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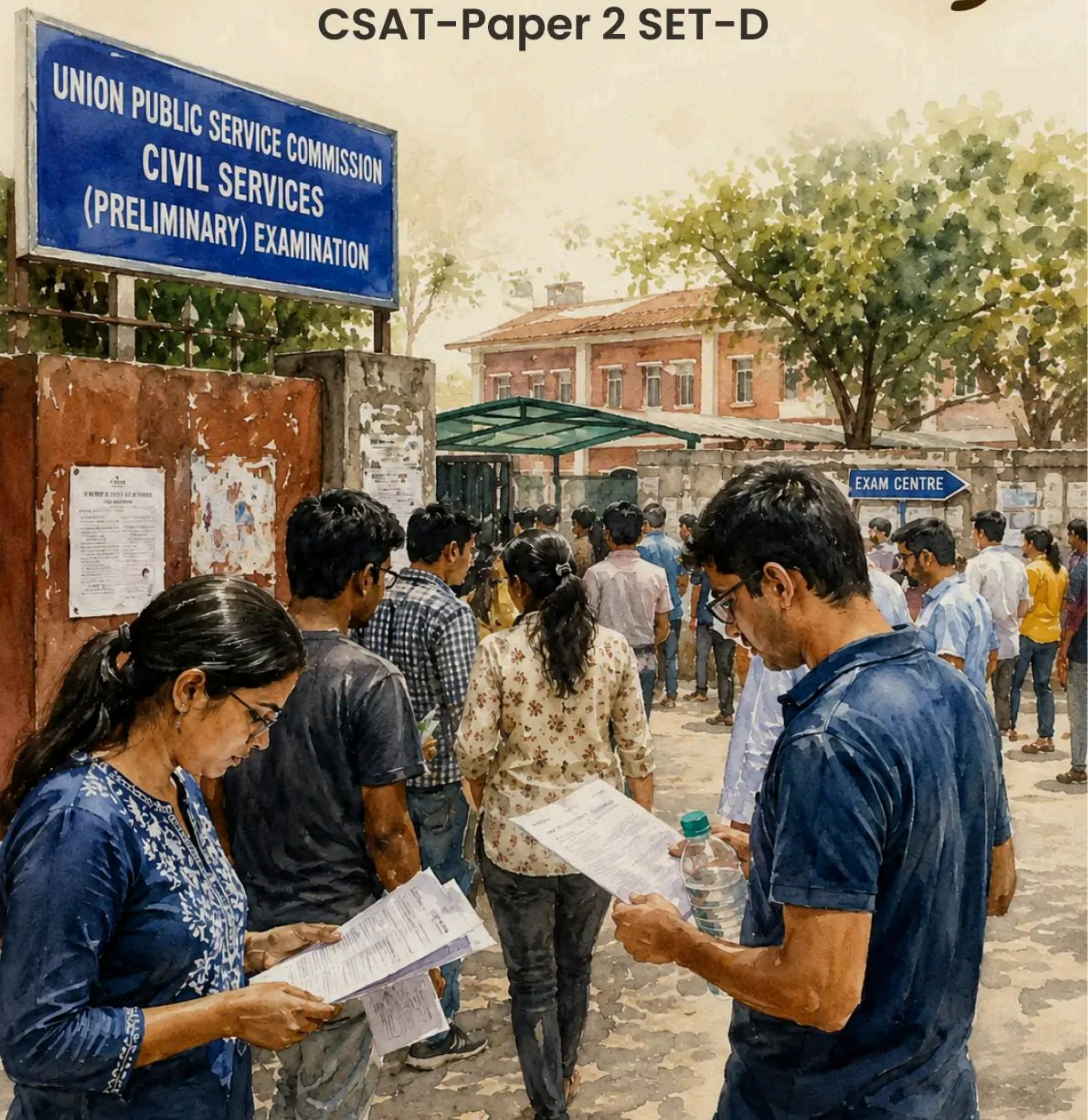
UPSC 2026

