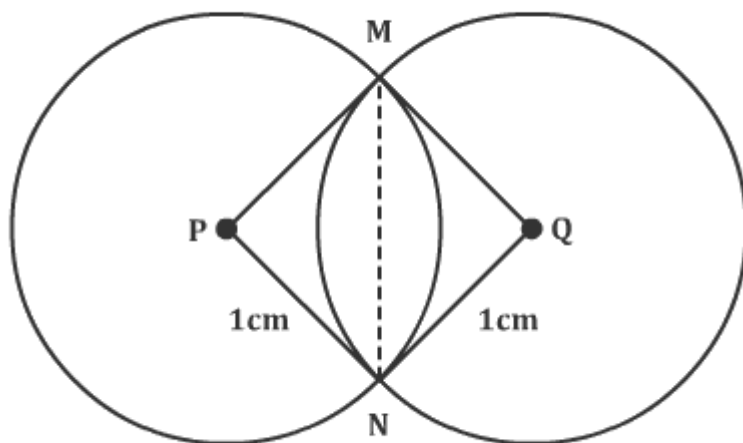


Solutions

1. $x = 16^3 + 17^3 + 18^3 + 19^3$
 $= (16^3 + 19^3) + (17^3 + 18^3)$
 $= (16 + 19)(16^2 + 16 \times 19 + 19^2) + (17 + 18)(17^2 + 17 \times 18 + 18^2)$
 $= 35 \times (\text{an odd number}) + 35 \times (\text{another odd number}) = 35 \times (\text{an even number})$
 $= 35 \times (2k) \dots (k \text{ is a positive integer})$
 $\therefore x = 70k$
 $\therefore x$ is divisible by 70.
 Remainder when x is divided by 70 = 0
 Hence, option 1.

2. The change in the amount of chemical in each tank after every minute is as follows:
 A: $-20 - 10 + 90 = 60$
 B: $-100 + 110 + 20 = 30$
 C: $-50 - 90 + 100 = -40$
 D: $-110 + 10 + 50 = -50$
 Since tank D loses the maximum amount of chemical in a minute, it will be emptied first.
 Let n minutes be the time taken by tank D to get empty.
 $\therefore 1000 - 50n = 0$
 $\therefore n = 20$ minutes
 Hence, option 3.

3.



Let the two circles with centres P and Q intersect at M and N.

Quadrilateral PQMN is a square.

$m\angle MPN = m\angle MQN = 90^\circ$

The area common to both the circles = $2(\text{Area of sector P-MN} - \text{Area of } \Delta \text{ PMN})$

$$= 2[(90/360 \times \pi \times 1^2) - (1/2 \times 1^2)]$$

$$= \pi/2 - 1$$

Hence, option 2.

4. Let r be the radius of the circular tracks.

Length and breadth of the rectangular track are $4r$ and $2r$ respectively.

Length (perimeter) of the rectangular track = $12r$

Length of the two circular tracks (figure of eight) = $4\pi r$

If A and B have to reach their starting points at the same time,

$$\frac{12r}{a} = \frac{4\pi r}{b}$$

(where a and b are the speeds of A and B respectively)

$$\therefore \frac{b}{a} = \frac{4\pi}{12}$$

$$\therefore (b - a) \times 100/a = 0.047 \times 100$$

$$= 4.7\%$$

Hence, option 4.

5. Let there be g girls and b boys.

Number of games between two girls = ${}^g C_2$

Number of games between two boys = ${}^b C_2$

$$\therefore g(g - 1)/2 = 45$$

$$\therefore g^2 - g - 90 = 0$$

$$\therefore (g - 10)(g + 9) = 0$$

$$\therefore g = 10$$

Also,

$$b(b - 1)/2 = 190$$

$$\therefore b^2 - b - 380 = 0$$

$$\therefore (b + 19)(b - 20) = 0$$

$$\therefore b = 20$$

$$\therefore \text{Total number of games} = (g + b)C_2 = {}^{30}C_2 = 435$$

$$\therefore \text{Number of games in which one player is a boy and the other is a girl} = 435 - 45 - 190 = 200$$

Hence, option 1.

6. Ram and Shyam run a race between points A and B, 5 km apart. Ram starts at 9 a.m. from A at a speed of 5 km/hr, reaches B, and returns to A at the same speed. Shyam starts at 9:45 a.m. from A at a speed of 10 km/hr, reaches B and comes back to A at the same speed.

Ram starts at 9:00 am and Shyam starts at 9:45 am from A.

Ram reaches B at 10:00 am (as his speed is 5km/hr and the distance between A and B is 5km)

When Ram reaches B, Shyam is $15/60 \times 10 = 2.5$ km away from A.

Ram meets Shyam $(2.5 \times 60)/(10 + 5)$ minutes after 10:00 a.m. i.e., at 10:10 a.m.

Shyam reaches B at 10:15 a.m.

At 10:15 a.m., Ram is $(15/60) \times 5 = 1.25$ km away from B.

Shyam overtakes Ram in $1.25/(10 - 5) = 0.25$ hrs = 15 minutes after 10:15 am i.e. at 10:30 a.m.

Hence, option 2.

7. Shyam overtakes Ram at 10:30 a.m.

Hence, option 2.

8.

$$R = \frac{30^{65} - 29^{65}}{30^{64} + 29^{64}}$$

$$\therefore a^n - b^n = (a - b)(a^{n-1} + a^{n-2}b + a^{n-3}b^2 + \dots + b^{n-1})$$

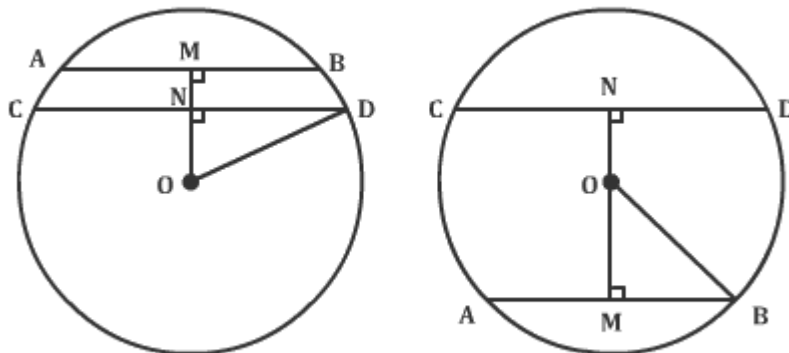
$$\therefore R = \frac{(30 - 29)[30^{64} + (30^{63} \times 29) + \dots + 29^{64}]}{30^{64} + 29^{64}}$$

$$\therefore 30^{64} + 30^{63} \times 29 + \dots + 29^{64} > 30^{64} + 29^{64}$$

$$\therefore R > 1$$

Hence, option 4.

9.



The two chords AB and CD can be on the same side or the opposite sides of the centre O.

Let M and N be the midpoints of AB and CD.

\therefore MN is the distance between the two chords.

MB = 12 cm and ND = 16 cm

OM and ON are perpendicular to AB and CD respectively.

$\therefore ON^2 = 20^2 - 16^2$ (By Pythagoras theorem)

$\therefore ON = 12$ cm

Similarly, OM = 16 cm

Case 1: AB and BC are on the same side of the centre.

$$MN = OM - ON = 4 \text{ cm}$$

Case 2: $MN = OM + ON = 28 \text{ cm}$

Hence, option 4.

10. We have, $x^2 = y^2$ and $(x - k)^2 + y^2 = 1$

Solving the two equations simultaneously, we get,

$$(x - k)^2 + x^2 = 1$$

$$\therefore x^2 - 2kx + k^2 + x^2 = 1$$

$$\therefore 2x^2 - 2kx + (k^2 - 1) = 0$$

If this equation has a unique solution for x , then discriminant = 0

$$\therefore 4k^2 - 8(k^2 - 1) = 0$$

$$\therefore 8 - 4k^2 = 0$$

$$\therefore k^2 = 2$$

$$\therefore k = \pm\sqrt{2}$$

Since k is positive the other solution is ruled out

$$\therefore k = \sqrt{2}$$

Hence, option 3.

