CAT 2008 Question Sets Mapping

Section – I

Set_111	Ans_111	Set_222	Set_333	Set_444
1	2	4	9	8
2	2	5	10	19
3	5	6	11	20
4	3	7	12	25
5	4	9	3	2
6	1	10	4	3
7	2	11	13	15
8	3	1	17	5
9	5	12	25	4
10	5	13	7	14
11	3	2	6	16
12	2	3	14	18
13	3	14	19	10
14	4	8	1	12
15	1	16	2	1
16	5	15	18	17
17	1	23	20	11
18	1	24	8	13
19	5	21	23	22
20	2	22	24	21
21	1	25	5	9
22	4	17	21	23
23	3	18	22	24
24	4	19	15	6
25	4	20	16	7

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Section – I : QA

Set – 222

1. (3) Total sum of the numbers written on the blackboard $= \frac{40 \times 41}{2} = 820$

When two numbers 'a' and 'b' are erased and replaced by a new number a + b – 1, the total sum of the numbers written on the blackboard is reduced by 1. Since, this operation is repeated 39 times, therefore, the total sum of the numbers will be reduced by 1 × 39 = 39.
Therefore, after 39 operations there will be only 1 number that will be left on the blackboard and that will be 820 – 39 = 781.
Hence, option (3) is the correct choice.

2. (3) The last two digits of any number in the form of 7^{4n} will always be equal to 01.
For example $7^4 = 2401$ and $7^8 = 5764801$.
Hence, option (3) is the correct choice.

3. (2) $x^2 - ax^2 + bx + c = 0$
Let the roots of the above cubic equation be $(\alpha - 1), \alpha, (\alpha + 1)$
$\Rightarrow \alpha(\alpha - 1) + \alpha(\alpha + 1) + (\alpha + 1)(\alpha - 1) = b$
$\Rightarrow \alpha^2 - \alpha + \alpha^2 + \alpha + \alpha^2 - 1 = b \Rightarrow 3\alpha^2 - 1 = b$

Thus, the minimum possible value of 'b' will be equal to – 1 and this value is attained at $\alpha = 0$.
Hence, option (2) is the correct choice.

4. (2) Amount of rice bought by the first customer $= \left(\frac{x}{2} + \frac{1}{2}\right)$ kgs

Amount of rice remaining $= x - \left(\frac{x}{2} + \frac{1}{2}\right) = \frac{x-1}{2}$ kgs

Amount of rice bought by the second customer $= \frac{1}{2} \times \left(\frac{x-1}{2}\right) + \frac{1}{2} = \frac{x+1}{4}$ kgs

Amount of rice remaining $= \left(\frac{x-1}{2}\right) - \left(\frac{x+1}{4}\right) = \frac{x-3}{4}$ kgs

Amount of rice bought by the third customer $= \frac{1}{2} \times \left(\frac{x-3}{4}\right) + \frac{1}{2} = \frac{x+1}{8}$ kgs

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As per the information given in the question $\frac{x+1}{8}=\frac{x-3}{4}$ because there is no rice left after the third customer has bought the rice.
Therefore, the value of 'x' = 7 kgs.
Hence, option (2) is the correct choice.

5. (2) Given that $f(x) = ax^2 + bx + c$
Also, $f(5) = -3f(2) \Rightarrow f(5) + 3f(2) = 0$
$(25a + 5b + c) + 3(4a + 2b + c) = 0$
$37a + 11b + 4c = 0$ …(i)
Also, as 3 is a root of f(x) = 0, therefore f(3) = 0.
Therefore, $9a + 3b + c = 0$ …(ii)
Using equation (i) and (ii), we get that a = b
Therefore, c = –12a
$\Rightarrow f(x) = a(x^2 + x - 12) = a(x + 4)(x - 3)$
Therefore, the other root of f(x) = 0 is –4.
Hence, option (2) is the correct choice.

6. (5) $f(x) = a(x^2 + x - 12)$
Therefore, the value of a + b + c cannot be uniquely determined.
Hence, option (5) is the correct choice.

