CAT 2025 QA Slot 3 Paper With Answers & Explanation

Q. 1 For a 4-digit number (greater than 1000), sum of the digits in the thousands, hundreds, and tens places is 15. Sum of the digits in the hundreds, tens, and units places is 16. Also, the digit in the tens place is 6 more than the digit in the units place. The difference between the largest and smallest possible value of the number is

1) 735 2) 3289 3) 4078 4)811

Correct Answer

4

Explanation

Let the digits be Thousands = a, Hundreds = b, Tens = c, Units = d. Given: a + b + c = 15, b + c + d = 16 and c = d + 6. So (c, d) can be (7, 1), (8, 2) or (9, 3).

The corresponding values of b can be 8, 6 and 4 respectively. Further corresponding values of a can be 0, 1, and 2 respectively.

But a must be ≥ 1.

Therefore, largest possible value will be = 2493 and smallest possible value will be = 1682.

Hence, required difference = 2493 – 1682 = 811.

Q. 2 The average salary of 5 managers and 25 engineers in a company is 60000 rupees. If each of the managers received 20% salary increase while the salary of the engineers remained unchanged, the average salary of all 30 employees would have increased by 5%. The average salary, in rupees, of the engineers is

1) 45000 2) 54000 3)40000 4) 50000

Correct Answer

2

Explanation

Let average salary of engineers and managers be x and y respectively.

Total original salary = 30 × 60000 = Rs. 18,00,000 Managers get 20% increase; engineers' salaries remain unchanged.

Overall average increases by 5%, therefore, new average = Rs. 63,000.

New total salary: 30 × 63000 = Rs. 18,90,000 Increase in total salary = 1890000 – 1800000 = Rs. 90,000

Increase comes only from managers: 5 × 0.2y = y or, y = Rs. 90,000.

Original total salary is 5y + 25x = 18,00,000 Hence, 5 × (90000) + 25x = 1800000 or, x = Rs. 54,000.

Q. 3 The monthly sales of a product from January to April were 120, 135, 150 and 165 units, respectively. The cost price of the product was Rs. 240 per unit, and a fixed marked price was used for the product in all the four months. Discounts of 20%, 10% and 5% were given on the marked price per unit in January, February and March, respectively, while no discounts were given in April. If the total profit from January to April was Rs. 138825, then the marked price per unit, in rupees, was

1) **525 2) 520 3) 510 4) 515**

Correct Answer

1

Explanation

Let marked price = M

In January, SP = 0.8M

In February, SP = 0.9M

In March, SP = 0.95M

In April, SP = M

Total profit = 120 × 0.8M + 135 × 0.9M + 150 × 0.95M + 165 × M – 570 × 240 = 138825

Simplifying: 525M – 136800 = 138825 or, 525M

= 275625 or, M = Rs. 525

Q. 4 A triangle ABC is formed with AB = AC = 50 cm and BC = 80 cm. Then, the sum of the lengths, in cm, of all three altitudes of the triangle ABC is

Correct Answer

126

Explanation

Given: AB = AC = 50 cm, BC = 80 cm

Triangle is isosceles, therefore, the altitude drawn

from the vertex angle (between the two equal sides)

to the base acts as a perpendicular bisector.

Area of the triangle ABC

= 1/2 × 80 × 30

= 1200 cm2.

Altitudes:

ha = 2 × Area / BC = 30 cm

hb = 2 × Area / AC = 2400 / 50 = 48 cm

hc = 2 × Area / AB = 48 cm

Hence, the sum of altitudes = 30 + 48 + 48

= 126 cm.

Q. 5 In ΔABC, AB = AC = 12 cm and D is a point on side BC such that AD = 8 cm. If AD is extended to a point E such that ∠ACB = ∠AEB, then the length, in cm, of AE is

1) 18 2) 16 3) 14 4) 20

Correct Answer

1

Explanation

As per the question.

Since AB = AC, therefore, ∠ABC = ∠ACB and its given ∠ACB = ∠AEB.

This implies that points C, B, E, A lie on a common circle (same angle subtended by chord AB). So A, B, C, E are concyclic.