11. $p = (1 \times 1!) + (2 \times 2!) + (3 \times 3!) + (4 \times 4!) + \dots + (10 \times 10!)$

$$\text{Now, } n \times n! = [(n + 1) - 1] \times n! = (n + 1)! - n!$$

$$\therefore p = 2! - 1! + 3! - 2! + 4! - 3! + 5! - 4! + \dots + 11! - 10!$$

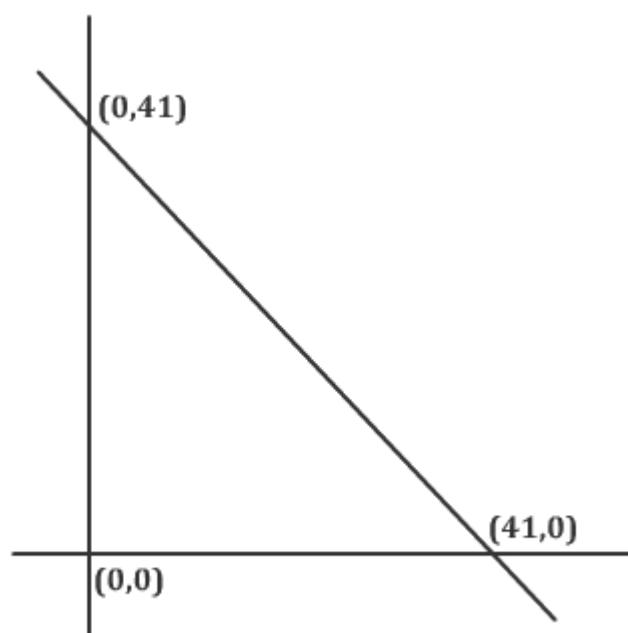
$$\therefore p = 11! - 1! = 11! - 1$$

$$\therefore p + 2 = 11! + 1$$

$\therefore p + 2$ when divided by $11!$ leaves a remainder of 1.

Hence, option 4.

12.



The points satisfying the equations $x + y < 41$, $y > 0$, $x > 0$ lie inside the triangle.

Integer solutions of $x + y < 41$ can be found as follows.

If $x + y = 40$

(x, y) (1, 39), (2, 38), ..., (39, 1) ... (39 solutions)

If $x + y = 39$

(1, 38), (2, 37), ..., (38, 1) ... (38 solutions)

If $x + y = 38$, we get 37 solutions and so on till $x + y = 2$... (1 solution)

Thus there are $39 \times 40 / 2 = 780$ integer solutions to $x + y < 41$

The number of points with integer coordinates lying inside the circle = 780

Hence, option 1.

13. Let $A = 100x + 10y + z$ ($x \neq 0$, x, y, z are single digit numbers)

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

$$\therefore B - A = 99(z - x)$$

As $(B - A)$ is divisible by 7 and 99 is not, $(z - x)$ is divisible by 7

$\therefore z$ and x can have values (8, 1) or (9, 2)

y can have any value from 0 to 9.

$$A = 1y8 \text{ or } 2y9$$

\therefore Lowest possible value of A is 108 and the highest possible value of A is 299.

Hence, option 2.

14. $a_1 = 1$

$$a_{n+1} = 4n + 3a_n - 2$$

$$a_2 = 4 - 2 + 3(1) = 5 = 3^2 - 1$$

$$a_3 = 4(2) + 3(5) - 2 = 21 = 3^3 - 6$$

$$a_4 = 4(3) + 3(21) - 2 = 73 = 3^4 - 8$$

$$\therefore a_n = 3^n - 2(n)$$

$$\therefore a_{100} = 3^{100} - 200$$

Hence, option 3.

15. Let O and E represent odd and even digits respectively.

$\therefore S$ can have digits of the form
O _ O _ E or O _ E _ O or E _ O _ O

Case 1: O _ O _ E

The first digit can be chosen in 3 ways out of 1, 3 and 5

The third can be chosen in 2 ways.

The fifth digit can be chosen in 2 ways after which the second and fourth digits can be chosen in 2 ways.

\therefore There are $3 \times 2 \times 2 \times 3 = 24$ ways in which this number can be written. 12 out of these ways will have 2 in the rightmost position and 12 will have 4 in the rightmost position.

\therefore The sum of the rightmost digits in Case 1 = $(12 \times 2) + (12 \times 4) = 72$

Case 2: O _ E _ O

This number can again be written in 24 ways.

8 out of these ways will have 1 in the rightmost position, 8 will have 3 in the rightmost position and 8 will have 5 in the rightmost position.

Thus the sum of the rightmost digits in Case 2 = $(8 \times 1) + (8 \times 3) + (8 \times 5) = 72$

Case 3: E _ O _ O

This number can also be written in 24 ways.

As in Case 2, 8 out of these ways will have 1 in the rightmost position, 8 will have 3 in the rightmost position and 8 will have 5 in the rightmost position.

\therefore The sum of the rightmost digits in Case 3 = $(8 \times 1) + (8 \times 3) + (8 \times 5) = 72$

\therefore The sum of the digits in the rightmost position of the numbers in $S = 72 + 72 + 72 = 216$

Hence, option 2.

16. $30^{2720} = 3^{2720} \times 10^{2720}$

The rightmost non zero digit of 30^{2720} will be the digit in the unit's place of 3^{2720} .

3's power cycle is 3, 9, 7, 1 and cyclicity is 4.

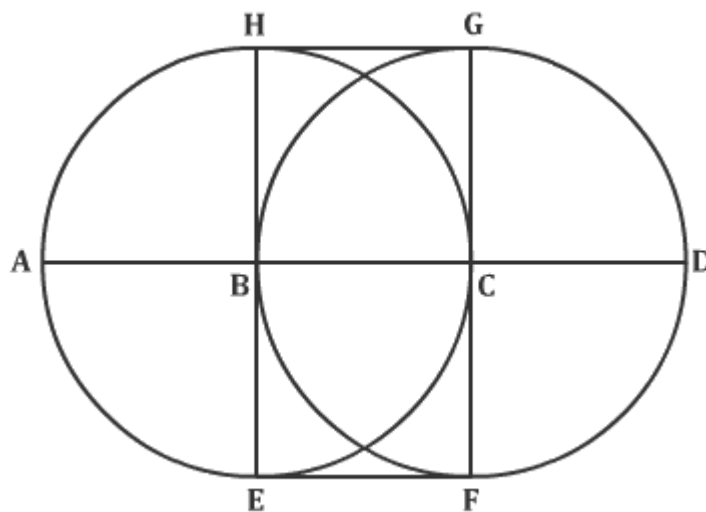
$$2720 = 680 \times 4$$

\therefore The digit in the unit's place of 3^{2720} is 1.

\therefore The rightmost non-zero digit of 30^{2720} is 1.

Hence, option 1.

17.



The ant will not go into the circles with centers B and C and radius = 1 m
 The minimum distance that the ant has to traverse = the distance of the path A-H-G-D

$$HG = 1\text{ m}$$

$$AH = GD = \frac{1}{4} \times \text{Circumference of Circle} = \frac{\pi}{2}$$

$$AH + GD = \pi \text{ m}$$

∴ The ant must traverse $1 + \pi$ m

Hence, option 2.

18.

$$\begin{aligned} \log_x \left(\frac{x}{y} \right) + \log_y \left(\frac{y}{x} \right) &= \frac{\log x - \log y}{\log x} + \frac{\log y - \log x}{\log y} \\ &= 1 - \log_x y + 1 - \log_y x \\ &= 2 - \log_x y - \log_y x \\ &= 2 - (\log_x y + \log_y x) \end{aligned}$$

As $x \geq y$ and $y > 1$,

$$\log_y x \geq 1 \text{ and } \log_x y \leq 1$$

$$\log_y x + \log_x y > 1$$

$$\therefore 2 - (\log_x y + \log_y x) < 1$$

$$\therefore \log_x \left(\frac{x}{y} \right) + \log_y \left(\frac{y}{x} \right) \neq 1$$

Hence, option 4.

