

Section I

Answer the questions 1 to 5 on the basis of the information given below.

In a Class X Board examination, ten papers are distributed over five Groups – PCB, Mathematics, Social Science, Vernacular and English. Each of the ten papers is evaluated out of 100. The final score of a student is calculated in the following manner. First, the Group Scores are obtained by averaging marks in the papers within the Group. The final score is the simple average of the Group Scores. The data for the top ten students are presented below. (Dipan's score in English Paper II has been intentionally removed in the table).

	PCB Group			Mathem atics Group	Social Science Group		Vernacular Group		English Group		Final Score
Name of the student	Phy.	Chem.	Bio.		Hist.	Geo.	Paper I	Paper II	Paper I	Paper II	
Ayesha (G)	98	96	97	98	95	93	94	96	96	98	96.2
Ram (B)	97	99	95	97	95	96	94	94	96	98	96.1
Dipan (B)	98	98	98	95	96	95	96	94	96	??	96.0
Sagnik (B)	97	98	99	96	96	98	94	97	92	94	95.9
Sanjiv (B)	95	96	97	98	97	96	92	93	95	96	95.7
Shreya (G)	96	89	85	100	97	98	94	95	96	95	95.5
Joseph (B)	90	94	98	100	94	97	90	92	94	95	95.0
Agni (B)	96	99	96	99	95	96	82	93	92	93	94.3
Pritam (B)	98	98	95	98	83	95	90	93	94	94	93.9
Tirna (G)	96	98	79	99	85	94	92	91	87	96	93.7

Note: B or G against the name of a student respectively indicates whether the student is a boy or a girl.

1. How much did Dipan get in English Paper II?

- (1) 94
- (2) 96.5
- (3) 97
- (4) 98
- (5) 99

Solution:

Dipan's Group Scores are as follows:

$$\text{PCB Group} = 98 \times \left(\frac{3}{3}\right) = 98$$

$$\text{Mathematics Group} = 95$$

$$\text{Social Science Group} = \frac{96 + 95}{2} = 95.5$$

$$\text{Vernacular Group} = \frac{96 + 94}{2} = 95$$

$$\text{English Group} = \frac{96 + x}{2} = 48 + \left(\frac{x}{2}\right)$$

$$\text{Dipan's final score} = 96$$

$$\therefore \text{Sum of Dipan's Group Scores} = 96 \times 5 = 480$$

$$\therefore 98 + 95 + 95.5 + 95 + 48 + \frac{x}{2} = 480$$

$$\therefore \frac{x}{2} = 48.5$$

$$\therefore x = 97$$

Dipan scored 97 marks in English Paper II.

Hence, option 3.

2. Students who obtained Group Scores of at least 95 in every group are eligible to apply for a prize. Among those who are eligible, the student obtaining the highest Group Score in Social Science Group is awarded this prize. The prize was awarded to:
- (1) Shreya
 - (2) Ram
 - (3) Ayesha
 - (4) Dipan
 - (5) no one from the top ten

Solution:

From the table we can observe that only Dipan is eligible to apply for the prize. So Dipan gets the prize.

Hence, option 4.

3. Among the top ten students, how many boys scored at least 95 in at least one paper from each of the groups?
- (1) 1
 - (2) 2
 - (3) 3
 - (4) 4
 - (5) 5

Solution:

Dipan was the only boy to score at least 95 in at least one paper from each of the groups.

Hence, option 1.

4. Each of the ten students was allowed to improve his/her score in exactly one paper of choice with the objective of maximizing his/her final score. Everyone scored 100 in the paper in which he or she chose to improve. After that, the topper among the ten students was:

- (1) Ram
- (2) Agni
- (3) Pritam
- (4) Ayesha
- (5) Dipan

Solution:

In order to maximize scores, each student would choose to improve his/her score in the paper which would affect the group score the most.

Consider the options.

Ram chooses Vernacular Paper I or II.

His original group score in Vernacular group = 94

$$\text{His new score would change by } \frac{\frac{(94 + 100)}{2} - 94}{5} = 0.6$$

$$\text{His new score} = 96.1 + 0.6 = 96.7$$

Agni chooses Vernacular Paper I.

His original group score in Vernacular group = 87.5

$$\text{His new score would change by } \frac{\frac{(93 + 100)}{2} - 87.5}{5} = 1.8$$

$$\text{His new score} = 94.3 + 1.8 = 96.1$$

Pritam chooses History.

His original group score in Social Science group = 89

$$\text{His new score would change by } \frac{\frac{(95 + 100)}{2} - 89}{5} = 1.7$$

His new score = $93.9 + 1.7 = 95.6$

Ayesha chooses Geography.

Her original group score in Social Science group = 94

His new score would change by $\frac{\frac{(95 + 100)}{2} - 94}{5} = 0.7$

Her new score = $96.2 + 0.7 = 96.9$

Dipan chooses Mathematics.

His original group score in Mathematics group = 95

His new score would change by $\frac{100 - 95}{5} = 1$

His new score = $96 + 0.6 = 97$, which is the highest among the five options.

Hence, option 5.

5. Had Joseph, Agni, Pritam and Tirna each obtained Group Score of 100 in the Social Science Group, then their standing in decreasing order of final score would be:
- (1) Pritam, Joseph, Tirna, Agni
 - (2) Joseph, Tirna, Agni, Pritam
 - (3) Pritam, Agni, Tirna, Joseph
 - (4) Joseph, Tirna, Pritam, Agni
 - (5) Pritam, Tirna, Agni, Joseph

Solution:

Group scores of Joseph, Agni, Pritam and Tirna in Social Science Group are 95.5, 95.5, 89 and 89.5 respectively.

Their final scores are 95, 94.3, 93.9, 93.7 respectively.

If their group scores in social science change to hundred their final scores will be affected by $4.5/5$, $4.5/5$, $11/5$ and $10.5/5$ respectively.

Their new final scores would be 95.9, 95.2, 96.1 and 95.8 respectively.

Their standing in decreasing order of final score would be Pritam, Joseph, Tirna, Agni.

Hence, option 1.

Answer questions 6 to 10 on the basis of the information given below.

Mathematicians are assigned a number called Erdős number, (named after the famous mathematician, Paul Erdős). Only Paul Erdős himself has an Erdős number of zero. Any mathematician who has written a research paper with Erdős has an Erdős number of 1. For other mathematicians, the calculation of his/her Erdős number is illustrated below:

Suppose that a mathematician X has co-authored papers with several other mathematicians. From among them, mathematician Y has the smallest Erdős number. Let the Erdős number of Y be y . Then X has an Erdős number of $y + 1$. Hence any mathematician with no co-authorship chain connected to Erdős has an Erdős number of infinity.

- In a seven day long mini-conference organized in memory of Paul Erdős, a close group of eight mathematicians, call them A, B, C, D, E, F, G and H, discussed some research problems. At the beginning of the conference, A was the only participant who had an infinite Erdős number. Nobody had an Erdős number less than that of F.
 - On the third day of the conference F co-authored a paper jointly with A and C. This reduced the average Erdős number of the group of eight mathematicians to 3. The Erdős numbers of B, D, E, G and H remained unchanged with the writing of this paper. Further, no other co-authorship among any three members would have reduced the average Erdős number of the group of eight to as low as 3.
 - At the end of the third day, five members of this group had identical Erdős numbers while the other three had Erdős numbers distinct from each other.
 - On the fifth day, E co-authored a paper with F which reduced the group's average Erdős number by 0.5. The Erdős numbers of the remaining six were unchanged with the writing of this paper.
 - No other paper was written during the conference.
6. The person having the largest Erdős number at the end of the conference must have had Erdős number (at that time):
- (1) 5
 - (2) 7
 - (3) 9
 - (4) 14
 - (5) 15

Solution:

Let F and E have Erdős numbers f and e respectively, at the beginning of the conference.

On the third day, A's and C's Erdős numbers become $(f + 1)$

The sum of Erdős numbers changed to $8 \times 3 = 24$

At the end of the third day, five members had identical Erdős numbers while the other three had distinct ones.

On the fifth day, E's Erdős numbers became $f + 1$ and this reduced the group's average by 0.5. This means that E's Erdős numbers was not $f + 1$ on the third day.

Thus we have,

At the end of the third day, $5(f + 1) + f + e + y = 24$

Hence $6f + 5 + e + y = 24$

Hence $6f + e + y = 19$

At the end of the fifth day,

$6(f + 1) + f + y = 2.5 \times 8 = 20$

Hence $7f + y = 14$

Among the eight mathematicians, F has the smallest Erdős number.

Let $f = 2$

$\therefore y = 0$

However, only Paul Erdős himself has an Erdős number of 0. So f cannot be equal to 2. Any other value greater than 2, would render y as a negative number, which is also not possible.

So, $f = 1$

$\therefore y = 7$

$\therefore e = 6$

Now, we can solve all the questions.

From the above explanation, the largest Erdős number at the end of the conference would be 7.

Hence, option 2.

7. How many participants in the conference did not change their Erdős number during the conference?
- (1) 2
 - (2) 3
 - (3) 4
 - (4) 5
 - (5) Cannot be determined

Solution:

As per the explanation given in the first question, the Erdős numbers of B, D, G, H and F did not change during the conference.

Hence, option 4.

8. The Erdős number of C at the end of the conference was:

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

Solution:

As follows from the explanation given in the first question, C's Erdős number was $f + 1 = 2$ on the third day and thereafter.

Hence, option 2.

9. The Erdős number of E at the beginning of the conference was:

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

Solution:

It can be inferred from the common explanation that E's Erdős number was 6.

Hence, option 3.

10. How many participants had the same Erdős number at the beginning of the conference?

- (1) 2
- (2) 3
- (3) 4
- (4) 5
- (5) Cannot be determined

Solution:

Since 5 participants had identical Erdős numbers at the end of day three and two of these were A and C whose Erdős numbers had changed on the same day, three had the same Erdős numbers at the beginning of the conference.

Hence, option 2.

Answer questions 11 to 15 on the basis of the information given below.

Two traders, Chetan and Michael, were involved in the buying and selling of MCS shares over five trading days. At the beginning of the first day, the MCS share was priced at Rs. 100, while at the end of the fifth day it was priced at Rs. 110. At the end of each day, the MCS share price either went up by Rs. 10, or else, it came down by Rs. 10. Both Chetan and Michael took buying and selling decisions at the end of each trading day.

The beginning price of MCS share on a given day was the same as the ending price of the previous day.

Chetan and Michael started with the same number of shares and amount of cash, and had enough of both. Below are some additional facts about how Chetan and Michael traded over the five trading days.

- Each day if the price went up, Chetan sold 10 shares of MCS at the closing price. On the other hand, each day if the price went down, he bought 10 shares at the closing price.
- If on any day, the closing price was above Rs. 110, then Michael sold 10 shares of MCS, while if it was below Rs. 90, he bought 10 shares, all at the closing price.

11. If Chetan sold 10 shares of MCS on three consecutive days, while Michael sold 10 shares only once during the five days, what was the price of MCS at the end of day 3?

- (1) Rs. 90
- (2) Rs. 100
- (3) Rs. 110
- (4) Rs. 120
- (5) Rs. 130

Solution:

Let the price of the share rise on x days and fall on y days. As the price increases by Rs. 10 in the five days, we have:

$$x + y = 5 \text{ and } 10x - 10y = 10$$

Solving the above two equations simultaneously, we have

$$x = 3 \text{ and } y = 2$$

The price of the share goes up on 3 days and falls on 2 days.

The three days on which the price rises can be selected in ${}^5C_3 = 10$ ways

The following are the 10 cases:

		Day 1	Day 2	Day 3	Day 4	Day 5	Chetan		Michael	
							Cash	Shares	Cash	Shares
Case 1	Opening	100	110	120	130	120	1300	-10	3700	-30
	Closing	110	120	130	120	110				
Case 2	Opening	100	90	80	90	100	1300	-10	-800	10
	Closing	90	80	90	100	110				
Case 3	Opening	100	90	100	110	120	1300	-10	1200	-10
	Closing	90	100	110	120	110				
Case 4	Opening	100	110	100	110	100	1300	-10	0	0
	Closing	110	100	110	100	110				
Case 5	Opening	100	110	120	110	120	1300	-10	2400	-20
	Closing	110	120	110	120	110				
Case 6	Opening	100	110	120	110	100	1300	-10	1200	-10
	Closing	110	120	110	100	110				
Case 7	Opening	100	90	100	110	100	1300	-10	0	0
	Closing	90	100	110	100	110				
Case 8	Opening	100	110	100	110	120	1300	-10	1200	-10
	Closing	110	100	110	120	110				
Case 9	Opening	100	90	100	90	100	1300	-10	0	0
	Closing	90	100	90	100	110				
Case 10	Opening	100	110	100	90	100	1300	-10	0	0
	Closing	110	100	90	100	110				

Consider Case 5

Chetan sells on Days 1, 2 and 4 and buys on days 3 and 5.

Change in the number of shares he has = $-30 + 20 = -10$

Change in his cash = $10 \times (110 + 120 + 120) - 10 \times (110 + 110) = \text{Rs. } 1300$

Michael sells on days 2 and 4, but never buys as the share price does not go below Rs. 90.

