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Prime CAT 08 2022 QA

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Qs Analysis (QsAnalysis.jsp?sid=aaaN5tjtX0b7WgArBjowySun Jan 08 23:59:25 IST 2023&qsetId=t8zHeFDGciY=&qsetName=Prime CAT 08 2022 QA)

Video Attempt / Solution (VideoAnalysis.jsp?sid=aaaN5tjtX0b7WgArBjowySun Jan 08 23:59:25 IST 2023&qsetId=t8zHeFDGciY=&qsetName=Prime CAT 08 2022 QA)

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Section-1

Sec 1

Q.1 [11831809]

What is the sum of all the real roots of the equation $|x - 3|(|x - 3| + 1) = 20$?

1 ◯ 12

2 ◯ 8

3 ◯ 6

4 ◯ −12

Solution:

Answer key/Solution

Correct Answer : 3

$|x-3|(|x-3|+1)=20 \Rightarrow |x-3|^2+|x-3|=20$

Case 1: $x > 3$

The equation (i) becomes $(x-3)^2+(x-3)=20$

$\Rightarrow x^2-6x+9+x-3=20$

$\Rightarrow x^2-5x-14=0$

$\Rightarrow (x-7)(x+2)=0$

So $x=7$ or $x=-2$

Since $x > 3$, therefore, $x=7$

Case 2: $x < 3$

The equation (i) becomes $(x-3)^2-(x-3)=20$

$\Rightarrow x^2-6x+9-x+3=20$

$\Rightarrow x^2-7x-8=0$

$\Rightarrow (x-8)(x+1)=0$

So $x=8$ or $x=-1$

Since $x < 3$, therefore, $x=-1$

Hence, the sum of roots $= 7-1=6$.

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Q.2 [11831809]

Priya had two glasses A and B having capacities 'a' ml and 'b' ml respectively, both a and b are natural numbers. Glass A was 5/6 full of water and B was 3/7 full of water. If Priya poured all the water from glass A into B, then glass B will be 3/4 full of water. If fully filled A and B glasses are poured into a glass C, then what should be the minimum volume (in ml) of glass C?

Solution:

Answer key/Solution

Correct Answer : 97

Let the volume of glass A and B be a and b.

Then, $\frac{5}{6}a+\frac{3}{7}b=\frac{3}{4}b \Rightarrow \frac{a}{b}=\frac{27}{70}$

Hence, the minimum value of glass C can be $27+70=97$ ml.

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Q.3 [11831809]

Sasha went to a shop to buy a dress. She spent 10% of the amount in her wallet to travel to the shop by a taxi. The amount left was equal to the list price of one of the dresses in the shop. After purchasing the dress at a 30% discount on the list price, she was able to buy a hand bag worth Rs.580 and still save Rs.230. What was the initial amount (in Rs.) in Sasha's wallet?

Solution:

Correct Answer : 3000

Answer key/Solution

Let the initial amount with Sasha be Rs.x.
Then, remaining amount = 0.9x
List price of the dress = 0.9x.
Due to the discount, she bought a hand bag for Rs.580 and saved Rs.230.
Hence, $0.9x \times 0.3 = 580 + 230 \Rightarrow 0.27x = 810 \Rightarrow x =$ Rs. 3,000.

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Q.4 [11831809]

NCC cadets are made to stand in rows in the Independence Day Parade. If there are 6 additional cadets in a row, then there would be 3 rows less. If there are 6 cadets less in a row, there would be 4 rows more. The total number of NCC cadets in the parade is

Solution:

Correct Answer : 1008

Answer key/Solution

Let the number of rows be r and the number of cadets in each row be n.
Then, $(n + 6)(r - 3) = nr \Rightarrow -n + 2r = 6$ ... (i)
And $(n - 6)(r + 4) = nr \Rightarrow 2n - 3r = 12$ ... (ii)
Solving (i) and (ii), we get
$n = 42$ and $r = 24$
Hence, the total number of NCC cadets in the parade $= 42 \times 24 = 1008$.