19. n can be a 2 digit or a 3 digit number.

Case (I)

Let n be a 2 digit number.

Let $n = 10x + y$, where x and y are non-negative integers,

$$P_n = xy \text{ and } S_n = x + y$$

Now, $P_n + S_n = n$

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

$$\therefore xy = 9x \implies y = 9$$

There are 9 two digit numbers (19, 29, 39, ..., 99) for which $y = 9$

Case (II)

Let n be a 3 digit number.

Let $n = 100x + 10y + z$, where x, y and z are non-negative integers,

$$P_n = xyz \text{ and } S_n = x + y + z$$

Now, $P_n + S_n = n$

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

$$\therefore xyz = 99x + 9y$$

$$\therefore z = 99/y + 9/x$$

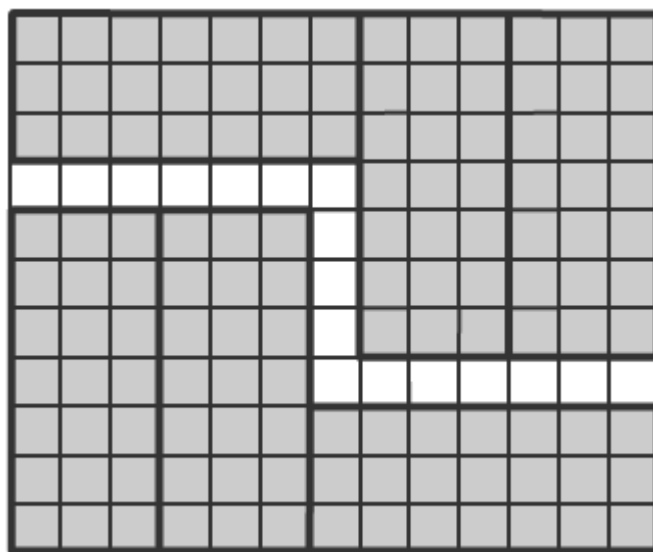
From the above expression, $0 < x, y < 9$

But, we cannot find any value of x and y , for which z is a single digit number.

\therefore There are no 3 digit numbers which satisfy $P_n + S_n = n$

Hence, option 4.

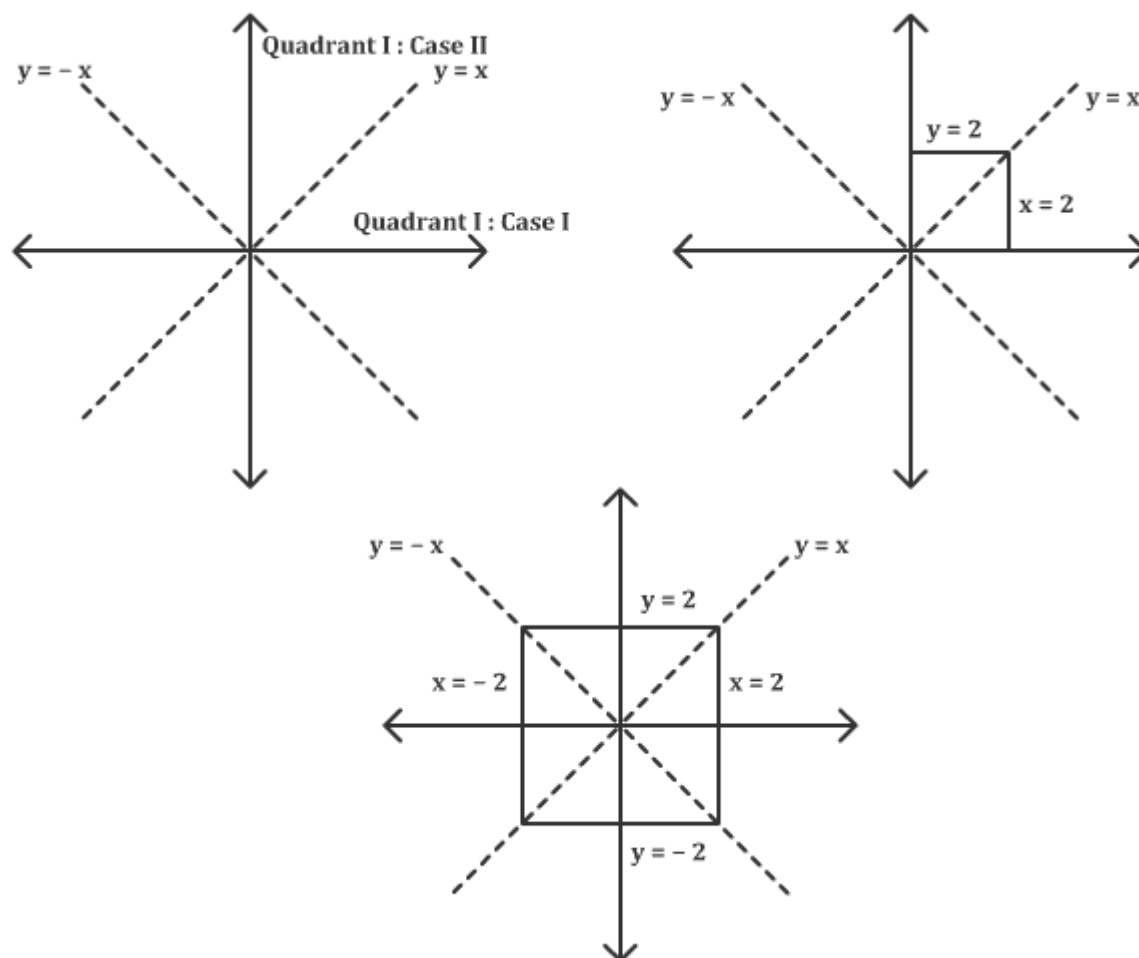
20.



This problem can be solved by trying different ways of placing the tiles on the floor. The maximum number of tiles that can be accommodated is 6 as shown in the figure.

Hence, option 3.

21.



$$|x + y| + |x - y| = 4 \quad \dots (i)$$

Consider the case when x and y are both positive. This is the area of quadrant I
 In this case two cases are possible.

Case I: $x > y$

In this case expression (i) becomes

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

$$\therefore 2x = 4$$

$$\therefore x = 2$$

Case II: $x < y$

In this case expression (i) becomes

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

$$\therefore 2y = 4$$

$$\therefore y = 2$$

\therefore The area for the first quadrant is as shown in the figure.

Extending the same logic to other quadrants we get the area as shown in the diagram.

$$\therefore \text{Its area} = 4 \times 4 = 16 \text{ sq. units}$$

Hence, option 3.

22. $AO = OD = 1.5 \text{ cm}$

$$AE + EB = 3 \text{ cm and } AE:EB = 1:2$$

$$\therefore AE = 1 \text{ cm and } EB = 2 \text{ cm}$$

$$OE = AO - AE = 1.5 - 1 = 0.5 \text{ cm}$$

$$\text{Similarly, } NL = 1 \text{ cm, } M = 2 \text{ cm and } OL = 0.5 \text{ cm}$$

OEHL is a square as all its angles are right angles and $OE = OL$

$$\therefore EH = HL = 0.5 \text{ cm}$$

$$\text{In } \triangle ODL, OD^2 = OL^2 + DL^2$$

$$1.5^2 = 0.5^2 + (0.5 + DH)^2$$

$$2.25 = 0.25 + 0.25 + DH + DH^2$$

$$DH^2 + DH - 1.75 = 0$$

$$DH = \frac{-1 \pm \sqrt{1 - 4(-1.75)}}{2}$$

$$= \frac{(2\sqrt{2} - 1)}{2} \quad (DH > 0)$$

Hence, option 2.

23. $m\angle BCD = m\angle BAC$ and B is common to triangles ABC and CBD.