Change in the number of shares he has = -20

Change in his cash = $10 \times (120 + 120) = \text{Rs. } 2400$

The other cases are evaluated in a similar manner and the data is tabulated as shown above.

Chetan sold on three consecutive days \Rightarrow Cases 1, 2 and 3.

Michael sold only once \Rightarrow Case 3.

∴ The price of the share at the end of day 3 = Rs. 110
Hence, option 3.

- 12.** If Michael ended up with Rs. 100 less cash than Chetan at the end of day 5, what was the difference in the number of shares possessed by Michael and Chetan (at the end of day 5)?
- (1) Michael had 10 less shares than Chetan.
 - (2) Michael had 10 more shares than Chetan.
 - (3) Chetan had 10 more shares than Michael.
 - (4) Chetan had 20 more shares than Michael.
 - (5) Both had the same number of shares.

Solution:

Referring to the formulated table of the first question, Michael ends up with Rs. 100 less cash than Chetan in cases 3, 6 and 8. In each of these cases, both of them hold the same number of shares at the end of day 5.
Hence, option 5.

- 13.** If Chetan ended up with Rs. 1300 more cash than Michael at the end of day 5, what was the price of MCS share at the end of day 4?
- (1) Rs. 90
 - (2) Rs. 100
 - (3) Rs. 110
 - (4) Rs. 120
 - (5) Not uniquely determinable

Solution:

This information corresponds to cases 4, 7, 9 and 10 from the solution table. The price at the end of day 4 in each of these cases is Rs. 100.
Hence, option 2.

- 14.** What could have been the maximum possible increase in combined cash balance of Chetan and Michael at the end of the fifth day?
- (1) Rs. 3700
 - (2) Rs. 4000
 - (3) Rs. 4700
 - (4) Rs. 5000
 - (5) Rs. 6000

Solution:

The maximum increase in combined cash balance of Chetan and Michael = $1300 + 3700 = \text{Rs. } 5000$ (case 1 from the table)

Hence, option 4.

15. If Michael ended up with 20 more shares than Chetan at the end of day 5, what was the price of the share at the end of day 3?

- (1) Rs. 90
- (2) Rs. 100
- (3) Rs. 110
- (4) Rs. 120
- (5) Rs. 130

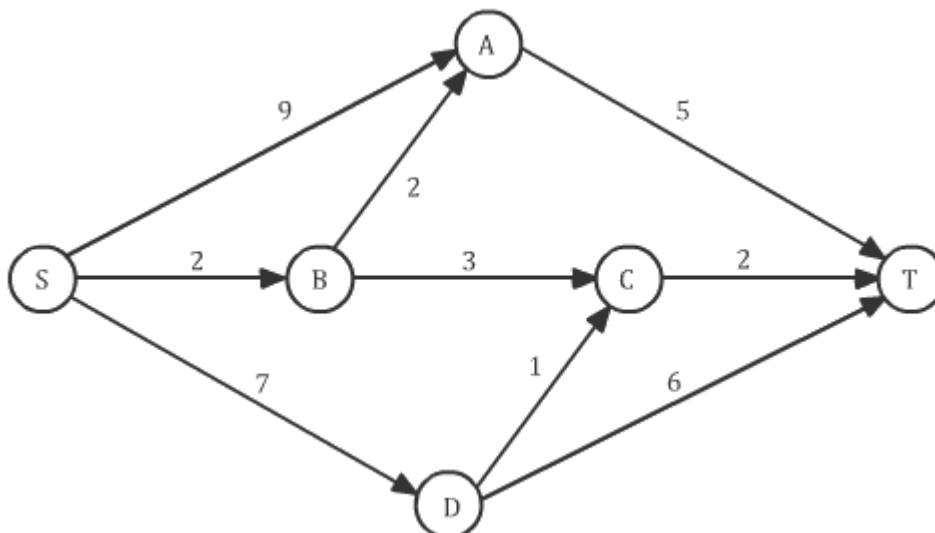
Solution:

This information corresponds to case 2 from the table. The price at the end of day 3 was Rs. 90.

Hence, option 1.

Answer questions 16 to 20 on the basis of the information given below.

A significant amount of traffic flows from point S to point T in the one-way street network shown below. Points A, B, C, and D are junctions in the network, and the arrows mark the direction of traffic flow. The fuel cost in rupees for travelling along a street is indicated by the number adjacent to the arrow representing the street.



Motorists travelling from point S to point T would obviously take the route for which the total cost of travelling is the minimum. If two or more routes have the same least travel cost, then motorists are indifferent between them. Hence, the traffic gets evenly distributed among all the least cost routes.

The government can control the flow of traffic only by levying appropriate toll at each junction. For example, if a motorist takes the route S-A-T (using junction A alone), then the total cost of travel would be Rs. 14 (i.e. Rs. 9 + Rs. 5) plus the toll charged at junction A.

16. If the government wants to ensure that all motorists travelling from S to T pay the same amount (fuel costs and toll combined) regardless of the route they choose and the street from B to C is under repairs (and hence unusable), then a feasible set of toll charged (in rupees) at junctions A, B, C, and D respectively to achieve this goal is:

- (1) 2, 5, 3, 2
- (2) 0, 5, 3, 1
- (3) 1, 5, 3, 2
- (4) 2, 3, 5, 1
- (5) 1, 3, 5, 1

Solution:

Let the toll charged at junctions A, B, C and D be a , b , c and d respectively.

Since the cost of travel including toll on routes S-A-T, S-D-T, S-B-A-T and S-D-C-T is the same.

$$\therefore 14 + a = 13 + d = 9 + a + b = 10 + c + d$$

$$\text{Thus, } b = 5, d - a = 1, c = 3$$

If $a = 0$, $d = 1$, If $a = 1$, $d = 2$ and if $a = 2$, $d = 3$

Hence, both options 2 and 3 satisfy the given criteria.

Note: The question makers took care of this inconsistency while calculating scores.

17. If the government wants to ensure that no traffic flows on the street from D to T, while equal amount of traffic flows through junctions A and C, then a feasible set of toll charged (in rupees) at junctions A, B, C, and D respectively to achieve this goal is:

- (1) 1, 5, 3, 3
- (2) 1, 4, 4, 3
- (3) 1, 5, 4, 2
- (4) 0, 5, 2, 3
- (5) 0, 5, 2, 2

Solution:

Since the cost of travel including toll on routes S-A-T, S-B-C-T, S-B-A-T and S-D-C-T is the same.

$$\therefore 14 + a = 7 + b + c = 9 + a + b = 10 + c + d$$

$$\therefore b = 5, d = 2, c - a = 2$$

Only option 5 satisfies these criteria.
Hence, option 5.

18. If the government wants to ensure that all routes from S to T get the same amount of traffic, then a feasible set of toll charged (in rupees) at junctions A, B, C, and D respectively to achieve this goal is:

- (1) 0, 5, 2, 2
- (2) 0, 5, 4, 1
- (3) 1, 5, 3, 3
- (4) 1, 5, 3, 2
- (5) 1, 5, 4, 2

Solution:

Since the cost of travel including toll on all routes is the same.

$$\therefore 14 + a = 7 + b + c = 13 + d = 9 + a + b = 10 + c + d$$

$$\therefore b = 5, d = 2, c = 3 \text{ and } a = 1$$

Hence, option 4.

19. If the government wants to ensure that the traffic at S gets evenly distributed along streets from S to A, from S to B, and from S to D, then a feasible set of toll charged (in rupees) at junctions A, B, C, and D respectively to achieve this goal is:

- (1) 0, 5, 4, 1
- (2) 0, 5, 2, 2
- (3) 1, 5, 3, 3
- (4) 1, 5, 3, 2
- (5) 0, 4, 3, 2

Solution:

If we make the cost of travelling on all the routes equal, traffic along S-B will be twice that along S-A.

But we want traffic along S-A, S-B and S-D to be the same.

As routes lead to C from both B and D, we can increase the toll at C so that the cost of travelling along S-B-C-T and S-D-C-T is more than that along the other three routes.

$$\text{Now, } 14 + a = 9 + b = 13 + d$$

$$\therefore a = 0, b = 5 \text{ and } d = 1$$

$$\text{Also, } 7 + b + c > 14 \text{ and } 10 + d + c > 14$$

$$\therefore c > 3$$

Hence, option 1.

20. The government wants to devise a toll policy such that the total cost to the commuters per trip is minimized. The policy should also ensure that not more than 70 per cent of the total traffic passes through junction B. The cost incurred by the commuter travelling from point S to point T under this policy will be:

- (1) Rs. 7
- (2) Rs. 9
- (3) Rs. 10
- (4) Rs. 13
- (5) Rs. 14

Solution:

If toll charges at all junctions are made 0, 100% traffic will pass through S-B-C-T. This is not possible.

If toll charges at A and B are made 0, then 100% traffic will pass through S-B-A-T. This is also not possible.

If toll charges at C and D are made 0, that at B are made Rs.3, then the traffic will get equally divided between S-D-C-T and S-B-C-T.

Thus, the cost incurred will be Rs. 10.

Hence, option 3.

Answer questions 21 to 25 on the basis of the information given below.

K, L, M, N, P, Q, R, S, U and W are the only ten members in a department. There is a proposal to form a team from within the members of the department, subject to the following conditions:

- A team must include exactly one among P, R, and S.
- A team must include either M or Q, but not both.
- If a team includes K, then it must also include L, and vice versa.
- If a team includes one among S, U, and W, then it must also include the other two.
- L and N cannot be members of the same team.
- L and U cannot be members of the same team.
- The size of a team is defined as the number of members in the team.

21. What could be the size of a team that includes K?

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

Solution:

As K is included, L is included. So, N and U cannot be included. As U is not included, S and W are not included. One out of M and Q and one out of P and R will be included. Thus, the team will include: K, L, (M or Q) and (P or R). Hence, option 5.

22. In how many ways a team can be constituted so that the team includes N?

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

Solution:

If the team includes N, it does not include L and K. One out of M and Q can be included and one out of P, S and R can be included. If S is a member, so are U and W. Thus the possible teams are:

- 1. N, M, P
- 2. N, M, R
- 3. N, Q, P
- 4. N, Q, R
- 5. N, M, S, U, W
- 6. N, Q, S, U, W

Hence, option 5.

23. What would be the size of the largest possible team?

- (1) 8
- (2) 7
- (3) 6
- (4) 5
- (5) Cannot be determined

Solution:

If S is not included, the team can have P or R, M or Q, K and L. If S is included, the team will have S, U, W, M or Q, N. This is the largest possible team. Hence, option 4.

24. Who can be a member of a team of size 5?

- (1) K
- (2) L
- (3) M
- (4) P
- (5) R

Solution:

If K or L are included, N, U, S and W are excluded. One out of P and R and one out of M and Q are included. Thus the team has only 4 members.

If P or R are included, the team can have M or Q, K and L. This team also has 4 members.

A team having M can have S, U, W and N i.e., 5 members.

Hence, option 3.

25. Who cannot be a member of a team of size 3?

- (1) L
- (2) M
- (3) N
- (4) P
- (5) Q

Solution:

A team sized 3 has to have M or Q and P or R. The only other member that can be selected all alone is N.

L cannot be selected as K has to be selected with him.

Hence, option 1.

Section II

Directions for Questions 26 to 30: Each of the questions below has a set of sequentially ordered statements. Each statement can be classified as one of the following:

- A. Facts, which deal with the pieces of information that one has heard, seen or read, and which are open to discovery or verification (the answer option indicates such a statement with an 'F')
- B. Inferences, which are conclusions drawn about the unknown, on the basis of the known (the answer option indicates such a statement with an 'I')
- C. Judgements, which are opinions that imply approval or disapproval of persons, objects, situations and occurrences in the past, the present or the future (the answer option indicates such a statement with a 'J')

Select the answer option that best describes the set of statements.

26.

1. So much of our day-to-day focus seems to be on getting things done, trudging our way through the tasks of living - it can feel like a treadmill that gets you nowhere; where is the childlike joy?
 2. We are not doing the things that make us happy; that which brings us joy; the things that we cannot wait to do because we enjoy them so much.
 3. This is the stuff that joyful living is made of - identifying your calling and committing yourself wholeheartedly to it.
 4. When this happens, each moment becomes a celebration of you; there is a rush of energy that comes with feeling completely immersed in doing what you love most.
- (1) IIIJ
 - (2) IFIJ
 - (3) JFJJ
 - (4) JJJJ
 - (5) JFII

Solution:

Statement 1 states, "It can feel like a treadmill that gets you nowhere". This can neither be experienced nor verified as it is a personal viewpoint, hence a judgement. Statement 2 is a personal viewpoint not necessarily agreed to by many. It is a judgement.

Statement 3 is an opinion, neither verifiable nor directly experienced. It is a judgement.

Statement 4 is someone's personal assessment of his own experience. It is also a judgement.

Hence, option 4.

27.

