

**Examination duration: 2 hours**

**SECTION I**

**Sub-section I-A: Number of Questions = 10**

**Note: Questions 1 to 10 carry one mark each.**

**Directions for Questions 1 to 5: Answer the questions independently of each other.**

1. If  $x = (16^3 + 17^3 + 18^3 + 19^3)$ , then  $x$  divided by 70 leaves a remainder of
- (1) 0
  - (2) 1
  - (3) 69
  - (4) 35

**Solution:**

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

2. A chemical plant has four tanks (A, B, C, and D), each containing 1000 litres of a chemical. The chemical is being pumped from one tank to another as follows:
- From A to B @ 20 litres/minute
  - From C to A @ 90 litres/minute
  - From A to D @ 10 litres/minute
  - From C to D @ 50 litres/minute
  - From B to C @ 100 litres/minute
  - From D to B @ 110 litres/minute

Which tank gets emptied first and how long does it take (in minutes) to get empty after pumping starts?

- (1) A, 16.66
- (2) C, 20
- (3) D, 20
- (4) D, 25

**Solution:**

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. Two identical circles intersect so that their centres, and the points at which they intersect, form a square of side 1 cm. The area in sq. cm of the portion that is common to the two circles is

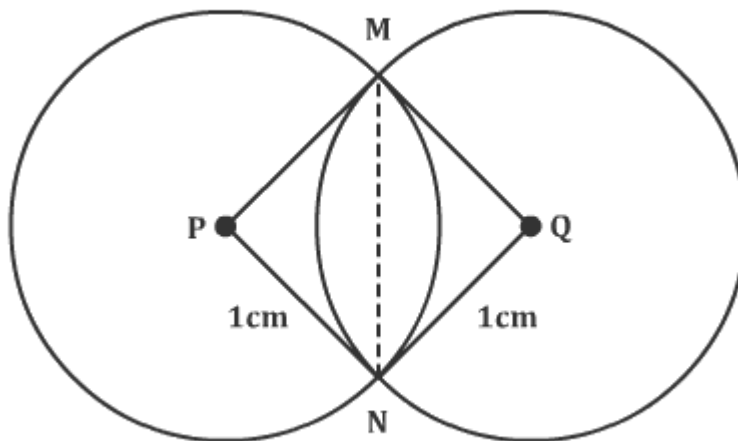
(1)  $\pi/4$

(2)  $\frac{\pi}{2} - 1$

(3)  $\frac{\pi}{5}$

(4)  $\sqrt{2} - 1$

**Solution:**



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

Quadrilateral PMQN is a square.

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

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

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

$$= \frac{\pi}{2} - 1$$

Hence, option 2.

4. A jogging park has two identical circular tracks touching each other, and a rectangular track enclosing the two circles. The edges of the rectangles are tangential to the circles. Two friends, A and B, start jogging simultaneously from the point where one of the circular tracks touches the smaller side of the rectangular track. A jogs along the rectangular track, while B jogs along the two circular tracks in a figure of eight. Approximately, how much faster than A does B have to run, so that they take the same time to return to their starting point?

- (1) 3.88%
- (2) 4.22%
- (3) 4.44%
- (4) 4.72%

**Solution:**

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)

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

$$\therefore (b - a) \times \frac{100}{a} = 0.047 \times 100$$

$$= 4.7\%$$

Hence, option 4.

5. In a chess competition involving some boys and girls of a school, every student had to play exactly one game with every other student. It was found that in 45 games both the players were girls, and in 190 games both were boys. The number of games in which one player was a boy and the other was a girl is
- (1) 200
  - (2) 216
  - (3) 235
  - (4) 256

**Solution:**

Let there be  $g$  girls and  $b$  boys.

Number of games between two girls =  ${}^gC_2$

Number of games between two boys =  ${}^bC_2$

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

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

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

Since the number of girls cannot be negative,  $\therefore g = 10$

Also,

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

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

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

$$\therefore b = 20$$

$$\therefore \text{Total number of games} = (g + b)C_2 = {}^{30}C_2 = 30 \times 29/2 = 435$$

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

Hence, option 1.

**Directions for Questions 6 and 7:** Answer the questions on the basis of the information given below.

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.

6. At what time do Ram and Shyam first meet each other?
- (1) 10:00 a.m.
  - (2) 10:10 a.m.
  - (3) 10:20 a.m.
  - (4) 10:30 a.m.

**Solution:**

The distance between points A and B is 5 km.

Ram starts at 9 a.m. from A at a speed of 5 km/hr. So, he reaches B at 10:00 a.m.

When Ram reaches B (i.e. at 10.00 a.m., or 15 minutes after Shyam started from A), Shyam (running at a speed of 10 km/hr) 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. Hence, option 2.

7. At what time does Shyam overtake Ram?

- (1) 10:20 a.m.
- (2) 10:30 a.m.
- (3) 10:40 a.m.
- (4) 10:50 a.m.

**Solution:**

Ram reaches B at 10.00 a.m. while 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  $1.25/(10 - 5) = 0.25$  hrs = 15 minutes after 10:15 a.m., i.e. at 10:30 a.m.

Hence, option 2.

**Directions for Questions 8 to 10:** Answer the questions independently of each other.

8.

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

- (1)  $0 < R \leq 0.1$
- (2)  $0.1 < R \leq 0.5$
- (3)  $0.5 < R \leq 1.0$
- (4)  $R > 1.0$

**Solution:**

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

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

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

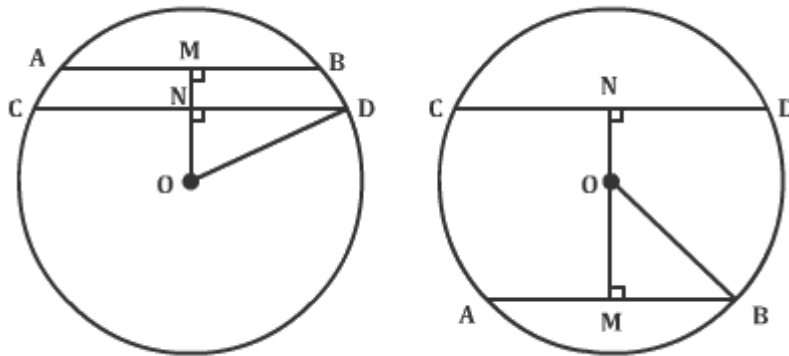
$$\therefore 30^{64} + 30^{63} \times 29 + \dots + 29^{64} > 30^{64} + 29^{64}$$

$$\therefore R > 1$$

Hence, option 4.

9. What is the distance in cm between two parallel chords of lengths 32 cm and 24 cm in a circle of radius 20 cm?
- (1) 1 or 7  
 (2) 2 or 14  
 (3) 3 or 21  
 (4) 4 or 28

**Solution:**



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.

$$MB = 12 \text{ cm and } ND = 16 \text{ cm}$$

OM and ON are perpendicular to AB and CD respectively.

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

$$\therefore ON = 12 \text{ cm}$$

$$\text{Similarly, } OM = 16 \text{ cm}$$

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. For which value of  $k$  does the following pair of equations yield a unique solution for  $x$  such that the solution is positive?

$$x^2 - y^2 = 0$$

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

(1) 2

(2) 0

(3)  $\sqrt{2}$

(4)  $-\sqrt{2}$

**Solution:**

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.

**Sub-section I-B: Number of Questions = 20**  
**Note: Questions 11 to 30 carry two marks each.**

**Directions for Questions 11 to 30:** Answer the questions independently of each other.

- 11.** Let  $n! = 1 \times 2 \times 3 \times \dots \times n$  for integer  $n \geq 1$ . If  $p = 1! + (2 \times 2!) + (3 \times 3!) + \dots + (10 \times 10!)$ , then  $p + 2$  when divided by  $11!$  leaves a remainder of
- (1) 10
  - (2) 0
  - (3) 7
  - (4) 1

**Solution:**

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

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

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

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

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

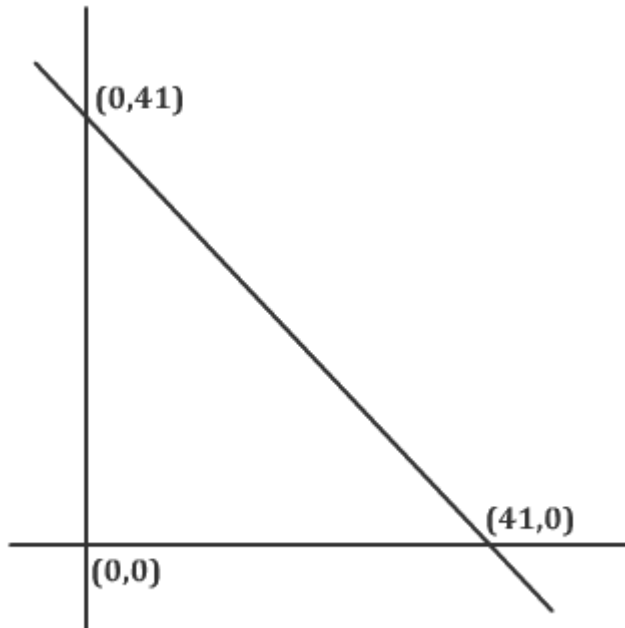
$$\therefore p + 2 \text{ when divided by } 11! \text{ leaves a remainder of } 1.$$

Hence, option 4.

- 12.** Consider a triangle drawn on the X-Y plane with its three vertices at  $(41, 0)$ ,  $(0, 41)$  and  $(0, 0)$ , each vertex being represented by its  $(X, Y)$  coordinates. The number of points with integer coordinates inside the triangle (excluding all the points on the boundary) is
- (1) 780
  - (2) 800
  - (3) 820
  - (4) 741



**Solution:**



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  $x + y = 40$ , then

$(x, y)$  could be  $(1, 39), (2, 38), \dots, (39, 1)$  ... (39 solutions)

If  $x + y = 39$ , then

$(x, y)$  could be  $(1, 38), (2, 37), \dots, (38, 1)$  ... (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.** The digits of a three-digit number  $A$  are written in the reverse order to form another three-digit number  $B$ . If  $B > A$  and  $B - A$  is perfectly divisible by 7, then which of the following is necessarily true?

(1)  $100 < A < 299$

(2)  $106 < A < 305$

(3)  $112 < A < 311$

(4)  $118 < A < 317$

**Solution:**

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.

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

$\therefore$  The lowest possible value of  $A$  is 108 and the highest possible value of  $A$  is 299.

Hence, option 2.

14. If  $a_1 = 1$  and  $a_{n+1} - 3a_n + 2 = 4n$  for every positive integer  $n$ , then  $a_{100}$  equals

(1)  $3^{99} - 200$

(2)  $3^{99} + 200$

(3)  $3^{100} - 200$

(4)  $3^{100} + 200$

**Solution:**

$$a_1 = 1$$

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

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

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

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

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

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

Hence, option 3.