Prelims Answer Key

CSAT-Paper 2 SET-D



UPSC Prelims 2026 Answer Key

CSAT Set – D

1	B
2	B
3	B
4	A
5	B
6	B
7	D
8	B
9	C
10	B
11	D
12	A
13	D
14	C
15	B
16	A
17	A
18	B
19	B
20	C

21	C
22	C
23	B
24	D
25	C
26	C
27	C
28	D
29	B
30	D
31	A
32	C
33	D
34	C
35	D
36	D
37	D
38	B
39	C
40	D

41	C
42	B
43	A
44	B
45	A
46	B
47	B
48	A
49	A
50	A
51	D
52	B
53	C
54	C
55	D
56	C
57	D
58	A
59	B
60	D

61	A
62	D
63	C
64	D
65	A
66	A
67	A
68	B
69	D
70	D
71	D
72	B
73	D
74	A
75	B
76	D
77	A
78	D
79	B
80	C

Question 1

Maths

For $\frac{1}{3} < x < y < 2$, which of the following statements is/are always correct?

I. $x + \frac{1}{x} < y + \frac{1}{y}$

II. $\frac{\sqrt{1+y^2}}{y} < \frac{\sqrt{1+x^2}}{x}$

Select the answer using the code given below.

A. I only

B. II only

C. Both I and II

D. Neither I nor II

Answer – B

Explanation

Answer: B (II only)

Statement I — Not always true.

Consider $f(t) = t + \frac{1}{t}$. Its derivative is $f'(t) = 1 - \frac{1}{t^2}$, which is negative on $(0, 1)$ and positive on $(1, \infty)$. So f decreases on $(\frac{1}{3}, 1)$ and increases on $(1, 2)$ — not monotonic on the whole interval.

Counterexample: $x = \frac{1}{2}, y = \frac{3}{4}$. Then $x + \frac{1}{x} = 2.5$ but $y + \frac{1}{y} = 0.75 + 1.333\ldots \approx 2.083$. So $x + \frac{1}{x} > y + \frac{1}{y}$, contradicting I.

Statement II — Always true.

Rewrite:

$$\frac{\sqrt{1+t^2}}{t} = \sqrt{\frac{1+t^2}{t^2}} = \sqrt{\frac{1}{t^2} + 1}$$

For $t > 0$, as t increases, $\frac{1}{t^2}$ decreases, so $\sqrt{\frac{1}{t^2} + 1}$ decreases. Thus $g(t) = \frac{\sqrt{1+t^2}}{t}$ is strictly decreasing on $(0, \infty)$.

Since $x < y$ (both positive), $g(x) > g(y)$, i.e.

$$\frac{\sqrt{1+y^2}}{y} < \frac{\sqrt{1+x^2}}{x}. \checkmark$$

Question 2

Maths

What is the minimum number of times one needs to measure to get 298 litres of water from a tank, if the measuring cylinders have capacities 1 litre, 6 litres, 25 litres and 100 litres?

A. 4

B. 5

C. 9

D. 13

Answer – B

Explanation

To find the minimum number of measurements required to get exactly 298 litres, we can use a combination of drawing water from the tank (adding to our container) and pouring water back into the tank (subtracting from our container).

Approach 1: Only Adding Water

If we only draw water, we would use the greedy approach (using the largest possible cylinders first):

- 2 times 100 litres = 200 litres
- 3 times 25 litres = 75 litres
- 3 times 6 litres = 18 litres
- 5 times 1 litre = 5 litres

Total volume = $200 + 75 + 18 + 5 = 298$ litres.

Total measurements = $2 + 3 + 3 + 5 = 13$ times.

Approach 2: Adding and Subtracting Water (Optimal)

To minimize the number of measurements, we can overshoot the target volume and then remove the excess water by pouring it back into the tank.