$\triangle ABC$ is similar to $\triangle CBD$

$$AB/CB = BC/BD = AC/CD$$

$$AB/12 = 12/9 = AC/6$$

$$AB = 16 \text{ cm and } AC = 8 \text{ cm}$$

$$AD = AB - BD = 16 - 9 = 7 \text{ cm}$$

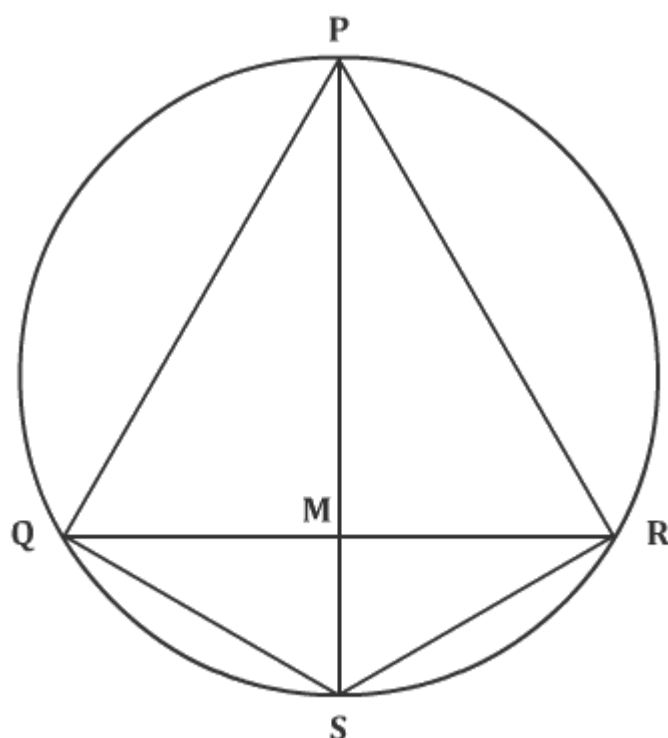
$$\therefore \text{Perimeter of } \triangle ABC = 7 + 6 + 8 = 21 \text{ cm}$$

$$\therefore \text{Perimeter of } \triangle BDC = 9 + 6 + 12 = 27 \text{ cm}$$

$$\therefore \text{Required ratio} = 21/27 = 7/9$$

Hence, option 1.

24.



ΔPQR is an equilateral triangle and PS is the diameter.
 $\therefore m\angle PQS = m\angle PRS = 90^\circ$ (angles subtended in a semi-circle)
 PS bisects QR as it is the median of ΔPQR
 $m\angle PMQ = m\angle PMR = 90^\circ$
 $\therefore m\angle QPS = m\angle RPS = 30^\circ$
 $\therefore m\angle PSQ = m\angle PSR = 60^\circ$

Radius = r
 $\therefore PS = 2r$
 As $\Delta PQS, \Delta PQM, \Delta MQS$ are $30^\circ-60^\circ-90^\circ$ triangles,
 $QS = r, PQ = \sqrt{3}r$
 Similarly, $RS = r, PR = \sqrt{3}r$
 \therefore Perimeter of quadrilateral $PQRS = 2r + 2\sqrt{3}r = 2r(1 + \sqrt{3})$
 Hence, option 1.

25. n will be of the form $11ab$, where a and b are odd numbers.
 We are looking for all n 's divisible by 3.
 $\therefore 1 + 1 + a + b = 3$ or 9 or 12 or 15 or 18
 $\therefore a + b = 1$ or 4 or 7 or 10 or 13 or 16
 $\therefore a + b = 1$ or 7 or 13 is not possible as the sum of two odd numbers cannot be odd.
 $\therefore (a, b) = (1, 3), (3, 1), (1, 9), (3, 7), (5, 5), (7, 3), (9, 1), (7, 9), (9, 7)$
 $\therefore 9$ elements of S are divisible by 3.

Hence, option 1.

26.

$$x = \sqrt{4 + \sqrt{4 - \sqrt{4 + \sqrt{4 - \dots}} \text{ to infinity}}}$$

$$x^2 - 4 = \sqrt{4 - \sqrt{4 + \sqrt{4 - \dots}} \text{ to infinity}}$$

$$(x^2 - 4)^2 - 4 = -\sqrt{4 - \sqrt{4 + \dots}} \text{ to infinity}$$

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

Now, substituting options, we find that only option 3 satisfies the above equation.

Hence, option 3.

$$27. g(x+1) + g(x-1) = g(x)$$

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

Now, let $g(x-1) = a$ and $g(x) = b$

$$\therefore g(x+1) = b - a$$

$$\therefore g(x+2) = b - a - b = -a$$

$$\therefore g(x+3) = -a - b + a = -b$$

$$\therefore g(x+4) = -b + a = a - b$$

$$\therefore g(x+5) = a - b + b = a = g(x-1)$$

$$\therefore g(x+6) = a - a + b = b = g(x)$$

and so on.

Thus we observe that the values of $g(x+6)$ and $g(x)$ are always equal.

Hence, option 4.

28. Let x females and y males be employed.

As the total number of calls to be answered = 1000 and males and females can handle 40 and 50 calls respectively everyday

$$50x + 40y = 1000$$

$$40y = 1000 - 50x$$

$$\therefore y = 25 - x - x/4$$

As $7 < x < 12$, x can be 8 or 12

If $x = 8$, $y = 15$ and if $x = 12$, $y = 10$

The total cost of employing x females and y males

$$= 300x + 250y + (50 \times 10 \times x) + (40 \times 10 \times y)$$

$$= 800x + 650y$$

If $x = 8$ and $y = 15$, cost = Rs. 16150

If $x = 12$ and $y = 10$, cost = Rs. 16100

Thus cost is minimized when the number of male operators is 10.

Hence, option 4.

29. Let E_1 , E_2 and E_3 be the three Englishmen and F_1 , F_2 and F_3 be the three Frenchmen.

Let E_1 be the only Englishman knowing French.

Now, let $A \leftrightarrow B$ denote a phone call between A and B , where they both tell each other their secrets. The following phone calls will ensure that all six persons know all the six secrets.

1. $E_1 \leftrightarrow E_2$
2. $E_2 \leftrightarrow E_3$ (Now E_3 knows all the secrets with the Englishmen)
3. $F_1 \leftrightarrow F_2$
4. $F_2 \leftrightarrow F_3$ (Now F_3 knows all the secrets with the Frenchmen)
5. $F_3 \leftrightarrow E_3$ (Now F_3 and E_3 know all the secrets)
6. $E_3 \leftrightarrow E_2$
7. $E_2 \leftrightarrow E_1$
8. $F_3 \leftrightarrow F_2$
9. $F_2 \leftrightarrow F_1$

Thus, a minimum of 9 calls are needed to pass all the secrets to all the six persons.

Hence, option 3.

30. Let each square tile have side = 1 unit

Let the length of the rectangular floor be m units and the breadth be n units.

Number of red tiles = $(m - 2)(n - 2)$

Number of white tiles = $mn - (m - 2)(n - 2)$

Now, $(m - 2)(n - 2) = mn - (m - 2)(n - 2)$

$$\therefore 2(mn - 2m - 2n + 4) - mn = 0$$

$$\therefore mn - 4m - 4n + 8 = 0$$

$$\therefore n(m - 4) - 4m = -8$$

$$\therefore n = 4(m - 2)/(m - 4)$$

Now, consider options.

1. If $m = 10$, $n = 32/6$, which is not possible as n is an integer
2. If $m = 12$, $n = 40/8 = 5$, which is possible
3. If $m = 14$, $n = 48/10$, which is not possible as n is an integer
4. If $m = 16$, $n = 56/12$, which is not possible as n is an integer

Hence, option 2.

31. Option 1 is eliminated because it states that 'internal conflicts' are found in serious literature.

Option 2 states that 'internal conflict is widely prevalent in society.

Option 4 talks about threat to the reader (which is ridiculous). None of these will address the query why internal conflicts are more interesting than external conflicts.

Answer is derived from: "Psychologically, most interesting situations arise when the interests of the players are partly coincident and partly opposed, because then one can postulate not only a conflict among the players but also inner conflicts within the players. Each is torn between a tendency to cooperate, so as to promote the common interests, and a tendency to compete, so as to enhance his own individual interests."

