CAT - 2005

Explanatory Answers

(Set - 222)

IMPORTANT

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SECTION - I

Sub-section I-A

1. $R = \dfrac{30^{65} - 29^{65}}{30^{64} + 29^{64}}$

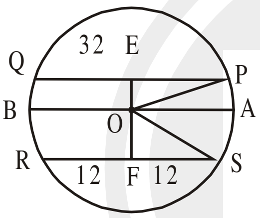
$= \dfrac{(30 - 29)(30^{64} + 30^{63} \times 29 + 30^{62} \times 29^2 + ... + 29^{64})}{30^{64} + 29^{64}}$

$= \dfrac{(30^{64} + 29^{64} + (30^{63} \times 29 + 30^{62} \times 29^2 + ...)}{30^{64} + 29^{64}}$

$= 1 + \dfrac{30^{63} \times 29 + 30^{62} \times 29^2 + ... + 30 \times 29^{63}}{30^{64} + 29^{64}}$

$\therefore$ R > 1
Hence, [4].

2. The two chords can be on one side of origin or on opposite sides.



In Δ PEO,
OP = 20 cm, EP = 16 cm
$\therefore$ OE = 12 cam
In Δ SOF,
SO = 20 cm, FS = 12 cm
$\therefore$ OF = 16 cm
$\therefore$ If two chords are on the same side, distance between them = 16 – 12 = 4 cm of they are on the opposite side then the distance between them = 16 + 12 = 28 cm. Hence, [4].
Note: 4 × (3, 4, 5) = (12, 16, 20) is a Pythagorean triplet.

3. $x^2 - y^2 = 0$ ... (1)
$(x - k)^2 + y^2 = 1$ ... (2)
Subtracting from (1),
$(x - k)^2 + x^2 = 1$
i.e., $x^2 - 2kx + k^2 + x^2 = 1$
$\Rightarrow 2x^2 - 2kx + k^2 - 1 = 0$
This equation will have unique solution if the discriminator = 0
i.e., $(-2k)^2 - 4(k^2 - 1) \times 2 = 0$
i.e., $4k^2 - 8(k^2 - 1) = 0$
i.e., $4k^2 - 8k^2 + 8 = 0$
i.e., $4k^2 = 8$
i.e., $k^2 = 2$ i.e., $k = I\sqrt{2}$
Also x is positive $\Rightarrow$ k is positive $\therefore k = \sqrt{2}$
Hence, [3].

4. $x = (16^3 + 17^3 + 18^3 + 19^3)$

$= (16^3 + 19^3 + 17^3 + 18^3)$

$= (16 + 19)(16^2 + 19^2 - 16 \times 19) + (17 + 18)(17^2 + 18^2 - 17 \times 18)$

$= 35(16^2 + 19^2 + 17^2 + 18^2 - 17 \times 18 - 16 \times 19)$

The expression in the bracket is divisible by 2.

$\therefore$ x is divisible by $35 \times 2 = 70$

$\therefore$ Remainder = 0

Hence, [1].

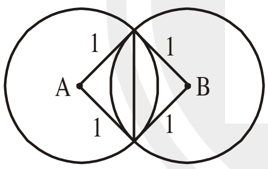
5. Per minute

	Chemical pumped in the tank (A)	Chemical pumped out from the tank (B)	Difference (A – B)
A	90 litres	20 + 10 = 30 litres	60 litres
B	20 + 110 = 130 litres	100 litres	30 litres
C	100 litres	90 + 50 = 140 litres	–40 litres
D	10 + 50 litres	110 litres	–50 litres

Thus, the maximum water pumped out per minute is from tank D at 50 litres per munute. The capacity of the tank = 1000 litres.

$\therefore$ The tank will get empty in $\frac{1000}{50}$ = 20 minutes. Hence, [3].

6.



The portion common to two circles is union of two identical segments of circles. Each segment makes an angle of 90^o with the centre of the circle.

$$\therefore \text{ Area of each segment } = r^2\left(\frac{\pi\theta}{360} - \frac{\sin\theta}{2}\right)$$

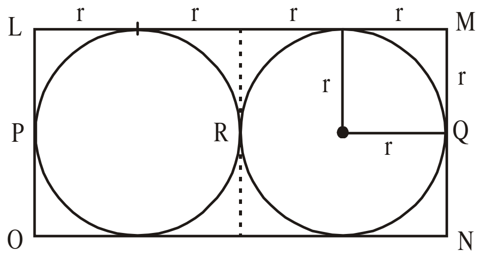
$$= 1\left(\frac{\pi \times 90}{360} - \frac{\sin 90}{2}\right)$$

$$= \left(\frac{\pi}{4} - \frac{1}{2}\right)$$

$$\therefore \text{ Area of the portion } = 2\left(\frac{\pi}{4} - \frac{1}{2}\right) = \frac{\pi}{2} - 1$$

Hence, [2].

7. The circular and rectangular tracks are shown below:



Let 'A' and 'B' start from P.
The two circles are of radius 'r'.
Length of the rectangle = 4r
Breadth of the rectangle = 2r
Let the time taken by 'A' and 'B' to reach P again be 't' min.
'A' covers 2(4r + 2r) = 12r in t minutes

$\therefore$ A's speed = $\frac{12r}{t}$

B covers $2\pi r + 2\pi r = 4\pi r$ in t minutes

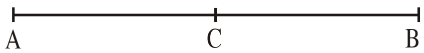
$\therefore$ B's speed = $\frac{4\pi r}{t}$

$$\frac{\text{B's speed}}{\text{A's speed}} = \frac{4\pi r / t}{12r / t} = \frac{\pi}{3} \approx 1.047$$

$\therefore$ B's speed $\approx 0.47 \times 100 = 4.7\%$ more than A. Hence, [4].

