CAT 2020 Question Paper with Solution
Slot 2 QA

1. In how many ways can a pair of integers (x, a) be chosen such that $x^2 - 2|x| + |a-2| = 0$?

A.7
B. 5
C. 6
D. 4

Answer: A

Solution:

Case 1: If $a \geq 2$, then we can write the following:

$|x|^2 - 2|x| + a - 2 = 0$

$D = (-2)^2 - 4 \times 1 \times (a-2) = 12 - 4a$

$|x| = \dfrac{2 \pm \sqrt{12-4a}}{2}$

$\Rightarrow |x| = 1 \pm \sqrt{3-a}$

Here, $3 - a \geq 0$
$\Rightarrow a \leq 3$

Since $a \geq 2$ and $a \leq 3$, there are only two integral values possible for a.

If a = 2, then

$|x| = 2$ or 0.

x = 2, −2, 0

If a = 3, then

$|x| = 1$

x = 1, −1

So, the possible integral pairs (x, a) are (2, 2), (−2, 2), (0, 2), (1, 3), (−1, 3).

Case 2: If a < 2, we can write the following:

$|x|^2 - 2|x| + 2 - a = 0$

$D = (-2)^2 - 4 \times 1 \times (2-a) = 4a - 4$

$|x| = \dfrac{2 \pm \sqrt{4a-4}}{2}$

$\Rightarrow |x| = 1 \pm \sqrt{a-1}$

Here, $a - 1 \geq 0$
$\Rightarrow a \geq 1$

So, $a \geq 1$ and $a < 2$

$\therefore a = 1$, then

$|x| = 1$

$x = 1, -1$

So, the possible integral pairs (x, a) are (1, 1) and (−1, 1).

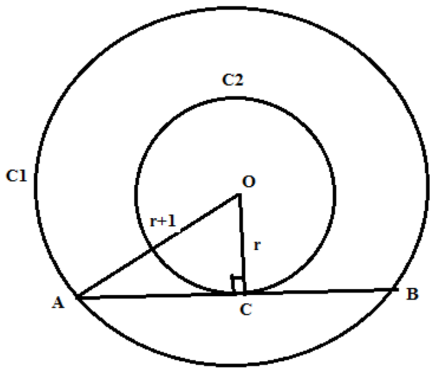
Hence, there are a total of 7 possible pairs.

###TOPIC###Quantitative Aptitude||Algebra||Quadratic Equations###

2. Let C1 and C2 be concentric circles such that the diameter of C1 is 2 cm longer than that of C2. If a chord of C1 has length 6 cm and is a tangent to C2, then the diameter, in cm, of C1 is ___.

Answer: 10

Solution:



Since the diameter of circle C_1 = 2 + diameter of circle C_2, radius of circle C_1 = 1 + the radius of circle C_2.

Let the radius of C_1 (OC) be r.

Radius of C_2 (OA) = r + 1

The angle between radius and tangent at the point of contact is always 90^0.

$\therefore \angle OCA = 90^0$

AB = 6 cm (given)

AC = 6/2 = 3 cm (perpendicular from the centre bisects the chord)

Using Pythagoras for triangle OCA, we can write the following:

$OA^2 = OC^2 + AC^2$

$\Rightarrow (r + 1)^2 = r^2 + 3^2$

$\Rightarrow r^2 + 2r + 1 = r^2 + 9$

$\Rightarrow r = 4$ cm

Radius of circle C_1 = r + 1 = 5 cm

Diameter of circle C_1 = 10 cm

###TOPIC###Quantitative Aptitude||Geometry||Plane Geometry###

3. In May, John bought the same amount of rice and the same amount of wheat as he had bought in April, but spent ₹ 150 more due to the price increase of rice and wheat by 20% and 12%, respectively. If John had spent ₹ 450 on rice in April, then how much did he spend on wheat in May?

A. 570
B. 590
C. 580
D. 560

Answer: D

Solution:

Let the amount spent on wheat in April be 'k'.