15. Let  $S$  be the set of five digit numbers formed by the digits 1, 2, 3, 4 and 5, using each digit exactly once such that exactly two odd positions are occupied by odd digits. What is the sum of the digits in the rightmost position of the numbers in  $S$ ?

(1) 228

(2) 216

(3) 294

(4) 192

**Solution:**

Let O and E represent odd and even digits respectively.

$\therefore S$  can have digits of the form:

$$O\_O\_E \text{ or } O\_E\_O \text{ or } E\_O\_O$$

*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.

∴ There are  $3 \times 2 \times 2 \times 2 = 24$  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.

∴ 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.

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

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

Hence, option 2.

16. The rightmost non-zero digit of the number  $30^{2720}$  is

- (1) 1
- (2) 3
- (3) 7
- (4) 9

**Solution:**

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

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.

i.e. if we get a remainder of 1, 2, 3, or 0 when 2720 is divided by 4, then the digit in the units place will be 3, 9, 7, or 1 respectively.

$$2720 = 680 \times 4, \text{ i.e. the remainder is } 0$$

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

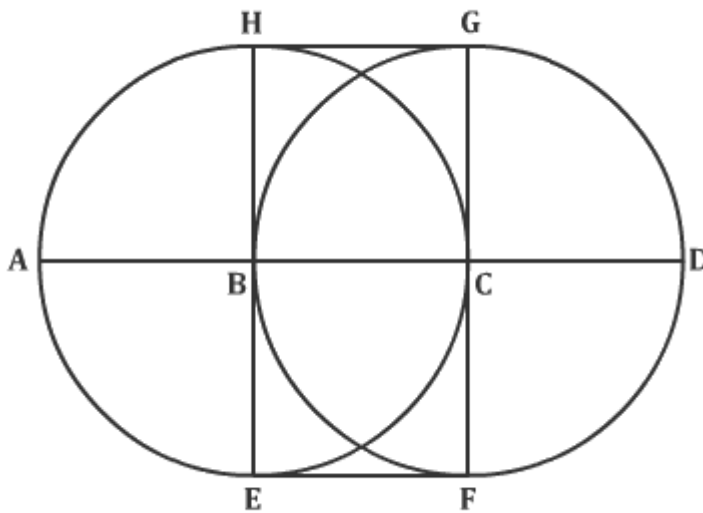
∴ The rightmost non-zero digit of  $30^{2720}$  is 1.

Hence, option 1.

17. Four points A, B, C and D lie on a straight line in the X-Y plane, such that  $AB = BC = CD$ , and the length of AB is 1 metre. An ant at A wants to reach a sugar particle at D. But there are insect repellents kept at points B and C. The ant would not go within one metre of any insect repellent. The minimum distance in metres the ant must traverse to reach the sugar particle is

- (1)  $3\sqrt{2}$
- (2)  $1 + \pi$
- (3)  $\frac{4\pi}{3}$
- (4) 5

**Solution:**



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

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

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

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

$\therefore$  The ant must traverse  $(1 + \pi)$  m.

Hence, option 2.

18. If  $x \geq y$  and  $y > 1$ , then the value of the expression

$\log_x \left(\frac{x}{y}\right) + \log_y \left(\frac{y}{x}\right)$  can never be

- (1) -1
- (2) -0.5
- (3) 0
- (4) 1

**Solution:**

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

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.** For a positive integer  $n$ , let  $P_n$  denote the product of the digits of  $n$ , and  $S_n$  denote the sum of the digits of  $n$ . The number of integers between 10 and 1000 for which  $P_n + S_n = n$  is

- (1) 81
- (2) 16
- (3) 18
- (4) 9

**Solution:**

$n$  can be a 2-digit or a 3-digit number.

*Case 1:*

Let  $n$  be a 2-digit number.

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

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

$$\text{Now, } P_n + S_n = n$$

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

$$\therefore xy = 9x \text{ or } y = 9$$

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

*Case 2:*

Let  $n$  be a 3-digit number.

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

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

$$\text{Now, } P_n + S_n = n$$

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

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

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

From the above expression,  $0 < x, y \leq 9$ .

But, we cannot find any value of  $x$  and  $y$ , for which  $z$  is a single-digit number.  $z$  will be minimum when  $x$  and  $y$  are both 9, but even then its value is 12.

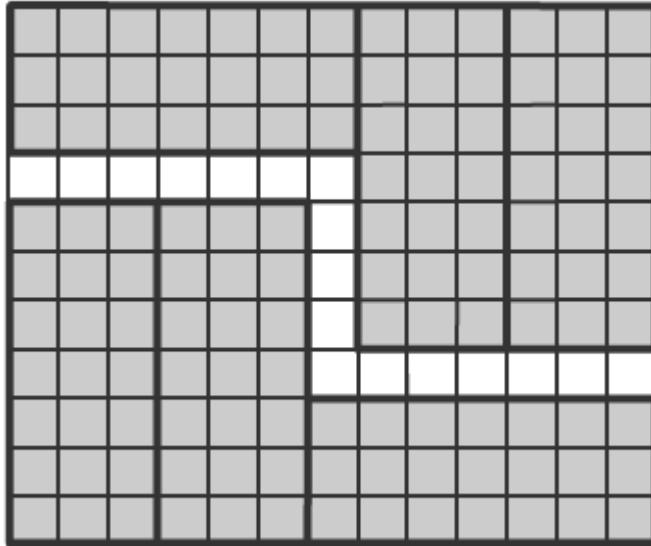
$\therefore$  There are no 3-digit numbers which satisfy  $P_n + S_n = n$

Hence, option 4.

**20.** Rectangular tiles each of size 70 cm by 30 cm must be laid horizontally on a rectangular floor of size 110 cm by 130 cm, such that the tiles do not overlap. A tile can be placed in any orientation so long as its edges are parallel to the edges of the floor. No tile should overshoot any edge of the floor. The maximum number of tiles that can be accommodated on the floor is

- (1) 4
- (2) 5
- (3) 6
- (4) 7

**Solution:**



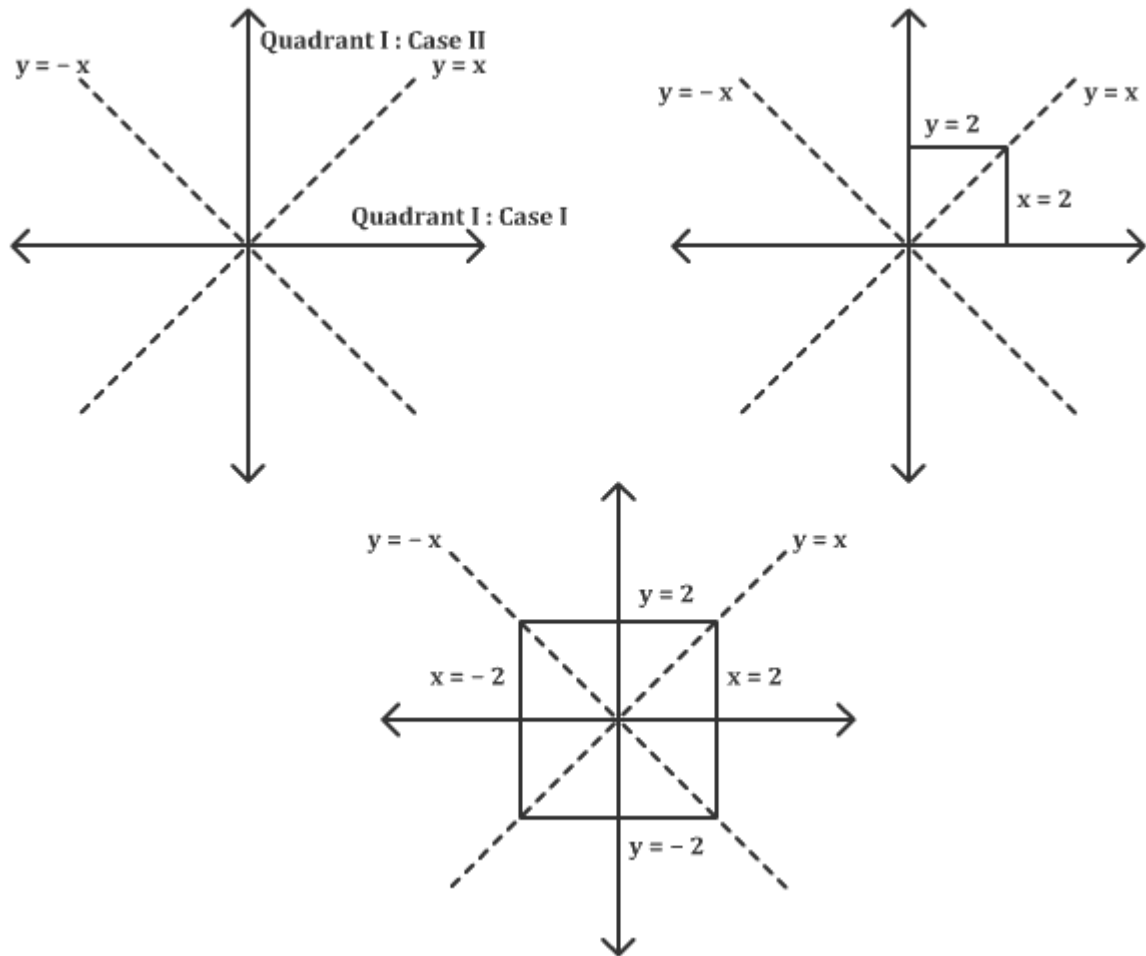
This problem can be solved by trying different ways of placing the tiles on the floor. The maximum number of tiles that can be accommodated is 6, as shown in the figure.

Hence, option 3.

**21.** In the X-Y plane, the area of the region bounded by the graph of  $|x + y| + |x - y| = 4$  is

- (1) 8
- (2) 12
- (3) 16
- (4) 20

**Solution:**



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

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 1:  $x > y$*

In this case, expression (i) becomes:

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

$$\therefore 2x = 4$$

$$\therefore x = 2$$

Case 2:  $x < y$

In this case, expression (i) becomes:

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

$$\therefore 2y = 4$$

$$\therefore y = 2$$

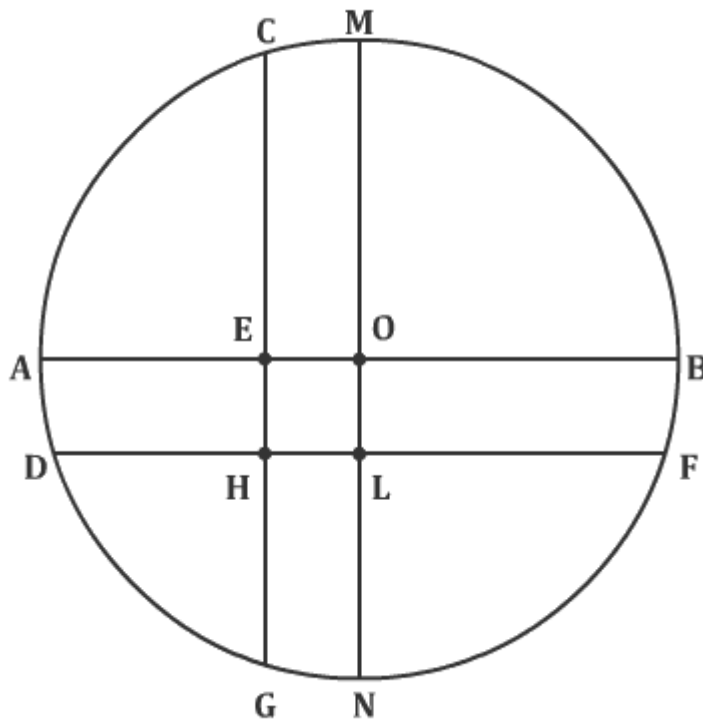
$\therefore$  The area for the first quadrant is as shown in the figure.