1. Given the poor quality of service in the public sector, the HIV/AIDS affected should be switching to private initiatives that supply anti-retroviral drugs (ARVs) at a low cost.
 2. The government has been supplying free drugs since 2004, and 35000 have benefited up to now - though the size of the affected population is 150 times this number.
 3. The recent initiatives of networks and companies like AIDSCare Network, Emcure, Reliance-Cipla-CII, would lead to availability of much-needed drugs to a larger number of affected people.
 4. But how ironic it is that we should face a perennial shortage of drugs when India is one of the world's largest suppliers of generic drugs to the developing world.
- (1) JFIJ
 - (2) JIIJ
 - (3) IFIJ
 - (4) IFFJ
 - (5) JFII

Solution:

The given options require you to evaluate statement 1 as either a Judgement or an Inference. 'Given the *poor quality* of services in the public sector ... ' is more of a judgement than an inference. Based on this the conclusion "should be switching...." establishes statement 1 as a judgement. This eliminates option 3 and 4.

The numbers in statement 2 are a result of direct verification. Hence it is easy to see that statement 2 is a fact. This eliminates option 2.

Evaluating options 1 and 5, both of which say statement 4 is an inference, one has to now establish whether statement 5 is an inference or a judgement (as per the options 1 and 5).

"... how ironic it is.." is neither verified nor verifiable through facts. Statement 4 is a judgement.

Hence, option 1.

28.

1. According to all statistical indications, the Sarva Shiksha Abhiyan has managed to keep pace with its ambitious goals.
2. The Mid-day Meal Scheme has been a significant incentive for the poor to send their little ones to school, thus establishing the vital link between healthy bodies and healthy minds.

3. Only about 13 million children in the age group of 6 to 14 years are out of school.
 4. The goal of universalisation of elementary education has to be a pre-requisite for the evolution and development of our country.
- (1) IIFJ
 - (2) IIJ
 - (3) IJFJ
 - (4) IJFI
 - (5) JIFI

Solution:

Statement 1 is an inference. "According to statistical indications" tells us that what follows is based on statistics, hence an inference. This eliminates options 2 and 5.

In statement 2 (to be evaluated as Judgement or Inference), though 'significant incentive' may be inferred by checking with available data, 'the vital link between healthy bodies and healthy minds' cannot be investigated for data – medical or otherwise. Hence, it is a judgement.

Options 3 and 4 remain. The options state that sentence 3 is Fact.

Sentence 4 needs to be evaluated as either an Inference or a Judgement. "... has to be a prerequisite for the evolution...." cannot be verified from facts making sentence 4 a Judgement.

Hence, option 3.

29.

1. We should not be hopelessly addicted to an erroneous belief that corruption in India is caused by the crookedness of Indians.
 2. The truth is that we have more red tape - we take eighty-nine days to start a small business, Australians take two.
 3. Red tape leads to corruption and distorts a people's character.
 4. Every red tape procedure is a point of contact with an official, and such contacts have the potential to become opportunities for money to change hands.
- (1) JFIF
 - (2) JFJJ
 - (3) JIJF
 - (4) IFJF
 - (5) JFI

Solution:

Several things make statement 1 a judgement – 'should not be', 'hopelessly addicted', 'erroneous belief', and 'crookedness of Indians'; none of them are facts, nor verifiable inferences.

Statement 2 is a combination of inference and facts. 'we have more red tape' is an inference, but 'we take 89 days etc..' is a fact. Since the thrust of the statement is based on the facts it has to be classified as a fact.

Therefore options 3 and 4 are eliminated.

Options 1, 2 and 5 remain. Statement 3 is clearly a judgement or an opinion and is classified in both options 2 and 5 as a Judgement. Eliminate option 1.

Statement 4 is to be evaluated a Judgement or an Inference. The first part of sentence 4 is a fact. In the second part, 'potential' is inferred based on facts/experiences. Hence it is an inference. This eliminates option 2.

Hence, the correct answer is option 5.

30.

1. Inequitable distribution of all kinds of resources is certainly one of the strongest and most sinister sources of conflict.
2. Even without war, we know that conflicts continue to trouble us - they only change in character.
3. Extensive disarmament is the only insurance for our future; imagine the amount of resources that can be released and redeployed.
4. The economies of the industrialized western world derive 20% of their income from the sale of all kinds of arms.

- (1) IJJI
- (2) IJIF
- (3) IJIF
- (4) JIIF
- (5) IJIF

Solution:

The first sentence is to be evaluated as a Judgement or an Inference. 'Most sinister' is neither verified nor verifiable. It is clearly an opinion, making it a Judgement. This eliminates options 1, 3 and 5.

Evaluating options 2 and 4, one has to decide whether statement 3 is an Inference or a Judgement. 'Only insurance' is neither a verified fact nor a verifiable inference.

Hence it is a judgement, which eliminates option 4.

Hence, option 2.

Directions for Questions 31 to 35: 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.

31. I am sometimes attacked for imposing 'rules'. Nothing could be further from the truth. I hate rules. All I do is report on how consumers react to different stimuli. I may say to a copywriter, "Research shows that commercials with celebrities are below average in persuading people to buy products. Are you sure you want to use a celebrity?" Call that a rule? Or I may say to an art director, "Research suggests that if you set the copy in black type on a white background, more people will read it than if you set it in white type on a black background."

- (1) Guidance based on applied research can hardly qualify as 'rules'.
- (2) Thus, all my so called 'rules' are rooted in applied research.
- (3) A suggestion perhaps, but scarcely a rule.
- (4) Such principles are unavoidable if one wants to be systematic about consumer behaviour.
- (5) Fundamentally it is about consumer behaviour - not about celebrities or type settings.

Solution:

It is not a difficult choice, when one understands that the concluding sentence of a paragraph should fulfill the purpose for which the paragraph is written, leaving no loose ends that may require further clarification. The first three sentences of the paragraph establish this purpose. Then the writer provides certain example situations.

Option 3 concludes the paragraph smoothly – the writer tells us what his 'alleged' rules are. In consistence with the conversational tone of the paragraph, the writer does not assert even his explanation with undue vigor in the last sentence.

Option 1 is contrary to the purpose of the paragraph because 'guidance based on applied research' makes his actions more binding on others than are rules.

Options 2 and 4 are also eliminated for the same reason.

Option 5 talks about one of the examples and not related to the purpose of the paragraph.

Hence, option 3.

32. Relations between the factory and the dealer are distant and usually strained as the factory tries to force cars on the dealers to smooth out production. Relations between the dealer and the customer are equally strained because dealers continuously adjust prices - make deals - to adjust demand with supply while maximizing profits. This becomes a system marked by a lack of long-term

commitment on either side, which maximize feelings of mistrust. In order to maximize their bargaining positions, everyone holds back information - the dealer about the product and the consumer about his true desires.

- (1) As a result, 'deal making' becomes rampant, without concern for customer satisfaction.
- (2) As a result, inefficiencies creep into the supply chain.
- (3) As a result, everyone treats the other as an adversary, rather than as an ally.
- (4) As a result, fundamental innovations are becoming scarce in the automobile industry.
- (5) As a result, everyone loses in the long run.

Solution:

All options begin with "as a result". One has the freedom to ignore this or to work intensely on this phrase. 'As a result' indicates that one needs to discover the immediate consequence of the details given in the paragraph.

Option 4 is the first to get eliminated as it is not a consequence at all.

Options 1 and 2 are not consequences but what may currently exist in the industry; as explained in the paragraph.

Option 3 brings in 'adversary' and 'ally'. This is hardly sustained by the data in the paragraph, unless one justifies them. If one justifies them, the option gets eliminated, because again, it is not a consequence, but what exists there.

The direct consequence is stated briefly in option 5 bringing the paragraph to a smooth closure as no further clarification is required. "As a result" has to be worked upon and not ignored.

Hence, option 5.

33. In the evolving world order, the comparative advantage of the United States lies in its military force. Diplomacy and international law have always been regarded as annoying encumbrances, unless they can be used to advantage against an enemy. Every active player in world affairs professes to seek only peace and to prefer negotiation to violence and coercion.

- (1) However, diplomacy has often been used as a mask by nations which intended to use force.
- (2) However, when the veil is lifted, we commonly see that diplomacy is understood as a disguise for the rule of force.
- (3) However, history has shown that many of these nations do not practice what they profess.
- (4) However, history tells us that peace is professed by those who intend to use violence.
- (5) However, when unmasked, such nations reveal a penchant for the use of force.

Solution:

The word 'professes' towards the end is significant. 'However' is constant in the options. One needs to pick out the best contrast.

Options 3 and 4 get easily eliminated as they contain 'history', which will require a lot of explanation in the context. The last sentence will not contain any new ideas requiring further clarification.

Option 5 is eliminated because of 'penchant' – the paragraph does not make such assertions.

For the same reason, the 'intention' in option 1 gets it eliminated.

The word 'professes' in the paragraph directly leads to the 'veil' and 'understood' in option 2.

Hence, option 2.

34. Age has a curvilinear relationship with the exploitation of opportunity. Initially, age will increase the likelihood that a person will exploit an entrepreneurial opportunity because people gather much of the knowledge necessary to exploit opportunities over the course of their lives, and because age provides credibility in transmitting that information to others. However, as people become older, their willingness to bear risks declines, their opportunity costs rise, and they become less receptive to new information.

- (1) As a result, people transmit more information rather than experiment with new ideas as they reach an advanced age.
- (2) As a result, people are reluctant to experiment with new ideas as they reach an advanced age.
- (3) As a result, only people with lower opportunity costs exploit opportunity when they reach an advanced age.
- (4) As a result, people become reluctant to exploit entrepreneurial opportunities when they reach an advanced age.
- (5) As a result, people depend on credibility rather than on novelty as they reach an advanced age.

Solution:

'As a result' is a constant in the options. One needs to identify the direct consequence of what is stated in the paragraph. Also establish the purpose of the paragraph by looking at the first and the last sentences given to you. ('Age has ...' and 'however, as people become older...').

Options 3 and 5 get eliminated most easily. Neither of these options is a consequence of the curvilinear relationship between age and exploitation of opportunity.

The reluctance to “experiment with new ideas” (options 1 and 2) does not necessarily translate into the ‘entrepreneurial opportunity’ given in the paragraph. Option 4 includes all this and is specific to the ideas presented in the paragraph and is a direct consequence.

Hence, option 4.

35. We can usefully think of theoretical models as maps, which help us navigate unfamiliar territory. The most accurate map that it is possible to construct would be of no practical use whatsoever, for it would be an exact replica, on exactly the same scale, of the place where we were. Good maps pull out the most important features and throw away a huge amount of much less valuable information. Of course, maps can be bad as well as good - witness the attempts by medieval Europe to produce a map of the world. In the same way, a bad theory, no matter how impressive it may seem in principle, does little or nothing to help us understand a problem.

- (1) But good theories, just like good maps, are invaluable, even if they are simplified.
- (2) But good theories, just like good maps, will never represent unfamiliar concepts in detail.
- (3) But good theories, just like good maps, need to balance detail and feasibility of representation.
- (4) But good theories, just like good maps, are accurate only at a certain level of abstraction.
- (5) But good theories, just like good maps, are useful in the hands of a user who knows their limitations.

Solution:

'We can usefully think of theoretical models as maps.' The first sentence has established the purpose of the paragraph which is to understand the usefulness of theoretical models using the comparison of maps. This purpose is fulfilled in option 1 that they are invaluable.

That theoretical models ‘will never represent’ (option 2), ‘need to balance’ (option 3), ‘are accurate only’ (option 4) do not fulfill this purpose.

Option 5 is a generalization that the paragraph does not support.

Hence, option 1.

Directions for Questions 36 to 40: The passage given below is followed by a set of questions. Choose the most appropriate answer to each question.

Fifteen years after communism was officially pronounced dead, its spectre seems once again to be haunting Europe. Last month, the Council of Europe's parliamentary assembly voted to condemn the crimes of totalitarian communist regimes," linking them with Nazism and complaining that communist parties are still legal and active in some countries."Now Goran Lindblad, the conservative Swedish MP behind the resolution, wants to go further. Demands that European Ministers launch a continent-wide anti-communist campaign - including school textbook revisions, official memorial days, and museums - only narrowly missed the necessary two-thirds majority. Mr. Lindblad pledged to bring the wider plans back to the Council of Europe in the coming months.

He has chosen a good year for his ideological offensive: this is the 50th anniversary of Nikita Khrushchev's denunciation of Josef Stalin and the subsequent Hungarian uprising, which will doubtless be the cue for further excoriation of the communist record. Paradoxically, given that there is no communist government left in Europe outside Moldova, the attacks have if anything, become more extreme as time has gone on. A clue as to why that might be can be found in the rambling report by Mr. Lindblad that led to the Council of Europe declaration. Blaming class struggle and public ownership, he explained different elements of communist ideology such as equality or social justice still seduce many" and a sort of nostalgia for communism is still alive." Perhaps the real problem for Mr. Lindblad and his right-wing allies in Eastern Europe is that communism is not dead enough - and they will only be content when they have driven a stake through its heart.