The amount spent on rice in April = ₹450

Total expenditure in April = k + 450

Since the quantity remains the same in April and May, the percent change in price will be equal to the percentage change in expenditure.

$\therefore$ 1.12(k) + 1.20(450) = k + 450 + 150

$\Rightarrow$ 1.12 k + 540 = k + 600

- $\Rightarrow$ 0.12k = 60
- $\Rightarrow$ K = 60/0.12

$\Rightarrow$ k = 500

Amount spent on wheat in May = 1.12(500) = ₹560

###TOPIC###Quantitative Aptitude||Arithmetic||Percentages###

4. A and B are two points on a straight line. Ram runs from A to B, while Rahim runs from B to A. After crossing each other, Ram and Rahim reach their destinations in one minute and four minutes, respectively. If they start at the same time, then the ratio of Ram's speed to Rahim's speed is _____.

A. 2

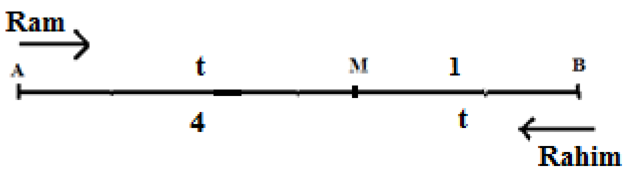
B. 1/2

C. $2\sqrt{2}$

D. $\sqrt{2}$

Answer: A

Solution:



Let Ram and Rahim cross each other at point M.

And the time they took to reach point M after the start = t min

Also assume that the speed of Ram is S_1 and the speed of Rahim is S_2.

Time taken by Ram to travel from A to M = t min

Time taken by Rahim to travel from M to A = 4 min

Since the distance is the same in both cases, we can write the following:

$S_1 t = 4S_2$

$\frac{S_1}{S_2} = \frac{4}{t}$ ……………………………………(1)

Similarly, we can write the following:

Time taken by Ram to travel from M to B = 1 min

Time taken by Rahim to travel from B to M = t min

Applying the previous concept, we get the following:

$\frac{S_1}{S_2} = \frac{t}{1}$ ……………………………………(2)

From (1) and (2), we get the following:

$$\frac{4}{t} = \frac{t}{1}$$

$$\Rightarrow t = 2 \text{ min}$$

Substituting t = 2 in the first equation, we get the following:

$$\frac{S_1}{S_2} = \frac{4}{2} = \frac{2}{1}$$

###TOPIC###Quantitative Aptitude||Arithmetic||Speed, Time and Distance###

5. A sum of money is split among Amal, Sunil, and Mita so that the ratio of the shares of Amal and Sunil is 3:2, while the ratio of the shares of Sunil and Mita is 4:5. If the difference between the largest and the smallest of these three shares is Rs. 400, then Sunil's share, in rupees, is ____.

Answer: 800

Solution:

A:S = 3:2 and S:M = 4:5

A:S:M = 6:4:5

Let the shares of Amal, Sunil, and Mita be 6x, 4x, and 5x, respectively.

$6x - 4x = 400$

$\Rightarrow x = 200$

Sunil's share = 4x = Rs. 800.

###TOPIC###Quantitative Aptitude||Arithmetic||Ratio and Proportion###

6. From an interior point of an equilateral triangle, perpendiculars are drawn on all three sides. The sum of the lengths of the three perpendiculars is s. Then the area of the triangle is _____.

A. $\frac{2s^2}{\sqrt{3}}$

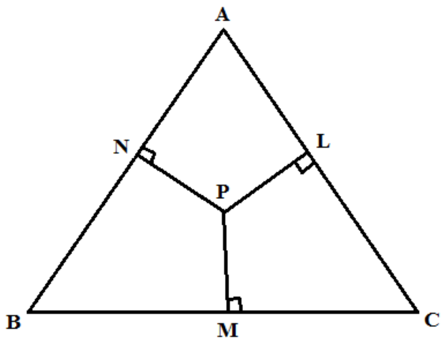
B. $\frac{s^2}{2\sqrt{3}}$

C. $\frac{\sqrt{3}s^2}{2}$

D. $\frac{s^2}{\sqrt{3}}$

Answer: D

Solution:



Let ABC be the equilateral triangle and P be the given point.

