CAT 2025 Slot 3 QA Question Paper with Solutions

Time Allowed : 40 Minutes	Maximum Marks : 66	Total Questions : 22

General Instructions

Read the following instructions very carefully:

1. The total duration of the QA section is **40 minutes**.
2. Each correct answer carries **+3 marks**.
3. For multiple-choice questions (MCQs), **−1 mark** will be deducted for each wrong answer.
4. There is **no negative marking** for Type-in-the-Answer (TITA) questions.
5. Once the allotted time for a section ends, you will automatically move to the next section. You cannot go back to a previous section.
6. All answers must be entered on the computer screen using the mouse and keyboard. Rough sheets will be provided.
7. The use of calculators, mobile phones, or any other electronic device is strictly prohibited. An on-screen basic calculator will be provided.

1. There are 4 people M, S, P, R.

- **P gets 20% of the total.**
- **M gets 40% of the remaining amount.**
- **S gets 20% less than M.**
- **R gets the remaining amount.**

Find the ratio P : R.

(A) 25 : 28
(B) 20 : 23
(C) 5 : 6
(D) 50 : 53

Correct Answer: (A) 25 : 28

Solution:
Let the total amount be 100 units.

Step 1: Calculate P's share.
P gets 20% of the total.

$P = 20\%$ of $100 = 20$.

Step 2: Calculate the remaining amount.
Remaining Amount = Total - P
Remaining Amount $= 100 - 20 = 80$.

Step 3: Calculate M's share.
M gets 40% of the *remaining* amount.
$M = 40\%$ of $80 = \frac{40}{100} \times 80 = 32$.

Step 4: Calculate S's share.
S gets 20% *less* than M.
$S = M - (20\%$ of $M)$
$S = 32 - (0.2 \times 32)$
$S = 32 - 6.4 = 25.6$.

Step 5: Calculate R's share.
R gets the remaining amount after P, M, and S.
Total Distributed to P, M, S $= 20 + 32 + 25.6 = 77.6$.
$R = 100 - 77.6 = 22.4$.

Step 6: Calculate Ratio P : R.
Ratio = 20 : 22.4
Multiply by 10 to remove decimals: 200 : 224
Divide by 8: $\frac{200}{8} : \frac{224}{8}$
Ratio = 25 : 28.

> Quick Tip
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> When dealing with percentage distributions involving "remaining" amounts, always assume the Total Value is 100. This simplifies calculations by eliminating variable x early on.

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2. N is a 3-digit number with non-zero digits. No digit is a perfect square and only 1 of the digits is a prime number. What is the number of factors of the smallest such number possible?

(A) 6
(B) 8
(C) 10
(D) 12

Correct Answer: (B) 8

Solution:

Step 1: Identify the allowed digits.

The digits must be non-zero: $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$.
Remove perfect squares $(1, 4, 9)$.
Remaining allowed digits: $\{2, 3, 5, 6, 7, 8\}$.

Step 2: Classify allowed digits as Prime or Non-Prime.

Primes: $\{2, 3, 5, 7\}$.
Non-Primes (Composites): $\{6, 8\}$.

Step 3: Construct the smallest number N.

To find the smallest 3-digit number, we must place the smallest possible digits in the highest place values (Hundreds $\rightarrow$ Tens $\rightarrow$ Units).
We are constrained to use exactly **one** prime digit and **two** non-prime digits.

Case A: The Prime is at the Hundreds place.
Smallest Prime available: 2.
Remaining two digits must be non-primes. Smallest non-prime available: 6.
We can repeat digits (unless specified otherwise).
Number formed: 266.

Case B: The Prime is not at the Hundreds place.
Smallest non-prime for Hundreds place: 6.
This results in a number in the 600s, which is greater than 266.
So, the smallest number N is **266**.

Step 4: Find the number of factors of 266.

Perform prime factorization of 266:
$266 = 2 \times 133$
$133 = 7 \times 19$
So, $266 = 2^1 \times 7^1 \times 19^1$.

Using the formula for the number of factors $(a + 1)(b + 1)(c + 1)$:
Number of Factors $= (1 + 1)(1 + 1)(1 + 1) = 2 \times 2 \times 2 = 8$.

> Quick Tip
>
> To minimize a number, minimize the leftmost digits first. Also, remember that 1 is a perfect square ($1^2 = 1$), so it must be excluded from the list of allowed digits.