The fashionable attempt to equate communism and Nazism is in reality a moral and historical nonsense. Despite the cruelties of the Stalin terror, there was no Soviet Treblinka or Sobibor, no extermination camps built to murder millions. Nor did the Soviet Union launch the most devastating war in history at a cost of more than 50 million lives - in fact it played the decisive role in the defeat of the German war machine. Mr. Lindblad and the Council of Europe adopt as fact the wildest estimates of those killed by communist regimes (mostly in famines) from the fiercely contested Black Book of Communism, which also underplays the number of deaths attributable to Hitler. But, in any case, none of this explains why anyone might be nostalgic in former communist states, now enjoying the delights of capitalist restoration. The dominant account gives no sense of how communist regimes renewed themselves after 1956 or why Western leaders feared they might overtake the capitalist world well into the 1960s. For all its brutalities and failures, communism in the Soviet Union, Eastern Europe, and elsewhere delivered rapid industrialization, mass education, job security, and huge advances in social and gender

equality. Its existence helped to drive up welfare standards in the West, and provided a powerful counterweight to Western global domination.

It would be easier to take the Council of Europe's condemnation of communist state crimes seriously if it had also seen fit to denounce the far bloodier record of European colonialism - which only finally came to an end in the 1970s. This was a system of racist despotism, which dominated the globe in Stalin's time. And while there is precious little connection between the ideas of fascism and communism, there is an intimate link between colonialism and Nazism. The terms *lebensraum* and *konzentrationslager* were both first used by the German colonial regime in south-west Africa (now Namibia), which committed genocide against the Herero and Nama peoples and bequeathed its ideas and personnel directly to the Nazi party.

Around 10 million Congolese died as a result of Belgian forced labour and mass murder in the early twentieth century; tens of millions perished in avoidable or enforced famines in British-ruled India; up to a million Algerians died in their war for independence, while controversy now rages in France about a new law requiring teachers to put a positive spin on colonial history. Comparable atrocities were carried out by all European colonialists, but not a word of condemnation from the Council of Europe. Presumably, European lives count for more.

No major twentieth century political tradition is without blood on its hands, but battles over history are more about the future than the past. Part of the current enthusiasm in official Western circles for dancing on the grave of communism is no doubt about relations with today's Russia and China. But it also reflects a determination to prove there is no alternative to the new global capitalist order - and that any attempt to find one is bound to lead to suffering. With the new imperialism now being resisted in the Muslim world and Latin America, growing international demands for social justice and ever greater doubts about whether the environmental crisis can be solved within the existing economic system, the pressure for alternatives will increase.

36. Among all the apprehensions that Mr. Goran Lindblad expresses against communism, which one gets admitted, although indirectly, by the author?

- (1) There is nostalgia for communist ideology even if communism has been abandoned by most European nations.
- (2) Notions of social justice inherent in communist ideology appeal to critics of existing systems.
- (3) Communist regimes were totalitarian and marked by brutalities and large scale violence.

- (4) The existing economic order is wrongly viewed as imperialistic by proponents of communism.
- (5) Communist ideology is faulted because communist regimes resulted in economic failures.

Solution:

It is stated in the passage: “*Despite the cruelties of the Stalin terror*, there was no Soviet Treblinka or Sobibor, no extermination camps built to murder millions.” Later on, “*For all its brutalities and failures*, communism in the Soviet union, ...”

There is no evidence to support the other options.

Hence, option 3.

37. What, according to the author, is the real reason for a renewed attack against communism?

- (1) Disguising the unintended consequences of the current economic order such as social injustice and environmental crisis.
- (2) Idealising the existing ideology of global capitalism.
- (3) Making communism a generic representative of all historical atrocities, especially those perpetrated by the European imperialists.
- (4) Communism still survives, in bits and pieces, in the minds and hearts of people.
- (5) Renewal of some communist regimes has led to the apprehension that communist nations might overtake the capitalists.

Solution:

From the last paragraph: “Part of the current enthusiasm in official western circles for *dancing on the grave of communism* is no doubt about relations with today’s Russia and China. But it also reflects a *determination to prove there is no alternative to the new global capitalist order* – and that any attempt to find one is bound to lead to suffering.”

From the second paragraph: “Blaming class struggle and public ownership, and they will only be content when they have driven a stake through its heart.” This part of the passage also gives certain reasons which will answer the above question. Based on these two parts of the passage, the options to be evaluated are option 2 and option 4. Option 4 gets eliminated because the question asks the ‘real’ reason. If communism did not pose a threat to capitalism, there is no need to destroy it completely. Mere survival of something cannot be sufficient reason to destroy it, unless it is a threat to something else. As a result option 2 becomes the *real* reason and not option 4.

Hence, option 2.

38. The author cites examples of atrocities perpetrated by European colonial regimes in order to

- (1) compare the atrocities committed by colonial regimes with those of communist regimes.
- (2) prove that the atrocities committed by colonial regimes were more than those of communist regimes.
- (3) prove that, ideologically, communism was much better than colonialism and Nazism.
- (4) neutralise the arguments of Mr. Lindblad and to point out that the atrocities committed by colonial regimes were more than those of communist regimes.
- (5) neutralise the arguments of Mr. Lindblad and to argue that one needs to go beyond and look at the motives of these regimes.

Solution:

The reason why the writer cites examples of colonial atrocities has to be inferred from the passage. The writer's apparently pro-communism stand is attributable to his comparison of communism, colonialism, and Nazism. Comparing these three the writer argues that communism is the least evil of the three. The writer compares Colonialism to Nazism because the Council of Europe (Mr. Lindblad) and the 'anti-communists' compare communism to Nazism. The writer argues that colonialism is closer to Nazism than is communism because of the motives of each. The writer terms colonialism and Nazism as 'racist despotism' whereas communism had helped a large number of people. He states: "It would be easier to take the Council of Europe's condemnation of communist state crimes seriously if it had also seen fit to denounce the far bloodier record of European colonialism ...". The atrocities attributed to colonialism neutralizes the arguments of Lindblad against communism, and calls for an objective evaluation of communism, colonialism, and Nazism as mentioned in option 5.

The other options may appear close when the comprehension of the passage is not adequate. One may mistakenly choose option 4 in this case. However, option 4 though correct in the light of the passage is not the writer's purpose in citing the example.

Hence, option 5.

39. Why, according to the author, is Nazism closer to colonialism than it is to communism?

- (1) Both colonialism and Nazism were examples of tyranny of one race over another.
- (2) The genocides committed by the colonial and the Nazi regimes were of similar magnitude.
- (3) Several ideas of the Nazi regime were directly imported from colonial regimes.
- (4) Both colonialism and Nazism are based on the principles of imperialism.
- (5) While communism was never limited to Europe, both the Nazis and the colonialists originated in Europe.

Solution:

The writer, in the passage, establishes greater similarity between colonialism and Nazism than communism and Nazism because “the fashionable attempt (by Lidblad) to equate communism and Nazism is in reality a moral and historical nonsense.” If communism has less to do with Nazism the question actually is what makes colonialism closer to Nazism?

Option 3 may be chosen mistakenly if one is trying to find one of the intimate links between Nazism and colonialism without any reference to communism. Also, note that the options states “imported from colonial regimes”, whereas the text below shows that it was the *German* colonial regime.

From the fourth and fifth paragraphs of the passage: “The terms lebensraum and konzentrationslager were both first used by the German colonial regime in south-west Africa (now Namibia), which committed *genocide against the Herero and Nama* peoples and *bequeathed its ideas* and personnel directly to the Nazi party.

Around *10 million Congolese* died as a result of Belgian forced labour and mass murder in the early twentieth century; tens of millions perished in avoidable or enforced famines in British-ruled India; *up to a million Algerians* died in their war for independence, while controversy now rages in France about a new law requiring teachers to put a positive spin on colonial history.”

Option 1 answers the question by covering the gist of the two paragraphs that are relevant to the question: that both are examples of tyranny or ‘racist despotism’.

The other options are not supported by the passage.

Hence, option 1.

40. Which of the following cannot be inferred as a compelling reason for the silence of the Council of Europe on colonial atrocities?

- (1) The Council of Europe being dominated by erstwhile colonialists.

- (2) Generating support for condemning communist ideology.
- (3) Unwillingness to antagonize allies by raking up an embarrassing past.
- (4) Greater value seemingly placed on European lives.
- (5) Portraying both communism and Nazism as ideologies to be condemned.

Solution:

All options are compelling reasons for the silence of the Council of Europe about colonial atrocities, whereas option 4 is the compelling reason for its (council of Europe's) condemnation of communism.

Hence, option 4

Directions for Questions 41 to 45: The passage given below is followed by a set of five questions. Choose the most appropriate answer to each question.

My aim is to present a conception of justice which generalizes and carries to a higher level of abstraction the familiar theory of the social contract. In order to do this we are not to think of the original contract as one to enter a particular society or to set up a particular form of government. Rather, the idea is that the principles of justice for the basic structure of society are the object of the original agreement. They are the principles that free and rational persons concerned to further their own interests would accept in an initial position of equality. These principles are to regulate all further agreements; they specify the kinds of social cooperation that can be entered into and the forms of government that can be established. This way of regarding the principles of justice, I shall call justice as fairness. Thus, we are to imagine that those who engage in social cooperation choose together, in one joint act, the principles which are to assign basic rights and duties and to determine the division of social benefits. Just as each person must decide by rational reflection what constitutes his good, that is, the system of ends which it is rational for him to pursue, so a group of persons must decide once and for all what is to count among them as just and unjust. The choice which rational men would make in this hypothetical situation of equal liberty determines the principles of justice.

In 'justice as fairness', the original position is not an actual historical state of affairs. It is understood as a purely hypothetical situation characterized so as to lead to a certain conception of justice. Among the essential features of this situation is that no one knows his place in society, his class position or social status, nor does anyone know his fortune in the distribution of natural assets and abilities, his intelligence, strength, and the like. I shall even assume that the parties do not know their conceptions of the good or their special psychological propensities. The principles of justice are chosen behind a veil of ignorance. This ensures that no one is advantaged or disadvantaged in the choice of principles by the outcome of natural chance or the contingency of social circumstances. Since all are

similarly situated and no one is able to design principles to favor his particular condition, the principles of justice are the result of a fair agreement or bargain.

Justice as fairness begins with one of the most general of all choices which persons might make together, namely, with the choice of the first principles of a conception of justice which is to regulate all subsequent criticism and reform of institutions. Then, having chosen a conception of justice, we can suppose that they are to choose a constitution and a legislature to enact laws, and so on, all in accordance with the principles of justice initially agreed upon. Our social situation is just if it is such that by this sequence of hypothetical agreements we would have contracted into the general system of rules which defines it. Moreover, assuming that the original position does determine a set of principles, it will then be true that whenever social institutions satisfy these principles, those engaged in them can say to one another that they are cooperating on terms to which they would agree if they were free and equal persons whose relation with respect to one another were fair. They could all view their arrangements as meeting the stipulations which they would acknowledge in an initial situation that embodies widely accepted and reasonable constraints on the choice of principles. The general recognition of this fact would provide the basis for a public acceptance of the corresponding principles of justice. No society can, of course, be a scheme of cooperation which men enter voluntarily in a literal sense; each person finds himself placed at birth in some particular position in some particular society, and the nature of this position materially affects his life prospects. Yet a society satisfying the principles of justice as fairness comes as close as a society can to being a voluntary scheme, for it meets the principles which free and equal persons would assent to under circumstances that are fair.

41. A just society, as conceptualized in the passage, can be best described as:

- (1) A Utopia in which everyone is equal and no one enjoys any privilege based on their existing positions and powers.
- (2) A hypothetical society in which people agree upon principles of justice which are fair.
- (3) A society in which principles of justice are not based on the existing positions and powers of the individuals.
- (4) A society in which principles of justice are fair to all.
- (5) A hypothetical society in which principles of justice are not based on the existing positions and powers of the individuals.

Solution:

Options 2 and 5 are eliminated because though the passage mentions a hypothetical situation in which 'justice as fairness' could be formulated, the society

described/conceptualized in the passage is in no way 'hypothetical' as given in options 2 and 5.

Option 1 is eliminated because 'a just society' is not a Utopia.

Between options 3 and 4, the idea of fairness, which is casually mentioned in option 4, is fully explained in option 3 and is essential to answer the question, because the word 'fair' has a special and specific definition in the passage.

Hence, option 3.

42. The original agreement or original position in the passage has been used by the author as:

- (1) A hypothetical situation conceived to derive principles of justice which are not influenced by position, status and condition of individuals in the society.
- (2) A hypothetical situation in which every individual is equal and no individual enjoys any privilege based on the existing positions and powers.
- (3) A hypothetical situation to ensure fairness of agreements among individuals in society.
- (4) An imagined situation in which principles of justice would have to be fair.
- (5) An imagined situation in which fairness is the objective of the principles of justice to ensure that no individual enjoys any privilege based on the existing positions and powers.

Solution:

The passage states: "In 'justice as fairness', the original position is not an actual historical state of affairs. It is understood as a purely hypothetical situation characterized so as to lead to a certain conception of justice. Among the essential features of this situation is that no one knows his place in society, his class position or social status, nor does anyone know his fortune in the distribution of natural assets and abilities, his intelligence, strength, and the like." This makes option 1 correct and a mere repetition of what is stated in the passage.