- We can draw 100 litres 3 times: $3 \times 100 = 300$ litres. (This takes 3 measurements)
- We have an excess of 2 litres ($300 - 298 = 2$).
- We can remove this excess by using the 1-litre cylinder to pour water back into the tank 2 times: $2 \times 1 = 2$ litres. (This takes 2 measurements)

Total volume = $300 - 2 = 298$ litres.

Total measurements = 3 (drawing) $+2$ (pouring back) = 5 times.

Can we do it in 4 measurements?

To get close to 298 with 4 measurements, we must use the 100-litre cylinder 3 times (300 litres). We would then have only 1 measurement left to subtract the excess.

The closest volumes we could achieve are:

- $3 \times 100 - 1 \times 1 = 299$ litres
- $3 \times 100 - 1 \times 6 = 294$ litres

Since neither gives exactly 298 litres, 4 measurements are not enough.

Thus, the minimum number of times one needs to measure is 5.

Question 3

Maths

There are four types of weights, namely 1 kg, 2 kg, 5 kg and 10 kg. What is the maximum number of different ways one can measure 20 kg, if at least eight but not more than eleven weights of 1 kg are to be used while measuring?

A. 7

B. 8

C. 9

D. 10

Answer – B

Explanation

Answer: 8

Let a, b, c, d be the number of 1, 2, 5, 10 kg weights. We need

$$a + 2b + 5c + 10d = 20, \quad a \in \{8, 9, 10, 11\},\ b, c, d \geq 0.$$

Case $a = 8$: $2b + 5c + 10d = 12$

- $d = 0$: $(b, c) = (6, 0), (1, 2)$ → 2 ways
- $d = 1$: $(b, c) = (1, 0)$ → 1 way

Subtotal: **3**

Case $a = 9$: $2b + 5c + 10d = 11$ (odd, so c must be odd)

- $d = 0$: $(b, c) = (3, 1)$ → 1 way

Subtotal: **1**

Case $a = 10$: $2b + 5c + 10d = 10$

- $d = 0$: $(b, c) = (5, 0), (0, 2)$ → 2 ways
- $d = 1$: $(b, c) = (0, 0)$ → 1 way

Subtotal: **3**

Case $a = 11$: $2b + 5c + 10d = 9$ (c odd)

- $d = 0$: $(b, c) = (2, 1)$ → 1 way

Subtotal: **1**

Total: $3 + 1 + 3 + 1 = 8$

Question 4

Maths

A cut on a solid object divides the object into two parts where the new surfaces thus produced are plane. On the other hand, one single cut can be used to cut more than one object at a time. In an experiment, the total number of pieces produced by applying n cuts is denoted by x_n. The experiment is performed on a solid cube where pieces remain unmoved after each cut. In this experiment, if after the third cut, the pieces are identical, then which of the following is **not** a possible value for x_4?

A. 16

B. 12

C. 8

D. 5

Answer – A

Explanation

Answer: A — 16

The condition says that after the third cut, the pieces are identical. It does not necessarily mean that there are 8 pieces. For example, three parallel equally spaced cuts can produce 4 identical slabs, and other arrangements can produce 6 or 8 identical pieces.

A fourth cut can only increase the number of pieces by the number of existing pieces it actually cuts. Hence:

$$x_4 = x_3 + (\text{number of existing pieces cut by the 4th plane})$$

Now check the options:

- $x_4 = 5$ is possible: after three parallel cuts, there are 4 identical slabs; the fourth cut may cut only one slab, giving $4 + 1 = 5$.
- $x_4 = 8$ is possible: after three parallel cuts, there are 4 identical slabs; the fourth cut may cut all 4 slabs, giving $4 + 4 = 8$.
- $x_4 = 12$ is possible: after three cuts producing 6 identical pieces, the fourth cut may cut all 6 pieces, giving $6 + 6 = 12$.
- $x_4 = 16$ would require $x_3 = 8$ and the fourth cut to cut all 8 pieces. But after three cuts producing 8 identical pieces, the cube is divided into a $2 \times 2 \times 2$ arrangement, and a single plane cannot pass through the interiors of all 8 pieces.