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3. From an external point P, two tangents PA and PB are drawn to a circle with centre O. Radii OA and OB are perpendicular to the tangents and the angle

$\angle AOB = 50°$. **A third tangent is drawn which intersects both PA and PB. Find the angle $\angle APB$.**

(A) 110°
(B) 120°
(C) 130°
(D) 140°

Correct Answer: (C) 130°

Solution:
Step 1: Understand the Geometry.
We have a circle with center O.
PA and PB are tangents from an external point P.
A and B are the points of contact.

Step 2: Use the Radius-Tangent Property.
The radius is perpendicular to the tangent at the point of contact.
Therefore, $\angle OAP = 90°$ and $\angle OBP = 90°$.

Step 3: Consider the Quadrilateral OAPB.
The sum of angles in a quadrilateral is 360°.
$\angle APB + \angle OAP + \angle AOB + \angle OBP = 360°$.

Step 4: Substitute the known values.
We are given $\angle AOB = 50°$.
$\angle APB + 90° + 50° + 90° = 360°$.
$\angle APB + 230° = 360°$.

Step 5: Solve for $\angle APB$.
$\angle APB = 360° - 230° = 130°$.
(Note: The information regarding the "third tangent" is extraneous for calculating $\angle APB$, although it would be relevant if the question asked for the angle subtended by that third tangent at the center).

> Quick Tip
>
> For any two tangents drawn from an external point to a circle, the angle between the tangents ($\angle APB$) and the angle between the radii ($\angle AOB$) are always supplementary (i.e., they add up to 180°).

Question 4. If $(2m+n)+(2n+m) = 27$, find the maximum value of $(2m-3)$, assuming

m and n are positive integers.

(A) 11
(B) 13
(C) 15
(D) 17

Correct Answer: (B) 13

Solution:
Step 1: Simplify the given equation.
$(2m + n) + (2n + m) = 27$
Combine like terms:
$3m + 3n = 27$
Divide the entire equation by 3:
$m + n = 9$.

Step 2: Analyze the constraints.
We are given that m and n are positive integers $(1, 2, 3, \dots)$.
Therefore, $n \geq 1$.

Step 3: Maximize the variable m.
To maximize the expression $(2m - 3)$, we must maximize the value of m.
From the equation $m = 9 - n$, the value of m is largest when n is smallest.
Minimum value of $n = 1$.
Maximum value of $m = 9 - 1 = 8$.

Step 4: Calculate the maximum value of the expression.
Substitute $m = 8$ into $(2m - 3)$:
$2(8) - 3 = 16 - 3 = 13$.

(Note: If n were allowed to be 0 (non-negative), m would be 9 and the answer 15, but "positive integers" strictly excludes zero).

> Quick Tip
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> Pay close attention to domain constraints like "positive integers" (Z^+ starts at 1) versus "non-negative integers" (starts at 0). This distinction often changes the boundary conditions for maximum/minimum problems.

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5. Find the sum of digits of the number $625^{65} \times 128^{36}$.

(A) 20
(B) 25
(C) 30
(D) 35

Correct Answer: (B) 25

Solution:
Step 1: Simplify the bases to prime factors.
$625 = 5^4$
$128 = 2^7$
Substitute these into the expression:
$N = (5^4)^{65} \times (2^7)^{36}$.

Step 2: Apply exponent laws.
$(a^m)^n = a^{mn}$
$N = 5^{(4\times65)} \times 2^{(7\times36)}$
$N = 5^{260} \times 2^{252}$.

Step 3: Group terms to form powers of 10.
To form a power of 10, we need equal powers of 2 and 5. The smaller exponent is 252.
$N = 5^{(260-252)} \times 5^{252} \times 2^{252}$
$N = 5^8 \times (5 \times 2)^{252}$
$N = 5^8 \times 10^{252}$.

Step 4: Calculate the value of the coefficient 5^8.
$5^4 = 625$
$5^8 = 625 \times 625$
$625 \times 625 = (600 + 25)^2 = 360000 + 30000 + 625 = 390625$.

Step 5: Calculate the sum of digits.
The number N is 390625 followed by 252 zeros. The zeros do not contribute to the sum.
Sum of digits $= 3 + 9 + 0 + 6 + 2 + 5$.
Sum $= 25$.

Quick Tip

To find the sum of digits of a large number involving powers of 2 and 5, always convert pairs of $2^n \times 5^n$ into 10^n. The sum of digits depends solely on the remaining factor, as multiplying by 10^n only appends zeros.

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6. A man takes a loan of 1000 and repays it by paying 530 at the end of the first year, and 594 at the end of the second year. Find the rate of interest per annum.

(A) 8%
(B) 10%
(C) 12%
(D) 9%

Correct Answer: (A) 8%

Solution:
Step 1: Define the variables.
Let the rate of interest be $r\%$ per annum.
Let the multiplying factor be $x = 1 + \frac{r}{100}$.