8. Let there be x girls and y boys.
The number of games in which both the players were girls is ${}^{x}C_2 = 45$
$\Rightarrow$ x = 10
The number of games in which both the players were boys is ${}^{y}C_2 = 190$
$\Rightarrow$ y = 20
The number of games in which one player was a boy and other was a girl is ${}^{10}C_1 \times {}^{20}C_1 = 200$.
Hence, [1].

9.



Ram starts from A at 9 a.m. and reaches B at 10 a.m. at speed of 5 km/hr.
Shyam starts from A at 9.45 a.m. at speed of 10 km/hr
In 15 minutes Shyam will cover 2.5 km from A at point C.
Now from C, both Ram adn Shyam are travelling in opposite.
Since Shyam's speed is twice that of Rams the distance covered by Shyam is 2 times that of Ram.

$\therefore$ Shyam covered $2.5 \times \frac{2}{3} = \frac{5}{3}$ km before meeting Ram.

$\therefore$ The time taken by Shyam is $\frac{3}{10} = \frac{1}{6}$ hrs i.e., 10 min

$\therefore$ They will meet 1st time at 10.10 a.m. Hence, [2].

10. Ram takes one hour to travel 5 km while Shyam takes 30 minutes to travel 5 km.
At 10 a.m. $\rightarrow$ Ram at B, Shyam at C.
At 10.30 a.m. $\rightarrow$ Ram at C, Shyam at C.
Then, Shyam overtakes Ram at C. Hence, [2].

Sub-section I-B

11. $x = \sqrt{4 - \sqrt{4 + \sqrt{4 - \infty}}}$

Given equation will be,

$x^2 = 4 + \sqrt{4 - x}$

$x^2 - 4 = \sqrt{4 - x}$

$(x^2 - 4)^2 = 4 - x$

$x^4 - 8x^2 + 16 = 4 - x$

$x^4 - 8x^2 + x + 12 = 0$

Substituting $x = \dfrac{\sqrt{13} + 1}{2} \approx 2.3$ we get

$(2.3)^4 - 8(2.3)^2 - 2.3 + 12 = 0$

$27.98 \pm 42.32 - 2.3 + 12 = 0.$

Hence, [3].

We do not get 0 for other value in option.

12. $g(x - 1) + g(x - 1) = g(x)$

$\Rightarrow g(x + 1) = g(x) - g(x - 1)$ ... (1)

Replacing x + 1 by x + 2 we get

$\therefore g(x + 2) = g(x + 1) - g(x)$

$= g(x) - g(x - 1) - g(x)$ [from (1)]

$= -g(x - 1)$

Replacing x + 1 by x + 3 in (1) we get

$\therefore g(x + 3) = g(x + 2) - g(x + 1)$

$= -g(x - 1) - g(x + 1)$

$= -g(x - 1) - g(x) + g(x - 1)$

$= -g(x)$

Again replacing x + 1 by x + 5 in (1) we get

$\therefore g(x + 5) = g(x + 4) - g(x + 3)$

$= g(x + 4) + g(x)$ ... (2)

Now, replacing x + 1 by x + 6 in (1) we get

$g(x + 6) = g(x + 5) - g(x + 4)$

$= g(x + 4) + g(x) - g(x + 4)$ [from (2)]

$g(x + 6) = g(x)$

Hence, [4].

13.

	Fixed wage	Additional	Speed
Female operator	Rs.300	Rs.10 per call	50 calls per day
Male operator	Rs.250	Rs.15 per call	40 calls per day

Let the number of female operators be x $[7 < x \leq 12]$
and the number of male operators be y
Total expenditure,
$[(7 + x) \times 300 + (7 + x)(50)(10)] + [y \times 250 + (y \times 15 \times 40)]$
$= 2100 + 300x + 3500 + 500x + 250y + 600y$
$= 5600 + 800x + 850y$ ... (1)
Calls to be answered, are 1000,
$(7 + x)50 + y \times 40 = 1000$
$350 + 50x + 40y = 1000$
$50x + 40y = 650$
$5x + 4y = 65$

$$y = \frac{65 - 5x}{4} = \frac{5(13 - x)}{4}$$

For y to be integer, x should be 1 or 5.
For $x = 1$, $y = 15$
For $x = 5$, $y = 10$
Substituting $x = 1$ and $y = 15$ in equation (1)
Expenditure = 5600 + 800 + 12750 = 19150
Substituting $x = 5$ and $y = 10$ in equation (1)
Expenditure = 5600 + 4000 + 8500 = 18100
Hence, [4].
Alternatively,
one day payment of a female operator = 300 + 500 = Rs.800
one day payment to a male operator = 250 + 600 = Rs.850
Since the number of call handled by a female operator (per day) is more and the expenditure (i.e., payment) is less than a male operator.
$\Rightarrow$ Maximum female operators (i.e.,) 12 to be employed to minimise the expenditure.
$\therefore$ Number of calls handed by the 12 female operator = $12 \times 50 = 600$
Number of calls left to be handed by male operator = $1000 - 600 = 400$
$\therefore$ Number of calls operators to eb employed = 10 ($\because$ each male can handle 40 calls per day)
Hence, [4].

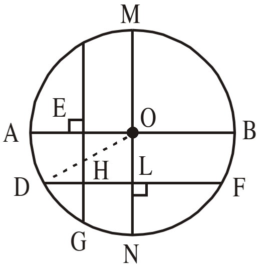
14. Let the three Frenchmen be F_1, F_2, F_3
Let the three Englishmen be E_1, E_2, E_3
Let E1 be the Englishmen who knows French.

Calls	Person (Secrets)
$E_1 - F_1$	$E_1(2)$, $F_1(2)$
$E_1 - F_2$	$E_1(3)$, $F_2(3)$
$E_1 - F_3$	$E_1(4)$, $F_3(4)$
$E_1 - E_2$	$E_1(5)$, $E_2(5)$
$E_1 - E_3$	$E_1(6)$, $E_3(6)$
$E_2 - E_3$	$E_3(6)$, $E_2(6)$
$E_1 - F_1$	$E_1(6)$, $F_1(6)$
$E_1 - F_2$	$E_1(6)$, $F_2(6)$
$E_1 - F_3$	$E_1(6)$, $F_1(6)$

Hence, [3].

