to 7 pm, to fill the tank. At what time was the tank filled on Thursday if both pumps were used simultaneously all along?

A 4:48 pm

B 4:12 pm

C 4:24 pm

D 4:36 pm

Answer: C

Video Solution

Explanation:
Let 't' pm be the time when the tank is emptied everyday. Let 'a' and 'b' be the liters/hr filled by pump A and pump B respectively.

On Monday, A alone completed filling the tank at 8 pm. Therefore, we can say that pump A worked for (8 - t) hours. Hence, the volume of the tank = a*(8 - t) liters.

Similarly, on Tuesday, B alone completed filling the tank at 6 pm. Therefore, we can say that pump B worked for (6 - t) hours. Hence, the volume of the tank = b*(6 - t) liters.

On Wednesday, A alone worked till 5 pm, and then B worked alone from 5 pm to 7 pm, to fill the tank. Therefore, we can say that pump A worked for (5 - t) hours and pump B worked for 2 hours. Hence, the volume of the tank = a*(5 - t)+2b liters.

We can say that a*(8 - t) = b*(6 - t) = a*(5 - t) + 2b

a*(8 - t) = a*(5 - t) + 2b

$\Rightarrow$ 3a = 2b ... (1)

a*(8 - t) = b*(6 - t)

Using equation (1), we can say that

$$a * (8 - t) = \frac{3a}{2} * (6 - t)$$

$t = 2$

Therefore, we can say that the tank gets emptied at 2 pm daily. We can see that A takes 6 hours and pump B takes 4 hours alone.

Hence, working together both can fill the tank in = \dfrac{6*4}{6+4} = 2.4 hours or 2 hours and 24 minutes.

The pumps started filling the tank at 2:00 pm. Hence, the tank will be filled by 4:24 pm.

Question 12

Two ants A and B start from a point P on a circle at the same time, with A moving clock-wise and B moving anti-clockwise. They meet for the first time at 10:00 am when A has covered 60% of the track. If A returns to P at 10:12 am, then B returns to P at

A 10:25 am

B 10:45 am

C 10:18 am

D 10:27 am

Answer: D

Video Solution

Explanation:
When A and B met for the first time at 10:00 AM, A covered 60% of the track.

So B must have covered 40% of the track.

It is given that A returns to P at 10:12 AM i.e A covers 40% of the track in 12 minutes

60% of the track in 18 minutes

B covers 40% of track when A covers 60% of the track.

B covers 40% of the track in 18 minutes.

B will cover the rest 60% in 27 minutes, hence it will return to B at 10:27 AM

Question 13

A cyclist leaves A at 10 am and reaches B at 11 am. Starting from 10:01 am, every minute a motorcycle leaves A and moves towards B. Forty-five such motorcycles reach B by 11 am. All motorcycles have the same speed. If the cyclist had doubled his speed, how many motorcycles would have reached B by the time the cyclist reached B?

A 22

B 23

C 15

D 20

Answer: C

Video Solution

Explanation:
It is given that starting from 10:01 am, every minute a motorcycle leaves A and moves towards B.

Forty-five such motorcycles reach B by 11 am.

It means that the forty-fifth motorcycle starts at 10:45 AM at A and reaches B by 11:00 AM i.e 15 minutes.

Since the speed of all the motorcycles is the same, all the motorcycles will take the same duration i.e 15 minutes.

If the cyclist doubles the speed, then he will reach B by 10:30 AM. (Since if the speed is doubled, time is reduced by half)

Since each motorcycle takes 15 minutes to reach B, 15 motorcycles would have reached B by the time the cyclist reaches B

Question 14

Leaving home at the same time, Amal reaches the office at 10:15 am if he travels at 8 km/hr, and at 9:40 am if he travels at 15 km/hr. Leaving home at 9.10 am, at what speed, in km/hr, must he travel so as to reach office exactly at 10 am?

A 13

B 12

C 14

D 11

Answer: B

Video Solution

Explanation:
The difference in the time take to traverse the same distance $'d'$ at two different speeds is 35 minutes. Equating this: $\frac{d}{8} - \frac{d}{15} = \frac{35}{60}$

On solving, we obtain $d = 10kms$. Let $xkmph$ be the speed at which Amal needs to travel to reach the office in 50 minutes; then $\frac{10}{x} = \frac{50}{60}\ or\ x = 12\ kmph$.Hence, Option B is the correct answer.

Question 15

A train travelled at one-thirds of its usual speed, and hence reached the destination 30 minutes after the scheduled time. On its return journey, the train initially travelled at its usual speed for 5 minutes but then stopped for 4 minutes for an emergency. The percentage by which the train must now increase its usual speed so as to reach the destination at the scheduled time, is nearest to

A 50

B 58

C 67

D 61

Answer: C

Video Solution

Explanation:
Let the total distance be 'D' km and the speed of the train be 's' kmph. The time taken to cover D at speed d is 't' hours. Based on the information: on equating the distance, we get $s \times t = \frac{s}{3} \times \left(t + \frac{1}{2}\right)$
On solving we acquire the value of $t = \frac{1}{4}$ or 15 mins. We understand that during the return journey, the first 5 minutes are spent traveling at speed 's' {distance traveled in terms of s = $\frac{s}{12}$}. Remaining distance in terms of 's' = $\frac{s}{4} - \frac{s}{12} = \frac{s}{6}$

The rest 4 minutes of stoppage added to this initial 5 minutes amounts to a total of 9 minutes. The train has to complete the rest of the journey in $15 - 9 = 6mins$ or {1/10 hours}. Thus, let 'x' kmph be the new value of speed. Based on the above, we get $\frac{\frac{s}{6}}{x} = \frac{1}{10}\ or\ x = \frac{10s}{6}$

Since the increase in speed needs to be calculated: $\frac{\left(\frac{10s}{6} - s\right)}{s} \times 100 = \frac{200}{3} \approx 67\%$ increase.