Therefore, 16 is not a possible value of x_4.

Question 5

Maths

The class average x in a test increases by 4 when the score of a student is rectified, whose corrected score is 100 instead of 0. Later, the score of another student was found to have been recorded as 81 in place of 56. If there are no other corrections and the final corrected average is y, then $y - x$ is

A. 2

B. 3

C. 5

D. 6

Answer – B

Explanation

Answer: B — 3

Let the number of students in the class be n.

The first correction changes a student's score from 0 to 100, so the total score increases by 100. Since the average increases by 4, we have:

$$\frac{100}{n} = 4$$

Therefore:

$$n = 25$$

Now, another student's score was recorded as 81 instead of 56. Correcting this decreases the total score by:

$$81 - 56 = 25$$

Since there are 25 students, the average decreases by:

$$\frac{25}{25} = 1$$

After the first correction, the average becomes $x + 4$. After the second correction, the final corrected average is:

$$y = x + 4 - 1 = x + 3$$

Hence:

$$y - x = 3$$

Therefore, the correct answer is 3.

Question 6

Comprehension

> When SARS-CoV-2 was first detected in 2019, it was a truly novel virus for the world. At that time, no one in the world had been exposed to SARS-CoV-2 or had specific immunity against it. In contrast, people across the world have been exposed to HMPV for decades and the virus is well-studied. HMPV and SARS-CoV-2 belong to two very different virus families with fundamentally different characteristics and epidemiology, with strong seasonality seen in HMPV, unlike SARS-CoV-2. Both viruses cause different severity of symptoms, particularly over the long term, and the affected population segments do not fully overlap. In general, HMPV causes milder illness with deaths being very rare and with no long-term post-viral symptoms.

Which of the following conclusions is/are valid?

1. Though SARS-CoV-2 and HMPV are similar viruses with somewhat different epidemiology, the former became a pandemic because it was novel and people had not been exposed to it in the past.
2. The two viruses have fundamentally different impacts on human populations and should not therefore be dealt with in a similar manner.

Select the answer using the code given below.

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer – B

Explanation

Answer: B — 2 only

Statement 1 — Invalid. The passage explicitly states that HMPV and SARS-CoV-2 "belong to two very different virus families with fundamentally different characteristics and epidemiology." Calling them "similar viruses" directly contradicts the passage. While the passage does support that SARS-CoV-2 was novel and no one had specific immunity to it (which fits the second half of statement 1), the premise that the two viruses are "similar" undermines the conclusion as stated.

Statement 2 — Valid. The passage establishes that the two viruses have fundamentally different characteristics, different epidemiology (with strong seasonality in HMPV but not SARS-CoV-2), different severity of symptoms — particularly over the long term — and "affected population segments [that] do not fully overlap." This collectively supports the inference that they have different impacts on human populations and therefore should not be dealt with in a similar manner.

Question 7

Comprehension

> When SARS-CoV-2 was first detected in 2019, it was a truly novel virus for the world. At that time, no one in the world had been exposed to SARS-CoV-2 or had specific immunity against it. In contrast, people across the world have been exposed to HMPV for decades and the virus is well-studied. HMPV and SARS-CoV-2 belong to two very different virus families with fundamentally different characteristics and epidemiology, with strong seasonality seen in HMPV, unlike SARS-CoV-2. Both viruses cause different severity of symptoms, particularly over the long term, and the affected population segments do not fully overlap. In general, HMPV causes milder illness with deaths being very rare and with no long-term post-viral symptoms.

Which of the following reflect the intent of the writer in the above passage?

1. To evolve methodologies for objective analysis of the two viruses
2. To establish the epidemiological similarities and differences between the two viruses
3. To offer a better understanding of the remedies of HMPV when analysed in conjunction with SARS-CoV-2

Select the answer using the code given below.

A. 1 and 2

B. 2 and 3

C. 1 and 3

D. None of the above

Answer – D

Explanation

Answer: D — None of the above

Statement 1 — Incorrect. The passage describes existing knowledge about the two viruses (exposure history, epidemiology, symptom severity). It does not propose or develop methodologies for analysis. So "evolving methodologies for objective analysis" is not the intent.