Since D lies inside the circle and AD is extended to E: DA × DE = DB × DC (Power of Point property) But in an isosceles triangle with AB = AC, the altitude from A to BC also bisects BC. Hence D lies on the perpendicular bisector only if DB = DC.

So, DB = DC

Therefore, $DB \times DC = DB^2$

Thus, $AD \times DE = DB^2$

DE = AE – AD = AE – 8

So $8 \times (AE - 8) = DB^2$

In triangle ABD, AB = 12 cm and AD = 8 cm.

Using Pythagoras:

$DB^2 = AB^2 - AD^2$ or, $DB^2 = 12^2 - 8^2 = 80$

Hence, 8(AE – 8) = 80 or, AE = 18 cm.

Q. 6 For real values of x, the range of the function

$f(x) = \frac{2x-3}{2x^2+4x-6}$ is

1) $\left(-\infty, \frac{1}{4}\right] \cup [1, \infty)$

2) $\left(-\infty, \frac{1}{4}\right] \cup \left[\frac{1}{2}, \infty\right)$

3) $\left(-\infty, \frac{1}{8}\right] \cup \left[\frac{1}{2}, \infty\right)$

4) $\left(-\infty, \frac{1}{8}\right] \cup [1, \infty)$

Correct Answer : 3

Given: $f(x) = (2x - 3)/(2x^2 + 4x - 6)$

Let $y = (2x - 3) / (2x^2 + 4x - 6)$

Rearrange: $y(2x^2 + 4x - 6) = 2x - 3$

$\Rightarrow 2y(x^2) + 4y(x) - 6y - 2x + 3 = 0$

This is a quadratic equation in x. For real x, discriminant ≥ 0.

Discriminant: $(4y - 2)^2 - 4(2y)(-6y + 3) \geq 0$

$\Rightarrow 16y^2 - 16y + 4 + 48y^2 - 24y \geq 0$

$\Rightarrow 64y^2 - 40y + 4 \geq 0$

$\Rightarrow 16y^2 - 10y + 1 \geq 0$

$\Rightarrow 16y^2 - 8y - 2y + 1 \geq 0$

$\Rightarrow (8y - 1)(2y - 1) \geq 0$

$\Rightarrow y = 1/8, 1/2$

Range of f(x): $y \leq 1/8$ or $y \geq 1/2$

Hence, the range is: $(-\infty, 1/8] \cup [1/2, \infty)$.

Q. 7 The sum of all possible real values of x for which

$\log_{x-3}(x^2 - 9) = \log_{x-3}(x + 1) + 2$, is

1) $\frac{3+\sqrt{33}}{2}$

2) $\sqrt{33}$

3) 3

4) -3

Correct Answer : 1

Given: $\log_{(x-3)}(x^2 - 9) = \log_{(x-3)}(x + 1) + 2$

Let $2 = \log_{(x-3)}((x - 3)^2)$ and substitute in the above equation.

$\Rightarrow \log_{(x-3)}(x^2 - 9) = \log_{(x-3)}(x + 1) + \log_{(x-3)}((x-3)^2)$

$\Rightarrow \log_{(x-3)}(x^2 - 9) = \log_{(x-3)}((x + 1)(x - 3)^2)$

$\Rightarrow x^2 - 9 = (x + 1)(x - 3)^2$

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

Since $x \neq 3$, therefore, $x + 3 = (x + 1)(x - 3)$.

$\Rightarrow x + 3 = x^2 - 2x - 3$

$\Rightarrow x^2 - 3x - 6 = 0$ or, $x = (3 \pm \sqrt{33})/2$

Since, domain: $x - 3 > 0 \Rightarrow x > 3$, only valid value is $x = (3 + \sqrt{33})/2$.

Q. 8 Rahul starts on his journey at 5 pm at a constant speed so that he reaches his destination at 11 pm the same day. However, on his way, he stops for 20 minutes, and after that, increases his speed by 3 km per hour to reach on time. If he had stopped for 10 minutes more, he would have had to increase his speed by 5 km per hour to reach on time. His initial speed, in km per hour, was

1) 12 2) 20 3) 18 4) 15

Correct Answer

4

Explanation

Let initial speed = v km/h and let total distance = D

Total scheduled time = 5 pm to 11 pm = 6 hours.