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Q.5 [11831809]

In a construction project, machine A operates on a cycle of 20 hours of work followed by 4 hours of rest and machine B operates on a cycle of 40 hours of work followed by 8 hours of rest. Both machines began their respective cycles at 12 PM on Monday and continued till 12 PM on the following Saturday. On which days during that time period was there a time when both machines were at rest?

1 ◯ Wednesday and Saturday

2 ◯ Tuesday and Thursday

3 ◯ Wednesday and Friday

4 ◯ Tuesday and Friday

Solution:
Correct Answer : 3

Answer key/Solution

After machine A completes one work-rest cycle, which will take 20 + 4 = 24 hours, it will rest again between 24 + 20 = 44 and 44 + 4 = 48 hours after starting the first cycle.
Machine B rests between 40 and 48 hours after starting the first cycle.
Therefore, the two machines are resting at the same time at the second rest stop of machine A, which is between 44 and 48 hours after Monday 12:00 PM. Since 48 hours following Monday 12:00 PM is Wednesday 12:00 PM, the two machines rest together for the first time between 8:00 AM and 12:00 PM on Wednesday.
The above cycle will repeat once more, and thus, the two machines will rest together between 44 and 48 hours after Wednesday 12:00 PM; which will be between 8:00 AM and 12:00 PM on Friday, by the same reasoning as above.
Since another 48 hours from Wednesday 12:00 PM brings us to Sunday, the only days where the two machines are resting together in the given time period are Wednesday and Friday.

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Q.6 [11831809]

Two trains running at 72 kmph and 54 kmph cross each other in 16 seconds, when they run in opposite directions. When they run in the same direction, a person in the faster train observes that he crossed the other train in 50 seconds. Find the length (in meter) of the longer train.

1 ◯ 250

2 ◯ 320

3 ◯ 310

4 ◯ 290

Solution:
Correct Answer : 3

Answer key/Solution

Let p, q be the lengths of the slow and faster trains, respectively.
When the trains are traveling in the opposite direction, relative speed = 72 + 54 = 126 kmph = 35 m/sec.
Distance covered = sum of the lengths of the two trains
$\Rightarrow p + q = 35 \times 16 = 560$ m ...(i)
If trains are traveling in the same direction, we know that
Relative speed = 72 – 54 = 18 kmph = 5 m/sec
$q = 5 \times 50 = 250$ m ...(ii)
Hence, from (i) and (ii), we get $p = 560 - 250 = 310$ m.

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Q.7 [11831809]

If on a square ABCD, point P lies on AB and Q lies on CD such that CP = PQ = QA = 10 cm, then the area (in sq. cm) of the square ABCD is

1 ◯ 100

2 ◯ 90

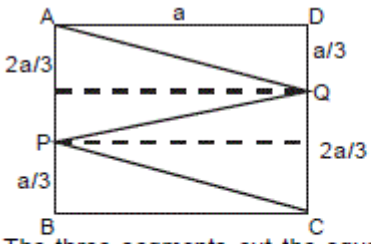
3 ◯ 900/13

4 ◯ 80

Solution:

Correct Answer : 2

Answer key/Solution



The three segments cut the square into three equal horizontal sections.
Let the side of the square ABCD be a.
Then, in right angled triangle PBC,
$(a/3)^2 + a^2 = 100 \Rightarrow a^2 = 90$ sq. cm.
Hence, area of square ABCD is 90 sq. cm.

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Q.8 [11831809]

What is the number of 4-digit numbers that can be formed from the digits 1, 2, 4, 5, 6, 7, 8 and 9 in which at least one digit is repeated?

1 ◯ 3537

2 ◯ 4096

3 ◯ 1561

4 ◯ 2416

Solution:

Correct Answer : 4

Answer key/Solution

The number of 4-digit numbers that can be formed from the digits 1, 2, 4, 5, 6, 7, 8 and 9
= 8 × 8 × 8 × 8 = 4096
The number of 4-digit numbers which have none of their digits repeated
= 8 × 7 × 6 × 5 = 1680
Hence, the required number = 4096 – 1680 = 2416.

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Q.9 [11831809]

Two pipes A and B can fill a tank in 12 minutes and 24 minutes respectively. The tank also has two holes, one at half the height and the second at 3/4th the height from bottom which could empty the tank (if they were at the bottom of the tank) in 40 minutes and 60 minutes respectively. If the tank is initially empty and the two pipes A and B are opened simultaneously, in how much time (in minutes) will the tank be full?