PL + PM + PN = s

Area of triangle ABC = Area of triangle APB + Area of triangle BPC + Area of triangle CPA

Since area of any triangle = 1/2 × base × height, we can write the following:

$$\frac{1}{2}\times BC\times height=\frac{1}{2}\times AB\times PN+\frac{1}{2}\times BC\times PM+\frac{1}{2}\times CA\times PL$$

$$\Rightarrow\frac{1}{2}\times BC\times height=\frac{1}{2}\times BC\times PN+\frac{1}{2}\times BC\times PM+\frac{1}{2}\times BC\times PL$$ (∵ AB = BC = CA)

$$\Rightarrow height=PN+PM+PL$$

$$\Rightarrow\frac{\sqrt{3}}{2}(BC)=s$$

$$\Rightarrow BC=\frac{2s}{\sqrt{3}}$$

Area = $\frac{1}{2} \times □□□□ \times □□□□□□ = \frac{1}{2} \times \frac{2□}{\sqrt{3}} \times □ = \frac{□^2}{\sqrt{3}}$

###TOPIC###Quantitative Aptitude||Geometry|| Triangles###

7. Anil buys 12 toys and labels each with the same selling price. He sells 8 toys initially at a 20% discount on the labeled price. Then he sells the remaining 4 toys at an additional 25% discount on the discounted price. Thus, he gets a total of Rs. 2112 and makes a 10% profit. With no discounts, his percentage of profit would have been ___.

A. 54
B. 60
C. 50
D. 55

Answer: C

Solution:

Total SP of 12 toys = Rs. 2112

Profit = 10%

Total CP of 12 toys = $\frac{2112}{1.1} = \text{Rs. } 1920$

CP of 1 toy = 1920/12 = Rs. 160

Let the labelled price of each toy be k.

8 (0.8 × k) + 4 (0.75 × 0.8 × k) = 2112

8.8k = 2112

$\Rightarrow k = 240$

Profit percentage if there is no discount = $\frac{240-160}{160} \times 100 = 50\%$

###TOPIC###Quantitative Aptitude||Arithmetic||Profit, Loss and Discount###

8. For real x, the maximum possible value of $\frac{x}{\sqrt{1+x^4}}$ is _____.

A. 1

B. $\frac{1}{\sqrt{3}}$

C. $\frac{1}{2}$

D. $\frac{1}{\sqrt{2}}$

Answer: D

Solution:

$$\frac{x}{\sqrt{1+x^4}}$$

Dividing both the numerator and denominator by x, the given expression becomes

$$\frac{1}{\sqrt{\frac{1}{x^2}+x^2}}$$

When $\frac{1}{x^2}+x^2$ is minimum, the given expression will be maximum.

Since the least possible value of a positive number and its reciprocal is 2.

So, the largest value of $\frac{1}{\sqrt{\frac{1}{x^2}+x^2}}$ is $\frac{1}{\sqrt{2}}$.

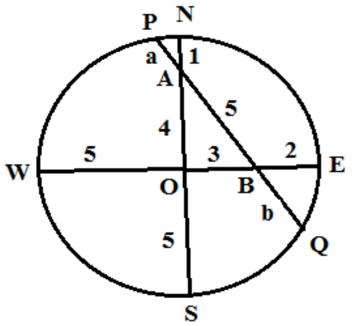
###TOPIC###Quantitative Aptitude||Algebra||Inequalities###

9. Let C be a circle of radius 5 metres having a centre at O. Let PQ be a chord of C that passes through points A and B where A is located 4 meters north of O and B is located 3 metres east of O. Then, the length of PQ, in meters, is nearest to ____.