Options 4 and 5 are eliminated due to "would have to be fair" and "ensure" respectively. There is no data in the passage to indicate compulsion.

Option 3 loses out similarly due to "ensure"

Between options 1 and 2, option 1 resonates better with the ideas presented with "original position".

Hence, option 1.

43. Which of the following best illustrates the situation that is equivalent to choosing "the principles of justice" behind a "veil of ignorance"?

- (1) The principles of justice are chosen by businessmen, who are marooned on an uninhabited island after a shipwreck, but have some possibility of returning.

- (2) The principles of justice are chosen by a group of school children whose capabilities are yet to develop.
- (3) The principles of justice are chosen by businessmen, who are marooned on an uninhabited island after a shipwreck and have no possibility of returning.
- (4) The principles of justice are chosen assuming that such principles will govern the lives of the rule makers only in their next birth if the rule makers agree that they will be born again.
- (5) The principles of justice are chosen by potential immigrants who are unaware of the resources necessary to succeed in a foreign country.

Solution:

The passage states the conditions termed as ‘veil of ignorance’ thus: “In ‘justice as fairness’, the original position is understood as a purely hypothetical situation characterized so as to lead to a certain conception of justice. Among the essential features of this situation is that no one knows his place in society, his class position or social status, nor does anyone know his fortune in the distribution of natural assets and abilities, his intelligence, strength, and the like. I shall even assume that the parties do not know their conceptions of the good or their special psychological propensities. The principles of justice are chosen behind a veil of ignorance.”

Option 4 fulfills these conditions best. The rule makers in the options cannot know even their sex in the next birth – a clear case of veil of ignorance. Situations in all the other options exhibit some degree of knowledge or awareness of their position etc. The businessmen, school children, and immigrants have some degree of awareness of their existence.

Hence, option 4.

44. Why, according to the passage, do principles of justice need to be based on an original agreement?

- (1) Social institutions and laws can be considered fair only if they conform to principles of justice.
- (2) Social institutions and laws can be fair only if they are consistent with the principles of justice as initially agreed upon.
- (3) Social institutions and laws need to be fair in order to be just.
- (4) Social institutions and laws evolve fairly only if they are consistent with the principles of justice as initially agreed upon.
- (5) Social institutions and laws conform to the principles of justice as initially agreed upon.

Solution:

One may evaluate options 1, 2 and 5 as likely answers. Options 3 and 4 are quickly eliminated.

Option 3 is eliminated because 'fair in order to be just' is vague does not relate to the 'original agreement' included in the question.

Option 4 talks about the 'evolution' of social institutions which is completely new to the ideas presented in the passage.

Between options 1, 2 and 5 option 2 is the best answer because options 1 and 5 are partial.

Option 1 leaves out 'original agreement' which is required to answer the question, and option 5 leaves out the idea of 'fairness' which is the crux of the passage.

Hence, option 2.

45. Which of the following situations best represents the idea of justice as fairness, as argued in the passage?

- (1) All individuals are paid equally for the work they do.
- (2) Everyone is assigned some work for his or her livelihood.
- (3) All acts of theft are penalized equally.
- (4) All children are provided free education in similar schools.
- (5) All individuals are provided a fixed sum of money to take care of their health.

Solution:

The idea of 'justice as fairness' can be explained thus: From a hypothetical "initial position of equality" and "behind a veil of ignorance", "a group of persons must decide once and for all what is to count among them as just and unjust." The initial equality and veil of ignorance are crucial. From such a position what one can choose as fair is only option 4. The passage further states that "Since all are *similarly situated* and no one is able to design principles to favour his particular condition, the principles of justice are the result of a fair agreement or bargain." All other options would be considered unfair from a position of 'no knowledge' and the members are not "similarly situated". If *all children* were to be given free education in *similar schools*, it immediately places them in similar situations. The initial position is now fair- Children may make use of their education (resources) differently, but will have to accept the later inequalities (that may develop) because the initial position was just and fair.

Hence, option 4.

Directions for Questions 46 to 50: The passage given below is followed by a set of five questions. Choose the most appropriate answer to each question.

Our propensity to look out for regularities, and to impose laws upon nature, leads to the psychological phenomenon of dogmatic thinking or, more generally, dogmatic behaviour: we expect regularities everywhere and attempt to find them even where there are none; events which do not yield to these attempts we are inclined to treat as a kind of 'background noise'; and we stick to our expectations even when they are inadequate and we ought to accept defeat. This dogmatism is to some extent necessary. It is demanded by a situation which can only be dealt with by forcing our conjectures upon the world. Moreover, this dogmatism allows us to approach a good theory in stages, by way of approximations: if we accept defeat too easily, we may prevent ourselves from finding that we were very nearly right.

It is clear that this *dogmatic attitude*, which makes us stick to our first impressions, is indicative of a strong belief; while a critical attitude, which is ready to modify its tenets, which admits doubt and demands tests, is indicative of a weaker belief. Now according to Hume's theory, and to the popular theory, the strength of a belief should be a product of repetition; thus it should always grow with experience, and always be greater in less primitive persons. But dogmatic thinking, an uncontrolled wish to impose regularities, a manifest pleasure in rites and in repetition as such, is characteristic of primitives and children; and increasing experience and maturity sometimes create an attitude of caution and criticism rather than of dogmatism.

My logical criticism of Hume's psychological theory, and the considerations connected with it, may seem a little removed from the field of the philosophy of science. But the distinction between dogmatic and critical thinking, or the dogmatic and the critical attitude, brings us right back to our central problem. For the dogmatic attitude is clearly related to the tendency to verify our laws and schemata by seeking to apply them and to confirm them, even to the point of neglecting refutations, whereas the critical attitude is one of readiness to change them - to test them; to refute them; to falsify them, if possible. This suggests that we may identify the critical attitude with the scientific attitude, and the dogmatic attitude with the one which we have described as pseudo-scientific. It further suggests that genetically speaking the pseudo-scientific attitude is more primitive than, and prior to, the scientific attitude: that it is a pre-scientific attitude. And this primitivity or priority also has its logical aspect. For the critical attitude is not so much opposed to the dogmatic attitude as super-imposed upon it: criticism must be directed against existing and influential beliefs in need of critical revision - in other words, dogmatic beliefs. A critical attitude needs for its raw material, as it were, theories or beliefs which are held more or less dogmatically.

Thus, science must begin with myths, and with the criticism of myths; neither with the collection of observations, nor with the invention of experiments, but with the critical discussion of myths, and of magical techniques and practices. The scientific tradition is distinguished from the pre-scientific tradition in having two layers. Like the latter, it passes on its theories; but it also passes on a critical attitude towards them. The theories are passed on, not as dogmas, but rather with the challenge to discuss them and improve upon them.

The critical attitude, the tradition of free discussion of theories with the aim of discovering their weak spots so that they may be improved upon, is the attitude of reasonableness, of rationality. From the point of view here developed, all laws, all theories, remain essentially tentative, or conjectural, or hypothetical, even when we feel unable to doubt them any longer. Before a theory has been refuted we can never know in what way it may have to be modified.

46. In the context of science, according to the passage, the interaction of *dogmatic beliefs* and *critical attitude* can be best described as:

- (1) A duel between two warriors in which one has to die.
- (2) The effect of a chisel on a marble stone while making a sculpture.
- (3) The feedstock (natural gas) in fertilizer industry being transformed into fertilizers.
- (4) A predator killing its prey.
- (5) The effect of fertilizers on a sapling.

Solution:

The answer is derived from “For the critical attitude is not so much opposed to the dogmatic attitude as *super-imposed* upon it: criticism must be directed against existing and influential beliefs in need of critical *revision* - in other words, dogmatic beliefs. A critical attitude needs for its *raw material*, as it were, theories or beliefs which are held more or less dogmatically.”

Based on this principle option 1 is eliminated there is neither raw material nor any critical revision in the example of warriors.

Option 3 is eliminated because it talks about a transformation, whereas the passage only talks about a refinement.

Options 4 and 5 talk about something ‘feeding’ or ‘growing’ on something else. Science does not ‘feed’ or ‘grow’ on dogma. Both are eliminated.

Hence, option 2.

47. According to the passage, the role of a dogmatic attitude or dogmatic behaviour in the development of science is

- (1) critical and important, as, without it, initial hypotheses or conjectures can never be made.
- (2) positive, as conjectures arising out of our dogmatic attitude become science.
- (3) negative, as it leads to pseudo-science.
- (4) neutral, as the development of science is essentially because of our critical attitude.
- (5) inferior to critical attitude, as a critical attitude leads to the attitude of reasonableness and rationality.

Solution:

The writer believes that dogma is important, because dogmas are refined into science with time. With this comprehension one is able to eliminate options 3, 4 and 5.

Between options 1 and 2, option 2 erroneously states that dogmas become science whereas dogma merely provide the substance or the hypothesis that later on get refined into science. Hence option 2 is eliminated.

Hence, option 1.

48. Dogmatic behaviour, in this passage, has been associated with primitives and children. Which of the following best describes the reason why the author compares primitives with children?

- (1) Primitives are people who are not educated, and hence can be compared with children, who have not yet been through school.
- (2) Primitives are people who, though not modern, are as innocent as children.
- (3) Primitives are people without a critical attitude, just as children are.
- (4) Primitives are people in the early stages of human evolution; similarly, children are in the early stages of their lives.
- (5) Primitives are people who are not civilized enough, just as children are not.

Solution:

The answer is available with the analysis of this part of the passage: "But dogmatic thinking, an uncontrolled wish to impose regularities, a manifest pleasure in rites and in repetition as such, is characteristic of primitives and children; and *increasing experience and maturity sometimes create an attitude of caution and criticism rather than of dogmatism.*"

Option 1 is eliminated because 'education' is not the reason that the writer associates dogma with primitives and children.

Option 2 is eliminated for 'innocence'.

Option 3 is contrary to the italicized part of the sentence.

Option 5 is eliminated for 'civilization'.

Hence, option 4.

49. Which of the following statements best supports the argument in the passage that a critical attitude leads to a weaker belief than a dogmatic attitude does?

- (1) A critical attitude implies endless questioning, and, therefore, it cannot lead to strong beliefs.
- (2) A critical attitude, by definition, is centred on an analysis of anomalies and "noise".
- (3) A critical attitude leads to questioning everything, and in the process generates "noise" without any conviction.
- (4) A critical attitude is antithetical to conviction, which is required for strong beliefs.
- (5) A critical attitude leads to questioning and to tentative hypotheses.

Solution:

The last paragraph of the passage completely supports option 5. The question asks you to best support "critical attitude leads to a weaker belief". Option 5 supports this by stating that critical attitude leads to questioning and hypothesis – these weaken beliefs.

Option 1 states 'cannot lead to strong beliefs'. As we are in fact, asked to support this; it is not the best option.

Options 2 and 3 are eliminated for the 'noise', which does not suffice to support the notion.

Option 4 states what is required for 'strong beliefs' and does not support the thesis, 'critical attitude leads to a weaker belief'.

Hence, option 5.

50. According to the passage, which of the following statements best describes the difference between science and pseudo-science?

- (1) Scientific theories or hypothesis are tentatively true whereas pseudo-sciences are always true.
- (2) Scientific laws and theories are permanent and immutable whereas pseudo-sciences are contingent on the prevalent mode of thinking in a society.
- (3) Science always allows the possibility of rejecting a theory or hypothesis, whereas pseudo-sciences seek to validate their ideas or theories.
- (4) Science focuses on anomalies and exceptions so that fundamental truths can be uncovered, whereas pseudo-sciences focus mainly on general truths.
- (5) Science progresses by collection of observations or by experimentation, whereas pseudo-sciences do not worry about observations and experiments.

Solution:

From paragraph 3: *"For the dogmatic attitudes clearly related to the tendency to verify our laws and schemata by seeking to apply them and to confirm them, even to the point of neglecting refutations, whereas the critical attitude is one of readiness to change them - to test them; to refute them; to falsify them, if possible. This suggests that we may identify the critical attitude with the scientific attitude, and the dogmatic attitude with the one which we have described as pseudo-scientific."*

Only option 3 best answers about the difference between science and pseudo-science.

Hence, option 3.

Section III

51. If $x = -0.5$, then which of the following has the smallest value?

- (1) $2^{\frac{1}{x}}$
- (2) $\frac{1}{x}$
- (3) $\frac{1}{x^2}$
- (4) 2^x
- (5) $\frac{1}{\sqrt{-x}}$

Solution:

Out of the options, only $\frac{1}{x}$ is negative.

All the others are positive.

$\therefore \frac{1}{x}$ is the smallest.

Hence, option 2.

52. Which among $2^{1/2}$, $3^{1/3}$, $4^{1/4}$, $6^{1/6}$ and $12^{1/12}$ is the largest ?

- (1) $2^{1/2}$
- (2) $3^{1/3}$
- (3) $4^{1/4}$
- (4) $6^{1/6}$
- (5) $12^{1/12}$

Solution:

$$2^{1/2} = 2^{6/12} = (2^6)^{1/12} = 64^{1/12}$$

$$\text{Similarly, } 3^{1/3} = 81^{1/12}, 4^{1/4} = 64^{1/12}, 6^{1/6} = 36^{1/12}$$

Now, all the powers are equal. Thus the option with the largest base is the largest.