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. In the following figure, the diameter of the circle is 3 cm. AB and MN are two diameters such that MN is perpendicular to AB. In addition, CG is perpendicular to AB such that  $AE:EB = 1:2$ , and DF is perpendicular to MN such that  $NL:LM = 1:2$ . The length of DH in cm is



- (1)  $2\sqrt{2} - 1$
- (2)  $((2\sqrt{2} - 1))/2$
- (3)  $((3\sqrt{2} - 1))/2$
- (4)  $((2\sqrt{2} - 1))/3$

**Solution:**



$$\begin{aligned} AO &= OD = 1.5 \text{ cm} \\ AE + EB &= 3 \text{ cm and } AE:EB = 1:2 \\ \therefore AE &= 1 \text{ cm and } EB = 2 \text{ cm} \\ OE &= AO - AE = 1.5 - 1 = 0.5 \text{ cm} \end{aligned}$$

Similarly,  $NL = 1 \text{ cm}$ ,  $LM = 2 \text{ cm}$  and  $OL = 0.5 \text{ cm}$   
 $OEHL$  is a square as all its angles are right angles and  $OE = OL$   
 $\therefore EH = HL = 0.5 \text{ cm}$

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

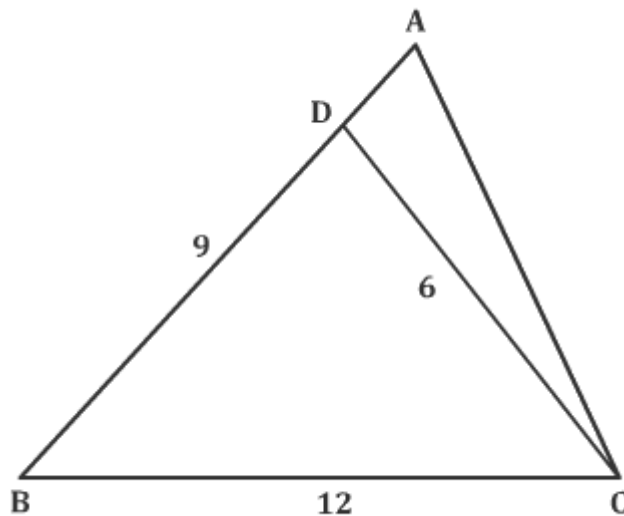
$$\begin{aligned} 1.5^2 &= 0.5^2 + (0.5 + DH)^2 \\ 2.25 &= 0.25 + 0.25 + DH + DH^2 \end{aligned}$$

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

$$\begin{aligned} DH &= \frac{-1 \pm \sqrt{1 - 4(-1.75)}}{2} \\ &= \frac{2\sqrt{2} - 1}{2} \quad (DH > 0) \end{aligned}$$

Hence, option 2.

23. Consider the triangle ABC shown in the following figure where  $BC = 12 \text{ cm}$ ,  $DB = 9 \text{ cm}$ ,  $CD = 6 \text{ cm}$  and  $\angle BCD = \angle BAC$ . What is the ratio of the perimeter of the triangle ADC to that of the triangle BDC?



- (1)  $7/9$   
 (2)  $8/9$

(3)  $6/9$

(4)  $5/9$

**Solution:**

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

$\Delta ABC$  is similar to  $\Delta CBD$ .

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

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

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

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

$$\therefore \text{Perimeter of } \Delta ADC = 7 + 6 + 8 = 21 \text{ cm}$$

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

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

Hence, option 1.

**24.** P, Q, S, and R are points on the circumference of a circle of radius  $r$ , such that PQR is an equilateral triangle and PS is a diameter of the circle. What is the perimeter of the quadrilateral PQSR?

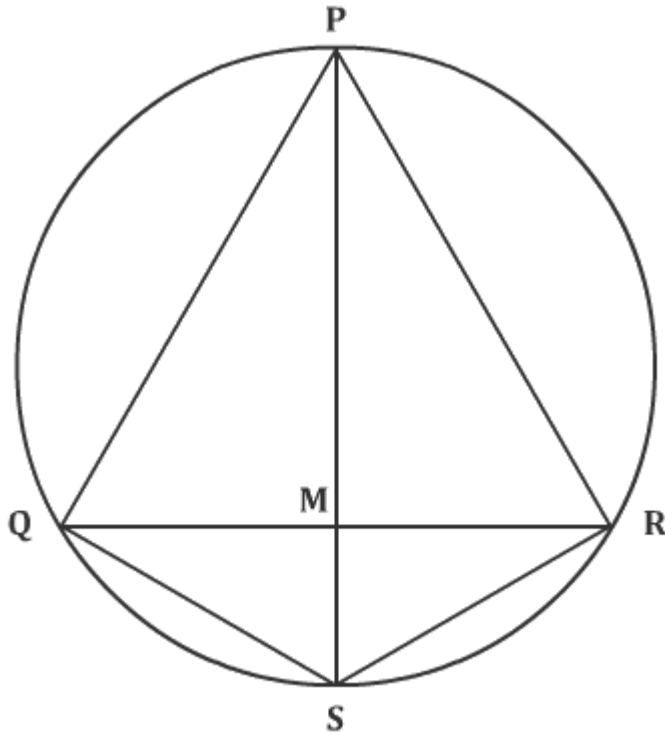
(1)  $2r(1 + \sqrt{3})$

(2)  $2r(2 + \sqrt{3})$

(3)  $r(1 + \sqrt{5})$

(4)  $2r + \sqrt{3}$

**Solution:**



$\Delta PQR$  is an equilateral triangle and  $PS$  is the diameter.

$\therefore m \angle PQS = m \angle PRS = 90^\circ$  (angles subtended in a semi-circle)  
 and  $m \angle PQM = m \angle PRM = m \angle QPR = 60^\circ$  (each angle in an equilateral triangle =  $60^\circ$ )

$PS$  bisects  $\angle QPS$  as it is the median of  $\Delta PQR$ .

$m \angle PMQ = m \angle PMR = 90^\circ$   
 $\therefore m \angle QPS = m \angle RPS = 30^\circ$   
 $\therefore m \angle PSQ = m \angle PSR = 60^\circ$

Radius =  $r$

$\therefore PS = 2r$

As  $\Delta PQS, \Delta PQR, \Delta QMS$  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. Let  $S$  be a set of positive integers such that every element  $n$  of  $S$  satisfies the conditions

a)  $1000 \leq n \leq 1200$

b) every digit in  $n$  is odd

Then how many elements of  $S$  are divisible by 3?

- (1) 9
- (2) 10
- (3) 11
- (4) 12

**Solution:**

$n$  will be of the form  $11ab$ , where  $a$  and  $b$  are odd numbers.

We are looking for all  $n$ 's divisible by 3.

$$\therefore 1 + 1 + a + b = 3 \text{ or } 6 \text{ or } 9 \text{ or } 12 \text{ or } 15 \text{ or } 18$$

$$\therefore a + b = 1 \text{ or } 4 \text{ or } 7 \text{ or } 10 \text{ or } 13 \text{ or } 16$$

$\therefore a + b = 1$  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.

Let  $x = \sqrt{4 + \sqrt{4 - \sqrt{4 + \sqrt{4 - \dots}}$  to infinity. Then  $x$  equals

- (1) 3
- (2)  $\frac{\sqrt{13}-1}{2}$
- (3)  $\frac{\sqrt{13}+1}{2}$
- (4)  $\sqrt{13}$

**Solution:**

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

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

$$(x^2 - 4)^2 - 4 = -\sqrt{4 + \sqrt{4 - \dots}}$$
 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. Let  $g(x)$  be a function such that  $g(x + 1) + g(x - 1) = g(x)$  for every real  $x$ . Then for what value of  $p$  is the relation  $g(x + p) = g(x)$  necessarily true for every real  $x$ ?

- (1) 5
- (2) 3
- (3) 2
- (4) 6

**Solution:**

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

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

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. A telecom service provider engages male and female operators for answering 1000 calls per day. A male operator can handle 40 calls per day whereas a female operator can handle 50 calls per day. The male and the female operators get a fixed wage of Rs. 250 and Rs. 300 per day respectively. In addition, a male operator gets Rs. 15 per call he answers and a female operator gets Rs. 10 per call she answers. To minimize the total cost, how many male operators should the service provider employ assuming he has to employ more than 7 of the 12 female operators available for the job?

- (1) 15
- (2) 14
- (3) 12
- (4) 10

**Solution:**

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  $7 < x \leq 12$ ,  $x$  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

$$= 300x + 250y + (50 \times 10 \times x) + (40 \times 15 \times y)$$

$$= 800x + 850y$$

If  $x = 8$  and  $y = 15$ , cost = Rs. 19,150

If  $x = 12$  and  $y = 10$ , cost = Rs. 18,100

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

Hence, option 4.

29. Three Englishmen and three Frenchmen work for the same company. Each of them knows a secret not known to others. They need to exchange these secrets over person-to-person phone calls so that eventually each person knows all six secrets. None of the Frenchmen knows English, and only one Englishman knows French. What is the minimum number of phone calls needed for the above purpose?

- (1) 5
- (2) 10
- (3) 9
- (4) 15

**Solution:**

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  $E_3$  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.** A rectangular floor is fully covered with square tiles of identical size. The tiles on the edges are white and the tiles in the interior are red. The number of white tiles is the same as the number of red tiles. A possible value of the number of tiles along one edge of the floor is

(1) 10

(2) 12

(3) 14

(4) 16

**Solution:**

Let each square tile have side = 1 unit

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

$$\text{Number of red tiles} = (m - 2)(n - 2)$$

$$\text{Number of white tiles} = mn - (m - 2)(n - 2)$$

$$\text{Now, } (m - 2)(n - 2) = mn - (m - 2)(n - 2)$$

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

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

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

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

Now, consider the 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.

**SECTION II****Sub-section II-A: Number of Questions =10****Note: Questions 31 to 40 carry one mark each.**

**Directions for Questions 31 to 34:** The passage given below is followed by a set of four questions. Choose the best answer to each question.