A. 7.2
B. 7.8
C. 8.8
D. 6.6

Answer: C

Solution:



ON = OE =OS =OW = 5 m, OA = 4 m, OB = 3 m, AN = 1 m, BE = 2 m, PA = a, BQ = b

In triangle OAB, using Pythagoras' Theorem, we get the following:

$AB^2 = OA^2 + OB^2$

$AB^2 = 4^2 + 3^2$

AB = 5 m

Now using the chord intersection theorem, we can say the intercepted parts will have the same product.

AN × AS = PA × AQ

1 × 9 = a(5 + b)

$a = \frac{9}{5+b}$ ....(1)

Similarly, we know the following:

BE × BW = QB × PB

2 × 8 = b × (5 + a)

$$\Rightarrow 16 = b \times \left(5 + \frac{9}{5+b}\right)$$

$$\Rightarrow 80 + 16b = 34b + 5b^2$$

$$\Rightarrow 5b^2 + 18b - 80 = 0$$

$$\Rightarrow b = \frac{-18 \pm \sqrt{1924}}{10}$$

$$\Rightarrow b \approx \frac{-18 \pm 44}{10} = -6.2 \text{ or } 2.6$$

Since b cannot be negative, we can write the following:

b = 2.6 m

a = $\frac{9}{5+2.6} \approx 1.2$

PQ ≈ 1.2 + 5 + 2.6 = 8.8 m

###TOPIC###Quantitative Aptitude||Geometry||Plane Geometry###

10. In a group of 10 students, the mean of the 9 lowest scores is 42, while the mean of the highest 9 scores is 47. For the entire group of 10 students, the maximum possible mean exceeds the minimum possible mean by ___.

A. 6
B. 5
C. 3
D. 4

Answer: D

Solution:

Let x_1, x_2, x_3............x_n be the scores of 10 students such that x_1 is minimum and x_{10} is maximum.

$x_1 + x_2 + x_3 \ldots\ldots + x_9 = 9 \times 42 = 378$...(1)

$x_2 + x_3 + x_4 \ldots\ldots + x_{10} = 9 \times 47 = 423$ ....(2)

Subtracting equation (1) from equation (2), we get the following:

$x_{10} - x_1 = 45$ ....(3)

Minimum possible value of x_{10} = 47 (highest number cannot be less than mean)

Minimum possible value of x_1 = 2

Minimum possible mean of the entire group = $\frac{423+2}{10}$ = 42.5

Maximum possible value of x_1 = 42 (least number cannot be greater than mean)

Maximum possible mean of the entire group = $\frac{423+42}{10}$ = 46.5

Required difference = 46.5 – 42.5 = 4

###TOPIC###Quantitative Aptitude||Arithmetic||Averages###

11.

Let the m -th and n -th terms of a geometric progression be $\frac{3}{4}$ and 12, respectively, where $\mathrm{m} < \mathrm{n}$. If the common ratio of the progression is an integer r, then the smallest possible value of $\mathrm{r}+\mathrm{n}-\mathrm{m}$ is

A. 2
B. −4
C. −2
D. 6

Answer: D

Solution:

According to the question, we can write the following:

$ar^{m-1} = \frac{3}{4}$ ....(1)

$ar^{n-1} = 12$ ....(2)

Dividing equation (2) by equation (1), we get the following:

$r^{n-m} = 16$ ....(3)

The possible solutions to the above equation are the following:

Case 1: r = 16, n − m = 1

Adding, we will get the following:

r + n − m = 16 + 1 = 17

Case 2: r = 4, n − m = 2

Adding, we will get the following:

r + n − m = 4 + 2 = 6

Case 3: r = − 4, n − m = 2

Adding, we will get the following:

r + n − m = −4 + 2 = −2

Case 4: r = 2, n − m = 4

Adding, we will get the following:

r + n − m = 2 + 4 = 6

Case 5: r = −2, n − m = 4

Adding, we will get the following:

$r + n - m = -2 + 4 = 2$

Considering all possible cases, the minimum possible value of $r + n - m = -2$

###TOPIC###Quantitative Aptitude||Progression||Geometric Progression###

12. For the same principal amount, the compound interest for two years at 5% per annum exceeds the simple interest for three years at 3% per annum by Rs. 1125. Then the principal amount, in rupees, is _______.