Step 2: Formulate the equation for the first year.
Principal at the start = 1000.
Amount at the end of Year 1 before payment = $1000x$.
Payment made = 530.
Outstanding Balance at the start of Year 2 = $1000x - 530$.

Step 3: Formulate the equation for the second year.
Interest is charged on the outstanding balance.
Amount at the end of Year 2 = $(1000x - 530)x$.
This amount is fully settled by the payment of 594.
So, $1000x^2 - 530x = 594$.
$1000x^2 - 530x - 594 = 0$.

Step 4: Solve for x.
Divide by 2: $500x^2 - 265x - 297 = 0$.
Using the quadratic formula $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$:
$x = \frac{265\pm\sqrt{(-265)^2-4(500)(-297)}}{1000}$
$x = \frac{265\pm\sqrt{70225+594000}}{1000} = \frac{265\pm\sqrt{664225}}{1000}$
$x = \frac{265+815}{1000} = \frac{1080}{1000} = 1.08$.
(We ignore the negative root).

Step 5: Calculate the rate.
$1 + \frac{r}{100} = 1.08 \Rightarrow \frac{r}{100} = 0.08 \Rightarrow r = 8\%$.

Alternative Method (Using Options):
Check Option (A) 8%:
Interest on 1000 for 1st year = 80. Amount = 1080.
Balance after 1st payment = $1080 - 530 = 550$.
Interest on 550 for 2nd year = $550 \times 0.08 = 44$.
Amount due = $550 + 44 = 594$.
Matches the final payment.

> 💡 Quick Tip
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> For compound interest problems involving installments or irregular payments, checking the options is usually much faster than solving a quadratic equation. Calculate the balance year by year using the rate in the option.

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7. The average of the first 7 numbers in a series is 60. When the 8th number is added, the average of the first 8 numbers becomes 63. The 9th number is 11 more than the 8th number. It is also given that the average of the 2nd to the 9th numbers is 66. Find the value of the 1st number in the series.

(A) 68
(B) 70
(C) 71
(D) 75

Correct Answer: (C) 71

Solution:
Step 1: Find the value of the 8th number (A_8).
Sum of first 7 numbers $= 7 \times 60 = 420$.
Sum of first 8 numbers $= 8 \times 63 = 504$.
$A_8 = (\text{Sum of first 8}) - (\text{Sum of first 7}) = 504 - 420 = 84$.

Step 2: Find the value of the 9th number (A_9).
We are given that $A_9 = A_8 + 11$.
$A_9 = 84 + 11 = 95$.

Step 3: Calculate the sum of numbers from A_2 to A_9.
There are 8 numbers in the set $\{A_2, \ldots, A_9\}$.
Average is 66.
$\text{Sum}(A_2 \ldots A_9) = 8 \times 66 = 528$.

Step 4: Relate the sums to find A_1.
Let S_{2-8} be the sum of numbers from A_2 to A_8.
We know: $\text{Sum}(A_1 \ldots A_8) = A_1 + S_{2-8} = 504$.
We know: $\text{Sum}(A_2 \ldots A_9) = S_{2-8} + A_9 = 528$.

Subtract the first equation from the second:
$(S_{2-8} + A_9) - (A_1 + S_{2-8}) = 528 - 504$.
$A_9 - A_1 = 24$.

Step 5: Solve for A_1.
Since $A_9 = 95$:

$95 - A_1 = 24$.
$A_1 = 95 - 24 = 71$.

Quick Tip

When a "sliding window" of numbers moves by one step (e.g., 1^{st} to 8^{th} vs 2^{nd} to 9^{th}), the difference in their sums is simply the difference between the incoming number (A_9) and the outgoing number (A_1).

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8. For the number $N = 2^3 \times 3^7 \times 5^7 \times 7^9 \times 10!$, how many factors are perfect squares and also multiples of 420?

(A) 400
(B) 450
(C) 500
(D) 600

Correct Answer: (C) 500

Solution:
Step 1: Find the prime factorization of N.
First, find the prime factorization of 10!:
$10! = 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$
$10! = (2 \cdot 5) \times (3^2) \times (2^3) \times (7) \times (2 \cdot 3) \times (5) \times (2^2) \times (3) \times (2)$
Grouping primes: $2^8 \times 3^4 \times 5^2 \times 7^1$.

Now substitute this into N:
$N = (2^3 \times 3^7 \times 5^7 \times 7^9) \times (2^8 \times 3^4 \times 5^2 \times 7^1)$
$N = 2^{11} \times 3^{11} \times 5^9 \times 7^{10}$.