15. Let edges of rectangular floor be m units and n units.
Total number of tiles = mn
Total number of white tiles = 2m + 2n – 4
Total number of red tiles = (m – 2)(n – 2)
Total number of white tiles = Total number of red tiles
$2m + 2n - 4 = (m - 2)(n - 2) = mn - 2m - 2n + 4$
$\therefore\ mn = 4m + 4n - 8 \quad \ldots (1)$
If m = 10,
$10n = 40 + 4n - 8$
$10n = 4n + 32$, n will not be integer
For m = 14 and m = 16, n does not have integer value.
If m = 12,
$12n = 48 + 4n - 8$
$8n = 40$
$\therefore\ n = 5$
Hence, [2].

16. $n \times n! = (n + 1 - 1)n! = (n + 1)n! - n! = (n + 1)! - n!$
Thus, we can write
$p = 1! + (3! - 2!) + (4! - 3!) + (5! - 4!) + \ldots (11! - 10!)$
$= 1! - 2! + 11!$
$= 1 - 2 + 11!$
$= 11! - 1$
$p + 2 = 11! - 1 + 2 = 11! + 1$
$\therefore$ p + 2 when divided by 11! leaves 1 as remainder.
Hence, [4].

17. 

Diameter is 3.

$\therefore$ AO = OB = MO = ON = 1.5 cm

AE : EB = 1 : 2

$\therefore$ EO = AO – AE = 1.5 – 1 = 0.5 cm

Similarly, NL : LM = 1 : 2 $\Rightarrow$ OL = 0.5 cm

$\therefore$ OD = radius = 1.5 cm

Δ DLO is a right angled triangle.

$\therefore$ DL = $\sqrt{(OD)^2 - (OL)^2} = \sqrt{(1.5)^2 - (0.5)^2} = \sqrt{2.25 - 0.25} = \sqrt{2}$ cm

HL = OE = 0.5 cm

$\therefore$ DH = DL – HL = $\sqrt{2} - 0.5 = \sqrt{2} - \frac{1}{2} = \frac{2\sqrt{2} - 1}{2}$. Hence, [2].

18. Let digits be x, y, z

$\therefore$ A = 100x + 10y + z

B = 100z + 10y + x [B > A]

B – A = [100z + 10y + x] – [100x + 10y + z] = 99z – 99x = 99(z – x)

If 99(z – x) is perfectly divisible by 7.

z – x will be divisible by 7.

$\therefore$ z – x = 7

If z = 9, x = 2 and if z = 8, x = 1

$\therefore$ A can be 1y8 or 2y9

So, minimum value of A will be at y = 0 i.e., 108.

Maximum value of A will be at y = 2 i.e., 299

108 and 299 are included in [2]. Hence, [2].

19. If $a_1 = 1$ $\quad a_{n+1} - 3a_n + 2 = 4n$ ... (given)
For $n = 1$, $a_2 - 3a_1 + 2 = 4(1)$
$a_2 - 3 + 2 = 4$
$\therefore\ a_2 = 5 = 3^2 - 4 = 3^n - 2n$ ... (1)
For $n = 2$, $a_3 - 3a_2 + 2 = 4(2)$
$a_3 - 3(5) + 2 = 8$
$\therefore\ a_3 = 21 = 3^3 - 6 = 3^n - 2n$ ... (2)
Thus, we get $a_n = 3^n - 2n$
$\therefore\ a_{100} = 3^{100} - 200$
Hence, [3].

20. There are 3 odd places and 3 number for choice
Case 1:

1 ___ 5 ___ 4 ___ 4 cases $\rightarrow$ addition = 12

5 ___ 1 ___ ___ ___ 4 cases $\rightarrow$ addition = 12

1 ___ 3 ___ ___ ___ 4 cases $\rightarrow$ addition = 12

3 ___ 1 ___ ___ ___ 4 cases $\rightarrow$ addition = 12

5 ___ 3 ___ ___ ___ 4 cases $\rightarrow$ addition = 12

3 ___ 5 ___ ___ ___ 4 cases $\rightarrow$ addition = 12

Thus, 72 cases are possible in each case last digit is 2 or 4.

1 ___ ___ ___ 5 $\rightarrow$ 4 cases $\rightarrow$ addition = 20

5 ___ ___ ___ 1 $\rightarrow$ 4 cases $\rightarrow$ addition = 4

1 ___ ___ ___ 3 $\rightarrow$ 4 cases $\rightarrow$ addition = 12

3 ___ ___ ___ 1 $\rightarrow$ 4 cases $\rightarrow$ addition = 12

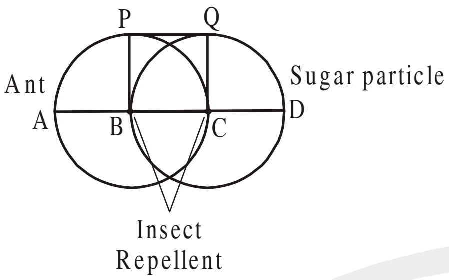
5 ___ ___ ___ 3 $\rightarrow$ 4 cases $\rightarrow$ addition = 12

3 ___ ___ ___ 5 $\rightarrow$ 4 cases $\rightarrow$ addition = 20

Thus, 72 cases are possible.
Similarly, 72 cases are possible with digits 1, 3, 5 at 3rd and fifth place.
Thus, $72 \times 3 = 216$. Hence, [2].

21. $(30)^{2720} = (3 \times 10)^{2720} = 3^{2720} \times 10^{2720}$
To find the rightmost nonzero digit, we need to find the rightmost digit of 3^{2720}.
$3^{2720} = (3^4)^{680} = 81^{680}$
$\therefore$ The last digit is 1.
$\therefore$ The rightmost nonzero digit in 3^{2720} is 1.
Hence, [1].