A game of strategy, as currently conceived in game theory, is a situation in which two or more "players" make choices among available alternatives (moves). 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.

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.

Internal conflicts are always psychologically interesting. What we vaguely call "interesting" psychology is in very great measure the psychology of inner conflict. Inner conflict is also held to be an important component of serious literature as distinguished from less serious genres. The classical tragedy, as well as the serious novel, reveals the inner conflict of central figures. The superficial adventure story, on the other hand, depicts only external conflict; that is, the threats to the person with whom the reader (or viewer) identifies stem in these stories exclusively from external obstacles and from the adversaries who create them. On the most primitive level this sort of external conflict is psychologically empty. In the fisticuffs between the protagonists of good and evil, no psychological problems are involved or, at any rate, none are depicted in juvenile representations of conflict.

The detective story, the "adult" analogue of a juvenile adventure tale, has at times been described as a glorification of intellectualized conflict. However, a great deal of the interest in the plots of these stories is sustained by withholding the unraveling of a solution to a problem. 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. If the adversary actively puts obstacles in the detective's path toward the solution, there is genuine conflict. But the conflict is psychologically interesting only to the extent that it contains irrational components such as a tactical error on the criminal's part or the detective's insight into some psychological quirk of the criminal or something of this sort. Conflict conducted in a perfectly rational manner is psychologically no more interesting than a standard



Western. For example, Tic-tac-toe, played perfectly by both players, is completely devoid of psychological interest. Chess may be psychologically interesting but only to the extent that it is played not quite rationally. Played completely rationally, chess would not be different from Tic-tac-toe.

In short, a pure conflict of interest (what is called a zero-sum game) although it offers a wealth of interesting conceptual problems, is not interesting psychologically, except to the extent that its conduct departs from rational norms.

31. According to the passage, internal conflicts are psychologically more interesting than external conflicts because

- (1) internal conflicts, rather than external conflicts, form an important component of serious literature as distinguished from less serious genres.
- (2) only juveniles or very few "adults" actually experience external conflict, while internal conflict is more widely prevalent in society.
- (3) in situations of internal conflict, individuals experience a dilemma in resolving their own preferences for different outcomes.
- (4) there are no threats to the reader (or viewer) in case of external conflicts.

**Solution:**

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. Which, according to the author, would qualify as interesting psychology?

- (1) A statistician's dilemma over choosing the best method to solve an optimisation problem.
- (2) A chess player's predicament over adopting a defensive strategy against an aggressive opponent.
- (3) A mountaineer's choice of the best path to Mt. Everest from the base camp.
- (4) A finance manager's quandary over the best way of raising money from the market.

**Solution:**

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.

Comparing the options, you notice that only in option 2 is there is a living adversary. Another clue is provided in option 4 – “the finance manager’s quandary” – in options 1, 3, and 4 they face confusion rather than ‘conflict’ – confusion cannot be equated with internal conflict – which is when, like in serious literature the adversary is not passive. In all three options the adversary is passive, and once the best choice is made (it may not be best owing to confusion) the ‘quandary’ ends. But in chess one understands that one’s choice triggers an array of options for the other, and the dynamism or unpredictability of the adversary’s reaction causes not confusion but ‘internal conflict’, which cannot end even after a choice is made. Hence, the correct answer is option 2.

33. According to the passage, which of the following options about the application of game theory to a conflict-of-interest situation is true?

- (1) Assuming that the rank order of preferences for options is different for different players.
- (2) Accepting that the interests of different players are often in conflict.
- (3) Not assuming that the interests are in complete disagreement.
- (4) All of the above.

**Solution:**

All the options are given in the first paragraph itself. “...*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.*”

Hence, the correct answer is option 4.

34. The problem solving process of a scientist is different from that of a detective because

- (1) scientists study inanimate objects, while detectives deal with living criminals or law offenders.
- (2) scientists study known objects, while detectives have to deal with unknown criminals or law offenders.
- (3) Scientists study phenomena that are not actively altered, while detectives deal with phenomena that have been deliberately influenced to mislead.
- (4) Scientists study psychologically interesting phenomena, while detectives deal with “adult” analogues of juvenile adventure tales.

**Solution:**

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. The reason for the difference in the problem solving process is then because of the difference in the object of the study. The objects of the scientist do not alter themselves because they (phenomena) are being observed. The object of the detective being aware that it (the criminal) is being observed/or may be observed tries to hide or mislead the detective. This is the reason for the difference in the problem solving process.

Option 1 states the difference as merely “inanimate vs. living”. Option 2 states the difference as “known vs. unknown” – not sufficient to change the process. What we are looking for is active vs. passive. Option 1 and 2 can both be passive.

Option 4 states that scientists study psychologically interesting phenomenon. This is contrary to the passage.

Hence, the correct answer is option 3.

**Directions for Questions 35 to 37:** The sentences given in each question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a letter. Choose the most logical order of sentences from among the given choices to construct a coherent paragraph.

35.

- A. Similarly, turning to caste, even though being lower caste is undoubtedly a separate cause of disparity, its impact is all the greater when the lower-caste families also happen to be poor.
- B. Belonging to a privileged class can help a woman to overcome many barriers that obstruct women from less thriving classes.
- C. It is the interactive presence of these two kinds of deprivation - being low class and being female - that massively impoverishes women from the less privileged classes.
- D. A congruence of class deprivation and gender discrimination can blight the lives of poorer women very severely.
- E. Gender is certainly a contributor to societal inequality, but it does not act independently of class.

- (1) EABDC
- (2) EBDCA
- (3) DAEBBC
- (4) BECDA

**Solution:**

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 make statement A better after EBDC than after E.

Hence, the correct answer is option 2.

36.

- A. When identity is thus ‘defined by contrast’, divergence with the West becomes central.
- B. Indian religious literature such as the *Bhagavad Gita* or the Tantric texts, which are identified as differing from secular writings seen as ‘western’, elicits much greater interest in the West than do other Indian writings, including India's long history of heterodoxy.
- C. There is a similar neglect of Indian writing on non-religious subjects, from mathematics, epistemology and natural science to economics and linguistics.
- D. Through selective emphasis that point up differences with the West, other civilizations can, in this way, be redefined in alien terms, which can be exotic and charming, or else bizarre and terrifying, or simply strange and engaging.
- E. The exception is the *Kamasutra* in which western readers have managed to cultivate an interest.

(1) BDACE

(2) DEABC

(3) BDECA

(4) BCEDA

**Solution:**

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.

- A. This is now orthodoxy to which I subscribe - up to a point.
  - B. It emerged from the mathematics of chance and statistics.
  - C. Therefore the risk is measurable and manageable.
  - D. The fundamental concept: Prices are not predictable, but the mathematical laws of chance can describe their fluctuations.
  - E. This is how what business schools now call modern finance was born.
- (1) ADCBE  
 (2) EBDCA  
 (3) ABDCE  
 (4) DCBEA

**Solution:**

The best way to solve this one is not through the options. There are two possibilities for the 'it' in statement B. The 'it' is either 'The fundamental concept' in D (i.e. DB) 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.

DB 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.

**Directions for Questions 38 to 40:** In each question, the word at the top is used in four different ways, numbered 1 to 4. Choose the option in which the usage of the word is incorrect or inappropriate.

**38. NEAR**

- (1) I got there just after you left – a near miss!
- (2) She and her near friend left early.
- (3) The war led to a near doubling of prices.
- (4) They came near to tears seeing the plight of the victims.

**Solution:**

'Near friend' in option 2 is incorrect usage. 'Close friend' is the right idiom. Hence, the correct answer is option 2.

**39. HAND**

- (1) I have my hand full, I cannot do it today.
- (2) The minister visited the jail to see the breach at first hand.
- (3) The situation is getting out of hand here.
- (4) When the roof of my house was blown away, he was willing to lend me a hand.

**Solution:**

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**

- (1) He has a great eye for detail.
- (2) We are waiting for the day.
- (3) I can't bear for her to be angry.
- (4) It couldn't be done for ever.

**Solution:**

*For ever* variant of *forever* has the following meanings in different contexts:

Continually e.g. *He was for ever looking at his watch.*

For all time e.g. *I'll love you for ever (and ever).*

Though the spaced 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.

Option 1 is a correct sentence because 'to have an eye for detail' is a standard idiom which means *to be good at noticing a particular type of thing*.

Option 2: We are waiting for the day – has no error. It can mean literally 'waiting for the (wedding) day' or idiomatically – 'waiting for the opportunity'.

Option 3, however, seems to have a technical flaw. "I can't bear for her to be angry" – None of the functions of either 'bear' (verb and noun) or the functions of 'for' (preposition and conjunction) seem to be applicable to this sentence. If 'bear for' is an idiom, our research is unable to find it.

**Sub-section II-B: Number of Questions = 20**

**Note: Questions 41 to 60 carry two marks each.**

**Directions for Questions 41 to 48:** Each of the two passages given below is followed by a set of four questions. Choose the best answer to each question.

**PASSAGE I**

Crinoline and croquet are out. As yet, no political activists have thrown themselves in front of the royal horse on Derby Day. Even so, some historians can spot the parallels. It is a time of rapid technological change. It is a period when the dominance of the world's superpower is coming under threat. It is an epoch when prosperity masks underlying economic strain. And, crucially, it is a time when policy-makers are confident that all is for the best in the best of all possible worlds. Welcome to the Edwardian Summer of the second age of globalisation.

Spare a moment to take stock of what's been happening in the past few months. Let's start with the oil price, which has rocketed to more than \$65 a barrel, more than double its level 18 months ago. The accepted wisdom is that we shouldn't worry our little heads about that, because the incentives are there for business to build new production and refining capacity, which will effortlessly bring demand and supply back into balance and bring crude prices back to \$25 a barrel. As Tommy Cooper used to say, 'just like that'.

Then there is the result of the French referendum on the European Constitution, seen as thick-headed luddites railing vainly against the modern world. What the French needed to realise, the argument went, was that there was no alternative to the reforms that would make the country more flexible, more competitive, more dynamic. Just the sort of reforms that allowed Gate Gourmet to sack hundreds of its staff at Heathrow after the sort of ultimatum that used to be handed out by Victorian mill owners. An alternative way of looking at the French "non" is that our neighbours translate "flexibility" as "you're fired".

Finally, take a squint at the United States. Just like Britain a century ago, a period of unquestioned superiority is drawing to a close. China is still a long way from matching America's wealth, but it is growing at a stupendous rate and economic strength brings geopolitical clout. Already, there is evidence of a new scramble for Africa as Washington and Beijing compete for oil stocks. Moreover, beneath the surface of the US economy, all is not well. Growth looks healthy enough, but the competition from China and elsewhere has meant the world's biggest economy now imports far more than it exports. The US is living beyond its means, but in this time of studied complacency a current account deficit worth 6 percent of gross domestic product is seen as a sign of strength, not weakness.