$3^{1/3}$ is the largest.

Hence, option 2.

53.

If $\frac{a}{b} = \frac{1}{3}$, $\frac{b}{c} = 2$, $\frac{c}{d} = \frac{1}{2}$, $\frac{d}{e} = 3$ and $\frac{e}{f} = \frac{1}{4}$ then what is the value of $\frac{abc}{def}$?

- (1) $3/8$
- (2) $27/8$
- (3) $3/4$
- (4) $27/4$
- (5) $1/4$

Solution:

$$\begin{aligned}\frac{a}{d} &= \frac{a}{b} \times \frac{b}{c} \times \frac{c}{d} = \frac{1}{3} \times 2 \times \frac{1}{2} = \frac{1}{3} \\ \frac{b}{e} &= \frac{b}{c} \times \frac{c}{d} \times \frac{d}{e} = 2 \times \frac{1}{2} \times 3 = 3 \\ \frac{c}{f} &= \frac{c}{d} \times \frac{d}{e} \times \frac{e}{f} = \frac{1}{2} \times 3 \times \frac{1}{4} = \frac{3}{8} \\ \therefore \frac{abc}{def} &= \frac{1}{3} \times 3 \times \frac{3}{8} = \frac{3}{8}\end{aligned}$$

Hence, option 1.

- 54.** The length, breadth and height of a room are in the ratio 3 : 2 : 1. If the breadth and height are halved while the length is doubled, then the total area of the four walls of the room will
- (1) remain the same
 - (2) decrease by 13.64%
 - (3) decrease by 15%
 - (4) decrease by 18.75%
 - (5) decrease by 30%

Solution:

Let the original length, breadth and height of the room be $3x$, $2x$ and x respectively.

\therefore The new length, breadth and height are $6x$, x and $x/2$ respectively.

Area of four walls = $(2 \times \text{length} \times \text{height}) + (2 \times \text{breadth} \times \text{height})$

Original area of four walls = $6x^2 + 4x^2 = 10x^2$

New area of four walls = $6x^2 + x^2 = 7x^2$

\therefore Area of wall decreases by $[(10x^2 - 7x^2)/10x^2] \times 100 = 30\%$

Hence, option 5.

- 55.** Consider a sequence where the n^{th} term, $t_n = \frac{n}{n+2}$, $n = 1, 2, \dots$

The value of $t_3 \times t_4 \times t_5 \times \dots \times t_{53}$ equals:

- (1) $2/495$
- (2) $2/477$
- (3) $12/55$
- (4) $1/1485$
- (5) $1/2970$

Solution:

$$t_n = \frac{n}{n+2}$$

$$\therefore t_3 = \frac{3}{3+2} = \frac{3}{5}$$

$$\therefore t_4 = \frac{4}{4+2} = \frac{4}{6}$$

$$\therefore t_5 = \frac{5}{5+2} = \frac{5}{7}$$

.

.

.

$$\therefore t_{51} = \frac{51}{53}$$

$$\therefore t_{52} = \frac{52}{54}$$

$$\therefore t_{53} = \frac{53}{55}$$

$$\begin{aligned} \therefore t_3 \times t_4 \times t_5 \times \dots \times t_{53} &= \frac{3}{5} \times \frac{4}{6} \times \frac{5}{7} \times \dots \times \frac{51}{53} \times \frac{52}{54} \times \frac{53}{55} \\ &= \frac{(3 \times 4)}{(54 \times 55)} = \frac{2}{495} \end{aligned}$$

Hence, option 1.

56. A group of 630 children is arranged in rows for a group photograph session. Each row contains three fewer children than the row in front of it. What number of rows is not possible?

(1) 3

(2) 4

(3) 5

(4) 6

(5) 7

Solution:

Let there be n rows and a students in the first row.

\therefore Number of students in the second row = $a + 3$

\therefore Number of students in the third row = $a + 6$ and so on.

\therefore The number of students in each row forms an arithmetic progression with common difference = 3

The total number of students = The sum of all terms in the arithmetic progression

$$= \frac{n[2a + 3(n - 1)]}{2} = 630$$

Now consider options.

1. $n = 3$

$$\frac{3[2a + 3(3 - 1)]}{2} = 630$$

$$\therefore a = 207$$

2. $n = 4$

$$\frac{4[2a + 3(4 - 1)]}{2} = 630$$

$$\therefore a = 153$$

3. $n = 5$

$$\frac{5[2a + 3(5 - 1)]}{2} = 630$$

$$\therefore a = 120$$

4. $n = 6$

$$\frac{6[2a + 3(6 - 1)]}{2} = 630$$

$$\therefore a = \frac{195}{2}$$

5. $n = 7$

$$\frac{7[2a + 3(7 - 1)]}{2} = 630$$

$$\therefore a = 81$$

As a is an integer, only $n = 6$ is not possible.

Hence, option 4.

57. What are the values of x and y that satisfy both the equations?

$$2^{0.7x} \times 3^{-1.25y} = 8\sqrt{6/27}$$

$$4^{0.3x} \times 9^{0.2y} = 8 \times (81)^{1/5}$$

(1) $x = 2, y = 5$

(2) $x = 2.5, y = 6$

(3) $x = 3, y = 5$

(4) $x = 3, y = 4$

(5) $x = 5, y = 2$

Solution:

$$2^{0.7x} \times 3^{-1.25y} = 2^{7/2} \times 3^{-5/2} = 2^{0.7 \times 5} \times 3^{-1.25 \times 2}$$

$$\therefore x = 5 \text{ and } y = 2$$

These values of x and y satisfy the second equation also.

Hence, option 5.

58. The number of solutions of the equation $2x + y = 40$ where both x and y are positive integers and $x \leq y$ is:

(1) 7

(2) 13

(3) 14

(4) 18

(5) 20

Solution:

$$2x + y = 40$$

$$\therefore y = 40 - 2x$$

x and y are positive integers and $x \leq y$

If $x = 1, y = 38$

$x = 2, y = 36$

$x = 3, y = 34$

.

.

$x = 12, y = 16$

$x = 13, y = 14$

$x = 14, y = 12$

\therefore For $x > 13, y \leq x$
 \therefore There are 13 solutions to the given equation.
Hence, option 2.

59. A survey was conducted of 100 people to find out whether they had read recent issues of Golmal, a monthly magazine. The summarized information regarding readership in 3 months is given below:

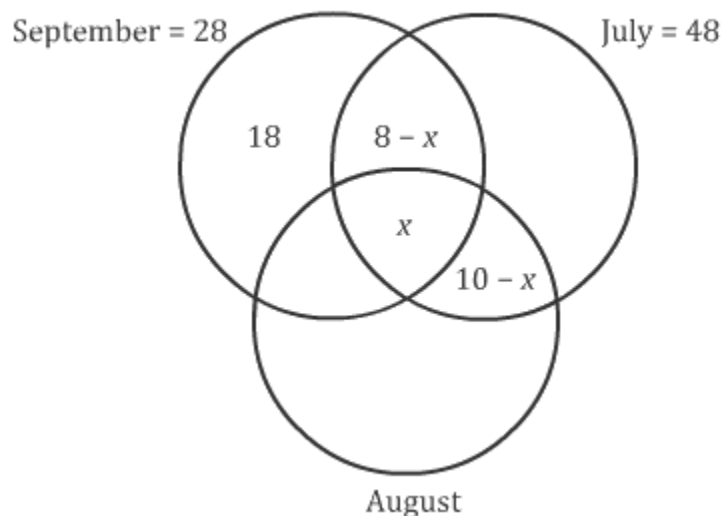
Only September: 18; September but not August: 23; September and July: 8; September: 28;

July: 48; July and August: 10; None of the three months: 24.

What is the number of surveyed people who have read exactly two consecutive issues (out of the three)?

- (1) 7
- (2) 9
- (3) 12
- (4) 14
- (5) 17

Solution:



$100 - 24 = 76$ had read at least one issue.

If x people read all the three issues, then $(8 - x)$ people read only the September and July issues.

23 people read the September issue but not the August issue.

$$\therefore 18 + 8 - x = 23$$

$$\therefore x = 3$$

As 28 people read the September issue, $[28 - (8 - 3) - 3 - 18] = 2$ people read only the August and September issues.

As 10 people read the July and August issues, $10 - 3 = 7$ people read only the July and August issues.

\therefore The number of people who have read exactly two consecutive issues $= 7 + 2 = 9$
Hence, option 2.

60. The sum of four consecutive two digit odd numbers, when divided by 10, becomes a perfect square. Which of the following can possibly be one of these four numbers?

(1) 21

(2) 25

(3) 41

(4) 67

(5) 73

Solution:

The four consecutive two-digit odd numbers will have (1, 3, 5, 7) or (3, 5, 7, 9) or (5, 7, 9, 1) or (7, 9, 1, 3) as units digits.

As the sum divided by 10 yields a perfect square, the sum is a multiple of 10.

\therefore The units digits have to be (7, 9, 1, 3).

Thus the four numbers will be $(10x + 7)$, $(10x + 9)$, $(10x + 11)$ and $(10x + 13)$, where $0 < x < 9$ (as each of these numbers is a two digit number)

$$\text{Sum of these numbers} = 40x + 40 = 40(x + 1)$$

Now, $40(x + 1)/10 = 4(x + 1)$ is a perfect square

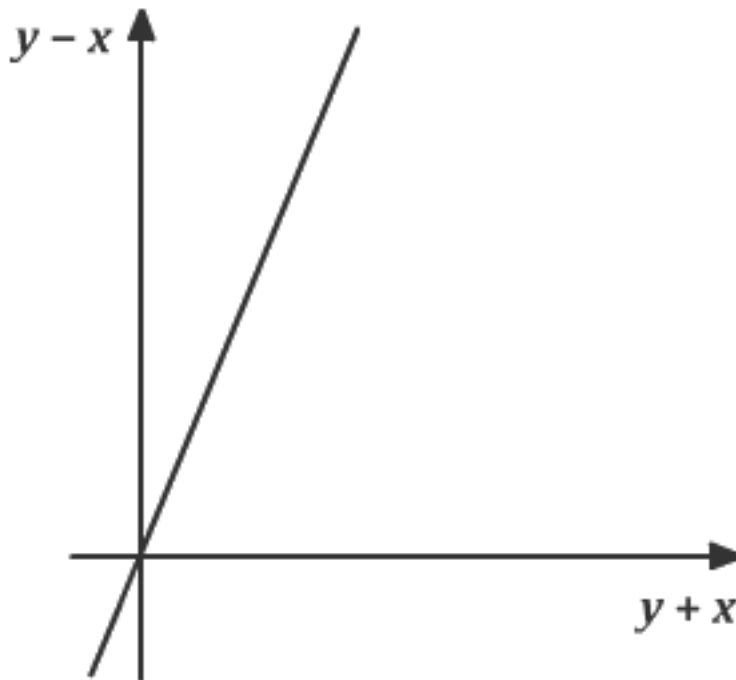
As 4 is a perfect square $(x + 1)$ is some perfect square < 10

$x + 1 = 4$, $x = 3$, and the four numbers are 37, 39, 41 and 43

$x + 1 = 9$, $x = 8$, and the four numbers are 87, 89, 91 and 93

Hence, option 3.

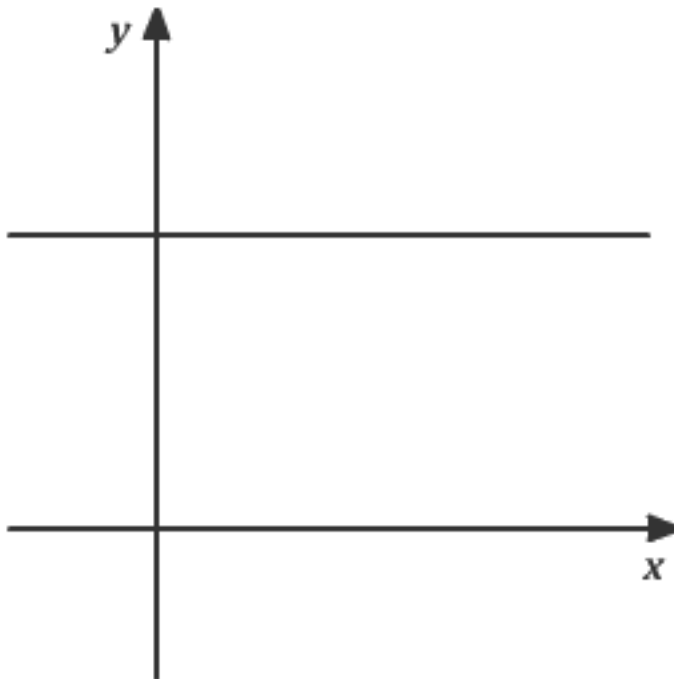
61. The graph of $y - x$ against $y + x$ is as shown below.