Hence, the correct answer is option 3.

32. To be considered 'interesting psychology', the passage states that internal conflicts are essential. Bereft of internal conflicts a situation does not qualify to be psychologically interesting. In that case, the only example available in the options which includes internal conflict is in option 2.

None of the other options include inner conflict, hence they do not merit evaluation.

Hence, the correct answer is option 2.

33. All the options are given in the first paragraph itself. "The totality of choices determines the outcomes of the game, and it is assumed that the rank order of preferences for the outcomes is different for different players. Thus the "interests" of the players are generally in conflict. Whether these interests are diametrically opposed or only partially opposed depends on the type of game." As a result, option 4 is a straightforward choice.

Hence, the correct answer is option 4.

34. The difference is stated in this part of the passage: For the detective "the effort of solving the problem is in itself not a conflict if the adversary (the unknown criminal) remains passive, like Nature, whose secrets the scientist supposedly unravels by deduction." The basic difference is that scientist deals with passive nature, whereas the detective has to deal with a criminal who may put obstacles (active) in his path. If the criminal remains passive there is no conflict. As a result option 3 best answers the question.

The other options, then, are easily eliminated.

Hence, the correct answer is option 3.

35. Statements B, C and D talk about class – which is introduced in statement E, along with gender. Hence E starts the paragraph.

'A congruence of class deprivation and gender discrimination' in statement D and 'these two kinds of deprivation' in statement C make DC a mandatory pair.

Statement B can be very easily placed before this pair because of the reference to class and women, making EBDC the best sequence.

The word 'similarly' in statement A and the reference to 'caste' something similar to class makes it easy to place statement A after EBDC.

Hence, the correct answer is option 2.

36. Comparing statements B and D for starters as per the options, statement B scores over statement D.

BD versus BC (as per the options) – By several reading of the sentences it is possible to see that BC is mandatory or that statement C cannot be placed next to any other statement available except immediately after statement B because of its 'there is similar neglect. The neglect is mentioned only in statement B.

BCED and BCDE would have been very difficult to decide. Fortunately we are not required to decide this, because BCED is the only choice.

Statement A then falls automatically at the end of the paragraph.

Hence, the correct answer is option 4.

37. The best way to solve this one is not through the options. If you read the sentence several times there are two possibilities for the 'it' in statement B. The 'it' is either 'The fundamental concept' in D (i.e. BD) or 'modern finance' in E (i.e. EB).

No other combination even as per the given options (CB and AB) would make sense if the 'it' is worked upon.

BD is not in the options. Now, one has to merely check if EBDCA makes sense and there is no other option to compare with.

Hence, the correct answer is option 2.

38. 'Near friend' in option 2 is the incorrect usage. It is probably an effort to confuse the candidate between 'near friend' which is incorrect, and 'close friend' which is the right idiom.

Hence, the correct answer is option 2.

39. To have your hands full, is an idiom which means to be so busy that you do not have time to do anything else. Option 1 states 'hand full' which is a corruption of the idiom.

Hence, the correct answer is option 1.

- 40.** For ever variant of forever has the following meanings in different contexts.
Continually e.g. - He was for ever looking at this watch.
For all time e.g. - I'll love you for ever (and ever).
Though the space out forever is accepted as correct, none of the meanings of the word fits into the context of sentence 4. It couldn't be done ever, or it could never be done will be correct versions.

Hence, the correct answer is option 4.

- 41.** "Welcome to the Edwardian Summer..." (end of first paragraph) is clue enough to choose the right answer. The passage does not talk about unparalleled opulence or a culmination of all round economic prosperity. Hence options 1 and 3 can be eliminated.
Option 4 is eliminated because of the 'imminent danger'. Nobody is welcomed to an imminent danger. Edwardian as a vocabulary item means 'of or pertaining to the reign of Edward VII' or reflecting the opulence or self-satisfaction characteristic of this reign.
Option 2 is correct because the writer is talking about 'this time of studied complacency' almost throughout the passage.

Hence, the correct answer is option 2.

- 42.** The last four paragraphs are summarized in option 3. Though all options are almost the same, each one is incomplete in one way or the other when compared to option 3. For example, if option 1 talks about shocks, it misses out on terrorism, etc. Option 3 is more inclusive and complete.

Hence, the correct answer is option 3.

- 43.** Options 2 and 3 get eliminated because there are broad generalizations. Such generalizations are not the key arguments of the writer. The writer is quite specific about the time and space we are living in.
Option 4 gets eliminated because the option stresses the 'imminent crisis' whereas the writer does not, and is cautioning about studied complacency.
Option 1 encapsulates the key arguments of the writer by mentioning a few examples and urges 'us to question' our complacency which is the key argument of the passage.

Hence, the correct answer is option 1.

- 44.** Tommy Copper was a comedian-magician one of whose catchphrases during his performances was 'Just like that'. The reference occurs in the second paragraph.

The writer talks about the 'more than doubling of oil prices' and our optimism that we would find a way to bring the prices down to pre increase levels. Then the writer in a completely sarcastic tone makes the reference to Tommy Cooper's catch phrase, implying that this optimism is ridiculous. Once this understood choosing option 4 becomes easy, because all the other options get eliminated together as they are all contrary to option 4.

Hence, the correct answer is option 4.

45. The passage states, "in its simplest formulation, deconstruction can be taken to refer to a methodological strategy which seeks to uncover layers of hidden meaning in a text that have been denied or suppressed." Options 1 and 3 are contrary to the passage, and option 2 gets eliminated because it says 'construction of reality' (interpretation in place of construction may have been acceptable).

Hence, the correct answer is option 4.

46. The passage states, "at the heart of Derrida's deconstructive approach is his critique of what he perceives to be the totalitarian impulse of the Enlightenment pursuit to bring all that exists in the world under the domain of a representative language, a pursuit he refers to as logocentrism."

Options 1 and 2 are eliminated from this point of view.

Option 4 is eliminated because deconstruction stands for seeking the hidden meaning and logocentrism stands for suppressing it.

If the above eliminates options other than option 3 what supports option 3 is to be found in the paragraph beginning, "In response to logocentrism, deconstruction posits the idea that the mechanism by which this process of marginalization and the ordering of truth occurs is through establishing systems of binary opposition." The binary opposition is then explained as the interdependence in option 3.

Hence, the correct answer is option 3.

47. This is directly stated in the passage. The system of binary opposition, or opposites like rational/irrational are not opposites, "rather, they exist, for Derrida, in a series of hierarchical relationships with the first term normally occupying a superior position."

No option other than option 1 merits evaluation if this part of the passage, which is then explained in detail, is clearly understood.

Hence, the correct answer is option 1.

48. The answer can be inferred from the last paragraph, beginning, "Meaning, then, is never fixed or stable, ..." followed by "Thus, any act of interpretation must refer not only to what the author of a text intends, but also to what is absent from his or her intention." This is why Derrida rejects 'definitive authority'.

In this case option 4 is contrary to the passage.

It is difficult to see how option 3 is relevant to the question, especially the 'often' in it.

Option 2 says the meaning is based on 'binary opposites' – whereas binary opposites may be an interpretation/analysis rather than the meaning of the text is based on it.

The last paragraph clearly supports the inference in option 1.

Hence, the correct answer is option 1.

49. Elimination is an important process to find the correct answer in these questions.

Option 2 gets eliminated because of the idea of 'popularity' in it. This is a new idea and will require some reader intervention to support it. Reader intervention is not required in the last sentence of a paragraph.

Option 3 gets eliminated because of 'even by children' - we need to assume that children lack 'vocabulary etc. etc. mentioned in the paragraph.

Option 4 contradicts the paragraph. The paragraph says it appeals to a logical mind.

Option 1 effortlessly closes the paragraph. The comparison between Crossword and Sudoku is completed and the purpose of the paragraph is fulfilled.

Hence, the correct answer is option 1.