Answer: 90000

Solution:

Let the principal be 'k'.

CI for two years at 5% p.a. = $k\left((1.05)^2 - 1\right) = 0.1025k$

SI for 3 years at 3% p.a. = $\frac{k \times 3 \times 3}{100} = 0.09k$

According to question, we know the following:

0.1025 k – 0.09k = 1125

$\Rightarrow k = \text{Rs. } 90000$

###TOPIC###Quantitative Aptitude||Arithmetic||Interest (Simple and Compound)###

13. The sum of the perimeters of an equilateral triangle and a rectangle is 90 cm. The area, T, of the triangle and the area, R, of the rectangle, both in sq cm, satisfy the relationship $R = T^2$. If the sides of the rectangle are in the ratio 1:3, then the length, in cm, of the longer side of the rectangle is ___.

A. 27
B. 24
C. 18
D. 21

Answer: A

Solution:

Let the sides of the rectangle be a & 3a.

Side of the equilateral triangle = b

According to question, we can write the following:

2(a + 3a) + 3(b) = 90

⇒ 8a + 3b = 90 ……………………………………………………………(1)

Since the area of the rectangle and the area of the equilateral triangle are equal

$$a \times 3a = \left(\frac{\sqrt{3}}{4}b^2\right)^2$$

$$\Rightarrow 3a^2 = \frac{3}{16}b^4$$

$$\Rightarrow a^2 = \frac{b^4}{16}$$

$$\Rightarrow a = \frac{b^2}{4} \quad \text{……………………………………………………………..(2)}$$

Putting it in equation (1), we get the following:

$2b^2 + 3b - 90 = 0$

⇒ (2b + 15)(b – 6) = 0

⇒ b = –15/2 or 6

As b cannot be negative, we can write the following:

b = 6 cm

$a = b^2/4 = 9$ cm

Longer side of rectangle = 3a = 27 cm

###TOPIC###Quantitative Aptitude||Geometry||Plane Geometry###

14.

The number of pairs of integers (x, y) satisfying $x \geq y \geq -20$ and $2x + 5y = 99$ is ____.

Answer: 17

Solution:

$2x + 5y = 99$, where $x \geq y \geq -20$

The following table shows an integral solution satisfying the given conditions.

X	97	92	87	.	.	22	17
Y	–19	–17	–15	.	.	11	13

If we increase the value of y beyond 13, then x will become smaller than y.

Now, we can see that the values of both the variables are in an AP. Considering any one of the two AP series, we can find the number of integral solutions satisfying all the conditions.

For values of y, we can write the following:

$a = -19$, $d = 2$, $a_n = 13$

$a + (n - 1)d = 13$

$\Rightarrow -19 + (n - 1)2 = 13$

$\Rightarrow (n - 1) = 16$

$\Rightarrow n = 17$

Hence, there are 17 pairs of integers (x, y) which satisfy the given conditions.

###TOPIC###Quantitative Aptitude||Algebra||Inequalities###

15.

The number of integers that satisfy the equality $\left(x^2 - 5x + 7\right)^{x+1} = 1$ is

A. 5
B. 4
C. 3
D. 2

Answer: C

Solution:

Case	$x^2 - 5x + 7$	$x + 1$	Value/s of x

1	1	Immaterial	3 or 2
2	Non zero	0	(−1)
3	(−1)	Even	No integral value

Hence, option (C) is the correct answer.

###TOPIC###Quantitative Aptitude||Algebra||Higher Degree Equations###

16. In a car race, car A beats car B by 45 km, car B beats car C by 50 km, and car A beats car C by 90 km. The distance (in km) over which the race has been conducted is ____.

A. 550
B. 500
C. 450
D. 475

Answer: C

Solution:

Let the distance of the race be d km and the speeds of A, B, C be S_A, S_B, S_C, respectively.