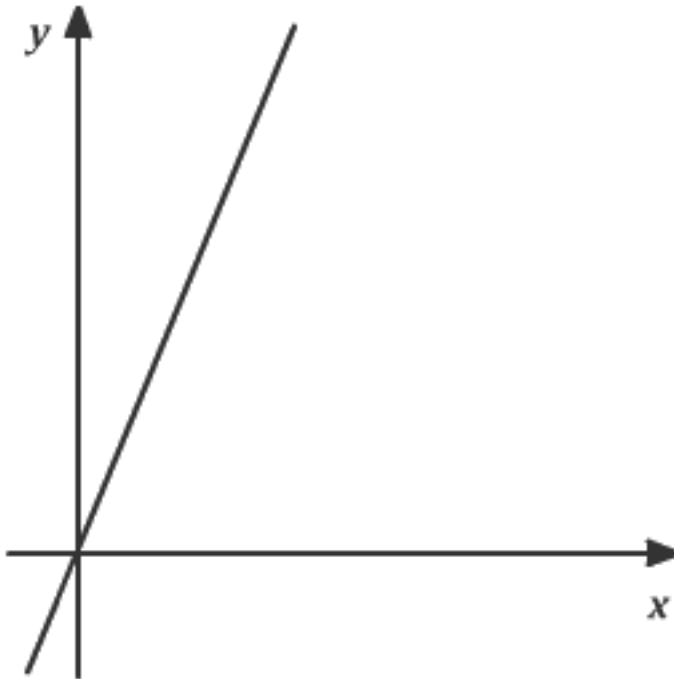
(All graphs in this question are drawn to scale and the same scale has been used on each axis).

Then, which of the options given shows the graph of y against x .

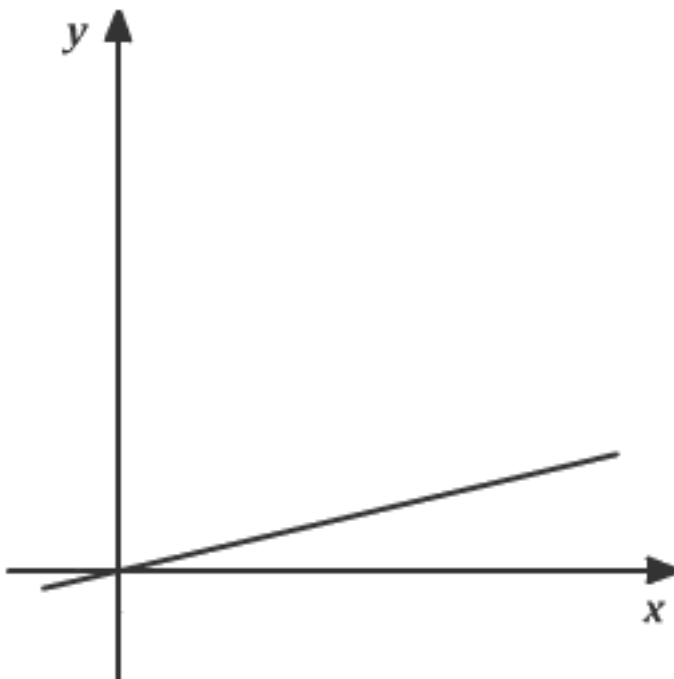
(1)



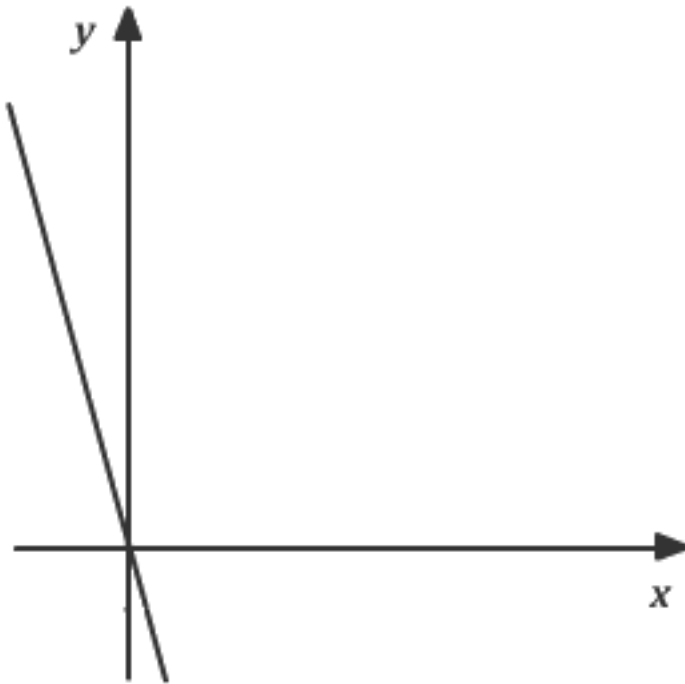
(2)



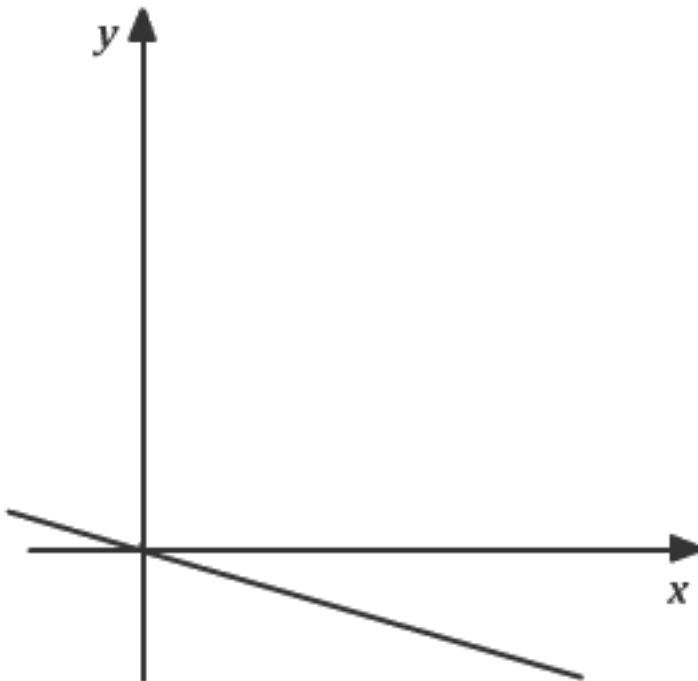
(3)



(4)



(5)



Solution:

All the given graphs are drawn to the same scale.

We can see that the line makes an angle which is more than 45° with the horizontal axis.

\therefore The slope of the line is greater than 1.

Let the slope be k .

$$\therefore (y - x) = k(y + x) \quad \{\because k > 1\}$$

$$\therefore y - x = ky + kx$$

$$\therefore y = \frac{x(k + 1)}{(1 - k)}$$

$$\frac{(k + 1)}{(1 - k)} \text{ is negative and } \left| \frac{(k + 1)}{(1 - k)} \right| > 1$$

\therefore The graph of y against x will be such that when x is positive, y is negative and $|x| < |y|$, except at $(0, 0)$.

Hence, option 4.

62. Consider the set $S = \{1, 2, 3, \dots, 1000\}$. How many arithmetic progressions can be formed from the elements of S that start with 1 and end with 1000 and have at least 3 elements?

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

Solution:

Let there be n terms ($n \geq 3$) in the arithmetic progression having 1 as the first term and 1000 as the last. Let d be the common difference.

$$1000 = 1 + (n - 1) \times d$$

$$\therefore 999 = (n - 1) \times d \quad \dots (i)$$

\therefore Factors of 999 are 1, 3, 9, 27, 37, 111, 333 and 999

Substituting in equation (i)

If $d = 1, n = 1000$

If $d = 3, n = 334$

If $d = 9, n = 112$

If $d = 27, n = 38$

If $d = 37, n = 28$

If $d = 111, n = 10$

If $d = 333, n = 4$

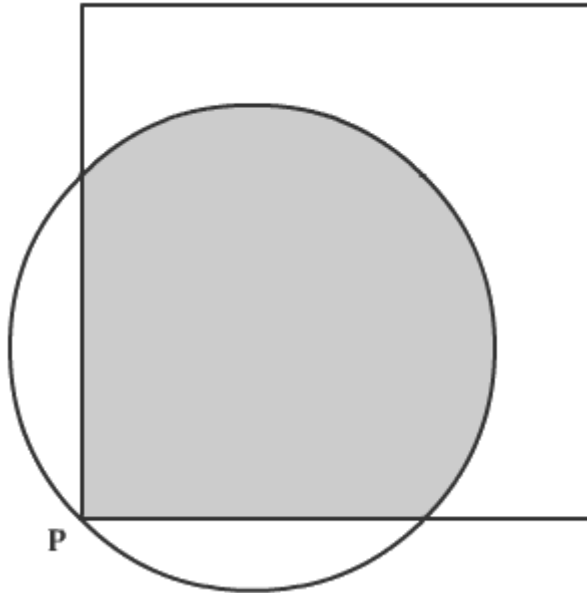
If $d = 999, n = 2$, which is not possible as $n > 2$

\therefore 7 arithmetic progressions can be formed.

Hence, option 4.

Answer Questions 63 and 64 on the basis of the information given below:

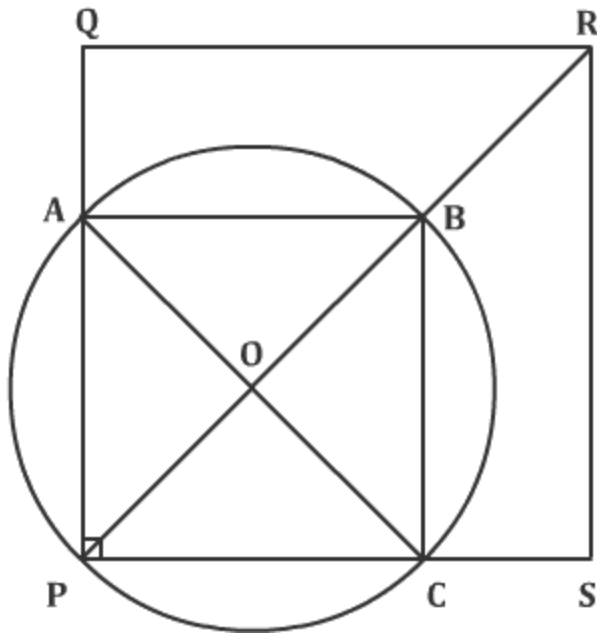
A punching machine is used to punch a circular hole of diameter two units from a square sheet of aluminum of width 2 units, as shown below. The hole is punched such that the circular hole touches one corner P of the square sheet and the diameter of the hole originating at P is in line with a diagonal of the square.



63. The proportion of the sheet area that remains after punching is:

- (1) $(\pi + 2)/8$
- (2) $(6 - \pi)/8$
- (3) $(4 - \pi)/4$
- (4) $(\pi - 2)/4$
- (5) $(14 - 3\pi)/6$

Solution:



Let PQRS be the square sheet and let the hole have centre O.

As P lies on the circumference of the circle and as $m\angle APC = 90^\circ$, AC is a diameter.

\therefore BP is a diameter, $m\angle PAB = m\angle BCP = 90^\circ$

\therefore BP = AC, ABCP is a square.

$\therefore m\angle POC = 90^\circ$ and $OP = OC = 1$ unit

The area of part of the circle falling outside the square sheet

$= 2 \times (\text{Area of sector POC} - \text{Area of } \Delta OPC)$

$$= 2 \times \left[\left(\frac{\pi \times 1^2}{4} \right) - \left(\frac{1}{2} \times 1^2 \right) \right]$$

$$= \frac{\pi - 2}{2} \text{ sq. units}$$

Area of part of hole on sheet =

Area of hole - Area of part of the circle falling outside the square sheet

$$= \pi - \left(\frac{\pi - 2}{2} \right) = \frac{\pi + 2}{2} \text{ sq. units}$$

Part of square remaining after punching = Area of square – Area of part of hole on sheet

$$= 4 - \left(\frac{\pi + 2}{2} \right) = \frac{6 - \pi}{2} \text{ sq. units}$$

$$\therefore \text{Proportion of sheet area that remains after punching} = \frac{\left(\frac{6 - \pi}{2} \right)}{4} = \frac{6 - \pi}{8}$$

Hence, option 2.

64. Find the area of the part of the circle (round punch) falling outside the square sheet.

- (1) $\pi/4$
- (2) $(\pi - 1)/2$
- (3) $(\pi - 1)/4$
- (4) $(\pi - 2)/2$
- (5) $(\pi - 2)/4$

Solution:

We have calculated this value while solving the previous question.

Hence, option 4.