Hence, Option C is the correct answer.

Question 16

Two persons are walking beside a railway track at respective speeds of 2 and 4 km per hour in the same direction. A train came from behind them and crossed them in 90 and 100 seconds, respectively. The time, in seconds, taken by the train to cross an electric post is nearest to

A 87

B 82

C 78

D 75

Answer: B

Video Solution

Explanation:
Let the length of the train be $lkms$ and speed be $skmph$. Base on the two scenarios presented, we obtain:

$\frac{l}{s-2} = \frac{90}{3600}$....(i) and $\frac{l}{s-4} = \frac{100}{3600}$...(ii)

On dividing (ii) by (i) and simplifying we acquire the value of s as $22kmph$. Substituting this value in (i), we have $l = \frac{90}{3600} \times 20\ kms$ {keeping it in km and hours for convenience}

Since we need to find $\frac{l}{s}$, let this be equal to x. Then, $x = 90 \times \frac{20}{22} = 81.81 \approx 82\ \sec onds$

Hence, Option B is the correct choice.

Question 17

A contractor agreed to construct a 6 km road in 200 days. He employed 140 persons for the work. After 60 days, he realized that only 1.5 km road has been completed. How many additional people would he need to employ in order to finish the work exactly on time?

Answer:40

Video Solution

Explanation:
Let the desired efficiency of each worker '6x' per day.

140*6x*200= 6 km ...(i)

In 60 days 60/200*6=1.8 km of work is to be done but actually 1.5km is only done.

Actual efficiency 'y'= 1.5/1.8 *6x =5x.

Now, left over work = 4.5km which is to be done in 140 days with 'n' workers whose efficiency is 'y'.

=> n*5x*140=4.5 ...(ii)

(i)/(ii) gives,

$\frac{(140 \cdot 6x \cdot 200)}{(n \cdot 5x \cdot 140)} = \frac{6}{4.5}$

=> n=180.

.'. Extra 180-140 =40 workers are needed.

Question 18

Vimla starts for office every day at 9 am and reaches exactly on time if she drives at her usual speed of 40 km/hr. She is late by 6 minutes if she drives at 35 km/hr. One day, she covers two-thirds of her distance to office in one-thirds of her usual total time to reach office, and then stops for 8 minutes. The speed, in km/hr, at which she should drive the remaining distance to reach office exactly on time is

A 29

B 26

C 28

D 27

Answer: C

Video Solution

Explanation:
Let distance = d

Given, $\frac{d}{35} - \frac{d}{40} = \frac{6}{60}$

=> d = 28km

The actual time taken to travel 28km = 28/40 = 7/10 hours = 42 min.

Given time taken to travel 58/3 km = 1/3 *42 = 14 min.

Then a break of 8 min.

To reach on time, he should cover remaining 28/3 km in 20 min => Speed = $\frac{\left(\frac{28}{3}\right)}{\frac{20}{60}} = 28$ km/hr

Question 19

Anil, Sunil, and Ravi run along a circular path of length 3 km, starting from the same point at the same time, and going in the clockwise direction. If they run at speeds of 15 km/hr, 10 km/hr, and 8 km/hr, respectively, how much distance in km will Ravi have run when Anil and Sunil meet again for the first time at the starting point?

A 4.8

B 4.6

C 5.2

D 4.2

Answer: A

Video Solution

Explanation:
Anil and Sunil will meet at a first point after LCM ($\frac{3}{15}$, $\frac{3}{10}$) = 3/5 hr

In the mean time, distance travelled by ravi = 8 * 3/5 = 4.8 km

Question 20

John takes twice as much time as Jack to finish a job. Jack and Jim together take one-thirds of the time to finish the job than John takes working alone. Moreover, in order to finish the job, John takes three days more than that taken by three of them working together. In how many days will Jim finish the job working alone?

Answer:4

Video Solution

Explanation:

Let Jack take "t" days to complete the work, then John will take "2t" days to complete the work. So work done by Jack in one day is (1/t) and John is (1/2t) .

Now let Jim take "m" days to complete the work. According to question, $\frac{1}{t}+\frac{1}{m}=\frac{3}{2t}\ or\ \frac{1}{m}=\frac{1}{2t}\ or\ m=2t$ Hence Jim takes "2t" time to complete the work.

Now let the three of them complete the work in "p" days. Hence John takes "p+3" days to complete the work.

$\frac{1}{2t}\left(m+3\right)=\left(\frac{4}{2t}\right)m$

$\frac{1}{2t}\left(m+3\right)=\left(\frac{4}{2t}\right)m$

or m=1. Hence JIm will take (1+3)=4 days to complete the work. Similarly John will also take 4 days to complete the work