It is given that car A beats car B by 45 km and car C by 90 km.

When car A travels d km, car B travels (d – 45) km, and car C travels (d – 90) km, we can write the following:

$$\therefore \frac{S_B}{S_c} = \frac{d-45}{d-90} \quad \text{.........(1)}$$

Also, car B beats car C by 50 km. So, when B travels d km, car C travels (d – 50) km.

$$\therefore \frac{S_B}{S_c} = \frac{d}{d-50} \quad \text{.........(2)}$$

From equations (1) and (2), we get the following:

$$\frac{d}{d-50} = \frac{d-45}{d-90}$$

$$\Rightarrow d^2 - 90d = d^2 - 95d + 2250$$

$5d^2 = 2250$

$$\Rightarrow d = 450 \text{ km}$$

###TOPIC###Quantitative Aptitude||Arithmetic||Speed, Time and Distance###

17. Aron bought some pencils and sharpeners. Spending the same amount of money as Aron, Aditya bought twice as many pencils and 10 less sharpeners. If the cost of one sharpener is ₹2 more than the cost of a pencil, then the minimum possible number of pencils bought by Aron and Aditya together is ___.

A. 36
B. 30
C. 27
D. 33

Answer: D

Solution:

Let the cost price of one pencil be k.
So, the cost price of one sharpener = k + 2
Let's assume Aron bought P pencils and S sharpeners.
Amount spent by Aron = Pk + S(k + 2)

Aditya bought 2P pencil and (S – 10) sharpeners.
Amount spent by Aditya = 2Pk + (S – 10) × (k +2)

According to question,

$Pk + S (k + 2) = 2Pk + (S - 10) \times (k + 2)$

$Pk - 10k = 20$ ……………………………………………….(1)

$k(P - 10) = 20$
Minimum value of P = 11 when k = 20
So, minimum number of pencils they bought together = P + 2P = 3P = 33.

###TOPIC###Quantitative Aptitude||Arithmetic||Profit, Loss and Discount###

18. If x and y are non-negative integers such that $x + 9 = z$, $y + 1 = z$ and $x + y < z + 5$, then the maximum possible value of $2x + y$ equals ____.

Answer: 23

Solution:

$x + 9 = z \quad \Rightarrow x = z - 9$ ....(1)

$y + 1 = z \quad \Rightarrow y = z - 1$ ....(2)

$x + y < z + 5$

$\Rightarrow z - 9 + z - 1 < z + 5$

$z < 15$

Maximum integral value of $z = 14$

Maximum integral value of $x = 14 - 9 = 5$

Maximum integral value of $y = 14 - 1 = 13$

Maximum value of $2x + y = 2 \times 5 + 13 = 23$

###TOPIC###Quantitative Aptitude||Algebra||Inequalities###

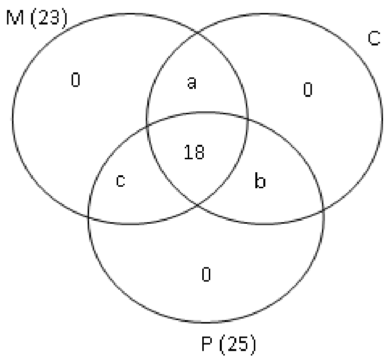
19. Students in a college have to choose at least two subjects from chemistry, mathematics, and physics. The number of students choosing all three subjects is 18, choosing mathematics as one of their subjects is 23, and choosing physics as one of their subjects is 25. The smallest possible number of students who could choose chemistry as one of their subjects is ___.

A. 21
B. 19
C. 20
D. 22

Answer: C

Solution:

Using the given data, we can make the following Venn diagram:



Number of people who choose Chemistry as one of their subjects = a + 18 + b

To minimize the above value, we need to minimize a + b and hence, maximize c.