So, D = 6v

Case 1: He drives at speed v first, then stops for 20 minutes or 1/3 hours, then drives at speed (v + 3). Let time driven at speed v be 't' hours.

Then remaining driving time after stop = 6 – t – 1/3 = 17/3 – t

vt + (v + 3)(17/3 – t) = D …(1)

Substitute: D = 6v

⇒ vt + (v + 3)(17/3 – t) = 6v

⇒ –3t + 17v/3 + 17 = 6v

⇒ t = (51 – v)/9 …(A)

Case 2: He drives at speed v first, then stops for 30 minutes or 1/2 hours, then drives at speed (v + 5). Let time driven at speed v be 't' hours.

Time after stop: $6 - t - 1/2 = 11/2 - t$

So $vt + (v + 5)(11/2 - t) = 6v$ …(2)

$\Rightarrow vt - vt - 5t + 11v/2 + 55/2 = 6v$

$\Rightarrow -5t + 11v/2 + 55/2 = 6v$

$\Rightarrow t = (55 - v)/10$ …(B)

Equate (A) and (B):

$\Rightarrow (51 - v)/9 = (55 - v)/10$

$\Rightarrow v = 15$ km/h

Q. 9 The ratio of the number of coins in boxes A and B was 17:7. After 108 coins were shifted from box A to box B, this ratio became 37:20. The number of coins that needs to be shifted further from A to B, to make this ratio 1:1, is

Correct Answer

272

Explanation

Let initial number of coins in A and B be 17x and 7x respectively.

After shifting 108 coins, number of coins in A = $17x - 108$ and in B = $7x + 108$.

So $(17x - 108)/(7x + 108) = 37/20$

$\Rightarrow 20(17x - 108) = 37(7x + 108)$

$\Rightarrow 340x - 2160 = 259x + 3996$

$\Rightarrow 81x = 6156 \Rightarrow x = 76$

So, after first shift:

$A = 17 \times 76 - 108 = 1184$

$B = 7 \times 76 + 108 = 640$

Difference = $1184 - 640 = 544$

To make ratio 1:1, shift half the difference.

Required shift = 544/2 = 272

Q. 10 Let p, q and r be three natural numbers such that their sum is 900, and r is a perfect square whose value lies between 150 and 500. If p is not less than 0.3q and not more than 0.7q, then the sum of the maximum and minimum possible values of p is

Correct Answer

397

Explanation

Given: $p + q + r = 900$ and r is a perfect square between 150 and 500.

Possible r values: 169, 196, 225, 256, 289, 324, 361, 400, 441, 484

We have $0.3q \le p \le 0.7q$, or $q + 0.3q \le p + q \le q + 0.7q$ or $1.3q \le p + q \le 1.7q$.

Also, we can rewrite $p + q = 900 – r$. Therefore, $1.3q \le 900 – r \le 1.7q$.

Since the extreme values (maximum and minimum) of p depend on the value of q (0.3q and 0.7q), we can maximise or minimise r to find the extreme values of p.

Since $1.3q \le 900 – r$, the minimum possible value of q would be when $1.3q = 900 – r$ and when r is maximum. The maximum value of r is 484. We get $1.3q = 900 – 484$, or $q = 320$.

This gives the minimum possible value of p as $0.3 \times 320 = 96$.

Since $900 – r \le 1.7q$, the maximum possible value of q would be when $900 – r = 1.7q$ and when r is minimum. The minimum value of r is 169. We get $1.7q = 900 – 169$ or $q = 430$.

This gives the maximum possible value of p as $0.7 \times 430 = 301$.

The sum of the maximum and minimum values of p is 96 + 301 = 397.

Q. 11 ABCD is a trapezium in which AB is parallel to DC, AD is perpendicular to AB, and AB = 3DC. If a circle inscribed in the trapezium touching all the sides has a radius of 3 cm, then the area, in sq. cm, of the trapezium is

1) 48 2) 543) 30√3 4) 36√2

Correct Answer

1

Explanation

Given: AB || DC, AD ⊥ AB, AB = 3DC and Radius of incircle = 3 cm

Let DC = x ⇒ AB = 3x Since circle touches both parallel sides, Height = 2r = 6.