In this new Edwardian summer, comfort is taken from the fact that dearer oil has not had the savage inflationary consequences of 1973-74, when a fourfold increase in the cost of crude brought an abrupt end to a postwar boom that had gone on uninterrupted for a quarter of a century. True, the cost of living has been affected by higher transport costs, but we are talking of inflation at 2.3 per cent and not 27 per cent. Yet the idea that higher oil prices are of little consequence is fanciful. If people are paying more to fill up their cars it leaves them with less to spend on everything else, but there is a reluctance to consume less. In the 1970s unions were strong and able to negotiate large, compensatory pay deals that served to intensify inflationary pressure. In 2005, that avenue is pretty much closed off, but the abolition of all the controls on credit that existed in the 1970s means that households are invited to borrow more rather than consume less. The knock-on effects of higher oil prices are thus felt in different ways - through high levels of indebtedness, in inflated asset prices, and in balance of payments deficits.

There are those who point out, rightly, that modern industrial capitalism has proved mightily resilient these past 250 years, and that a sign of the enduring strength of the system has been the way it apparently shrugged off everything - a stock market crash, 9/11, rising oil prices - that have been thrown at it in the half decade since the millennium. Even so, there are at least three reasons for concern. First, we have been here before. In terms of political economy, the first era of globalisation mirrored our own. There was a belief in unfettered capital flows, in free trade, and in the power of the market. It was a time of massive income inequality and unprecedented migration. Eventually, though, there was a backlash, manifested in a struggle between free traders and protectionists, and in rising labour militancy.

Second, the world is traditionally at its most fragile at times when the global balance of power is in flux. By the end of the nineteenth century, Britain's role as the hegemonic power was being challenged by the rise of the United States, Germany, and Japan while the Ottoman and Hapsburg empires were clearly in rapid decline. Looking ahead from 2005, it is clear that over the next two or three decades, both China and India - which together account for half the world's population - will flex their muscles.

Finally, there is the question of what rising oil prices tell us. The emergence of China and India means global demand for crude is likely to remain high at a time when experts say production is about to top out. If supply constraints start to bite, any declines in the price are likely to be short-term cyclical affairs punctuating a long upward trend.



41. By the expression 'Edwardian Summer', the author refers to a period in which there is

- (1) unparalleled luxury and opulence.
- (2) a sense of complacency among people because of all-round prosperity.
- (3) a culmination of all-round economic prosperity.
- (4) an imminent danger lurking behind economic prosperity.

**Solution:**

"Welcome to the Edwardian Summer..." (end of first paragraph) is the clue 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'. The tone of the writer is one of concern, and not danger. "Even so, there are at least three reasons for concern", following the reasons for concern are stated.

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. What, according to the author, has resulted in a widespread belief in the resilience of modern capitalism?

- (1) Growth in the economies of Western countries despite shocks in the form of increase in levels of indebtedness and inflated asset prices.
- (2) Increase in the prosperity of Western countries and China despite rising oil prices.
- (3) Continued growth of Western economies despite a rise in terrorism, an increase in oil prices and other similar shocks.
- (4) The success of continued reforms aimed at making Western economies more dynamic, competitive and efficient.

**Solution:**

Option 1 can be eliminated because the points mentioned are in the paragraph previous to "There are.....the millennium."

Option 2 can be eliminated because of the presence of the word 'China'.

Option 4 talks of 'reforms', which are not mentioned in the passage in the context of the topic.

The main sentence in the passage that answers the question is:

"There are those who point out, rightly, that *modern industrial capitalism* has proved *mightily resilient* these past 250 years, and that a sign of the enduring strength of the system has been the way it apparently shrugged off everything - a

*stock market crash, 9/11, rising oil prices* - that have been thrown at it in the half decade since the millennium.”

Option 3 is the only one that includes all three: *a stock market crash, 9/11, rising oil prices*.

Selection, rather than elimination, is the fastest way to answer this question.

Hence, the correct answer is option 3.

**43.** Which of the following best represents the key argument made by the author?

- (1) The rise in oil prices, the flux in the global balance of power and historical precedents should make us question our belief that the global economic prosperity would continue.
- (2) The belief that modern industrial capitalism is highly resilient and capable of overcoming shocks will be belied soon.
- (3) Widespread prosperity leads to neglect of early signs of underlying economic weakness, manifested in higher oil prices and a flux in the global balance of power.
- (4) A crisis is imminent in the West given the growth of countries like China and India and the increase in oil prices.

**Solution:**

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.** What can be inferred about the author's view when he states, 'As Tommy Cooper used to say "just like that"'?

- (1) Industry has incentive to build new production and refining capacity and therefore oil prices would reduce.
- (2) There would be a correction in the price levels of oil once new production capacity is added.
- (3) The decline in oil prices is likely to be short-term in nature.
- (4) It is not necessary that oil prices would go down to earlier levels.

**Solution:**

The reference to Tommy Cooper 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. Given the author's tone, option 4 is the only choice.

Options 1 and 2 are positive in tone, hence they are eliminated. There is nothing to substantiate option 3 in the passage.

*Note:* Tommy Cooper was a comedian-magician one of whose catchphrases during his performances was 'Just like that'.

Hence, the correct answer is option 4.

**PASSAGE II**

While complex in the extreme, Derrida's work has proven to be a particularly influential approach to the analysis of the ways in which language structures our understanding of ourselves and the world we inhabit, an approach he termed deconstruction. 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. The term 'text', in this respect, does not refer simply to a written form of communication, however. Rather, texts are something we all produce and reproduce constantly in our everyday social relations, be they spoken, written or embedded in the construction of material artifacts. 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. Logocentrism is the search for a rational language that is able to know and represent the world and all its aspects perfectly and accurately. Its totalitarian dimension, for Derrida at least, lies primarily in its tendency to marginalize or dismiss all that does not neatly comply with its particular linguistic representations, a tendency that, throughout history, has all too frequently been manifested in the form of authoritarian institutions. Thus logocentrism has, in its search for the truth of absolute representation, subsumed difference and oppressed that which it designates as its alien 'other'. For Derrida, western civilization has been built upon such a systematic assault on alien cultures and ways of life, typically in the name of reason and progress.

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. Oppositional linguistic dualisms, such as rational/irrational, culture/nature and good/bad are not, however, construed as equal partners as they are in, say, the semiological structuralism of Saussure. Rather, they exist, for Derrida, in a series of hierarchical relationships with the first term normally occupying a superior position. Derrida defines the relationship between such

oppositional terms using the neologism *différance*. This refers to the realization that in any statement, oppositional terms differ from each other (for instance, the difference between rationality and irrationality is constructed through oppositional usage), and at the same time, a hierarchical relationship is maintained by the deference of one term to the other (in the positing of rationality over irrationality, for instance). It is this latter point which is perhaps the key to understanding Derrida's approach to deconstruction, For the fact that at any given time one term must defer to its oppositional 'other', means that the two terms are constantly in a state of interdependence. The presence of one is dependent upon the absence or 'absent-presence' of the 'other', such as in the case of good and evil, whereby to understand the nature of one, we must constantly relate it to the absent term in order to grasp its meaning. That is, to do good, we must understand that our act is not evil for without that comparison the term becomes meaningless. Put simply, deconstruction represents an attempt to demonstrate the absent-presence of this oppositional 'other', to show that what we say or write is in itself not expressive simply of what is present, but also of what is absent. Thus, deconstruction seeks to reveal the interdependence of apparently dichotomous terms and their meanings relative to their textual context; that is, within the linguistic power relations which structure dichotomous terms hierarchically. In Derrida's own words, a deconstructive reading "must always aim at a certain relationship, unperceived by the writer, between what he commands and what he does not command of the patterns of a language that he uses. . . .[It] attempts to make the not-seen accessible to sight."

Meaning, then, is never fixed or stable, whatever the intention of the author of a text. For Derrida, language is a system of relations that are dynamic, in that all meanings we ascribe to the world are dependent not only on what we believe to be present but also on what is absent. 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 insight leads, once again, to Derrida's further rejection of the idea of the definitive authority of the intentional agent or subject. The subject is decentred; it is conceived as the outcome of relations of *différance*. As author of its own biography, the subject thus becomes the ideological fiction of modernity and its logocentric philosophy, one that depends upon the formation of hierarchical dualisms, which repress and deny the presence of the absent 'other'. No meaning can, therefore, ever be definitive, but is merely an outcome of a particular interpretation.

45. According to the passage, Derrida believes that:

- (1) Reality can be construed only through the use of rational analysis.
- (2) Language limits our construction of reality.
- (3) A universal language will facilitate a common understanding of reality.
- (4) We need to uncover the hidden meaning in a system of relations expressed by language.

**Solution:**

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. To Derrida, 'logocentrism' does not imply:

- (1) A totalitarian impulse.
- (2) A domain of representative language.
- (3) Interdependence of the meanings of dichotomous terms.
- (4) A strategy that seeks to suppress hidden meanings in a text.

**Solution:**

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.”

Also, the passage states “Its *totalitarian dimension...*”

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.

Supports for option 3 is to 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. According to the passage, Derrida believes that the system of binary opposition

- (1) represents a prioritization or hierarchy.
- (2) reconciles contradictions and dualities.
- (3) weakens the process of marginalization and ordering of truth.
- (4) deconstructs reality.

**Solution:**

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.** Derrida rejects the idea of 'definitive authority of the subject' because

- (1) interpretation of the text may not make the unseen visible.
- (2) the meaning of the text is based on binary opposites.
- (3) the implicit power relationship is often ignored.
- (4) any act of interpretation must refer to what the author intends.

**Solution:**

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.

Option 3 is not 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.

**Directions for Questions 49 to 52:** Each of the following questions has a paragraph from which the last sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

**49.** The audiences for crosswords and sudoku, understandably, overlap greatly, but there are differences, too. A crossword attracts a more literary person, while sudoku appeals to a keenly logical mind. Some crossword enthusiasts turn up their noses at sudoku because they feel it lacks depth. A good crossword requires vocabulary, knowledge, mental flexibility and sometimes even a sense of humor to complete. It touches numerous areas of life and provides an "Aha!" or two along the way.

- (1) Sudoku, on the other hand, is just a logical exercise, each one similar to the last.
- (2) Sudoku, incidentally, is growing faster in popularity than crosswords, even among the literati.
- (3) Sudoku, on the other hand, can be attempted and enjoyed even by children.
- (4) Sudoku, however, is not exciting in any sense of the term.

**Solution:**

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. mentioned in the paragraph.

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

In option 1, the comparison between Crossword and Sudoku is completed and the purpose of the paragraph is fulfilled. Note “sudoku appeals to a *keenly logical mind*.”

Hence, the correct answer is option 1.

50. Most firms consider expert individuals to be too elitist, temperamental, egocentric, and difficult to work with. Force such people to collaborate on a high-stakes project and they just might come to fisticuffs. Even the very notion of managing such a group seems unimaginable. So most organizations fall into default mode, setting up project teams of people who get along nicely.