Statement 2 — Plausible but not paired correctly. The passage *does* contrast the two viruses' epidemiology (HMPV has strong seasonality, SARS-CoV-2 was novel, families differ, exposure history differs), so this somewhat reflects the author's intent. However, no option offers "2 only".

Statement 3 — Incorrect. The passage discusses neither remedies nor a comparative treatment framework. It is purely descriptive about how the two viruses differ.

Since 1 and 3 are clearly not the writer's intent, the available options A (1 and 2), B (2 and 3) and C (1 and 3) all fail. The only consistent choice is **D — None of the above**.

Question 8

Comprehension

> When SARS-CoV-2 was first detected in 2019, it was a truly novel virus for the world. At that time, no one in the world had been exposed to SARS-CoV-2 or had specific immunity against it. In contrast, people across the world have been exposed to HMPV for decades and the virus is well-studied. HMPV and SARS-CoV-2 belong to two very different virus families with fundamentally different characteristics and epidemiology, with strong seasonality seen in HMPV, unlike SARS-CoV-2. Both viruses cause different severity of symptoms, particularly over the long term, and the affected population segments do not fully overlap. In general, HMPV causes milder illness with deaths being very rare and with no long-term post-viral symptoms.

Which of the following statements reflect the logical and rational inferences that can be drawn from the passage?

1. HMPV has, historically, had longer documentation of studies when compared with SARS-CoV2
2. The two viruses are different from each other and this results in markedly different outcomes amongst those affected.
3. Long-term impacts of the two viruses are dissimilar and this is an important differentiator between them.
4. One of the common factors between the two viruses is seasonal specificity.

Select the answer using the code given below.

A. 1 and 2 only

B. 1, 2 and 3

C. 3 and 4

D. 1 and 3 only

Answer – B

Explanation

Answer: B — 1, 2 and 3

Statement 1 — Correct. The passage states people have been exposed to HMPV "for decades" and the virus "is well-studied," whereas SARS-CoV-2 was "a truly novel virus" in 2019. So HMPV has a longer history of documentation and study than SARS-CoV-2.

Statement 2 — Correct. The passage notes that the two viruses cause "different severity of symptoms" and that "affected population segments do not fully overlap" — i.e., the differences between the viruses result in markedly different outcomes among those affected.

Statement 3 — Correct. The passage explicitly says symptoms differ "particularly over the long term," and that HMPV has "no long-term post-viral symptoms" (contrasted with SARS-CoV-2's known long-term sequelae). This

makes long-term impact a key differentiator between the two.

Statement 4 — Incorrect. The passage notes "strong seasonality seen in HMPV, unlike SARS-CoV-2." So seasonality is a *difference*, not a common factor between the two viruses.

Question 9

Maths

Three variables x, y and z take values $2, 3, 4$ or 5 such that their values are always distinct. If M and N denote the largest possible value and the smallest possible value, respectively, for the expression $\{(x \times y) + z\}$; then $M - N$ is

A. 11

B. 12

C. 13

D. 14

Answer – C

Explanation

To find the largest and smallest possible values for the expression $(x \times y) + z$, we must choose distinct values for x, y, and z from the given set $\{2, 3, 4, 5\}$.

Step 1: Finding the largest possible value (M)

To maximize the value of $(x \times y) + z$, we should maximize the product $(x \times y)$ because multiplication of numbers greater than 1 yields a larger result than addition.

- The two largest numbers available are 4 and 5. Therefore, we assign $x = 4$ and $y = 5$ (or vice versa), giving a product of $4 \times 5 = 20$.

- The remaining numbers are 2 and 3. To maximize the overall sum, we assign the largest remaining number to z, which is 3.

- Calculating the maximum value:

$$M = (4 \times 5) + 3 = 20 + 3 = 23$$

Step 2: Finding the smallest possible value (N)

To minimize the value of $(x \times y) + z$, we should minimize the product $(x \times y)$.