1 ◯ 7.5

2 ◯ 8

3 ◯ 9.5

4 ◯ 12

Solution:

Correct Answer : 3

Answer key/Solution

Let the height of the tank be h. There is no hole till half the tank is filled.
∴ Time taken = 1/2 × [24/(2 + 1)] = 4 minutes
From (1/2)h to (3/4)h, there are two pipes and 1 leak.
Portion to be filled = 3/4 – 1/2 = 1/4 of the tank.
∴ Time taken = 1/4 × [120/(10 + 5 – 3)] = 2.5 minutes.
After this there are two pipes and two leaks and the remaining portion is 1/4 of the tank.
So, time taken = 1/4 × [120/(10 + 5 – 3 – 2)] = 3 minutes.
Hence, total time taken = 4 + 2.5 + 3 = 9.5 minutes.

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Q.10 [11831809]

Total Rs. 7,800 is raised for a picnic by collecting the equal amount from a certain number of students. If there were 26 more students to raise the same amount, each student would have to contribute Rs. 400 less, how many students actually contributed?

Solution:

Answer key/Solution

Correct Answer : 13

Let the number of students, and the contribution of each student be n and x respectively.
Then, nx = 7800 ... (i)
(n + 26)(x – 400) = nx
⇒ nx – 400n + 26x – 10400 = nx
⇒ 26x – 400n = 10400 ... (ii)
Substituting the value of x from (ii) in (i), we get
26 × 7800/n – 400n = 10400
⇒ n^2 + 26n – 507 = 0
⇒ (n + 39)(n – 13) = 0
Hence, n = 13. (Since n cannot be –39.)

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Q.11 [11831809]

Let N = ab4530 is a 6-digit number where a and b are distinct positive integers, then what is the value of a + b such that N is divisible by 6, 7 and 9?

1 ◯ 15

2 ◯ 6

3 ◯ 12

4 ◯ 18

Solution:

Answer key/Solution

Correct Answer : 1

Given that N = ab4530. We know that if a number is divisible by 9, it is automatically divisible by 3. We can see that the given number is even, so if it is divisible by 9, then it is also divisible by 6. The sum of a and b has to be 6 or 15 for the number to be divisible by 9. So the distinct pair (a, b) can take values (1, 5), (2, 4) or (6, 9), (7, 8) in any order. We can see that when (a, b) takes values (1, 5) and (2, 4) the number N is not divisible by 7.
The remaining values are (6, 9) and (7, 8). When we check for divisibility by 7, we can see that for a = 9 and b = 6 the number N is divisible by 7.
Hence, the required value of (a + b) that satisfies the condition is 15.

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Q.12 [11831809]

The marked price of three articles A, B and C are Rs.2,200, Rs.3,000 and Rs.2,500 respectively. Article A is sold at a discount of 5%, B at a discount of 8% and C at a discount of 6%, yet the shopkeeper got an overall profit of 20%. If the cost price of B is 50% more than that of A and the cost price of A is twice that of C, then what percent above the cost price has article A been marked?

1 ◯ 5%

2 ◯ 10%

3 ◯ 12%

4 ◯ 15%

Solution:

Correct Answer : 2

Answer key/Solution

Marked price of A = Rs. 2,200; Selling price of A = 2200 × 0.95 = Rs. 2,090
Marked price of B = Rs. 3,000; Selling price of B = 3000 × 0.92 = Rs. 2,760
Marked price of C = Rs. 3,600; Selling price of C = 2500 × 0.94 = Rs. 2,350
Total SP = 2090 + 2760 + 2350 = Rs.7,200
Total CP × 1.2 = 7200 ⇒ Total CP = Rs. 6,000
Now, let CP of C = x, A = 2x, B = 3x
⇒ 2x + 3x + x = 6000 ⇒ x = 1000
CP of A = 2x = Rs. 2,000
Required percentage = (2200 – 2000)/2000 × 100 = 10%
Hence, article A is marked 10% above the cost price.