7. (3) Total number of terms in the sequence 17, 21, 25 … 417 is equal to
$\frac{417-17}{4}+1=101.$
Total number of terms in the sequence 16, 21, 26 … 466 is equal to
$\frac{466-16}{5}+1=91.$
n^{th} term of the first sequence = 4n + 13.
m^{th} term of the second sequence = 5m + 11.
As per the information given in the question 4n + 13 = 5m + 11
$\Rightarrow$ 5m – 4n = 2.
Possible integral values of n that satisfy 5m = 2 + 4n are (2, 7, 12 … 97)
Therefore, the total number of terms common in both the sequences is 20.
Hence, option (3) is the correct choice.

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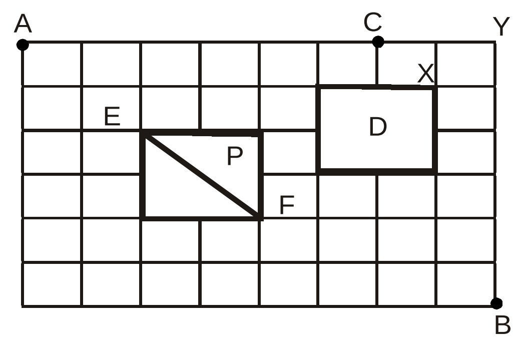
8. (4) In other words we need to find the total number of 4-digit numbers not more than 4000 using the digits 0, 1, 2, 3 and 4.
The digit at the thousands place can be selected in 3 ways.
The digits at the hundreds place can be selected in 5 ways.
The digits at the tens place can be selected in 5 ways.
The digits at the units place can be selected in 5 ways.
Therefore, the total number of 4-digit numbers less than 4000 is equal to
$3 \times 5 \times 5 \times 5 = 375$.
Therefore, the total number of 4-digit numbers not more than 4000 is equal to
$375 + 1 = 376$.
Hence, option (4) is the correct choice.

9. (4)



For the shortest route, Neelam follows the following path:-
$A \rightarrow E \rightarrow F \rightarrow B$

No, of ways to reach from A to E: $\frac{(2+2)!}{2! \times 2!} = 6$

No, of ways to reach from E to F: 1

No, of ways to reach from F to B: $\frac{(4+2)!}{4! \times 2!} = 15$

$\Rightarrow$ Total number of possible shortest paths
$= 6 \times 1 \times 15$
$= 90$
Hence, (4) is the correct option.

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10. (1) Neelam has to reach C via B.
From A to B, the number of paths are 90, as found in question 9.
From B to C, Neelam follows the route:
Case I: $B \rightarrow X \rightarrow C$
OR **Case II:** $B \rightarrow Y \rightarrow C$.
Case I: $B \rightarrow X \rightarrow C$
No. of ways to reach from B to X: $\frac{(5+1)!}{5! \times 1!} = 6$
No. of ways to reach from X to C : 2
So, total number of paths are 6 × 2 = 12 ways.

Case II: $B \rightarrow Y \rightarrow C$ **:**
There is just one way.
Hence, From B to C, there are 6 × 2 + 1 = 13 ways
$\Rightarrow$ Total number of ways of reaching from A to C, via B = 90 × 13 = 1170.
Hence, option (1) is the correct choice.

11. (2) f(x).f(y) = f(xy)
Given, f(2) = 4
We can also write;
f(2) = f(2 × 1) = f(2) × f(1)
OR f(1) × 4 = 4
$\Rightarrow$ f(1) = 1
Now we can also write,
$f(1) = f\left(2 \times \frac{1}{2}\right) = f(2) \times f\left(\frac{1}{2}\right)$
OR $f\left(\frac{1}{2}\right) = \frac{f(1)}{f(2)} = \frac{1}{4}$
OR $f\left(\frac{1}{2}\right) = \frac{1}{4}$
Hence, option (2) is the correct choice.

12. (5) seed(n) function will eventually give the digit-sum of any given number, n.
All the numbers ‘n’ for which seed(n) = 9 will give the remainder 0 when divided by 9.
For all positive integers n, n < 500, there are 55 multiples of 9.
Hence, option (5) is the correct choice.

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13. (5) We can use the formula for the circum radius of a triangle:

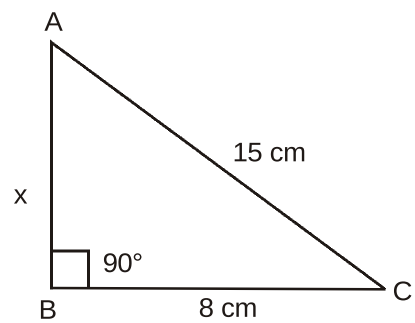
$$R = \frac{a \times b \times c}{4 \times (\text{Area of the triangle})}$$

$$\text{or } R = \frac{a \times b \times c}{4 \times \left(\frac{1}{2} \times b \times AD\right)} = \frac{a \times c}{2 \times AD} = \frac{17.5 \times 9}{2 \times 3} = 26.25 \text{ cm}^2$$

Hence, option (5) is the correct choice.