Area = 1/2 × (AB + DC) × height = 1/2 × (3x + x) × 6 = 12x

For a tangential trapezium: Sum of parallel sides

= sum of non-parallel sides

⇒ AB + DC = AD + BC

⇒ 4x = 6 + BC

⇒ BC = 4x – 6

Using right triangle: $BC^2 = (AB - DC)^2 + AD^2$

⇒ $(4x - 6)^2 = (2x)^2 + 36$

⇒ $16x^2 - 48x + 36 = 4x^2 + 36$

⇒ $12x^2 - 48x = 0$

⇒ x = 4

Hence, the area = 12x = 48 sq. cm.

Q. 12 Vessels A and B contain 60 litres of alcohol and 60 litres of water, respectively. A certain volume is taken out from A and poured into B. After stirring, the same volume is taken out from B and poured into A. If the resultant ratio of alcohol and water in A is 15 : 4, then the volume, in litres, initially taken out from A is

Correct Answer

16

Explanation

Let x litres be transferred from A to B.

After first transfer, A has 60 – x litres of alcohol and B has 'x' litres of alcohol and 60 litres of water.

Note: Fraction of alcohol in B = x / (60 + x) and, Fraction of water in B = 60 / (60 + x)

Again 'x' litres are taken from B and poured back into A.

Alcohol transferred back to A = x × x / (60 + x)

Water transferred back to A = x × 60 / (60 + x)

Therefore, alcohol in A = (60 – x) + x^2 / (60 + x) and water in A = 60x / (60 + x).

⇒ [(60 – x)(60 + x) + x^2] / 60x = 15/4

⇒ (3600 – x^2 + x^2) = 3600

⇒ 3600 / 60x = 15 / 4

⇒ 60 / x = 15 / 4

⇒ x = 16

Hence, initially 16 litres was transferred from

A to B.

Q. 13 The rate of water flow through three pipes A, B and C are in the ratio 4 : 9 : 36. An empty tank can be filled up completely by pipe A in 15 hours. If all the three pipes are used simultaneously to fill up this empty tank, the time, in minutes, required to fill up the entire tank completely is nearest to

1) 78 2) 71 3) 73 4) 76

Correct Answer

3

Explanation

Let rates of pipes A, B and C be 4k, 9k and 36k.

Since Pipe A alone fills the tank in 15 hours, so, rate of A = 1/15 tank per hour.

⇒ 4k = 1/15 ⇒ k = 1/60

Combined rate of all three pipes

A + B + C = (4k + 9k + 36k) = 49k = 49/60 tank per hour.

Time required = 1 ÷ (49/60) hours = 60/49 hours = (60/49) × 60 minutes ≈ 73.47 minutes

Hence, the nearest option = 73 minutes.

If $f(x) = (x^2 + 3x)(x^2 + 3x + 2)$, then the sum of all

Q. 14 real roots of the equation $\sqrt{f(x)+1} = 9701$ is

1) –3 2) 33) –64) 6

Correct Answer

1

Explanation

Given: f(x) = (x2 + 3x)(x2 + 3x + 2)

⇒ √(f(x) + 1) = 9701

⇒ f(x) + 1 = 97012

⇒ f(x) = 97012 – 1

Let y = x2 + 3x So y(y + 2) = 9700 × 9702

⇒ y2 + 2y – 9700 × 9702 = 0

⇒ y = 9700, –9702

When y = 9700:

⇒ x2 + 3x = 9700 or, x = 97, –100

When y = –9702:

⇒ x2 + 3x = –9702 will give no real value of x, therefore, discarded.

Hence, the sum of real values of x = 97 – 100

= –3.

Q. 15 The sum of all the digits of the number

(1050 - 1025 - 123) is

1) 221 2) 255 3) 324 4) 212

Correct Answer

1

Explanation

Number = 1050 + 1025 – 123 have 51 digits of which 51st and 26th digits are 1.