18 + c + a = 23

c + a = 5

Maximum possible value of c = 5

Minimum possible value of a = 0

b + c + 18 = 25

b = 2

∴ Minimum possible number of students who chose Chemistry as one of their subjects = 20

###TOPIC###Quantitative Aptitude||Set Theory||Set Theory###

20. Two circular tracks T1 and T2 of radii 100 m and 20 m, respectively, touch at a point A. Starting from A at the same time, Ram and Rahim are walking on track T1 and track T2 at speeds 15 km/h and 5 km/h, respectively. The number of full rounds that Ram will make before he meets Rahim again for the first time is ____.

A. 2
B. 5
C. 4
D. 3

Answer: D

Solution:

$$\frac{\text{length of track } T_1}{\text{length of track } T_2} = \frac{2\pi(100)}{2\pi(20)} = \frac{5}{1}$$

$$\frac{\text{speed of Ram}}{\text{Speed of Rahim}} = \frac{15}{5} = \frac{3}{1}$$

$$\frac{\text{Time taken by Ram to complete 1 round of track } T_1}{\text{Time taken by Rahim to complete 1 round of track } T_2} = \frac{5/3}{1/1} = \frac{5}{3}$$

Ratio of rounds completed by Ram and Rahim = 3:5

Number of full rounds that Ram will make before he meets Rahim again for the first time = 1 × 3 = 3

###TOPIC###Quantitative Aptitude||Arithmetic||Speed, Time and Distance###

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21. Let $f(x) = x^2 + ax + b$ and $g(x) = f(x+1) - f(x-1)$. If $f(x) \geq 0$ for all real x, and $g(20) = 72$, then the smallest possible value of b is

A. 0
B. 16
C. 4
D. 1

Answer: C

Solution:

It is given that $g(x) = f(x + 1) - f(x - 1)$.

$f(x + 1) = (x + 1)^2 + a(x + 1) + b = x^2 + (a + 2)x + (1 + a + b)$

$f(x - 1) = (x - 1)^2 + a(x - 1) + b = x^2 + (a - 2)x + (1 - a + b)$

$f(x + 1) - f(x - 1) = 4x + 2a$

$\Rightarrow g(x) = 4x + 2a$

$g(20) = 72$
$4 \times 20 + 2a = 72$

$\Rightarrow a = -4$

Now, $f(x) \geq 0$

$x^2 - 4x + b \geq 0$

$\Rightarrow D \leq 0$

$\Rightarrow b^2 - 4ac \leq 0$

$\Rightarrow 16 - 4b \leq 0$

$\Rightarrow b \geq 4$

###TOPIC###Quantitative Aptitude||Functions and Graphs||Functions and Graphs###

22. 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 the three of them working together. In how many days will Jim finish the job working alone?

Answer: 4

Solution:

Let the time taken by Jim to finish the work alone be 'a' days and the time taken by Jack to finish the work alone be 'b' days.

Time taken by Jack and Jim together = $\frac{ab}{a+b}$

Time taken by John to finish the job alone = 2b days

According to the question, we can write the following:

$$\frac{ab}{a+b} = \frac{1}{3}(2b)$$

$$\Rightarrow a = 2b$$

Total efficiency of John, Jack, and Jim = $\frac{1}{a} + \frac{1}{b} + \frac{1}{2b} = \frac{1}{2b} + \frac{1}{b} + \frac{1}{2b} = \frac{2}{b}$

Time taken by all three of them to finish the work working together = $\frac{b}{2}$

$$2b - \frac{b}{2} = 3$$

$$\Rightarrow b = 2 \text{ days}$$

Time required by Jim to complete the work alone = a = 2b = 4 days

###TOPIC###Quantitative Aptitude||Arithmetic||Time and Work###

23. How many 4-digit numbers, each greater than 1000 and each having four distinct digits, are there with 7 coming before 3?

Answer: 315

Solution:

We can consider two cases here.