(1) The result, however, is disastrous.

(2) The result is mediocrity.

(3) The result is creation of experts who then become elitists.

(4) Naturally, they drive innovations.

**Solution:**

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

Option 3 is eliminated since there is no evidence to suggest that experts are created from “*project teams who get along nicely*”.

Option 4 is eliminated because there is no evidence in the passage to suggest that “*they drive innovation*”.

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.

Hence, the correct answer is option 2.

51. Federer's fifth grand slam win prompted a reporter to ask whether he was the best ever. Federer is certainly not lacking in confidence, but he wasn't about to proclaim himself the best ever. "The best player of this generation, yes", he said, "But nowhere close to ever. Just look at the records that some guys have. I'm a minnow".

- (1) His win against Agassi, a genius from the previous generation, contradicts that.
- (2) Sampras, the king of an earlier generation, was as humble.
- (3) He is more than a minnow to his contemporaries.
- (4) The difference between 'the best of this generation' and 'the best ever' is a matter of perception.

**Solution:**

The passage is written to show how 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 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. Thus the end of knowledge and the closing of the frontier that it symbolizes is not a looming crisis at all, but merely one of many embarrassing fits of hubris in civilization's long history. In the end, it will pass away and be forgotten. Ours is not the first generation to struggle to understand the organizational laws of the frontier, deceive itself that it has succeeded, and go to its grave having failed.

- (1) One would be wise to be humble.
- (2) But we might be the first generation to actually reach the frontier.
- (3) But we might be the first generation to deal with the crisis.
- (4) However, this time the success is not illusory.

**Solution:**

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 the 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 not the first generation'.

Hence, the correct answer is option 1.



**Directions for Questions 53 to 56:** Each question consists of four sentences on a topic. Some sentences are grammatically incorrect or inappropriate. Select the option that indicates the grammatically correct and appropriate sentence(s).

53.

- A. When virtuoso teams begin their work, individuals are in and group consensus is out.
  - B. As project progresses, however, the individual stars harness themselves to the product of the group.
  - C. Sooner or later, the members break through their own egocentrism and become a plurality with single-minded focus on the goal.
  - D. In short, they morph into a powerful team with a shared identity.
- (1) A & C  
 (2) A & D  
 (3) B & D  
 (4) A, C & D

**Solution:**

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.

- A. Large reductions in the ozone layer, which sits about 15-30 km above the Earth, take place each winter over the Polar regions, especially the Antarctic, as low temperatures allow the formation of stratospheric clouds that assist chemical reactions breaking down ozone.
- B. Industrial chemicals containing chlorine and bromine have been blamed for thinning the layer because they attack the ozone molecules, making them to break apart.
- C. Many an offending chemicals have now been banned.
- D. It will still take several decades before these substances have disappeared from the atmosphere.

- (1) D only
- (2) B & D
- (3) A & D
- (4) A & C

**Solution:**

Statements B and C are incorrect. Statement B is incorrect because 'to break apart' is an 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.

- A. The balance of power will shift to the East as China and India evolve.
- B. Rarely the economic ascent of two still relatively poor nations has been watched with such a mixture of awe, opportunism, and trepidation.
- C. Postwar era witnessed economic miracles in Japan and South Korea, but neither was populous enough to power worldwide growth or change the game in a complete spectrum of industries.
- D. China and India, by contrast, possess the weight and dynamism to transform the 21st-century global economy.

- (1) A, B & C
- (2) A & D
- (3) C
- (4) C & D

**Solution:**

Statements 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.

- A. People have good reason to care about the welfare of animals.
- B. Ever since Enlightenment, their treatment has been seen as a measure of mankind's humanity.
- C. It is no coincidence that William Wilberforce and Sir Thomas Foxwell Buxton, two leaders of the movement to abolish the slave trade, helped found the Royal Society for the Prevention of Cruelty to Animals in 1820s.
- D. An increasing number of people go further: mankind has a duty not to cause pain to animals that have the capacity to suffer.

(1) A & D

(2) B

(3) A & C

(4) C & D

**Solution:**

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.

**Directions for Questions 57 to 60:** Each of the following questions has a paragraph with one italicized word that does not make sense. Choose the most appropriate replacement for that word from the options given below the paragraph.

57. Intelligent design derives from an early 19th-century explanation of the natural world given by an English clergyman, William Paley. Paley was the populariser of the famous watchmaker analogy. Proponents of intelligent design are *crupping* Paley's argument with a new gloss from molecular biology.

(1) destroying

(2) testing

(3) resurrecting

(4) questioning

**Solution:**

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. Women squat, heads covered, beside huge piles of limp fodder and *blunk* oil lamps, and just about all the cows in the three towns converge upon this spot. Sinners, supplicants and yes, even scallywags hand over a few coins for a crack at redemption and a handful of grass.

- (1) shining
- (2) bright
- (3) sputtering
- (4) effulgent

**Solution:**

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. It is *klang* to a sensitive traveller who walks through this great town, when he sees the streets, the roads, and cabin doors crowded with beggars, mostly women, followed by three, four, or six children, all in rags and importuning every passenger for alms.

- (1) amusing
- (2) irritating
- (3) disgusting
- (4) distressing

**Solution:**

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. Or there is the most *gingummy* diplomatic note on record: when Philip of Macedon wrote to the Spartans that, if he came within their borders, he would leave not one stone of their city, they wrote back the one word - "If".

- (1) witty
- (2) rude
- (3) simple
- (4) terse

**Solution:**

Terse means pointed and concise. What controls the replacement in the context is the 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 since it does not fit in, in the context of the "threats" in the paragraph.

Then we have rude and simple as options 2 and 3. Rude and simple are poor descriptions of the profound 'if' in the context.

Option 4 (terse) is the best choice.

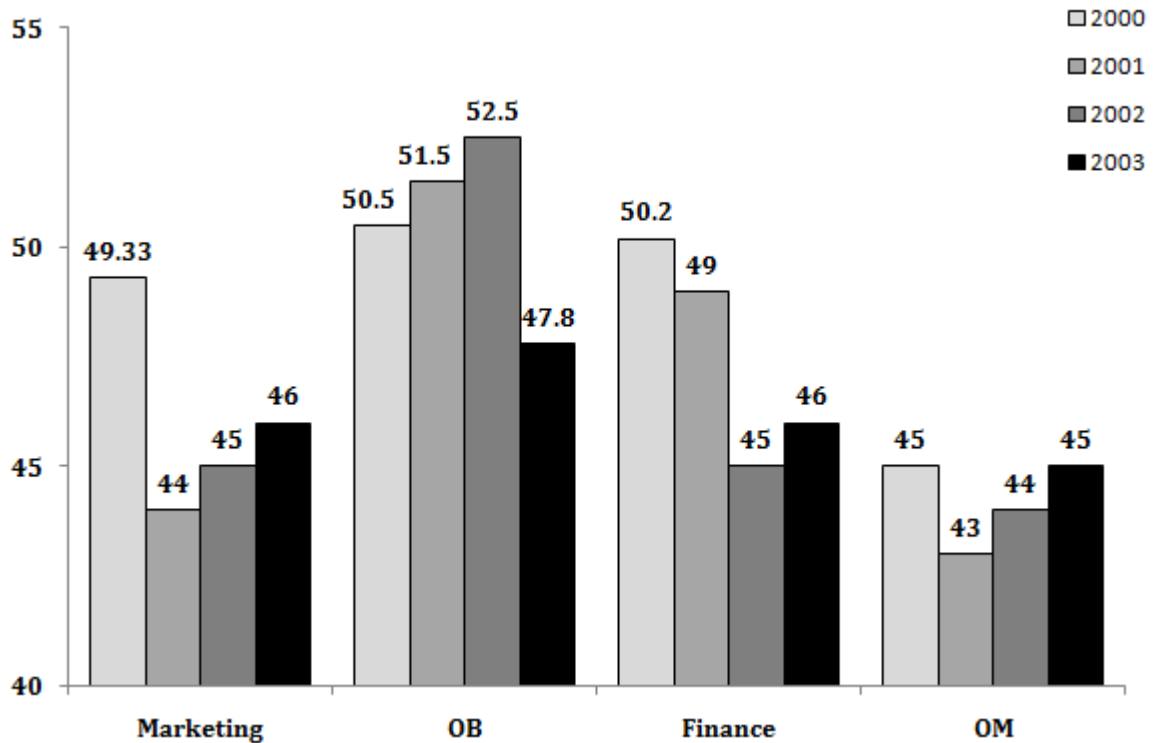
Hence, the correct answer is option 4.

**SECTION III**

**Sub-section III-A: Number of Questions = 10**  
**Note: Questions 61 to 70 carry one mark each.**

**Answer Questions 61 to 64 on the basis of the information given below:**

A management institute was established on January 1, 2000 with 3, 4, 5, and 6 faculty members in the Marketing, Organisational Behaviour (OB), Finance, and Operations Management (OM) areas respectively, to start with. No faculty member retired or joined the institute in the first three months of the year 2000. In the next four years, the institute recruited one faculty member in each of the four areas. All these new faculty members, who joined the institute subsequently over the years, were 25 years old at the time of their joining the institute. All of them joined the institute on April 1. During these four years, one of the faculty members retired at the age of 60. The following diagram gives the area-wise average age (in terms of number of completed years) of faculty members as on April 1 of 2000, 2001, 2002, and 2003.



**61.** From which area did the faculty member retire?

- (1) Finance
- (2) Marketing
- (3) OB
- (4) OM

**Solution:**

Consider this explanation that can be used to answer all the questions of this set. In any two consecutive years in which the number of faculty remains the 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 area 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 and 2002.

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. Professors Naresh and Devesh, two faculty members in the Marketing area, who have been with the Institute since its inception, share a birthday, which falls on

20<sup>th</sup> November. One was born in 1947 and the other one in 1950. On April 1 2005, what was the age of the third faculty member who has been in the same area since inception?

- (1) 47
- (2) 50
- (3) 51
- (4) 52

**Solution:**

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

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

Naresh's age on April 1, 2005 = 57 and Devesh's age on April 1, 2005 = 54

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

Hence, option 4.

**63.** In which year did the new faculty member join the Finance area?

- (1) 2000
- (2) 2001
- (3) 2002
- (4) 2003

**Solution:**

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.** What was the age of the new faculty member, who joined the OM area, as on April 1, 2003?

- (1) 25
- (2) 26
- (3) 27
- (4) 28

**Solution:**

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

∴ His age in 2003 = 27 years

Hence, option 3.

**Answer Questions 65 to 67 on the basis of the information given below:**



The table below reports annual statistics related to rice production in select states of India for a particular year.