22. AB = BC = CD and A, B, C, D are on a straight line, are have



Due to insect repellent, the ant avoid the area of circles (radius = 1 cm) with centre B and C.
$\therefore$ Ant will follow A – P – Q – D path

$\ell(\text{AP}) = \dfrac{2 \times \pi \times 1}{4}$

$\ell(\text{PQ}) = 1$

$\ell(\text{QD}) = \dfrac{2\pi}{4}$

$\ell(\text{A-P-Q-D}) = \dfrac{\pi}{2} + 1 + \dfrac{\pi}{2} = \pi + 1$

Hence, [2].

23. $\log_x\left(\dfrac{x}{y}\right) + \log_y\left(\dfrac{y}{x}\right)$
$= \log_x x - \log_x y + \log_y y - \log_y x$
$= 1 - \log_x y + 1 - \log_y x$
$= 2 - (\log_x y + \log_y x)$
For $x > y$, $y > 1$
$\log_y x > 1$
$\therefore \log_y x + \log_x y > 1$
$\therefore 2 - (\log_x y + \log_y x) < 2 - 1 = 1$

Hence, $\log_x\left(\dfrac{x}{y}\right) + \log_y\left(\dfrac{y}{x}\right)$ cannot be 1.

Hence, [4].

24. Let x and y are two digits of a number.

$\therefore$ x + y + xy = 10x + y or 10y + x

Consider x + y + xy = 10x + y

x(1 + y) = 10x

$\therefore$ 1 + y = 10

$\Rightarrow$ y = 9

x cannot be 0.

$\therefore$ 10x + y = 19, 29, ... 99 $\rightarrow$ 9 numbers.

Let x, y and z are digits of a three digit number

x + y + z + xyz = 100x + 10y + z

x + y + xyz = 100x + 10y

99x + 9y = xy

Thus, xyz must be divisible by 9.

This is possible only when x, y, z $\equiv$ (1, 1, 9)

OR

x, y, z $\equiv$ (1, 3, 3)

It can be seen than there is no three digit numbers that satisfy $p_n + s_n = n$

Hence, there are only 9 numbers.

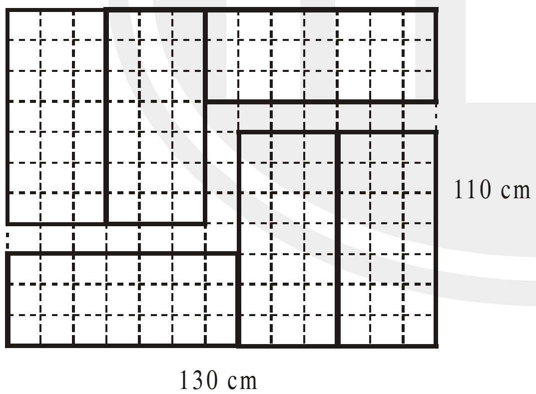
Hence, [4].

25. Option [4] is not possible, since total area of 7 tiles exceeds the area of the floor.

Each small square is of dimensions 10 cm × 10 cm

However 6 tiles can be palced as under

We have shown a diagram of rectangular floor below.



Thus, as shown above, the maximum number of tiles that can be accomodated on the floor is 6. Hence, [3].

26. Case 1:

$x, y > 0$

1a. $x > y$

$|x + y| + |x - y| = x + y + x - y = 4 \Rightarrow x = 2$ ... (1)

1b. $y > x$

$|x + y| + |x - y| = x + y - x + y = 4 \Rightarrow y = 2$ ... (2)

Case 2:

2a. $x > 0, y > 0$

$|x| > |y|$

$|x + y| + |x - y| = x - |y| + x + |y| = 4$

$x = 2$ ... (3)

2b. $|x| < |y|$

$|x + y| + |x - y| = |y| - x + x + |y| = 4$

$2|y| = 4$

$\Rightarrow |y| = 2$

$\Rightarrow y = -2$ ... (4)

Case 3:

$x < 0, y < 0$

3a. $|x + y| + |x - y| = |x| + |y| + |x| - |y| = 4$

$2|x| = 4$

$\Rightarrow x = -2$ ... (5)

3b. $|x| < |y|$

$|x + y| + |x - y| = |x| + |y| + |x| = 4$

$\Rightarrow y = -2$ ... (6)

Case 4:

$x < 0, y > 0$

4a. $|x| < |y|$

$|x + y| + |x - y| = y - |x| + |x| + y = 4$

$2y = 4$

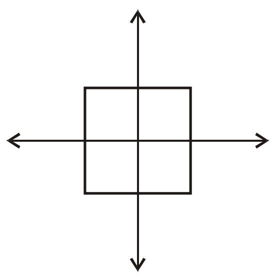
$\Rightarrow y = 2$ ... (7)

4b. $|x| > |y|$

$|x + y| + |x - y| = |x| - y + |x| + y = 4$

$\Rightarrow x = -2$ ... (8)

From (1) to (8) the graph of $|x + y| + |x - y| = 4$ can be drawn as:

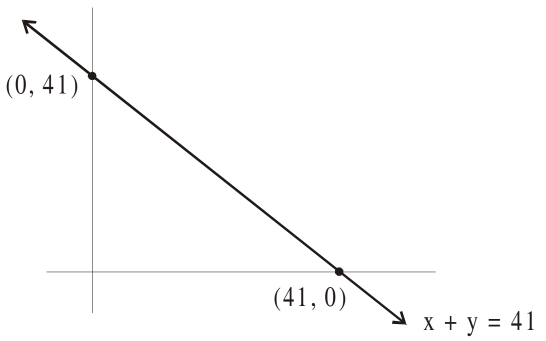


i.e., the region bounded by the graph is a square of side 4.

$\therefore$ Required area = $4 \times 4 = 16$ sq. units

Hence, [3].

27.



All integers such that $x + y < 41$ and $x > 0$, $y > 0$

For $x = 1$, $1 \leq y \leq 39 \equiv 39$ integers

For $x = 2$, $1 \leq y \leq 38 \equiv 38$ integers

....