14. (3) The three sides of the obtuse triangle are 8 cm, 15 cm and x cm. As 15 is less than 8, hence either x or 15 will be the largest side of this triangle. Consider two cases:

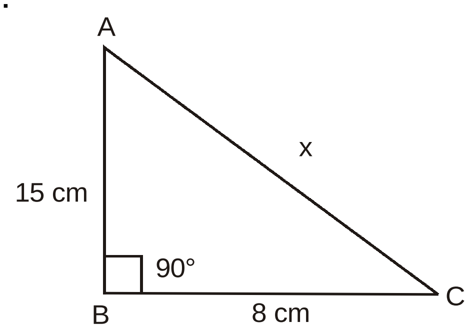
Case I:



Consider the right ΔABC above, $x = \sqrt{15^2 - 8^2} = 12.68$ cm

For all values of x < 12.68, the ΔABC will be obtuse. But as the sum of two sides of triangle must be greater than the third side hence (x + 8) > 15 or x > 7. Thus, the permissible values of x are 8, 9, 10, 11 and 12.

Case II:



In the right ΔABC above, $x = \sqrt{15^2 + 8^2} = 17$.

For all values of x > 17, ΔABC will be obtuse. But x < (15 + 8) or x < 23. The permissible values of x are: 18, 19, 20, 21 and 22.

From Case I and II, x can take 10 values.

Hence, option (3) is the correct choice.

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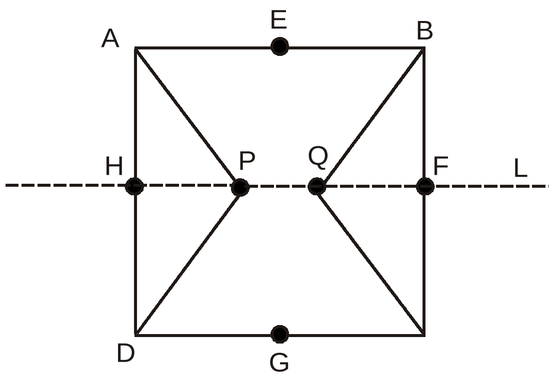
15. (5)



Let , the length of AH = ‘x’ cm

By symmetry of the figure given above, we can conclude that ΔAPD and ΔBQC will have the same area.

$\because \angle APD$ is 120° and line ‘L’ divides the square ABCD in 2 equal halves, therefore $\angle APH = \angle HPD = 60°$

In $\Delta AHP : \frac{AH}{HP} = \tan 60° = \sqrt{3} \Rightarrow HP = \frac{x}{\sqrt{3}}$ cm

Area of $\Delta APD = 2 \times \text{area}(\Delta AHP)$

$= 2 \times \frac{1}{2} \times x \times \frac{x}{\sqrt{3}} = \frac{x^2}{\sqrt{3}}$ cm

Area of ABQCDP = area (ABCD) – 2 area (ΔABD)

$$= 4x^2 - \frac{2x^2}{\sqrt{3}} = \frac{2x^2\left(2\sqrt{3}-1\right)}{\sqrt{3}}$$

Required Ratio $= \dfrac{\frac{2x^2\left(2\sqrt{3}-1\right)}{\sqrt{3}}}{\frac{2x^2}{\sqrt{3}}} = 2\sqrt{3}-1$

Hence, option (5) is the correct choice.

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16. (1) Number of terms in the given expansion is nothing but the non-negative integral solutions of the equation a + b + c = 20.

Total number of non-negative integral solutions $= {}^{20+3-1}C_{3-1} = {}^{22}C_2 = 231$

Alternative Method:

$(a+b+c)^{20} = \{(a+b)+c\}^{20}$

$= {}^{20}C_0(a+b)^{20}.C^0 + {}^{20}C_1(a+b)^{19}.C^1 + ... {}^{20}C_{20}(a+b)^0.C^{20}$

Number of terms = 21 + 20 + 19 + ….. +1 = 231

Hence, option (1) is the correct choice.