65. What values of x satisfy $x^{\frac{2}{3}} + x^{\frac{1}{3}} - 2 \leq 0$?

- (1) $-8 \leq x \leq 1$
- (2) $-1 \leq x \leq 8$
- (3) $1 < x < 8$
- (4) $1 \leq x \leq 8$
- (5) $-8 \leq x \leq 8$

Solution:

$$x^{\frac{2}{3}} + x^{\frac{1}{3}} - 2 \leq 0 \quad \dots (i)$$

$$\text{Put } y = x^{\frac{1}{3}}$$

Then equation (i) becomes $y^2 + y - 2 \leq 0$

$$(y + 2)(y - 1) \leq 0$$

$$-2 \leq y \leq 1$$

$$-2 \leq x^{\frac{1}{3}} \leq 1$$

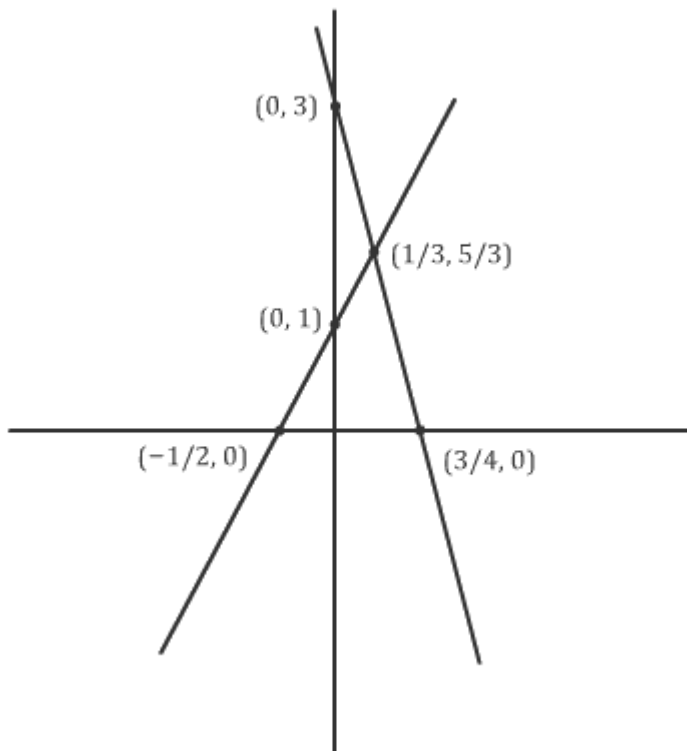
$$-8 \leq x \leq 1$$

Hence, option 1.

66. Let $f(x) = \max(2x + 1, 3 - 4x)$, where x is any real number. Then the minimum possible value of $f(x)$ is:

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

Solution:



Let the two lines represent the equations $y = 2x + 1$ and $y = 3 - 4x$ respectively.

The greater value between $2x + 1$ and $3 - 4x$ is greater than $5/3$, when $x < 1/3$ or $x > 1/3$.

The greater value is minimum at $x = 1/3$ and this value is $5/3$.

Hence, option 5.

Note: In general, the minimum value of the function $f(x) = \max(ax + b, cx + d)$ occurs when $ax + b = cx + d$

Answer Questions 67 and 68 on the basis of the information below:

An airline has a certain free luggage allowance and charges for excess luggage at a fixed rate per kg. Two passengers, Raja and Praja have 60 kg of luggage between them, and are charged Rs. 1200 and Rs. 2400 respectively for excess luggage. Had the entire luggage belonged to one of them, the excess luggage charge would have been Rs. 5400.

67. What is the weight of Praja's luggage?

- (1) 20 kg
- (2) 25 kg
- (3) 30 kg
- (4) 35 kg
- (5) 40 kg

Solution:

Let f kg be the free luggage allowance and let Raja and Praja have r kg and p kg excess luggage respectively.

Let x be the fixed rate per kg for excess luggage.

$$\therefore 2f + r + p = 60 \quad \dots (i)$$

$$rx = 1200 \quad \dots (ii)$$

$$px = 2400 \quad \dots (iii)$$

$$(60 - f)x = 5400 \quad \dots (iv)$$

From (ii) and (iii),

$$p = 2r \quad \dots (v)$$

Substituting in (i),

$$2f + 3r = 60$$

$$\therefore f = 30 - 3r/2 \quad \dots (vi)$$

Substituting in (iv),

$$(60 - 30 + 3r/2)x = 5400$$

$$\therefore 30x + 3rx/2 = 5400$$

From (ii),

$$rx = 1200$$

$$\therefore 30x = 3600$$

$$\therefore x = 120$$

$$\therefore r = 10, p = 20 \text{ and } f = 15$$

Hence, option 4.

68. What is the free luggage allowance?

- (1) 10 kg
- (2) 15 kg
- (3) 20 kg
- (4) 25 kg
- (5) 30 kg

Solution:

$$f = 15 \text{ kg}$$

Hence, option 2.

69. Arun, Barun and Kiranmala start from the same place and travel in the same direction at speeds of 30 km/hr, 40 km/hr and 60 km/hr respectively. Barun starts two hours after Arun. If Barun and Kiranmala overtake Arun at the same instant, how many hours after Arun did Kiranmala start?

- (1) 3
- (2) 3.5
- (3) 4
- (4) 4.5
- (5) 5

Solution:

Arun has travelled 60 km when Barun starts.

Barun overtakes Arun in $60/(40 - 30) = 6$ hrs

In this time, Barun travels $6 \times 40 = 240$ km from the starting point.

Kiranmala overtakes Arun at the same point.

Kiranmala takes $240/60 = 4$ hrs to reach there.

Arun takes $240/30 = 8$ hrs to reach there.

\therefore Kiranmala starts $8 - 4 = 4$ hrs after Arun.

Hence, option 3.

70. When you reverse the digits of the number 13, the number increases by 18. How many other two digit numbers increase by 18 when their digits are reversed?

- (1) 5
- (2) 6
- (3) 7
- (4) 8
- (5) 10

Solution:

Let $10x + y$ be a two digit number, where x and y are positive single digit integers and $x > 0$.

Its reverse = $10y + x$

Now, $10y + x - 10x - y = 18$

$$\therefore 9(y - x) = 18$$

$$\therefore y - x = 2$$

Thus y and x can be (1, 3), (2, 4), (3, 5), (4, 6), (5, 7), (6, 8) and (7, 9)

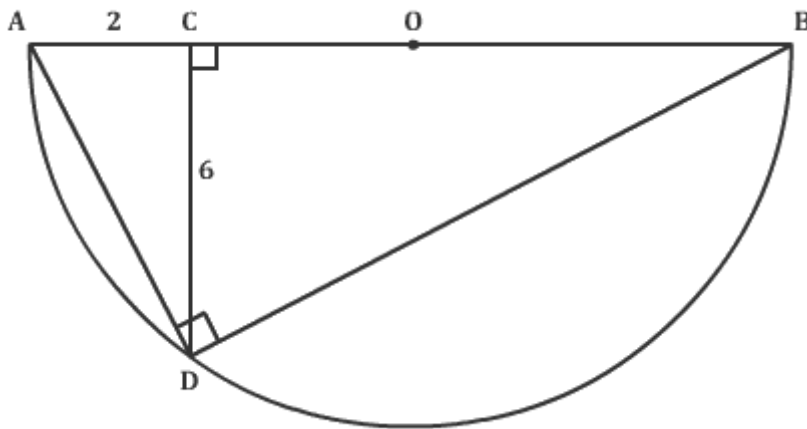
\therefore Other than 13, there are 6 such numbers.

Hence, option 2.

71. A semicircle is drawn with AB as its diameter. From C, a point on AB, a line perpendicular to AB is drawn meeting the circumference of the semicircle at D. Given that AC = 2 cm and CD = 6 cm, the area of the semicircle (in sq. cm.) will be:

- (1) 32π
- (2) 50π
- (3) 40.5π
- (4) 81π
- (5) undeterminable

Solution:



Let $CB = x$ cm

ΔACD and ΔADB are similar triangles.

$$\therefore AD/AB = AC/AD$$

$$\therefore AD^2 = AC \times AB$$

$$\therefore (AC^2 + CD^2) = 2 \times (2 + x)$$

$$\therefore 40 = 2 \times (2 + x)$$

$$\therefore x = 18$$

$$\therefore \text{Diameter } AB = 20 \text{ cm}$$

$$\therefore \text{Radius} = 10 \text{ cm}$$

$$\therefore \text{Area} = 50\pi \text{ sq. cm.}$$

Hence, option 2.

72. There are 6 tasks and 6 persons. Task 1 cannot be assigned either to person 1 or to person 2; task 2 must be assigned to either person 3 or person 4. Every person is to be assigned one task. In how many ways can the assignment be done?

- (1) 144
- (2) 180
- (3) 192
- (4) 360
- (5) 716

Solution:

Task 2 can be assigned in 2 ways (either to person 3 or person 4).

Task 1 can then be assigned in 3 ways (persons 3 or 4, 5 and 6)

The remaining 4 tasks can be assigned to the remaining 4 persons in $4! = 24$ ways

\therefore The assignment can be done in $24 \times 2 \times 3 = 144$ ways

Hence, option 1.

73. The number of employees in Obelix Menhir Co. is a prime number and is less than 300. The ratio of the number of employees who are graduates and above, to that of employees who are not, can possibly be:

- (1) 101 : 88
- (2) 87 : 100
- (3) 110 : 111
- (4) 85 : 98
- (5) 97 : 84

Solution:

Consider options. As the number of employees is prime we can add the numerator and denominator of ratios directly to find the number of employees.

1. Number of employees = $101 + 88 = 189$

Number of employees = 189, which is not a prime number.

\therefore Option 1 is eliminated.

2. Number of employees = $87 + 100 = 187$

Number of employees = 187, which is not a prime number.

\therefore Option 2 is eliminated.

3. Number of employees = $110 + 111 = 221$

Number of employees = 221, which is not a prime number.

\therefore Option 3 is eliminated.

4. Number of employees = $85 + 98 = 183$

Number of employees = 183, which is not a prime number.

\therefore Option 4 is eliminated.

5. Number of employees = $97 + 84 = 181$

Number of employees = 181, which is a prime number.

\therefore The ratio of employees = 97:84

Hence, option 5.

74. If $\log_y x = a$, $\log_z y = b$, $\log_x z = ab$,

then which of the following pairs of values for (a, b) is not possible?

(1) $-2, 1/2$

(2) $1, 1$

(3) $0.4, 2.5$

(4) $\pi, 1/\pi$

(5) $2, 2$

Solution:

If $\log_y x = a$, $\log_z y = b$, $\log_x z = ab$

$\therefore a \cdot \log_z y = ab$

$\therefore b = \log_z y$

$\therefore b \cdot \log_x z = ab$

$\therefore a = \log_x z$

$\therefore \log_y x = ab = \log_z y \times \log_x z$

$\therefore \frac{\log x}{\log y} = \frac{\log y}{\log z} \times \log z \log x$

$\therefore \frac{\log x}{\log y} = \frac{\log y}{\log x}$

$$\therefore (\log x)^2 = (\log y)^2$$

$$\therefore \log x = \pm \log y$$

$$\therefore \log x = \log y \text{ or } \log x = -\log y$$

$$\therefore x = y \text{ or } x = \frac{1}{y}$$

$$\therefore ab = \log_y x = 1 \text{ or } -1$$

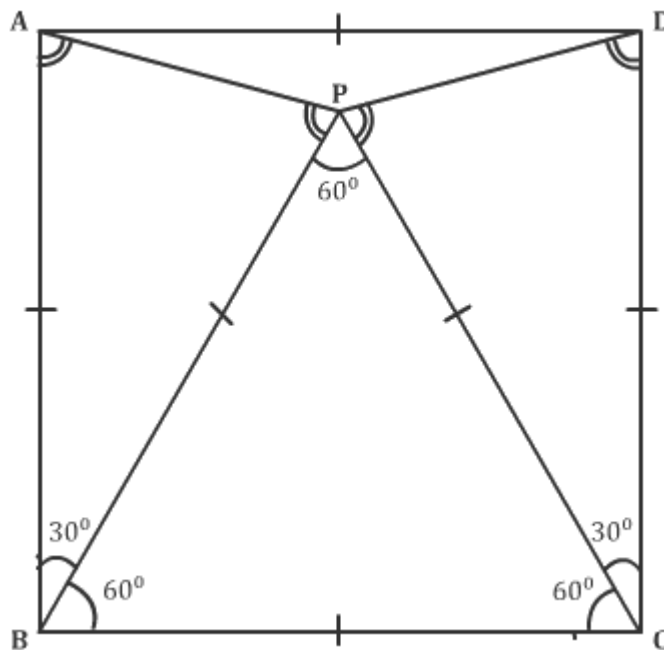
Only option 5 does not satisfy this.

Hence, option 5.

75. An equilateral triangle BPC is drawn inside a square ABCD. What is the value of the angle APD in degrees?

- (1) 75
- (2) 90
- (3) 120
- (4) 135
- (5) 150

Solution:



$$BP = PC = BC$$

$$m \angle BPC = m \angle PCB = m \angle PBC = 60^\circ$$

$$\text{Also, } PC = CD = BP = AB$$

ΔABP and ΔPCD are isosceles triangles.

$$m \angle ABP = m \angle PCD = 90 - 60 = 30^\circ$$

$$\therefore m \angle APB = m \angle DPC = (180 - 30)/2 = 75^\circ$$

$$\therefore m \angle APD = 360 - (m \angle APB + m \angle DPC + m \angle BPC) = 360 - (75 + 75 + 60) = 150^\circ$$

Hence, option 5.