....

$x = 39$, $y = 1 = 1$ integer

$\therefore$ Total number of integers $= 1 + 2 + ... + 38 + 39 = \dfrac{39 \times 40}{2} = 780$

Hence, [1].

28. Let AD = 1 and AC = b

In Δ BDC,

The angles are x, z and 180 − w

$\therefore$ In Δ ABC,

The angles are x, z, x + y

But 180 − w = x + y

$\therefore \angle BDC = ACB$

$\angle DBC = \angle ABC$

$\angle BCD = \angle BAC$

$\Delta BDC \approx \Delta BCA$

$$\frac{BD}{BC} = \frac{BD}{BA} = \frac{DC}{CA}$$

$$\frac{9}{12} = \frac{12}{9 + a} = \frac{6}{b}$$

$$\therefore b = \frac{6 \times 12}{9} = 8$$

$$9 + 9 = \frac{144}{9} = 16$$

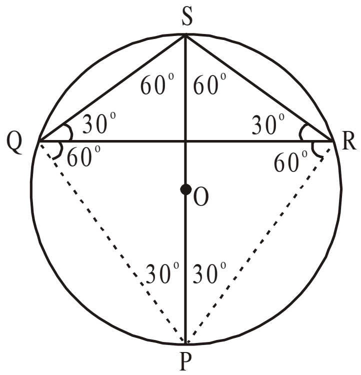
$a = 7$

$\therefore$ Sides of Δ ADC = 6, 7, 8

$$\therefore \text{Ratio} = \frac{\text{Perimeter of } \Delta ADC}{\text{Perimeter of } \Delta BDC} = \frac{21}{27} = \frac{7}{9}$$

Hence, [1].

29.



PS = 2r (diameter of circle)

Δ PQR is equilateral

$\therefore$ m$\angle$P = 60°

Thus, m$\angle$S = 180° – 60° = 120° (Cyclic quadrilateral)

m$\angle$PQS + m$\angle$PRS = 180° (Cyclic quadrilateral)

m$\angle$PQS + m$\angle$PRS = 90°

In right angled ΔPQS, m$\angle$QPS = 30°, m$\angle$PSQ = 60°

$\therefore$ PS = 2r, QS = r (side opposite to 30)

and PQ = $r\sqrt{3}$ (side opposite to 60)

Perimeter of $\square$PQSR = 2[$r\sqrt{3}$ + r] = 2r[$\sqrt{3}$ + 1].

Hence, [1].

30. According to conditions givenL

100 $\leq$ n $\leq$ 1200 and every digit should be odd.

We get numbers at 1113, 1119, 1131, 1137, 1155, 1173, 1179, 1191, 1197.

Thus, there are nine numbers. Hence, [1].

SECTION - II

Sub-section II-A

31. E is the only stand alone sentence in the paragraph. EA link cannot be established because there is no information that should precede 'similarly' in A. On the otherhand, B serves as an example and carries forward the idea stated in E. DC is another obvious link. Hence, [2].

32. B is the only stand alone sentence in the sequence. All the other sentences have words or ideas that allude to some information that has been mentioned before. BC is an obvious link because the comparison stated in B is further established in C with the help of the phrase 'there is a similar neglect of Indian writing'. Hence, [4].

33. This is a somewhat tricky paragraph where it is difficult to arrive at a stand alone sentence. EB is a plausible link because the birth of modern finance is further described in B. D further takes on the "mathematics of chance and statistics". So the EBD link. Hence, [2].

34. Refer to paragraph 2, last sentence. Hence, [3].

35. The conflict is between a chess player's predicament adopting a defensive strategy against an aggressive active opponent. Hence, [2].

36. Refer to the 1st paragraph 4th line. Also generally and often mean the same in a majority of cases. Hence, [2].

37. Refer to the 4th paragraph 2nd, 3rd, 4th sentences. Hence, [3].

38. Near-friend - wrong usage. Hence, [2].

39. Bear for her - wrong verbal, prepositional usage. Hence, [3].

40. Hand full is the wrong usage. Hence, [1].

Sub-section II-B

41. Refer to paragraph 2 as a whole. Hence, [1].

42. Refer to paragraph 3 – last line, and paragraph 4 – lines 3 and 4. Hence, [1].

43. Refer to the 3rd paragraph, 4th sentence. Hence, [4].

44. Refer to paragraph 1 sentences 5 to 9 (the latter part of the first paragraph). Options 1, 2, 4 are mentioned. Option [3] is not. Hence, [3].

45. Refer to paragraph 1, 5th sentence. Hence, [4].

46. Refer to the last two paragraphs. Hence, [4].

47. The answer can be inferred from the entire 2nd paragraph. Hence, [2].

48. Refer to the 1st sentence of the 6th paragraph. Hence, [3].

49. The highlight of the passage is Federer's humility. Federer also commented that the records of the other players have to be considered before proclaiming him to be the 'best ever' player. Option [2] directly links with the humility of Federer. Hence, [2].

50. [1] is completely beyond the purview of the passage. [2] talks of actually reaching the frontier whereas the passage mentions only a struggle to understand the organizational laws of the frontier'. The passage doesnot mention any success that has been achieved. The first sentence of the passage is a clue to the correct answer. Hence, [3].

51. The passage analyses the merits of Sudoku vs. Crosswords. It says Sudoku 'lacks depth' and then goes on describing the skills that come into play while solving Crosswords. The last sentence should logically establish the fact that Crosswords are in some way superior to Sudoku. [2] and [3] mention areas that are beyond the purview of the passage. 'Just a logical exercise' in [1] connects it to the phrase "feel it lacks depth". Hence, [1].

52. [4] is not connected to the paragraph. [3] is not hinted at in the passage. Between [1] and [2], [1] uses the word 'however' incorrectly. Hence, [1].