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Q.13 [11831809]

A dog is 30 of its own leaps behind a cat. The dog takes 4 leaps per second to cat's 3. If the dog and the cat cover 4 m and 2 m per leap respectively, then how far (in meter) did the cat run before being caught by the dog?

1 ◯ 192

2 ◯ 72

3 ◯ 60

4 ◯ 84

Solution:

Correct Answer : 2

Answer key/Solution

One leap of dog = 4 m, so 4 leaps of dog = 16 m
One leap of cat = 2 m, so 3 leaps of cat = 6 m
Let 't' be the time (in second) need the dog to catch up with the cat.
16t = 6t + 30 × 4
⇒ t = 12 seconds
Hence, the distance the cat will run in 12 seconds = 6 × 12 = 72 m.

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Q.14 [11831809]

Let $f_n(x) = f_1(x) + 2f_2(x) + \ldots + (n-1)f_{n-1}(x)$, $n \geq 2$, where n is a natural number and $f_1(x) = x/2$, then what is the value of $f_m(x)$?

1 ◯ $\frac{xm!}{2}$

2 ◯ $\frac{x(m-1)!}{2}$

3 ◯ $\frac{xm!}{4}$

4 ◯ $\frac{x(m-1)!}{4}$

Solution:
Correct Answer : 3

Answer key/Solution

We have $f_1(x) = \frac{x}{2}$

So $f_2(x) = f_1(x) = \frac{x}{2}$,

$f_3(x) = f_1(x) + 2f_2(x) = \frac{3x}{2} = 3f_2(x)$,

$f_4(x) = \frac{12x}{2} = 4f_3(x)$,

$f_5(x) = \frac{60x}{2} = 5f_4(x)$,

$\vdots$

Hence, $f_m(x) = \frac{x}{2}(m(m-1)\times\ldots\times 5\times 4\times 3)$

$= \frac{x}{2}\times\frac{m!}{2} = \frac{xm!}{4}$.

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Q.15 [11831809]

Srinath earned Rs.1.6 lakh per month from January to June after which there was a steady increase of Rs.10,000 per month for four months. The average monthly income of Srinath for the whole year was Rs.1.8 lakh. If the income for December was 20% more than that of October, then what was his monthly income (in Rs.) for November?

Solution:
Correct Answer : 220000

Answer key/Solution

Let the income for November be Rs.x lakh
From the given information we can say that:
Incomes for July, August, September and October are Rs.1.7 lakh, Rs.1.8 lakh, Rs.1.9 kah and Rs.2.0 lakh.
$\therefore 1.8 \times 12 = (1.6 \times 6) + (1.7 + 1.8 + 1.9 + 2.0 + x) + (2.0 \times 1.2)$
$\Rightarrow x =$ Rs.2.2 lakh.

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Q.16 [11831809]

If four circles of maximum equal area are cut out from a square of side 4 cm, then the ratio of the areas of the four circles to the area of the remaining part of the square is

1 ◯ $\pi : 4$

2 ◯ $2\pi : (4 - \pi)$

3 ◯ $\pi : (4 - \pi)$

4 ◯ $2\pi : (8 - \pi)$

Solution:
Correct Answer : 3
Area of the square = 16 sq. cm
Radius of the equal circles = 1 cm
Area of the four circles = 4π sq. cm
Area of the remaining part of the square = 16 – 4π = 4(4 – π) sq. cm
Hence, required ratio = 4π : 4(4 – π) = π : (4 – π).

Answer key/Solution

Bookmark FeedBack

Q.17 [11831809]

If $\log_3 [\log_2 (x^2 - 4x - 13)] = 1$, then the possible number of value(s) of x is

Solution:
Correct Answer : 2

Answer key/Solution

$\log_3\left[\log_2\left(x^2-4x-13\right)\right]=1$

$\Rightarrow \log_2\left(x^2-4x-13\right)=3$

$\Rightarrow x^2-4x-13=8$

$\Rightarrow x^2-4x-21=0$

$\Rightarrow (x-7)(x+3)=0$

So x = 7 or x = –3

Hence, 2 values of x are possible.