- The two smallest numbers available are 2 and 3. Therefore, we assign $x = 2$ and $y = 3$ (or vice versa), giving a product of $2 \times 3 = 6$.

- The remaining numbers are 4 and 5. To minimize the overall sum, we assign the smallest remaining number to z, which is 4.

- Calculating the minimum value:

$$N = (2 \times 3) + 4 = 6 + 4 = 10$$

(Self-check: If we tried $x = 2, y = 4, z = 3$, the result would be $(2 \times 4) + 3 = 11$, which is larger than 10. Thus, 10 is indeed the absolute minimum.)

Step 3: Finding the difference ($M - N$)

Now, we subtract the smallest value from the largest value:

$$M - N = 23 - 10 = 13$$

Therefore, the difference between the largest and smallest possible values is 13.

Question 10

Maths

Suppose x, y and z are variables taking positive real numbers as their possible values. It is given that y is directly proportional to x^2 and x is inversely proportional to z. For $z = \frac{7}{25}$, the values of x and y are 5 and 50, respectively. If $y = 98$, what is z equal to?

A. $\frac{1}{7}$
B. $\frac{1}{5}$
C. $\frac{5}{7}$
D. 1

Answer – B

Explanation

Answer: $\frac{1}{5}$

Set up the proportionalities.

- $y \propto x^2 \Rightarrow y = kx^2$
- $x \propto \frac{1}{z} \Rightarrow x = \frac{c}{z}$, i.e. $xz = c$

Find the constants using $z = \frac{7}{25},\ x = 5,\ y = 50$.

- From $y = kx^2$: $50 = k \cdot 25 \Rightarrow k = 2$
- From $xz = c$: $c = 5 \cdot \frac{7}{25} = \frac{7}{5}$

So $y = 2x^2$ and $xz = \frac{7}{5}$.

Use $y = 98$ to find x.

$$2x^2 = 98 \Rightarrow x^2 = 49 \Rightarrow x = 7$$

Find z.

$$z = \frac{c}{x} = \frac{7/5}{7} = \frac{1}{5}$$

Correct option: $\frac{1}{5}$

Question 11

Comprehension

> India is starting to deploy AI for critical use cases such as weather forecasting, pest detection and control, and crop yield optimisation. However, penetration is limited to a small subset of tech-savvy farmers. In the US and in Europe, generative AI tools have started offering precision farming at scale, integrating large datasets to provide real-time agronomic insights. For at-scale integration and accessibility of AI tools in India, it would be helpful to develop Indian languages-based AI tools for smallholder farmers, partner with AgTechs to create affordable AI solutions, and disseminate AI-based advisory services through government programmes.

Which of the following assumptions is/are **valid**?

1. Agricultural productivity has marched ahead in the West because of the economies of scale facilitated by the adoption of AI tools.
2. Affordable AI tools rendered available in local languages can help AI-based solutions reach more and more small farmers.
3. Though penetration is as yet low, critical application areas deploying AI tools are already in use in India.

Select the answer using the code given below.

A. 1, 2 and 3

B. 2 only

C. 1 and 3 only

D. 2 and 3 only

Answer – D

Explanation

Based on the passage, let us evaluate each statement:

1. **Statement 1 is invalid:** The passage mentions that in the US and Europe, generative AI tools have *started* offering precision farming at scale. It does not state or imply that the overall agricultural productivity in the West has "marched ahead" historically *because* of AI tools. The causal link is an overreach and cannot be assumed from the text.

2. **Statement 2 is valid:** The passage explicitly suggests that for "at-scale integration and accessibility" of AI tools in India, it is helpful to develop them in Indian languages and partner with AgTechs to create affordable solutions. This logically assumes that affordability and local language availability are key drivers to help these solutions reach a wider base of smallholder farmers.