53. Proponents do not destroy, test or question. Hence, [3].

54. In keeping with the negative tone of the passage – (words like limp fodder, sinners,- supplicants etc.) 'Sputtering' which means the sound made by a flickering flame, fits in best. Hence, [3].

55. A sensitive traveller gets distressed by poverty. Hence, [4].

56. Terse means short. 'If' is a short answer. Hence, [4].

57. B is wrong because it should be 'rarely has the economic ascent .... been watched' rather than 'rarely .... has been watched'. C is wrong it should be 'the past war era'. A and D are correct. Hence, [2].

58. B is wrong since it should have been 'ever since the enlightenment'. C is wrong because it should have been 'the two leaders' instead of 'two leaders'. Hence A and D are incorrect. Hence, [4].

59. B is wrong because 'the' is missing before project. The word 'however' is also misplaced. Hence, [4].

60. B is wrong because 'making them to break apart' is wrong usage – instead it should have been either 'causing them to break apart' or 'breaking them apart'.
C is incorrect because it should have been 'Many an offending chemical has now been banned'.
A and D are correct. Hence, [3].

SECTION - III

Sub-section III-A

For answers to questions 61 to 63:

All the questions in this set can be solved using basic calculations and observation.

61.

State	Area under cultivation (million hectares)	Production	State	Area under cultivation (million hectares)	Production
Himachal Pradesh	1.2	12	Gujarat	12	24
Kerala	2.4	4.8	Punjab	4	24
Rajasthan	6.8	6.8	Madhya Pradesh	6.4	24.8
Bihar	6	12	Tamil Nadu	9.1	27.3
Karnataka	9.5	19	Maharashtra	15.5	48
Haryana	3.2	19.2	Uttar Pradesh	16.8	67.2
West Bengal	7.2	21.6	Andhra Pradesh	22.4	112

We need to observe the values of $\dfrac{\text{Production}}{\text{Area under cultivation}}$.

By observation the values are largest for Haryana and Punjab (Both are 6). Hence, [1].

62. Per capita production of rice for Gujarat = $\dfrac{24}{51} < 0.5$.

The values for other states are:

Himachal Pradesh $\equiv \dfrac{1.2}{6} < 0.5$

Kerala $\equiv \dfrac{4.8}{32} < 0.5$

Rajasthan $\equiv \dfrac{6.8}{56} < 0.5$

Bihar $\equiv \dfrac{12}{83} < 0.5$

Karnataka $\equiv \dfrac{19.2}{53} < 0.5$

West Bengal $\equiv \dfrac{21.6}{80} < 0.5$

Punjab $\equiv \dfrac{24}{24} = 1 > 0.5$

Madhya Pradesh $\equiv \dfrac{24.8}{60} < 0.5$

Tamil Nadu $\equiv \dfrac{27.3}{60} < 0.5$

Maharashtra $\equiv \dfrac{48}{97} = \dfrac{24}{48.5} > \dfrac{24}{51}$

Uttar Pradesh $\equiv \dfrac{67.2}{166} < 0.5$

Andhra Pradesh $\equiv \dfrac{112}{76} > 0.5$

$\therefore$ 4 states have a per capita production of rice greater than Gujarat. Hence, [2].

63. We need to observe values of $\frac{\text{Production}}{\text{Population}}$ for all states.

Himachal Pradesh	$\frac{12}{6} \times 10^5 < 4 \times 10^5$	Gujarat	$\frac{240}{51} \times 10^5 > 4 \times 10^5$
Kerala	$\frac{48}{32} \times 10^5 < 4 \times 10^5$	Punjab	$\frac{240}{24} \times 10^5 > 4 \times 10^5$
Rajasthan	$\frac{68}{56} \times 10^5 < 4 \times 10^5$	Madhya Pradesh	$\frac{248}{60} \times 10^5 > 4 \times 10^5$
Bihar	$\frac{120}{83} \times 10^5 < 4 \times 10^5$	Tamil Nadu	$\frac{273}{62} \times 10^5 > 4 \times 10^5$
Karnataka	$\frac{190}{53} \times 10^5 < 4 \times 10^5$	Maharashtra	$\frac{480}{97} \times 10^5 > 4 \times 10^5$
Haryana	$\frac{192}{21} \times 10^5 < 4 \times 10^5$	Uttar Pradesh	$\frac{672}{166} \times 10^5 > 4 \times 10^5$
West Bengal	$\frac{216}{80} \times 10^5 < 4 \times 10^5$	Andhra Pradesh	$\frac{1120}{76} \times 10^5 > 4 \times 10^5$

$\therefore$ There are 8 states which are intensive rice producing states. Hence, [4].

64. Dinesh, Gayatri, Kalindi, Parul, Urvashi and Zeena are executives.
We want to find the number of executives who can attend only one or less than one workshops.
Dinesh has a project in January and is interested in BO, CS, EG.
$\therefore$ He can attend BO and EG.
Gayatri is interested in EG but has a project in March.
$\therefore$ She cannot attend any workshop.
Kalindi can attend BO and EG.
Parul can attend CS and EG.
Urvashi cannot attend EG as she has a project in February.
Zeena can attend only EG.
$\Rightarrow$ Gayatri, Urvashi and Zeena cannot attend more than one workshop. Hence, [3].

65. Anshul is interested in CS and EG but has projects in January and March.
$\therefore$ Anshul cannot attend any workshop.
Bushkant is interested in BO and EG, but has projects in February and March.
$\therefore$ Bushkant cannot attend any workshop.
Gayatri and Urvashi are interested in EG, but have a project in March.
$\Rightarrow$ Gayatri and Urvashi also cannot attend any workshop. Hence, [2].

66. Parul and Hari are attending the workshop.
Parul is a female and is young also. Hari is a male.
$\Rightarrow$ One more female is required.
Consider the options.
Option [1]: Rahul and Yamini are not committed to projects in January and are also interested in CS workshop.
$\therefore$ Rahul and Yamini can attend the CS workshop.
In options [2], [3] and [4], Dinesh, Anshul and Zeena have projects in January.
$\therefore$ They cannot attend the CS workshop. Hence, [1].