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Q.18 [11831809]

In 8 liters of milk and water mixture, the concentration of milk is 75%. A woman takes out 25% of the total mixture and adds the equal quantity of water in a new beaker to form a new mixture. With the total quantity of the new mixture, she wants to prepare tea where the concentration of milk should be 25%. How much more (in liters) water will she require to add to the mixture to prepare tea?

1 ◯ 2.5

2 ◯ 1

3 ◯ 1.5

4 ◯ 2

Solution:
Correct Answer : 4

Answer key/Solution

25% of 8 liters of mixture = 2 liters of mixture

Quantity of milk in 2 liters of mixture = 75% of 2 = 1.5 liters and quantity of water = 0.5 liters

When equal amount of water is added, the amount of water in the new mixture = 0.5 + 2 = 2.5 liters

Hence, to make up 25% of milk, she has to add 2 liters of water to the mixture to make tea.

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Q.19 [11831809]

Let a sequence a_n be defined recursively by $a_0 = 3$, $a_{n+1} = 2a_n + 3$. What is the last digit of a_{2018}?

Solution:

Correct Answer : 1

Answer key/Solution

Let n = 0, so $a_{n+1} = 2a_n + 3$ becomes
$a_1 = 2a_0 + 3 = 9 = 3 \times 3 = (2^2 - 1) \times 3$
For n = 1, $a_2 = 2a_1 + 3 = 7 \times 3 = (2^3 - 1) \times 3$
For n = 2, $a_3 = 2a_2 + 3 = 15 \times 3 = (2^4 - 1) \times 3$
Therefore, $a_n = 3(2^{n+1} - 1)$.
So, $a_{2018} = 3(2^{2019} - 1)$
Hence, as per cyclicity of 2, the last digit will be 1.

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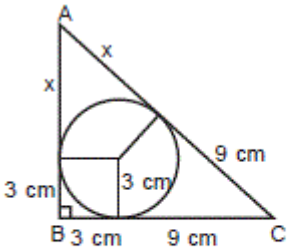
Q.20 [11831809]

A circle of radius 3 cm is inscribed in a right angled triangle ABC, right angled at B. If BC = 12 cm, then find the length (in cm) of side AB.

Solution:

Correct Answer : 9

Answer key/Solution



Since triangle ABC is a right angled triangle.
Therefore, $(9 + x)^2 = 12^2 + (x + 3)^2$
$\Rightarrow 81 + x^2 + 18x = 144 + x^2 + 9 + 6x$
$\Rightarrow 12x = 72 \Rightarrow x = 6$
Hence, AB = 6 + 3 = 9 cm.

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Q.21 [11831809]

If $|x^2 - 11x + 30| > x^2 - 11x + 30$, then which of the following statements is true?

1 ◯ x cannot take value greater than 5.

2 ◯ x can take any real value.

3 ◯ x can take any value between 5 and 6.

4 ◯ x can take values either less than 5 or greater than 6.

Solution:

Correct Answer : 3

Answer key/Solution

We have $|x^2 - 11x + 30| > x^2 - 11x + 30$

Note: if $|a| > a$, then $a < 0$.

Or, $x^2 - 11x + 30 < 0$

Or, $(x - 5)(x - 6) < 0$

Or, $5 < x < 6$.

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Q.22 [11831809]

Ramesh invested an amount of Rs.X for 2 years at 10% compound interest and received some amount of interest. Mahesh invested Rs. (X + 4400) for 3 years at 6% simple interest and received the same amount of interest as Ramesh received. Find the amount (in Rs.) that is invested by Mahesh.

1 ◯ 30,800

2 ◯ 25,600

3 ◯ 35,400

4 ◯ 40,200

Solution:

Correct Answer : 1

Answer key/Solution

According to the question,

$X(1 + 10/100)^2 - X = (X + 4400) \times 6/100 \times 3$

$\Rightarrow X \times 1.21 - X = X \times 0.18 + 792$

$\Rightarrow X \times 1.21 - X - X \times 0.18 = 792$

$\Rightarrow 0.03X = 792 \Rightarrow X =$ Rs. 26,400

Hence, amount invested by Mahesh = 26,400 + 4400 = Rs. 30,800.

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