After subtracting 123, borrow comes from 26th digit which is 1.

First three digits from right becomes 877 and digits

4th to 25th from right becomes 9. 26th digits (initially 1) becomes 0.

Hence, the digit sum calculation = 1 + 9 × 22 + 8

+ 2 × 7 = 221.

Q. 16 If $\left(x^2 + \frac{1}{x^2}\right) = 25$ and $x > 0$, then the value of $\left(x^7 + \frac{1}{x^7}\right)$ is

1) **44853√3** 2) **44850√3** 3) **44859√3** 4) **44856√3**

Correct Answer : 1

$(x + 1/x)^2 = x^2 + 1/x^2 + 2 = 25 + 2 = 27$

Therefore, $x + 1/x = \sqrt{27} = 3\sqrt{3}$

$(x + 1/x)^3 = x^3 + 1/x^3 + 3(x + 1/x)$

Therefore, $x^3 + 1/x^3 = (3\sqrt{3})^3 - 3(3\sqrt{3}) = 81\sqrt{3} - 9\sqrt{3}$
$= 72\sqrt{3}$

$(x^2 + 1/x^2)^2 = x^4 + 1/x^4 + 2$

Therefore, $x^4 + 1/x^4 = 25^2 - 2 = 623$.

$(x^4 + 1/x^4)(x^3 + 1/x^3) = x^7 + 1/x^7 + x + 1/x$

Therefore, $x^7 + 1/x^7 = 623(72\sqrt{3}) - 3\sqrt{3} = 44853\sqrt{3}$.

Q. 17 If 1212x × 424x+12 × 52y = 84z × 2012x × 2433x–6, where x, y and z are natural numbers, then x + y + z equals

Given: $12^{12x} \times 4^{24x+12} \times 5^{2y} = 8^{4z} \times 20^{12x} \times 243^{3x-6}$

Prime factorization: $12 = 2^2 \times 3$, $4 = 2^2$, $5 = 5$,
$8 = 2^3$, $20 = 2^2 \times 5$ and $243 = 3^5$

Substitute:

$\Rightarrow (2^2 \times 3)^{12x} \times (2^2)^{24x+12} \times 5^{2y}$

$= (2^2)^{4z} \times (2^2 \times 5)^{12x} \times (3^5)^{3x-6}$

$\Rightarrow 2^{24x} \times 3^{12x} \times 2^{48x+24} \times 5^{2y}$

$= 2^{24x+12z} \times 15^{12x} \times 3^{15x-30}$

$\Rightarrow 2^{74x+24} \times 3^{12x} \times 5^{2y}$

$= 2^{24x+12z} \times 5^{12x} \times 3^{15x-30}$

Equate powers.

Power of 2: $72x + 24 = 24x + 12z$

$\Rightarrow 48x + 24 = 12z$ or, $z = 4x + 2$

Power of 3: $12x = 15x - 30$

$\Rightarrow 3x = 30$ or, $x = 10$

Power of 5: $2y = 12x$ or, $y = 6x$ or, $y = 60$

Therefore, $z = 4(10) + 2 = 42$.

Hence, $x + y + z = 10 + 60 + 42 = 112$.

Q. 18 Teams A, B, and C consist of five, eight, and ten members, respectively, such that every member within a team is equally productive. Working separately, teams A, B, and C can complete a certain job in 40 hours, 50 hours, and 4 hours, respectively. Two members from team A, three members from team B, and one member from team C together start the job, and the member from team C leaves after 23 hours. The number of additional member(s) from team B, that would be required to replace the member from team C, to finish the job in the next one hour, is

1) 2 2) 3 3) 4 4) 1

Correct Answer

1

Explanation

As per the question, the rate of 1 member of A = 1/200, rate of 1 member of B = 1/400, And rate of 1 member of C = 1/40.

Initially, 2 members from A, 3 from B and 1 from C are working.