17. (4) Raju bets as following:

Horse	Amount
Red	Rs. 3000
White	Rs. 2000
Black	Rs. 1000

Consider the following 4 cases:

Rank	Case I	Case II	Case III	Case IV
First			Spotted	Black
Second	White	White		Grey
Third				White
Fourth	Red	Black	Red	Red
Fifth	Black	Red	Black	

Option (1)The spotted horse could have finished in first or in third rank. In both the cases, option (1) could be correct. This is evident in Case I, above.

Option (2) As evident in Case II above, this statement could be correct.

Option (3) As evident in Case III above, this statement could be correct.

Option (5) As evident in Case IV above, this statement could be correct.

Option (4) If there are 3 horses between White and Red, then only two cases arise:

Case (i): Red finishes first and White finishes last. This way; the least amount earned by Raju is (4 × 3000 + 0 × 2000) = Rs. 12000.

Case (ii): White finishes first and Red finishes last. This way; the least amount earned by Raju is (4 × 2000 + 0 × 3000) = Rs. 8000.

As the net balance with Raju is exactly Rs. 6000, statement in option (4) cannot be true.

Hence, option (4) is the correct choice.

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18. (3) We are given that Grey horse finished fourth. Consider the following 4 cases:

Rank	**Case I**	**Case II**	**Case III**	**Case IV**
First	Spotted	Black		Black
Second	Black		Black	
Third	Red	White	Red	White
Fourth	Grey	Grey	Grey	Grey
Fifth	White	Red		

We can see that each of the 4 statements in the options. (1), (2), (4) and (5) hold true for cases-I, II, II, and IV respectively. In each of these cases, Raju ends up with Rs. 6000 only.

<u>Option (3):</u>
If White came in second, then Raju gets 3 × 2000 = Rs. 6000 from White horse, alone. For the Red (with a bet of Rs. 3000) and Black (with a bet of Rs. 1000) ranks First, Third and Fifth are possible. Hence Raju will earn a minimum of (3 × 1000) = Rs. 3000, additionally. Hence, his total balance will be at least Rs. 9000.

As Raju's total balance is Rs. 6000, statement in option (3) cannot be true.

19. (4) **Using statement A:**
The question cannot be answered because we do not know the number of byes got by the champion.
Hence, statement A alone is not sufficient to answer the question.

Using statement B:
The question cannot be answered because we do not know the exact number of players in the tournament.
Hence, statement B alone is not sufficient to answer the question.

Combining both the statements together:
If there are 83 players, then there will be 6 rounds in the tournament and we know that the champion received only one bye, therefore the total number of matches played by the tournament will be 6 – 1 = 5.
Hence, option (4) is the correct choice.

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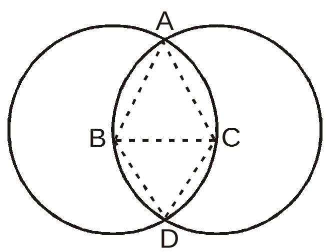
20. (4) **Using statement A:**
When n = 127, exactly one bye is given in round 1.
When = 96, exactly one bye is given in round 6.
As no unique value of n can be determined hence, statement A alone is not sufficient.

Using statement B:
As we do not exactly many bye's are given, in total, we cannot determine the value of n, uniquely.

Combining statement A and B:
There is a unique value of n = 120, for which exactly 1 bye is given from the third round to the fourth round.
Hence, option (4) is the correct choice.

21. (5)



It is given that AB = BC = AC = BD = DC = 1 cm.
Therefore, ΔABC is an equilateral triangle.
Hence, $\angle ACB = 60°$

Now area of sector $\widehat{AB} = \frac{60}{360} \times \pi(1)^2 = \frac{\pi}{6}$

Area of equilateral triangle $\Delta ABC = \frac{\sqrt{3}}{4}(1)^2 = \frac{\sqrt{3}}{4}$

Area of remaining portion in the common region $\widehat{ABC}$ excluding ABC

$= 2 \times \left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right)$

Hence, the total area of the intersecting region = $2 \times \frac{\sqrt{3}}{4} \times (1)^2 + 4 \times \left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right)$

$= \frac{2\pi}{3} - \frac{\sqrt{3}}{2}$ sq. cm.

Hence, option (5) is the correct choice.