For answers to questions 67 to 70:

The management institute was established on 1/1/00 and no faculty member retired or joined till 31/3/00. From 1/4/00 to 31/3/04 one faculty member was recruited in each area and one of the faculty members retired.

Note that for any area a drop in the average (age) means that either a faculty member has retired or a new faculty member has been introduced or both (in the year showing the drop).

The bar chart for Finance shows a drop twice, once for 2000-2001 and once for 2001-2002. Hence, it cannot be that the new faculty member (in Finance) joined on 1/4/00 (as then the next two drops cannot be taken care of). Hence, he joins on 1/4/01 or 1/4/02. For all the conditions on the Finance bar chart to be satisfied, the Finance faculty member must leave in 2000-2001 and the new one must join on 1/4/02. ---- (1)

[The total age of the 5 Finance faculty members on 1/4/00 = $50.2 \times 5 = 251$.
When one member leaves in 2000-2001 the total age of the remaining 4 faculty members on 1/4/01 = $251 - 60 + 4 = 195$.

Hence, average age of the 4 Finance faculty members = $\frac{195}{4} = 48.75 \approx 49$ (as shown in the bar chart).

When the new member joins on 1/4/02, the average age of the 5 (= 4 + 1) faculty members

$= \frac{195 + 25 + 4}{5} = 44.8 \approx 45$ (as shown in the bar chart).]

By process similar to those above, the new member must join on 1/4/01.

[The total age of 6 members in the OM area = $45 \times 6 = 270$.
No faculty member can leave, so the drop is explained by the addition of a new member on 1/4/01;

the average age of the 7 members = $\frac{270 + 25 + 6}{7} = 43$ (as shown in the bar chart).]

Hence, his age on April 1, 2003 is 27 years. ----- (2)

On 1/4/00, Naresh's age is 52 years and Devesh's age is 49 years (using their birth dates).

Let the third member's age be x years. Then $\frac{52 + 49 + x}{3} = 49.33$

$\Rightarrow x = 46.90$ i.e., $x = 47$ ---- (3)

Using (1), (2) and (3)

67-[3] 68-[3] 69-[1] 70-[1]

Sub-section III-B

For answers to questions 71 to 74:

Aggregate revenues of firms A, B, C and D are 190, 217, 222 and 185 (in million rupees) respectively. Hence, Aggressive Ltd. and Honest Ltd. are either firms A and D or firms B and C.

71. If statement 1 is true, then firm B is Honest Ltd. and hence firm C is Aggressive Ltd. But then Aggressive Ltd. does not have the highest share in the Bihar market, hence statement 2 is false. Similarly, if statement 2 is true, then statement 1 is false. Hence, [3].

72. If statement 1 is true, then firm B is Aggressive Ltd. and firm C is Honest Ltd. and its lowest revenue is from Bihar i.e., statement 2 is true. Hence, [3].

73. If statement 1 is true, then Profitable Ltd. is the firm B and hence firms A and D are Aggressive Ltd. and Honest Ltd. and firm C is Truthful Ltd. Now, we get that Honest Ltd.'s total revenue is Rs.190 mn or Rs.185 mn and that of Profitable Ltd. is Rs.217 mn. But, then statement 2 is false. Hence, [2].

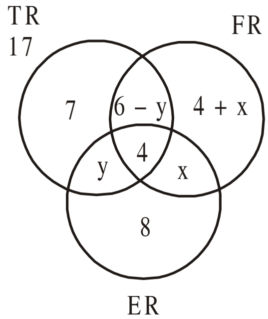
74. If Profitable Ltd.'s lowest revenue is from UP, then Profitable Ltd. is firm A or firm D and hence, firms B and C are Aggressive Ltd. and Honest Ltd. (not necessarily in this order). $\therefore$ Truthful Ltd. is firm A or firm D. Hence, [3].

For answers to questions 75 to 78:

17 volunteers are involved in TR and out of these 10 are also involved in at least one more project.
$\therefore$ Volunteers involved in TR only = 17 – 10 = 7
$\therefore$ Volunteers involved in ER only = 7 + 1 = 8

and volunteers involved in all the three projects = $\frac{8}{2}$ = 4.

Now, let x and y be the number of volunteers involved in 'ER and FR only' and 'ER and TR only', then volunteers involved in FR only = 4 + x.



Now, 17 + 4 + x + x + 8 = 37 $\Rightarrow$ x = $\frac{37 - 29}{2}$ = 4.

Now, since, maximum number of volunteers are involved in FR, y can take following values.

y	0	1	2
FR (22 – y)	22	21	20
ER (16 + y)	16	17	18
TR	17	17	17

75. Minimum number of volunteers involved in both FR and TR, but not in ER = 6 – y = 6 – 2 = 4. Hence, [3].

76. We already have the information given in options [2] and [3]. Information in option [1] will serve the purpose. Hence, [1].

77. After the volunteers withdraw from the respective projects we get,
FR and TR only = 6 – y + 1 = 7 – y
FR and ER only = 4 + 1 = 5
TR and ER only = y + 2
$\therefore$ Possible number of volunteers in each project are as follow:

y	0	1	2
FR (20 – y)	20	19	18
ER (15 + y)	15	16	17
TR 16	16	16	16

Hence, [2].

78. Data given in the question is not sufficient to answer the question. Hence, [4].

For answers to questions 79 to 82:

Venkat buys 4 stocks, each for Rs.100.
The average returns he would have got, had the returns been as per his expectations

$$= \frac{20 + 10 + 30 + 40}{4} = 25\%$$

(We can directly add as the base price of all stocks is Rs.100)

79. Venkat earned 35% returns on average.
$\Rightarrow$ The change in total price of all the stocks = 35 × 4 = Rs.40.
Without change in expected returns, the returns would be Rs.100 $\Rightarrow$ He has to earn Rs.40 from the stocks with extraordinarily good returns. This is possible if 20 is doubled and 40 is multiplied by 1.5.
$\Rightarrow$ Companies A and D give extraordinarily good results with A being from Cement or IT industry and D from the Auto or Steel industry.
$\therefore$ Statements II and III are necessarily true. Hence, [2].