50. Option 1 is eliminated for 'disastrous' – the passage does not justify it – because they get along well.

Option 3 is eliminated because the passage states that experts may not be hired.

Option 4 is eliminated because how they drive innovation is a big question mark.

Option 2 talks about the result of this 'default mode' where expert individuals are excluded and the selection is on the basis of conformity which is mediocrity. This then is the best sentence to conclude and the purpose for which the passage is written is brought to a close.

Hence, the correct answer is option 2.

51. The passage is written to show great Federer's achievements are and how modest he is. The answer option concludes the paragraph by stating that – his contemporaries rate him much greater than Federer's own modest assessment of himself.

Options 1 and 2 are thus easily eliminated. Though useful in continuing the passage they do not close the paragraph.

Rather than leaving it to the reader to decide about Federer (option 4, which then gets eliminated) option 3 brings the paragraph to a close in keeping with its purpose.

Hence, the correct answer is option 3.

52. The passage talks about the 'hubris' (exaggerated pride or self-confidence) of civilization.

All options other than option 1 are in line with this hubris. But the passage also talks about how the civilization 'deceives' itself. Hence purpose of the paragraph is to put this self deception in perspective. Option 1 fulfils this purpose by asking one to show humility as 'ours is no the first generation'.

The other options are partial and hence eliminated.

Hence, the correct answer is option 1.

53. Statements B and C are incorrect.

Statement B is incorrect because 'As project progresses' should be corrected to "As the project progresses..." The (definite or indefinite) article is required as a determiner.

Statement C is incorrect in the phrase 'a plurality with single-minded focus' – should be corrected to "a plurality with a single-minded focus..." The noun 'focus' needs a determiner (definite/indefinite article) 'a focus' is correct. An adjective (single-minded) breaks this order. 'A single-minded focus' like 'a beautiful car' is correct.

Since statements B and C are incorrect, options 1, 3 and 4 are eliminated.

Hence, the correct answer is option 2.

54. Statements B and C are incorrect. Statement B is incorrect because 'to break apart' is incorrect idiom. It should be "making them break apart"- the verb 'make' is not followed by an infinitive (to+verb). E.g. It makes me cry and not It makes me to cry.

Statement C is incorrect in 'many an offending chemicals'. The correct versions will be 'many offending chemicals (have)' or many an offending chemical (has)'.

This eliminates options 2 and 4. Statements A and D are both correct.

Hence, the correct answer is option 3.

55. B and C are incorrect.

B has to be corrected to "Rarely has the economic been watched".

C is incorrect. 'Post war era' has to be corrected to 'The post war era' – 'era' (noun needs a determiner).

Hence, the correct answer is option 2.

56. Statements B and C are incorrect.

Statement B should read 'Ever since the Enlightenment...' (the Enlightenment: a philosophical movement of the 18th century, characterized by belief in the power of human reason and by innovations in political, religious, and educational doctrine).

Statement C should read as "... in the 1820s"

Options 2, 3 and 4 are eliminated.

Hence, the correct answer is option 1.

57. Paley started it (the concept of intelligent design) in the 19th century. The *proponents* of it are _____ Paley's argument. The word *proponents* directly controls the word in the blank.

Proponents *destroying, questioning* or even *testing* Paley's concept is illogical. *Resurrect* means to bring to view, attention, or use again; to raise from the dead. Hence, the correct answer is option 3.

58. The word that is to be replaced is directly controlled by the word 'oil lamp', however the setting in which the lamp is placed with women squatting (a village scene) with piles of limp fodder etc. tells us that the oil lamps are definitely not effulgent (Option 4) meaning radiant/splendorous.

Options 1, 2 and 4 are synonyms so they are chosen together or eliminated together. Sputtering in the context (a natural choice) makes better sense than other options.

Hence, the correct answer is option 3.

59. The operative idea in the sentence that controls the word to be replaced is the idea of 'the *sensitive* traveler' followed by the scene he confronts.

The unpleasantness of the scene eliminates option 1 – *amusing*. Being sensitive – the capacity of being easily hurt, eliminates *disgust* and *irritation* (options 2 and 3) as these responses are not necessarily associated with being sensitive.

Distress (pain, suffering, or misery) is generally associated with being sensitive. Hence, the correct answer is option 4.

60. Terse means pointed and concise. What controls the replacement in the context is word 'if' as used at the end of the sentence. We are looking for a word which would classify this word in the context of the threat and the counter threat.

Option 1 (witty) is eliminated first. Then we have rude and simple as options 2 and 3. Rude and simple are poor description of the profound 'if' in the context. Option 4 (terse) is the best choice.

Hence, the correct answer is option 4.

61. Consider this explanation that can be used to answer all the questions of this set.

In any two consecutive years that the number of faculty remains same, the average age of every area increases by 1.

Wherever we find an increase/decrease not equal to 1, we can say that the number of faculty members has changed.

Consider the graphs of Marketing.

The number of faculty members in Marketing in 2000 = 3

\therefore Total age of faculty members in Marketing in 2000 = $3 \times 49.33 = 148$

In 2001, as the average has decreased, we can say that a faculty member aged 25 has been added to the area.

Thus, the new average = $(148 + 3 + 25)/4 = 44$

Thereafter the number of faculty remains the same.

Consider the area of OB.

The number of faculty members in 2000 = 4

The number of faculty members remains the same in 2001 and 2002. As it decreases in 2003, we can say that a faculty member has been added.

Thus the new average age = $(52.5 \times 4 + 4 + 25)/5 = 47.8$

Consider the area of Finance.

The number of faculty members in 2000 = 5

The number of faculty members has changed in 2001.

If a new member has been added, the new average would be $(50.2 \times 5 + 5 + 25)/6 = 46.83$, which is not true.

\therefore A faculty member aged 60 has retired.

New average = $(50.2 \times 5 + 5 - 60)/4 = 49$

In 2002, there is a change in the number of faculty members again. Here, a new member is added. New average = $(49 \times 4 + 4 + 25)/5 = 45$

The number of faculty members remains the same in 2003.

Consider the area of OM.

Following the above logic, we can say that a faculty member gets added in 2001.

Now, based on the explanation for the four areas, we can say that a member retired from the area of Finance.

Hence, option 1.

62. As calculated earlier, average age of the three professors in the Marketing area since inception = 49.33

\therefore The sum of their ages on April 1 2005 = $(49.33 + 5) \times 3 = 163$

Age of Naresh on April 1 2005 = 57 and Age of Devesh on April 1 2005 = 54

\therefore Age of the third professor = $163 - 57 - 54 = 52$ years

Hence, option 4.

63. As per the explanation given for the first question, one faculty member retired in 2001 and one joined in 2002. The number of members remained same in 2003.

Hence, option 3.

64. As calculated earlier, the new faculty member who joined the OM area in 2001 was 25 years old.

\therefore His age in 2003 = 27 years

Hence, option 3.

65. Observe the values of Production and Total Area. We can see that the figure for production is more than 4 times the figure for Total Area only for Haryana and Punjab.

For all the other states, it is less than 4 times the figure for Total Area. Therefore, the highest productivity is for Haryana and Punjab.

Hence, option 1.

66. Per capita production of rice for Gujarat = $24/51 = 48/102$ 48%

∴ We shall look for values of production that are close to half or more than half of the population.

We can see that only Haryana, Punjab, Maharashtra and Andhra Pradesh satisfy this criterion.

Hence, option 2.

67. We are looking for states with

Production in million tons \times 106/population in millions $>$ 4×10^5

i.e. production in million tons $\times 10 > 4 \times$ population in millions

Haryana, Gujarat, Punjab, Madhya Pradesh, Tamilnadu, Maharashtra, Uttar Pradesh and Andhra Pradesh are such states.

Hence, option 4.

68. Apart from Parul and Hari, at least one female should attend the CS workshop. Also, the two selected for the CS workshop should not be committed to internal projects in January.

Consider the options.

In options 2, 3 and 4, Dinesh, Anshul, Fatima and Zeena are committed to internal projects in January.