State	Total Area (in million hectares)	% of Area Under Rice Cultivation	Production (in million tons)	Population (in millions)
Himachal Pradesh	6	20	1.2	6
Kerala	4	60	4.8	32
Rajasthan	34	20	6.8	56
Bihar	10	60	12	83
Karnataka	19	50	19	53
Haryana	4	80	19.2	21
West Bengal	9	80	21.6	80
Gujarat	20	60	24	51
Punjab	5	80	24	24
Madhya Pradesh	31	40	24.8	60
Tamilnadu	13	70	27.3	62
Maharashtra	31	50	48	97
Uttar Pradesh	24	70	67.2	166
Andhra Pradesh	28	80	112	76

65. Which two states account for the highest productivity of rice (tons produced per hectare of rice cultivation)?

- (1) Haryana and Punjab
- (2) Punjab and Andhra Pradesh
- (3) Andhra Pradesh and Haryana
- (4) Uttar Pradesh and Haryana

**Solution:**

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. How many states have a per capita production of rice (defined as total rice production divided by its population) greater than Gujarat?

- (1) 3
- (2) 4
- (3) 5
- (4) 6

**Solution:**

Per capita production of rice for Gujarat =  $24/51 = 48/102 \cong 48\%$

∴ 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. An intensive rice producing state is defined as one whose annual rice production per million of population is at least 400,000 tons. How many states are intensive rice producing states?

- (1) 5
- (2) 6
- (3) 7
- (4) 8

**Solution:**

We are looking for states with

Production in million tons  $\times 10^6$  / population in millions  $> 4 \times 10^5$

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

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

Hence, option 4.

**Answer Questions 68 to 70 on the basis of the information given below:**

The table below reports the gender, designation and age-group of the employees in an organization. It also provides information on their commitment to projects coming up in the months of January (Jan), February (Feb), March (Mar) and April (Apr), as well as their interest in attending workshops on: Business Opportunities (BO), Communication Skills (CS), and E-Governance (EG).

Sl. No.	Name	Gender	Designation	Age Group	Committed to problems during	Interested in workshop on
1	Anshul	M	Mgr	Y	Jan, Mar	CS, EG
2	Bushkant	M	Dir	I	Feb, Mar	BO, EG
3	Charu	F	Mgr	I	Jan, Feb	BO, CS
4	Dinesh	M	Exe	O	Jan, Apr	BO, CS, EG
5	Eashwaran	M	Dir	O	Feb, Apr	BO
6	Fatima	F	Mgr	Y	Jan, Mar	BO, CS
7	Gayatri	F	Exe	Y	Feb, Mar	EG
8	Hari	M	Mgr	I	Feb, Mar	BO, CS, EG
9	Indira	F	Dir	O	Feb, Apr	BO, EG
10	John	M	Dir	Y	Jan, Mar	BO
11	Kalindi	F	Exe	I	Jan, Apr	BO, CS, EG
12	Lavanya	F	Mgr	O	Feb, Apr	CS, EG
13	Mandeep	M	Mgr	O	Mar, Apr	BO, EG
14	Nandlal	M	Dir	I	Jan, Feb	BO, EG
15	Parul	F	Exe	Y	Feb, Apr	CS, EG
16	Rahul	M	Mgr	Y	Mar, Apr	CS, EG
17	Sunita	F	Dir	Y	Jan, Feb	BO, EG
18	Urvashi	F	Exe	I	Feb, Mar	EG
19	Yamini	F	Mgr	O	Mar, Apr	CS, EG
20	Zeena	F	Exe	Y	Jan, Mar	BO, CS, EG

M = Male, F = Female; Exe = Executive, Mgr = Manager, Dir = Director; Y = Young, I = In-between, O = Old

For each workshop, exactly four employees are to be sent, of which at least two should be Females and at least one should be Young. No employee can be sent to a workshop in which he or she is not interested in. An employee cannot attend the workshop on

- Communication Skills, if he or she is committed to internal projects in the month of January;
- Business Opportunities, if he or she is committed to internal projects in the month of February;
- E-governance, if he or she is committed to internal projects in the month of March.

68. Assuming that Parul and Hari are attending the workshop on Communication Skills (CS), then which of the following employees can possibly attend the CS workshop?

- (1) Rahul and Yamini
- (2) Dinesh and Lavanya
- (3) Anshul and Yamini
- (4) Fatima and Zeena

**Solution:**

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. How many Executives (Exe) cannot attend more than one workshop?

- (1) 2
- (2) 3
- (3) 15
- (4) 16

**Solution:**

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. Which set of employees cannot attend any of the workshops?

- (1) Anshul, Charu, Eashwaran, and Lavanya
- (2) Anshul, Bushkant, Gayatri, and Urvashi
- (3) Charu, Urvashi, Bushkant, and Mandeep
- (4) Anshul, Gayatri, Eashwaran, and Mandeep

**Solution:**

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.

**Sub-section III-B: Number of Questions = 20**  
**Note: Questions 71 to 90 carry two marks each.**

**Answer Questions 71 to 74 on the basis of the information given below:**

In the table below is the listing of players, seeded from highest (#1) to lowest (#32), who are due to play in an Association of Tennis Players (ATP) tournament for women. This tournament has four knockout rounds before the final, i.e., first round, second round, quarterfinals, and semi-finals. In the first round, the highest seeded player plays the lowest seeded player (seed # 32) which is designated match No. 1 of first round; the 2nd seeded player plays the 31st seeded player which is designated match No. 2 of the first round, and so on. Thus, for instance, match No. 16 of first round is to be played between 16th seeded player and the 17th seeded player. In the second round, the winner of match No. 1 of first round plays the winner of match No. 16 of first round and is designated match No. 1 of second round. Similarly, the winner of match No. 2 of first round plays the winner of match No. 15 of first round, and is designated match No. 2 of second round. Thus, for instance, match No. 8 of the second round is to be played between the winner of match No. 8 of first round and the winner of match No. 9 of first round. The same pattern is followed for later rounds as well.

Seed #	Name of Player	Seed #	Name of Player	Seed #	Name of Player
1	Maria Sharapova	12	Mary Pierce	23	Silvia Farina Elia
2	Lindsay Davenport	13	Anastasia Myskina	24	Tatiana Golovin
3	Amelie Mauresmo	14	Alicia Molik	25	Shinobu Asagoe
4	Kim Clijsters	15	Nathalie Dechy	26	Francesca Schiavone
5	Svetlana Kuznetsova	16	Elena Bovina	27	Nicole Pietrangeli
6	Elena Dementieva	17	Jelena Jankovic	28	Gisela Dulko
7	Justine Henin	18	Ana Ivanovic	29	Flavia Pennetta
8	Serena Williams	19	Vera Zvonareva	30	Anna Chakvetadze
9	Nadia Petrova	20	Elena Likhovtseva	31	Ai Sugiyama
10	Venus Williams	21	Daniela Hantuchova	32	Anna-lena Groenefeld
11	Patty Schnyder	22	Dinara Safina		

**71.** If there are no upsets (a lower seeded player beating a higher seeded player) in the first round, and only match Nos. 6, 7, and 8 of the second round result in

upsets, then who would meet Lindsay Davenport in quarter finals, in case Davenport reaches quarter finals?

- (1) Justine Henin
- (2) Nadia Petrova
- (3) Patty Schnyder
- (4) Venus Williams

**Solution:**

Match No	Round 1		Round 2	
	1	1	32	1/32
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.** If Elena Dementieva and Serena Williams lose in the second round, while Justine Henin and Nadia Petrova make it to the semifinals, then who would play Maria Sharapova in the quarterfinals, in the event Sharapova reaches quarterfinals?

- (1) Dinara Safina
- (2) Justine Henin
- (3) Nadia Petrova
- (4) Patty Schnyder

**Solution:**

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 the quarterfinals.

Hence, option 3.

73. If, in the first round, all even numbered matches (and none of the odd numbered ones) result in upsets, and there are no upsets in the second round, then who could be the lowest seeded player facing Maria Sharapova in semi-finals?

- (1) Anastasia Myskina
- (2) Flavia Pennetta
- (3) Nadia Petrova
- (4) Svetlana Kuznetsova

**Solution:**

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. If the top eight seeds make it to the quarterfinals, then who, amongst the players listed below, would definitely not play against Maria Sharapova in the final, in case Sharapova reaches the final?

- (1) Amelie Mauresmo
- (2) Elena Dementieva
- (3) Kim Clijsters
- (4) Lindsay Davenport

**Solution:**

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 in the quarterfinals and one of seed numbers 4 or 5 in the semi-finals. So, she can play seed numbers 2, 3, 6, or 7 in the finals. Kim Clijsters is seeded 4. Thus she will definitely not play against Sharapova in the final.

Hence, option 3.

**Answer Questions 75 to 78 on the basis of the information given below:**

Venkat, a stockbroker, invested a part of his money in the stock of four companies - A, B, C and D. Each of these companies belonged to different industries, viz., Cement, Information Technology (IT), Auto, and Steel, in no particular order. At the time of investment, the price of each stock was Rs.100. Venkat purchased only one stock of each of these companies. He was expecting returns of 20%, 10%, 30%, and 40% from the stock of companies A, B, C and D, respectively. Returns are defined as the change in the value of the stock after one year, expressed as a percentage of the initial value. During the year, two of these companies announced extraordinarily good results. One of these two companies belonged to the Cement or the IT industry, while the other one belonged to either the Steel or the Auto industry. As a result, the returns on the stocks of these two companies were higher than the initially expected returns. For the company belonging to the Cement or the IT industry with extraordinarily good results, the returns were twice that of the initially expected returns. For the company belonging to the Steel or the Auto industry, the returns on announcement of extraordinarily good results were only one and a half times that of the initially expected returns. For the remaining two companies, which did not announce extraordinarily good results, the returns realized during the year were the same as initially expected.

75. What is the minimum average return Venkat would have earned during the year?

- (1) 30%
- (2) 31.25%
- (3) 32.5%
- (4) Cannot be determined



**Solution:**

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. If Venkat earned a 35% return on average during the year, then which of these statements would necessarily be true?

- I. Company A belonged either to Auto or to Steel Industry.
- II. Company B did not announce extraordinarily good results.
- III. Company A announced extraordinarily good results.
- IV. Company D did not announce extraordinarily good results.

- (1) I and II only
- (2) II and III only
- (3) I and IV only
- (4) II and IV only

**Solution:**

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

$\therefore$  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. If Venkat earned a 38.75% return on average during the year, then which of these statement(s) would necessarily be true?

- I. Company C belonged either to Auto or to Steel Industry.
- II. Company D belonged either to Auto or to Steel Industry.
- III. Company A announced extraordinarily good results.
- IV. Company B did not announce extraordinarily good results.

- (1) I and II only
- (2) II and III only
- (3) I and IV only
- (4) II and IV only

**Solution:**

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.** If Company C belonged to the Cement or the IT industry and did announce extraordinarily good results, then which of these statement(s) would necessarily be true?

- I. Venkat earned not more than 36.25% return on average.
- II. Venkat earned not less than 33.75% return on average.
- III. If Venkat earned 33.75% return on average, Company A announced extraordinarily good results.
- IV. If Venkat earned 33.75% return on average, Company B belonged either to Auto or to Steel Industry.