Case 1: If 7 is the leftmost digit, i.e., the number of the form 7 _ _ _

Number of ways to write 3 at one of the remaining places = 3

Number of ways to choose the remaining two digits = 8 × 7 = 56

Total number of four-digit numbers in this case = 3 × 56 = 168

Case 2: If 7 is not the leftmost digit

We can have 3 ways to write 7 and 3 at the remaining three places, i.e., (_ 7 3 _), (_ 7 _ 3), (_ _ 7 3)

Number of ways to choose the leftmost digit = 7 (except 7, 3, 0)

Number of ways to choose the fourth digit = 7

Number of four digit numbers formed in this case = 3 × 7 × 7 = 147

So, total number of 4-digit numbers with distinct digits where 7 comes before 3 = 168 + 147 = 315

###TOPIC###Quantitative Aptitude||Algebra||Permutation and Combination###

24.

The value of $\log_a\left(\frac{a}{b}\right)+\log_b\left(\frac{b}{a}\right)$, for $1 < a \le b$ cannot be equal to

A. −0.5
B. 1
C. −1
D. 0

Answer: B

Solution:

$\log_a\left(\frac{a}{b}\right)+\log_b\left(\frac{b}{a}\right)$

$\Rightarrow \log_a a - \log_a b + \log_b b - \log_b a$

$\Rightarrow 2 - (\log_a b + \log_b a)$

Since $\log_a b + \log_b a \ge 2$ (sum of a positive number and its reciprocal)

$\therefore 2 - (\log_a b + \log_b a) \le 0$

Hence, option (B) cannot be the value of the given expression.

###TOPIC###Quantitative Aptitude||Algebra||Logarithm###

25.

If x and y are positive real numbers satisfying $x + y = 102$, then the minimum possible value of $2601\left(1+\frac{1}{x}\right)\left(1+\frac{1}{y}\right)$ is

Answer: 2704

Solution:

$$2601\left(1+\frac{1}{x}\right)\left(1+\frac{1}{y}\right)$$

$$\Rightarrow 2601\left(\frac{x+1}{x}\right)\left(\frac{y+1}{y}\right)$$

$$\Rightarrow 2601\left(\frac{xy+x+y+1}{x}\right)$$

$$\Rightarrow 2601\left(\frac{xy+103}{xy}\right)$$

$$\Rightarrow 2601\left(1+\frac{103}{xy}\right)$$

To minimize the above expression, we have to maximize xy.

Since x + y = 102

Max (xy) = 51 × 51 = 2601

$$\therefore \min\left[2601\left(1+\frac{103}{xy}\right)\right]=2601\left(1+\frac{103}{2601}\right)=2704$$

###TOPIC###Quantitative Aptitude||Algebra||Inequalities###

26. The distance from B to C is thrice that from A to B. Two trains travel from A to C via B. The speed of train 2 is double that of train 1 while traveling from A to B and their speeds are interchanged while traveling from B to C. The ratio of the time taken by train 1 to that taken by train 2 in travelling from A to C is ____.

A. 4:1
B. 1:4
C. 7:5
D. 5:7

Answer: D

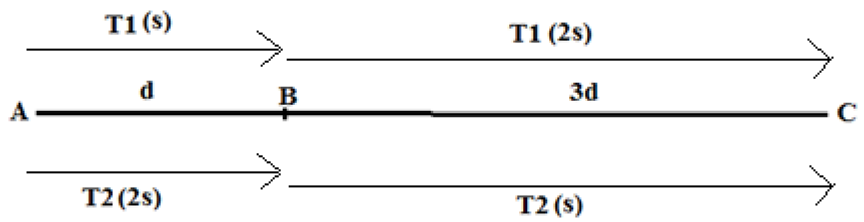
Solution:

Let distance AB = d

Distance BC = 3d

Initial speed of train 1 = s

Initial speed of train 2 = 2s



$$\frac{\text{time taken by train 1 to travel from A to C}}{\text{time taken by train 2 to travel from A to C}} = \frac{\frac{d}{s} + \frac{3d}{2s}}{\frac{d}{2s} + \frac{3d}{s}} = \frac{5/2}{7/2} = 5:7$$

###TOPIC###Quantitative Aptitude||Arithmetic||Speed, Time and Distance###