Employees in option 1 i.e. Rahul and Yamini can attend the CS workshop.

Hence, option 1.

69. Dinesh, Gayatri, Kalindi, Parul, Urvashi and Zeena are executives. Out of these, Dinesh, Kalindi and Parul can attend two workshops each. The rest attend less than two i.e. not more than one workshop.

Hence, option 2.

70. Consider the options.

Option 1: Lavanya can attend 2 workshops.

Option 3 and 4: Mandeep can attend 1 workshop.

All the employees in option 2 are unable to attend any workshop.

Hence, option 2.

71.

| Match No | Round 1 | | Round 2 | |
|----------|---------|----|---------|-------|
| 1 | 1 | 32 | 1/32 | 16/17 |
| 2 | 2 | 31 | 2/31 | 15/18 |
| 3 | 3 | 30 | 3/30 | 14/19 |
| 4 | 4 | 29 | 4/29 | 13/20 |
| 5 | 5 | 28 | 5/28 | 12/21 |
| 6 | 6 | 27 | 6/27 | 11/22 |
| 7 | 7 | 26 | 7/26 | 10/23 |
| 8 | 8 | 25 | 8/25 | 9/24 |
| 9 | 9 | 24 | | |
| 10 | 10 | 23 | | |
| 11 | 11 | 22 | | |
| 12 | 12 | 21 | | |
| 13 | 13 | 20 | | |
| 14 | 14 | 19 | | |
| 15 | 15 | 18 | | |
| 16 | 16 | 17 | | |

The table shows the match nos. and the seed numbers of players playing those matches in Round 1 and 2.

As there are no upsets in the first round, players seeded 1 to 16 reach round 2.

There are upsets only in matches 6, 7 and 8 in round 2. So, seed numbers 1, 2, 3, 4, 5, 11, 10 and 9 reach the quarter finals. Then Davenport who is seed no.2 plays seed no. 10, who is Venus Williams.

Hence, option 4.

72. Seed numbers 6 and 8 lose in the second round and seed numbers 7 and 9 reach the semi-finals.

Seed number 9 plays matches 9, 8 and 1 in rounds 1, 2 and the quarterfinals.

Sharapova, who is seed number 1, plays match no. 1 in every round. Thus, Sharapova plays seed number 9, Nadia Petrova, in quarterfinals.

Hence, option 3.

73.

| Match | Round 1 | | Round 2 | | Quarter Finals | | SemiFinals | |
|-------|---------|----|---------|----|----------------|----|------------|------|
| | | | | | | | | |
| 1 | 1 | 32 | 1 | 17 | 1 | 9 | 1/9 | 13/5 |
| 2 | 2 | 31 | 31 | 15 | 15 | 7 | 15/7 | 3/11 |
| 3 | 3 | 30 | 3 | 19 | 3 | 11 | | |
| 4 | 4 | 29 | 29 | 13 | 13 | 5 | | |
| 5 | 5 | 28 | 5 | 21 | | | | |
| 6 | 6 | 27 | 27 | 11 | | | | |
| 7 | 7 | 26 | 7 | 23 | | | | |
| 8 | 8 | 25 | 25 | 9 | | | | |
| 9 | 9 | 24 | | | | | | |
| 10 | 10 | 23 | | | | | | |
| 11 | 11 | 22 | | | | | | |
| 12 | 12 | 21 | | | | | | |
| 13 | 13 | 20 | | | | | | |
| 14 | 14 | 19 | | | | | | |
| 15 | 15 | 18 | | | | | | |
| 16 | 16 | 17 | | | | | | |

The matches in rounds 1 and 2, quarterfinals and semi-finals are as shown in the table.

Sharapova is seeded 1. The lowest seed that could face her in the semi-finals could be seed no. 13, which is Anastasia Myskina.

Hence, option 1.

74. The top 8 seeds make it to the quarterfinals. Thus matches 1 to 4 in quarter finals are between 1 and 8, 2 and 7, 3 and 6 and 4 and 5.

Sharapova is seeded 1. If she reaches the finals, she definitely beats seed number 8 and one of seed numbers 4 and 5. She can play seed numbers 2, 3, 6 and 7 in the finals. Kim Clijsters is seeded 4. Thus she will definitely not play against Sharapova in the final.

Hence, option 3.

75. At the time of investment, the total price of the four stocks was Rs. 400

Total expected returns = $(20 + 10 + 30 + 40) = \text{Rs. } 100$

Venkat would earn the minimum average return when the companies with the two lowest expected returns would give 2 times and 1.5 times their expected returns.

Thus, minimum expected returns = $20 \times 1.5 + 10 \times 2 + 30 + 40 = \text{Rs. } 120 = 30\%$ of initial investment

Hence, option 1.

76. Venkat earned 35% average return i.e. Rs. 140.

∴ He earned Rs. 40 more than expected.

$$\therefore 40 = x + 0.5y,$$

where x and y correspond to expected returns on stocks that gave extraordinarily good results.

$$\therefore 0.5y = 40 - x$$

But x and y can be 20, 10, 30 or 40.

If $x = 20, y = 40$, which is possible

If $x = 10, y = 60$, which is not possible

If $x = 30, y = 20$, which is possible

If $x = 40, y = 0$, which is not possible

Thus, Company A with $x = 20$ necessarily announced extraordinarily good results along with company C or D. B did not announce extraordinarily good results.

Hence, option 2.

77. Venkat earned a return of 38.75% = Rs. 155

∴ He earned Rs. 55 more than expected.

$$\therefore 55 = x + 0.5y$$

where x and y correspond to expected returns on stocks that gave extraordinarily good results.

But x and y can be 20, 10, 30 or 40.

If $x = 20, y = 70$, which is not possible.

If $x = 10, y = 90$, which is not possible.

If $x = 30, y = 50$, which is not possible.

If $x = 40, y = 30$, which is possible.

Thus company C and company D announced returns that were respectively one and a half and two times the initially expected returns.

∴ Company C belonged to either Auto or Steel Industry and Company A and B did not announce extraordinarily good results.

Statements I and IV are true.

Hence, option 3.

78. Company C gave a return of Rs.60.

∴ Total returns will be the minimum possible when B gives 1.5 times the initially expected returns.

$$\therefore \text{Total returns would be } 20 + 15 + 60 + 40 = \text{Rs.135} = 33.75\%$$

Statement II is true.

Also, when returns are 33.75%, company B belongs to Auto or Steel Industry.

Statement IV is true and Statement III is false.

Total returns will be the maximum possible when D gives 1.5 times the initially

expected returns.

\therefore Total returns would be $20 + 10 + 60 + 60 = \text{Rs.}150 = 37.5\%$

Statement I is false.

Hence, option 2.

79. Let there be x members in the IOC.

As a member cannot vote if his or her city is in contention, the number of voters in Round 1 ($R1$) = $x - 4$

The number of voters in Round 2 ($R2$) = $x - 3$ and

The number of voters in Round 3 ($R3$) = $x - 2 - n$

Where n is the number of voters who have voted for New York (NY) in $R1$ and Beijing (B) in $R2$.

Given $x - 3 = 83$, $x - 4 = 82$ and $x - 2 - n = 75 \Rightarrow n = 9$

21 members voted for B in $R2$. Out of these, 9 voted for NY in $R1$.

The remaining 12 who voted for B comprised 75% of those who voted for B in $R1$.

Thus $12/0.75 = 16$ members voted for B in $R1$.

\therefore Paris (P) got $82 - 16 - 30 - 12 = 24$ votes in $R1$.

All those who voted for London (L) and P in $R1$ continued to vote for the same cities in subsequent rounds. Thus, 24 voters of P in $R2$ had voted for P in $R1$ too. Also from the given information, 3 voters who had voted for NY in $R1$ voted for Paris in $R2$.

Out of the remaining 5 that voted for P in $R2$, 4 had voted for Beijing in $R1$ and 1 vote came from the member who represented NY.

In $R3$, the difference in the votes cast for L and P was 1. \Rightarrow L and P got 37 and 38 votes in some order.