Step 2: Determine the constraints for the factor.
Let the factor be $F = 2^a \times 3^b \times 5^c \times 7^d$.
For F to be a multiple of 420, we factorize 420:
$420 = 42 \times 10 = (2 \cdot 3 \cdot 7) \times (2 \cdot 5) = 2^2 \times 3^1 \times 5^1 \times 7^1$.
Condition 1 (Multiple of 420): $a \geq 2$, $b \geq 1$, $c \geq 1$, $d \geq 1$.
Condition 2 (Perfect Square): All exponents a, b, c, d must be even numbers.

Step 3: Count the valid values for each exponent.
For a (Power of 2): Range is $0 \leq a \leq 11$. Condition: $a \geq 2$ and a is even.
Valid values: $\{2, 4, 6, 8, 10\} \Rightarrow 5$ values.

For b (Power of 3): Range is $0 \le b \le 11$. Condition: $b \ge 1$ and b is even.
Valid values: $\{2, 4, 6, 8, 10\} \Rightarrow 5$ values.

For c (Power of 5): Range is $0 \le c \le 9$. Condition: $c \ge 1$ and c is even.
Valid values: $\{2, 4, 6, 8\} \Rightarrow 4$ values.

For d (Power of 7): Range is $0 \le d \le 10$. Condition: $d \ge 1$ and d is even.
Valid values: $\{2, 4, 6, 8, 10\} \Rightarrow 5$ values.

Step 4: Calculate total factors.
Total Factors $= 5 \times 5 \times 4 \times 5 = 500$.

> Quick Tip
>
> To find the number of perfect square factors, simply divide the highest power of each prime by 2 and take the integer part, then add 1 (for p^0). However, if there is a lower bound constraint (like "multiple of k"), list the possibilities to avoid "off-by-one" errors.

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9. For the quadratic function $f(x) = x^2 - kx + 12$, the minimum value of $f(x)$ is 3. Which of the following is the value of k?

(A) 6
(B) 8
(C) 10
(D) 12

Correct Answer: (A) 6

Solution:
Step 1: Identify the standard form coefficients.
The given function is $f(x) = 1x^2 - kx + 12$.
Comparing to $ax^2 + bx + c$, we have $a = 1$, $b = -k$, and $c = 12$.

Step 2: Recall the condition for the minimum value.
Since the coefficient of x^2 is positive ($a = 1 > 0$), the parabola opens upwards and has a minimum value at its vertex.
The minimum value occurs at $x = -\frac{b}{2a}$.
The formula for the minimum value is $y_{min} = \frac{4ac-b^2}{4a}$.

Step 3: Substitute the known values into the formula.
We are given that $y_{min} = 3$.

$3 = \frac{4(1)(12)-(-k)^2}{4(1)}$
$3 = \frac{48-k^2}{4}$.

Step 4: Solve for k.
Multiply both sides by 4:
$12 = 48 - k^2$
Rearrange the terms:
$k^2 = 48 - 12$
$k^2 = 36$
$k = \pm 6$.

Step 5: Check the options.
The positive value 6 is provided in Option (A).

> Quick Tip
>
> Alternatively, you can complete the square: $x^2 - kx + 12 = (x - \frac{k}{2})^2 - \frac{k^2}{4} + 12$. The minimum value is the constant term $-\frac{k^2}{4} + 12$. Set this to 3 and solve.

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10. Two circles of radii 6 cm and 6 cm intersect each other. The distance between their centers is 8 cm. What is the length of their common chord?

(A) $4\sqrt{5}$ cm
(B) $6\sqrt{2}$ cm
(C) 8 cm
(D) 6 cm

Correct Answer: (A) $4\sqrt{5}$ cm

Solution:
Step 1: Understand the geometry.
Since both circles have equal radii ($r = 6$), the figure is symmetrical. The line joining the centers (O_1 and O_2) is the perpendicular bisector of the common chord (AB).
Let M be the midpoint of the common chord AB.

Step 2: Determine the distance from the center to the chord.
Since the circles are identical, the chord intersects the line of centers exactly at its midpoint.
Distance between centers $d = 8$ cm.
Distance $O_1M = \frac{8}{2} = 4$ cm.

Step 3: Apply the Pythagorean theorem.
Consider the right-angled triangle $\triangle O_1MA$, where O_1A is the radius (r) and AM is half of the

chord length.
$O_1A^2 = O_1M^2 + AM^2$
$6^2 = 4^2 + AM^2$
$36 = 16 + AM^2$
$AM^2 = 36 - 16 = 20.$
$AM = \sqrt{20} = 2\sqrt{5}$ cm.