80. 38.75% $\Rightarrow$ Returns of 38.75 × 4 = 155 i.e., extra returns of Rs.55.
Which can be obtained if 40 is doubled and 30 is multiplied by 1.5.
$\Rightarrow$ Stock D belongs to the Cement or IT industry and stock C belongs to the Auto or Steel industry and both of them have shown extraordinarily good results.
$\therefore$ Statements I and IV are necessarily true. Hence, [3].

81. Company C gives 60% returns.

$\therefore$ Venkat will earn the minimum if company B gives 15% (1.5 × 10).

$\therefore$ His minimum average returns $= \dfrac{20 + 15 + 60 + 40}{4} = 33.75\%$.

He will earn maximum if company D gives 60% (1.5 × 40).

$\therefore$ His maximum average returns $= \dfrac{20 + 10 + 60 + 60}{4} = 37.5\%$.

Statement II is true and I is false.
Also, if returns are 33.75%, company B belongs to Auto or Steel industry.
$\therefore$ Statement IV is true. Hence, [2].

82. To get the minimum average return, the stock with the lowest expected returns should give returns which are twice that of the initially expected returns and the third lowest should give returns which are one and a half times that expected.

$\therefore$ We can say that A would give 20 + 10 = 30% and B would give 10 + 10 = 20%.

$\therefore$ Average returns would be $\dfrac{30 + 20 + 30 + 40}{4} = 30\%$. Hence, [1].

For answers to questions 83 to 86:

83 people voted in round 2. This included the representative of New York who had not voted in round 1. $\therefore$ 82 people voted in round 1.
Similarly, the 75 people who voted in round 2 included the representative of Beijing who had not voted in rounds 1 and 2.
$\therefore$ 74 of the 83 people who voted in round 2 voted in round 3.
$\Rightarrow$ 9 people became ineligible $\rightarrow$ 9 people voted for New York in round 1 and Beijing in round 2.
$\Rightarrow$ 21 – 9 = 12 people who had voted for Beijing in round 1 voted for Beijing in round 2.

$\therefore \dfrac{12}{0.75} = 16$ people voted for Beijing in round 1.

$\therefore$ 82 – 30 – 12 – 16 = 24 people voted for Paris in round 1.
Those who voted for New York in round 1, voted either for Beijing or Paris in round 2.
Since 9 out of the 12 people who voted for New York in round 1 voted for Beijing in round 2, 3 people who voted for New York in round 1, voted for Paris in round 2.
Also, 4 people who voted for Beijing in round 1 voted for Paris in round 2.
$\therefore$ Paris now will have 24 + 3 + 4 = 31 votes.
But Paris has 32 votes which implies that the representative of New York has voted for Paris in round 2.
Now, the votes obtained by the two cities contending in the last round are 37 and 38 and the cities are London and Paris.
50% of those who voted for Beijing in round 1, voted for Paris in round 3.
$\Rightarrow$ 8 people who voted for Beijing in round 1 voted for Paris in round 3 out of which 4 voted for Paris in round 2.
Also, Paris has at least 32 + 4 = 36 votes in round 3, but Paris can have 37 or 38 votes only.
$\Rightarrow$ The representative of Beijing who did not vote in round 2, voted for Paris in round 3.
Also, out of the 12 members who voted for Beijing in round 2, 8 voted for London in round 3.

i.e., $\dfrac{8}{12} = 66.67\%$.

Now, all the questions can be answered.

83-[4] 84-[4] 85-[1] 86-[4]

87. From the data in question, we know that first 16 players in the list won in 1^{st} round and in 2^{nd} round the players having seed numbers 1, 2, 3, 4, 5, 11, 10 and 9 won the matches in 1^{st}, 2^{nd}, 3^{rd}, ... and 8^{th} matches respectively.
Since, Lindsay Davenport is the winner of 2^{nd} match in round 2, she will play against the winner of 7^{th} match in 2^{nd} round i.e., Venus Williams (10). Hence, [4].

88. Since, Maria Sharapova reaches in the final, in finals she will play against the winner of 2^{nd} match in semifinals. In semifinals the 2^{nd} match was played between the winners of 2^{nd} and 3^{rd} matches in quarterfinals which were played between Lindasay Davenport and Justine Henin and between Amelie Mauresmo and Elena Dementieva i.e., amongst these four any one will play against Maria Sharapova in finals. Hence, [3].

89. The seed numbers of the players who won in 1^{st}, 2^{nd}, 3^{rd}, ... 16^{th} matches in 1^{st} round are 1, 31, 3, 29, 5, 27, 7, 25, 9, 23, 11, 21, 13, 19, 15 and 17.
Similarly, the seed numbers of the players who won in 1^{st}, 2^{nd}, ..., 8^{th} matches in 2^{nd} round are 1, 15, 3, 13, 5, 11, 7 and 9.
Now, in semifinals Maria Sharapova will play against the winner of the 4^{th} match in quarter finals which will be played between the players with seed numbers 13 and 5.
Hence, the lowest seeded player facing Maria Sharapova in finals could be Anastasia Myskina (13). Hence, [1].

90. Sharapova will play 1^{st} match in quarter finals against the winner of 8^{th} match of round 2. 8^{th} match in round 2 is played between the winners of 8^{th} and 9^{th} matches in round 1.
8^{th} match in round 1 was played between Serena Williams (8) and Shinobu Asagoe (25) and won by Serena Williams. Winner of the 9^{th} match of round 1 and 8^{th} match in round 2 has to be Nadia Petrova (9) as she made it to the semi-finals.
Thus, Sharapova will play against Nadia Petrova. Hence, [3].