The composition of 75 voters of $R3$ was as follows:

12 members who had voted for B in $R1$ and $R2$ were eligible for voting in $R3$.

30 and 24 members who voted for L and P in $R1$ continued to do so in $R3$.

4 voters of $R3$, voted for B in $R1$ and P in $R2$.

3 voters of $R3$, voted for NY in $R1$ and P in $R2$.

1 member represented NY and 1 represented B.

From given information, 50% of voters of B in $R1$ i.e. 8 voted for P in $R3 \Rightarrow$ 8 out of the 12 who voted for B in $R1$ and $R2$, voted for London in $R3$.

The information can be summarised as shown in the table:

Required percentage = $9 \times 100 / 12 = 75\%$

Hence, option 4.

| | R1 | R2 | Composition of votes of R2 | R3 | Composition of votes of R3 |
|---------|----|----|---------------------------------|----|---|
| London | 30 | 30 | 30 who voted for London in R1 | 38 | 30 who voted for London in R1 |
| NY | 12 | 0 | | 0 | |
| Paris | 24 | 32 | 24 who voted for Paris in R1 | 37 | 24 who voted for Paris in R1 |
| | | | + 3 who voted for NY in R1 | | + 3 who voted for NY in R1 and P in R2 |
| | | | + 1 representing NY | | + 1 representing NY |
| | | | + 4 who voted for Beijing in R1 | | + 1 representing NY |
| | | | | | + 4 who voted for Beijing in R1 and P in R2 |
| | | | | | + 1 member representing Beijing |
| Beijing | 16 | 21 | | 0 | |
| | | | 12 who voted for Beijing in R1 | | |
| | | | + 9 who voted for NY in R1 | | |
| Total | 82 | 83 | | 75 | |

80. As can be seen from the formulated table in the first question, 24 votes were cast for Paris in R1.

Hence, option 4.

81. From the explanation given earlier, required percentage = $8 \times 100/12 = 66.67\%$
Hence, option 4.

82. It can be clearly seen from the explanation given earlier that only statement a is true.

Hence, option 1.

83. Truthful Ltd. has the highest market share in MP.

Thus Truthful Ltd. could be Firm A or Firm C.

Aggregate revenues of Firms A, B, C and D are 190, 217, 222 and 185 (in million rupees) respectively.

Thus, Aggressive Ltd. and Honest Ltd. could be A and D or B and C in some order.

Case 1: Truthful Ltd. = A

Aggressive Ltd. and Honest Ltd. = B and C

Profitable Ltd. = D

Case 2: Truthful Ltd. = C

Aggressive Ltd. and Honest Ltd. = A and D

Profitable Ltd. = B

If statement 1 is true, then Firm B is profitable Ltd. => Honest Ltd. is Firm A or D.

But, the total revenue of Firms A and D each is lesser than that of firm B.

Thus, if statement 1 is true, statement 2 is necessarily false.

Hence, option 2.

84. If statement 1 is true then, Firm B is Aggressive Ltd. This implies that Firm C is Honest Ltd.

Firm C's lowest revenues are from Bihar. Thus, statement 2 is necessarily true.

Hence, option 3.

85. The two statements talk about two firms having the highest shares in the UP and Bihar Markets. Thus both the statements refer to Firm B. From the explanation given in the first question, only one of the two statements can be true at a time.

Hence, option 3.

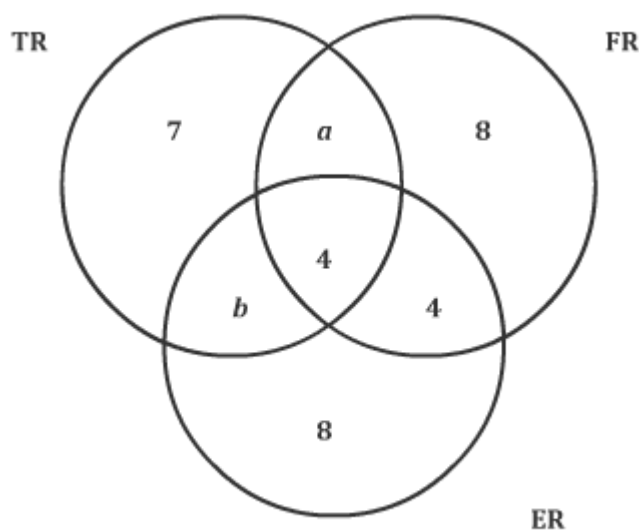
86. Profitable Ltd. is firm D (Case 1 from the explanation given earlier).

∴ Truthful Ltd. is firm A.

Thus, Truthful Ltd.'s lowest revenues are from UP.

Hence, option 3.

87.



17 volunteers are involved in the TR project and 10 in TR are also involved in other projects. \Rightarrow 7 volunteers are involved only in TR.

\therefore 8 volunteers are involved in ER alone.

\therefore 4 volunteers are involved in all the three projects.

Let x people be involved in FR alone.

\therefore Number of people involved in FR and ER but not TR = $x - 4$

Now, $a + b + 4 = 10 \Rightarrow a + b = 6$

Also, $7 + a + b + 4 + x + x - 4 + 8 = 37$

$\therefore 2x = 16 \Rightarrow x = 8$

Number of Volunteers involved in FR > Number of Volunteers involved in TR

And Number of Volunteers involved in FR > Number of Volunteers involved in ER

$\therefore 16 + a > 17$ and $16 + a > 16 + b \Rightarrow a > b$

$\therefore a$ and b can be (6, 0), (5, 1), (4, 2)

The minimum number of volunteers involved in both FR and TR projects, but not in the ER Project = minimum value of $a = 4$

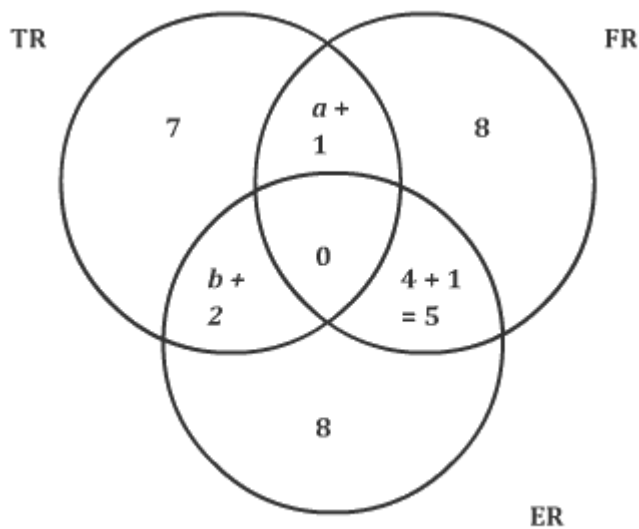
Hence, option 3.

88. We can obtain the information in options 2 and 3 from the initial data.

Based on the information given in the explanation to the first question, the information in option 1 will give us the value of a , which in turn will give us the value of b . Thus option 1 would enable us to find the exact number of volunteers involved in various projects.

Hence, option 1.

89.



After the volunteers withdraw as mentioned, the number of volunteers working on different projects is as shown.

$$\therefore \text{Number of volunteers working on TR} = 7 + 6 + 3 = 16$$

$$\text{Number of volunteers working on FR} = 14 + a$$

$$\text{Number of volunteers working on ER} = 15 + b$$

Considering the possible values of a and b , $14 + a > 15 + b$

\therefore More volunteers are now in FR than in ER

Hence, option 2.

90. Let m volunteers be added to TR project and n be added to each of FR and ER projects.

$$\text{Then, } 7 + m = 8 + n$$

$$\Rightarrow m = n + 1$$

$$\text{Also, } b + 2 = 5$$

$$\Rightarrow b = 3 \text{ and } a = 3$$

$$\text{Number of volunteers working on TR} = 7 + n + 1 + 4 + 5 = 17 + n$$

$$\text{Number of volunteers working on FR} = 17 + n$$

$$\text{Number of volunteers working on ER} = 18 + n$$

Thus ER has the highest number of volunteers.

Hence, option 1.