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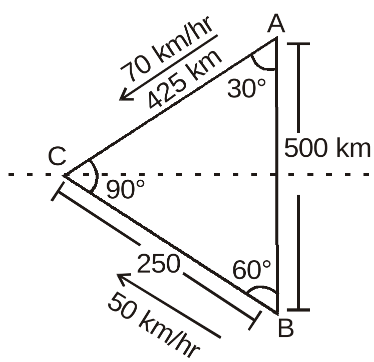
22. (2) As per the conditions given in the questions, we get the following figure.



The train leaving at B reaches C at 1:00 p.m. taking a total time of 5 hours, which means that Rahim should reach C by 12:45 p.m.
Now total time taken by Rahim moving with a speed of 70 km/hr is 't'.

$$t = \frac{500\sqrt{3}}{70} km/hr = 6.07 \text{ hrs.}$$

Therefore, the latest time by which Rahim must leave A and still catch the train is closest to 6:30 a.m.
Hence, option (2) is the correct choice.

23. (1) Let the three consecutive positive integers be equal to 'n – 1', 'n' and 'n + 1'.

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

$$\Rightarrow n^3+4n^2+4n=9n^2$$

$$\Rightarrow n^2-5n+4=0$$

$$\therefore n=1 \text{ or } n=4$$

Since, the three integers are positive, the value of 'n' cannot be equal to 1, therefore the value of 'n' = 4 or m = n – 1 = 3.
Hence, the three consecutive positive integers are 3, 4 and 5.
Hence, option (1) is the correct choice.

24. (1)

$$S = \sqrt{1+\frac{1}{1^2}+\frac{1}{2^2}} + \sqrt{1+\frac{1}{2^2}+\frac{1}{3^2}} + \ldots + \sqrt{1+\frac{1}{2007^2}+\frac{1}{2008^2}}$$

$$T_n = \sqrt{1+\frac{1}{n^2}+\frac{1}{(n+1)^2}}$$

$$= \sqrt{\frac{n^4+2n^3+3n^2+2n+1}{n^2(n+1)^2}}$$

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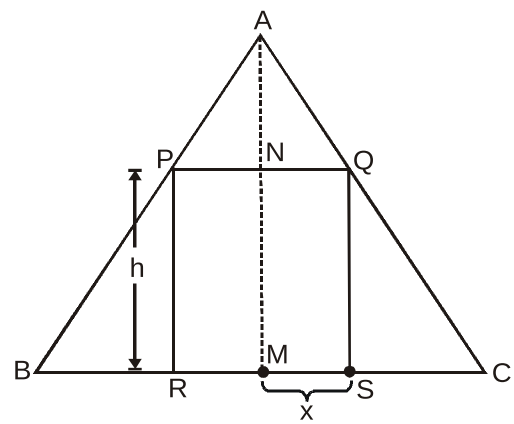
$$= \frac{n^2+n+1}{n^2+n} = 1 + \frac{1}{n^2+n}$$

$$S = \sum_{n=1}^{2007} T_n = 2007 + \sum_{n=1}^{2007}\left\{\frac{1}{n} - \frac{1}{n-1}\right\} = 2008 - \frac{1}{2008}$$

Hence, option (1) is the correct choice.

25. (1)



Let, the height of the cylinder be ‘h’ cm and radius be ‘x’ cm.

ΔANQ is similar to ΔQSC

$$\Rightarrow \frac{AN}{NQ} = \frac{QS}{SC} \Rightarrow \frac{10-h}{x} = \frac{h}{4-x}$$

$$\Rightarrow \frac{10}{h} - 1 = \frac{x}{4-x} \Rightarrow \frac{10}{h} = \frac{4}{4-x}$$

$$\therefore h = \frac{5}{2}(4-x)$$

Surface area of the cylinder PQSR = $2\pi\left[x^2 + hx\right]$

$$= 2\pi\left[x^2 + \frac{5x}{2}(4-x\right]$$

$$= 2\pi\left[x^2 - \frac{5}{2}x^2 + 10x\right] = 2\pi\left[10x - \frac{3}{2}x^2\right]$$

$$= 2\pi\left[-\frac{3}{2}\left(x - \frac{10}{3}\right)^2 + \frac{50}{3}\right]$$

Maximum value of surface area of the cylinder will be at $x = \frac{10}{3}$.

Hence, option (1) is the correct choice.

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