Work done per hour = 2(1/200) + 3(1/400) + 1/40 = 1/100 + 3/400 + 10/400 = 17/400

Hence, work done in 23 hours = 23 × 17/400 = 391/400

Remaining work = 1 – 391/400 = 9/400 To finish in the next 1 hour, required rate = 9/400 After member from C leaves, working rate

= 2(1/200) + (3 + x)(1/400) = 1/100 + (3 + x)/400

Therefore, 1/100 + (3 + x)/400 = 9/400

⇒ 4 + 3 + x = 9

⇒ x = 2.

Q. 19 In a school with 1500 students, each student chooses any one of the streams out of science, arts, and commerce, by paying a fee of Rs 1100, Rs 1000, and Rs 800, respectively. The total fee paid by all the students is Rs 15,50,000. If the number of science students is not more than the number of arts students, then the maximum possible number of science students in the school is

Correct Answer

700

Explanation

Let science, arts and commerce students be S, A and C

Total students = S + A + C = 1500

Total fees = 1100S + 1000A + 800C = 1550000

⇒ 300S + 200A = 350000

⇒ 3S + 2A = 3500

Given A ⇒ S. To maximize S, take minimum A = S

Substitute and get: 3S + 2S = 3500 or, ⇒ S = 700.

Q. 20 In an arithmetic progression, if the sum of fourth, seventh and tenth terms is 99, and the sum of the first fourteen terms is 497, then the sum of first five terms is

Correct Answer

65

Explanation

4th + 7th + 10th terms = (a + 3d) + (a + 6d) + (a + 9d) = 3a + 18d = 99

⇒ a + 6d = 33 … eq(1)

Sum of first 14 terms = 14/2 (2a + 13d)

⇒ 2a + 13d = 71 …eq (2)

Subtracting equations (1) and (2) and get:

⇒ d = 5 and a = 3

Sum of first 5 terms = 5/2 (2a + 4d) = 5/2 (6 + 20) = 65

Q. 21 Ankita walks from A to C through B, and runs back through the same route at a speed that is 40% more than her walking speed. She takes exactly 3 hours 30 minutes to walk from B to C as well as to run from B to A. The total time, in minutes, she would take to walk from A to B and run from B to C, is

Correct Answer

444

Explanation

Let walking speed = v. Then, running speed = 1.4v.

Given: Time taken to walk B to C = time taken to run B to A = 3.5 hours

Therefore, BC = 3.5v and BA = 3.5 × 1.4v = 4.9v.

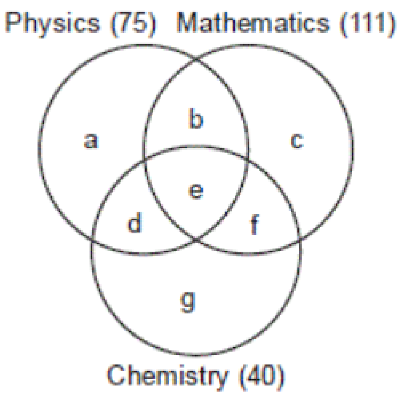
Required time = walking A to B + running B to C = 4.9v/v + 3.5v/1.4v

= 4.9 + 2.5 = 7.4 hours

Therefore, total time = 7.4 × 60 = 444 minutes.

Q. 22 In a class of 150 students, 75 students chose physics, 111 students chose mathematics and 40 students chose chemistry. All students chose at least one of the three subjects and at least one student chose all three subjects. The number of students who chose both physics and chemistry is equal to the number of students who chose both chemistry and mathematics, and this is half the number of students who chose both physics and mathematics. The maximum possible number of students who chose physics but not mathematics, is

1) 35 2) 55 3) 30 4) 40



Note: $d + e = x$, $e + f = x$, and $b + e = 2x$

Now $(a + c + g) + 2(b + d + f) + 3e$

$= 75 + 111 + 40$

$\Rightarrow 150 - e + 4x = 226$

$\Rightarrow 4x - e = 226 - 150 = 76$

$\Rightarrow 4x = 76 + e$

$$\Rightarrow x = \frac{76 + e}{4}$$

We need to maximise a + d = 75 – 2x Let e = 4, then x = 20

Hence, a + d = 75 – 40 = 35 is the maximum

possible value.