- (1) I and II only
- (2) II and IV only
- (3) II and III only
- (4) III and IV only

**Solution:**

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.

∴ Total returns would be  $20 + 15 + 60 + 40 = \text{Rs.}135 = 33.75\%$  of the initial investment.

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.

∴ Total returns would be  $20 + 10 + 60 + 60 = \text{Rs.}150 = 37.5\%$  of the initial investment.

Statement I is false.

Hence, option 2.

**Answer Questions 79 to 82 on the basis of the information given below:**

The year is 2089. Beijing, London, New York, and Paris are in contention to host the 2096 Olympics. The eventual winner is determined through several rounds of voting by members of the IOC with each member representing a different city. All the four cities in contention are also represented in IOC.

- In any round of voting, the city receiving the lowest number of votes in that round gets eliminated. The survivor after the last round of voting gets to host the event.
- A member is allowed to cast votes for at most two different cities in all rounds of voting combined. (Hence, a member becomes ineligible to cast a vote in a given round if both the cities (s)he voted for in earlier rounds are out of contention in that round of voting).
- A member is also ineligible to cast a vote in a round if the city (s)he represents is in contention in that round of voting.
- As long as the member is eligible, (s)he must vote and vote for only one candidate city in any round of voting.

The following incomplete table shows the information on cities that received the maximum and minimum votes in different rounds, the number of votes cast in their favour, and the total votes that were cast in those rounds.

Round	Total votes cast	Maximum votes cast		Eliminated	
		City	No. of votes	City	No. of votes
1		London	30	New York	12
2	83	Paris	32	Beijing	21
3	75				

It is also known that:

- All those who voted for London and Paris in round 1, continued to vote for the same cities in subsequent rounds as long as these cities were in contention. 75% of those who voted for Beijing in round 1, voted for Beijing in round 2 as well.

- Those who voted for New York in round 1, voted either for Beijing or Paris in round 2.
- The difference in votes cast for the two contending cities in the last round was 1.
- 50% of those who voted for Beijing in round 1, voted for Paris in round 3.

79. What percentage of members from among those who voted for New York in round 1, voted for Beijing in round 2?

- (1) 33.33  
 (2) 50  
 (3) 66.67  
 (4) 75

**Solution:**

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.

Since,  $x - 3 = 83$ , we get  $x - 4 = 82$  and  $x - 2 - n = 75$  or  $n = 9$

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.

∴ 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, i.e. 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. So, 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
					+ 8 who voted for Beijing in R1 and R2
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		+ 4 who voted for Beijing in R1 and R2
					+ 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. What is the number of votes cast for Paris in round 1?

- (1) 16
- (2) 18
- (3) 22
- (4) 24

**Solution:**

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

Hence, option 4.

81. What percentage of members from among those who voted for Beijing in round 2 and were eligible to vote in round 3, voted for London?

- (1) 33.33

- (2) 38.10
- (3) 50
- (4) 66.67

**Solution:**

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

**82.** Which of the following statements must be true?

- a. IOC member from New York must have voted for Paris in round 2.
  - b. IOC member from Beijing voted for London in round 3.
- (1) Only a
  - (2) Only b
  - (3) Both a and b
  - (4) Neither a nor b

**Solution:**

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

Hence, option 1.

**Answer Questions 83 to 86 on the basis of the information given below:**

The table below presents the revenue (in million rupees) of four firms in three states. These firms, Honest Ltd., Aggressive Ltd., Truthful Ltd. and Profitable Ltd. are disguised in the table as A, B, C and D, in no particular order.

States	Firm A	Firm B	Firm C	Firm D
UP	49	82	80	55
Bihar	69	72	70	65
MP	72	63	72	65

Further, it is known that:

- In the state of MP, Truthful Ltd. has the highest market share.
- Aggressive Ltd.'s aggregate revenue differs from Honest Ltd.'s by Rs. 5 million.

**83.** What can be said regarding the following two statements?

Statement 1: Profitable Ltd. has the lowest share in MP market.

Statement 2: Honest Ltd.'s total revenue is more than Profitable Ltd.

- (1) If Statement 1 is true then Statement 2 is necessarily true.
- (2) If Statement 1 is true then Statement 2 is necessarily false.
- (3) Both Statement 1 and Statement 2 are true.
- (4) Neither Statement 1 nor Statement 2 is true.

**Solution:**

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., which means that 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.** What can be said regarding the following two statements?

Statement 1: Aggressive Ltd.'s lowest revenues are from MP.

Statement 2: Honest Ltd.'s lowest revenues are from Bihar.

(1) If Statement 2 is true then Statement 1 is necessarily false.

(2) If Statement 1 is false then Statement 2 is necessarily true.

(3) If Statement 1 is true then Statement 2 is necessarily true.

(4) None of the above.

**Solution:**

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.** What can be said regarding the following two statements?

Statement 1: Honest Ltd. has the highest share in the UP market.

Statement 2: Aggressive Ltd. has the highest share in the Bihar market.

(1) Both statements could be true.

(2) At least one of the statements must be true.

(3) At most one of the statements is true.

(4) None of the above

**Solution:**

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.** If Profitable Ltd.'s lowest revenue is from UP, then which of the following is true?

- (1) Truthful Ltd.'s lowest revenues are from MP.
- (2) Truthful Ltd.'s lowest revenues are from Bihar.
- (3) Truthful Ltd.'s lowest revenues are from UP.
- (4) No definite conclusion is possible.

**Solution:**

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.

**Answer Questions 87 to 90 on the basis of the information given below:**

Help Distress (HD) is an NGO involved in providing assistance to people suffering from natural disasters. Currently, it has 37 volunteers. They are involved in three projects: Tsunami Relief (TR) in Tamil Nadu, Flood Relief (FR) in Maharashtra, and Earthquake Relief (ER) in Gujarat. Each volunteer working with Help Distress has to be involved in at least one relief work project.

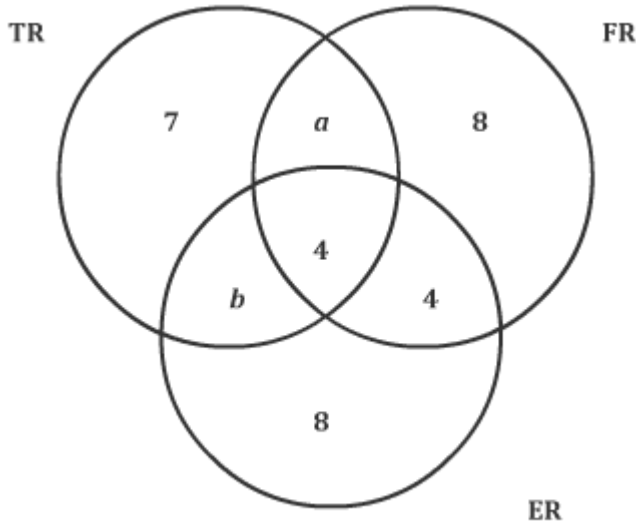
- A Maximum number of volunteers are involved in the FR project. Among them, the number of volunteers involved in FR project alone is equal to the volunteers having additional involvement in the ER project.
- The number of volunteers involved in the ER project alone is double the number of volunteers involved in all the three projects.
- 17 volunteers are involved in the TR project.
- The number of volunteers involved in the TR project alone is one less than the number of volunteers involved in ER Project alone.
- Ten volunteers involved in the TR project are also involved in at least one more project.

**87.** Based on the information given above, the minimum number of volunteers involved in both FR and TR projects, but not in the ER project is:



- (1) 1
- (2) 3
- (3) 4
- (4) 5

**Solution:**



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

∴ 8 volunteers are involved in ER alone.

∴ 4 volunteers are involved in all the three projects.

Let  $x$  people be involved in FR alone.

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

Now,  $a + b + 4 = 10$

∴  $a + b = 6$

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

∴  $2x = 16$  or  $x = 8$

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

∴  $16 + a > 17$  and  $16 + a > 16 + b$  or  $a > b$

∴  $a$  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.** Which of the following additional information would enable to find the exact number of volunteers involved in various projects?

- (1) Twenty volunteers are involved in FR.
- (2) Four volunteers are involved in all the three projects.

- (3) Twenty three volunteers are involved in exactly one project.
- (4) No need for any additional information.

**Solution:**

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.

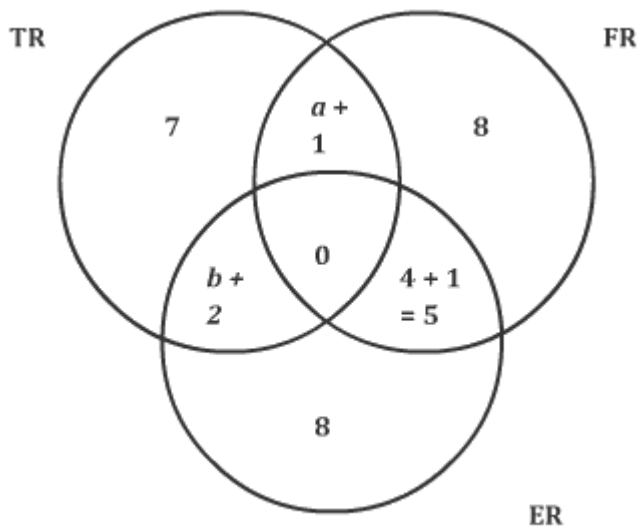
Hence, option 1.

**89.** After some time, the volunteers who were involved in all the three projects were asked to withdraw from one project. As a result, one of the volunteers opted out of the TR project, and one opted out of the ER project, while the remaining ones involved in all the three projects opted out of the FR project.

Which of the following statements, then, necessarily follows?

- (1) The lowest number of volunteers is now in TR project.
- (2) More volunteers are now in FR project as compared to ER project.
- (3) More volunteers are now in TR project as compared to ER project.
- (4) None of the above

**Solution:**



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

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

Number of volunteers working on FR =  $14 + a$

Number of volunteers working on ER =  $15 + b$

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

∴ More volunteers are now in FR than in ER  
Hence, option 2.

90. After the withdrawal of volunteers, as indicated in Question 89, some new volunteers joined the NGO. Each one of them was allotted only one project in a manner such that, the number of volunteers working in one project alone for each of the three projects became identical. At that point, it was also found that the number of volunteers involved in FR and ER projects was the same as the number of volunteers involved in TR and ER projects. Which of the projects now has the highest number of volunteers?

- (1) ER
- (2) FR
- (3) TR
- (4) Cannot be determined

**Solution:**

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

Then,  $7 + m = 8 + n$

∴  $m = n + 1$

Also,  $b + 2 = 5$

∴  $b = 3$  and  $a = 3$

Number of volunteers working on TR =  $7 + n + 1 + 4 + 5 = 17 + n$

Number of volunteers working on FR =  $17 + n$

Number of volunteers working on ER =  $18 + n$

Thus ER has the highest number of volunteers.

Hence, option 1.