Step 4: Calculate the total length of the common chord.
The total length $AB = 2 \times AM$.
$AB = 2 \times 2\sqrt{5} = 4\sqrt{5}$ cm.

Quick Tip

When two circles have the same radius r and the distance between their centers is d, the length of the common chord is given by the formula $L = \sqrt{4r^2 - d^2}$.

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11. A shopkeeper sells an item at a profit of 20%. If he had bought it at 10% less and sold it for 60 more, his profit would become 60%. What is the cost price of the item?

(A) 200
(B) 250
(C) 300
(D) 280

Correct Answer: (B) 250

Solution:
Step 1: Assume the initial Cost Price.
Let the original Cost Price (CP) be $100x$.
Then the original Selling Price (SP_1) with 20% profit is $120x$.

Step 2: Determine the new conditions.
New CP (CP_2) is 10% less than original CP:
$CP_2 = 100x - 10x = 90x$.
New SP (SP_2) is 60 more than original SP:
$SP_2 = 120x + 60$.

Step 3: Apply the profit formula for the second scenario.
The new profit is 60%. Therefore, $SP_2 = 160\%$ of CP_2.
$120x + 60 = \frac{160}{100} \times 90x$.

Step 4: Solve the equation.
$120x + 60 = 1.6 \times 90x$
$120x + 60 = 144x$
$144x - 120x = 60$
$24x = 60$
$x = \frac{60}{24} = 2.5.$

Step 5: Calculate the original Cost Price.
$CP = 100x = 100 \times 2.5 = 250.$

> 💡 Quick Tip
>
> Always assume the initial Cost Price as $100x$ (or 100 units). This makes percentage calculations for the "New CP" much simpler and avoids messy fractions in the intermediate steps.

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12. Find the range of x satisfying both: $|2x - 7| < 5$ **and** $x + 3 > 0$

(A) $1 < x < 6$
(B) $x > 1$
(C) $1 < x < 7$
(D) $x > -3$

Correct Answer: (A) $1 < x < 6$

Solution:
Step 1: Solve the first inequality involving the absolute value.
The inequality is $|2x - 7| < 5$.
Using the property $|A| < B \implies -B < A < B$, we write:
$-5 < 2x - 7 < 5.$

Add 7 to all parts of the inequality to isolate the x term:
$-5 + 7 < 2x < 5 + 7$
$2 < 2x < 12.$

Divide the entire inequality by 2:
$1 < x < 6.$

Step 2: Solve the second inequality.
The inequality is $x + 3 > 0$.
Subtract 3 from both sides:
$x > -3.$

Step 3: Find the intersection of the two solution sets.
We need values of x that satisfy both $1 < x < 6$ and $x > -3$.
Since the interval $(1, 6)$ lies entirely to the right of -3 (i.e., all numbers between 1 and 6 are greater than -3), the intersection is simply the more restrictive interval.
Intersection: $1 < x < 6$.

> Quick Tip
>
> When solving systems of inequalities, solve each one independently first. Then, draw a number line to visualize the overlap (intersection) of the valid regions. The final answer is the region where all conditions are true simultaneously.

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13. A container has a mixture of milk and water in the ratio 5 : 2. If 14 liters of this mixture is removed and replaced with water, the ratio becomes 5 : 4. What is the initial quantity of the mixture?

(A) 63 L
(B) 35 L
(C) 49 L
(D) 56 L

Correct Answer: (A) 63 L

Solution:
Step 1: Analyze the change in ratios.
The ratio of Milk to Water after removing the mixture is still $5 : 2$.
After adding water, the ratio becomes $5 : 4$.
Since only water is added, the quantity of Milk remains constant. In both ratios (5:2 and 5:4), the Milk part is already equal (5 parts).

Step 2: Calculate the value of one part.
The Water increases from 2 parts to 4 parts.
Difference $= 4 - 2 = 2$ parts.
This increase corresponds to the 14 liters of water added.
Therefore, 2 parts $= 14$ liters $\implies$ 1 part $= 7$ liters.

Step 3: Calculate the remaining mixture volume.
The remaining mixture (before adding water) has a total of $5 + 2 = 7$ parts.
Volume of remaining mixture $= 7 \times 7 = 49$ liters.

Step 4: Calculate the initial quantity.
Initial Quantity = Volume of remaining mixture + Volume removed.

Initial Quantity $= 49 + 14 = 63$ liters.

Quick Tip

In replacement problems, compare the ratio of the "Remaining Mixture" (after removal) with the "Final Mixture." The component that was **not** added (Milk) must have the same number of parts. If they are equal, the difference in the other component's parts equals the replaced volume.