3. **Statement 3 is valid:** The passage directly states that "India is starting to deploy AI for critical use cases such as weather forecasting, pest detection and control..." and follows it up by noting that "penetration is limited to a small

subset of tech-savvy farmers." This confirms that while penetration is low, critical applications of AI are indeed already in use in India.

Since Statements 2 and 3 are logically supported by the passage, the correct answer is **D**.

Question 12

Comprehension

> India is starting to deploy AI for critical use cases such as weather forecasting, pest detection and control, and crop yield optimisation. However, penetration is limited to a small subset of tech-savvy farmers. In the US and in Europe, generative AI tools have started offering precision farming at scale, integrating large datasets to provide real-time agronomic insights. For at-scale integration and accessibility of AI tools in India, it would be helpful to develop Indian languages-based AI tools for smallholder farmers, partner with AgTechs to create affordable AI solutions, and disseminate AI-based advisory services through government programmes.

Which of the following statements is/are **not** correct?

1. Tech-savvy farmers will drive the AgTech companies of the future.
2. The development of advisory services by the government programmes for the use of AI tools in agriculture would be helpful.
3. In the US and Europe, AI tools have replaced traditional agricultural practices.
4. The integration of large datasets for use in real-time agronomic analysis is already a reality.

Select the answer using the code given below.

A. 1 and 3 only

B. 1, 3 and 4

C. 2 and 4

D. 3 only

Answer – A

Explanation

Based on the logical analysis of the statements in the context of artificial intelligence and agriculture:

1. **Statement 1 is incorrect:** In the context of agricultural technology, it is typically the innovations and advancements by AgTech companies that drive the transformation of agriculture and empower farmers (making them tech-savvy), rather than the farmers driving the AgTech companies. The statement reverses the general cause-and-effect relationship highlighted in such contexts.
2. **Statement 2 is correct:** The development of government advisory services to train and assist farmers in using AI tools is a highly practical and positive step toward agricultural modernization.
3. **Statement 3 is incorrect:** This is an extreme statement. Even in developed regions like the US and Europe, AI tools and precision agriculture *augment* and *assist* traditional agricultural practices to improve efficiency and yield; they have not completely *replaced* traditional farming practices.
4. **Statement 4 is correct:** The integration of large datasets (Big Data) for real-time agronomic analysis (such as weather forecasting, soil health monitoring, and crop predictive analytics) is already a reality in modern precision agriculture.

Since the question asks for the statements that are **not** correct, the correct combination is 1 and 3.

Question 13

Reasoning

P, Q, R, S and T are ranked 1 to 5 (not necessarily in that order). The rank of P is 4, the rank of Q is not 5, the rank of R is 1, the rank of S is not 2, the rank of T is not 3. Then which of the following is/are correct?
I. If the rank of S is 3, then that of T is 2.
II. If the rank of Q is 3, then that of T is 5.

Select the answer using the code given below.

A. I only

B. II only

C. Both I and II

D. Neither I nor II

Answer – D

Explanation

Answer: D — Neither I nor II

Given: $P = 4, R = 1, Q \neq 5, S \neq 2, T \neq 3$. The remaining ranks $\{2, 3, 5\}$ are distributed among Q, S, T.

Statement I: *If* $S = 3$, *then* $T = 2$.

If $S = 3$, then Q and T take $\{2, 5\}$. Since $Q \neq 5$, we must have $Q = 2$, which forces $T = 5$. So $T = 5$, not 2.
Statement I is incorrect.

Statement II: *If* $Q = 3$, *then* $T = 5$.

If $Q = 3$, then S and T take $\{2, 5\}$. Since $S \neq 2$, we must have $S = 5$, which forces $T = 2$. So $T = 2$, not 5.
**Statement II is incorrect.

Question 14

Reasoning

Two identical straight rods are painted in five distinct colours so that each of them gets divided into five equal parts along the length. In one of them, the portions are marked $P1$, $P2$, $P3$, $P4$ and $P5$ (not necessarily in that order) whereas in the other, they are marked $Q1$, $Q2$, $Q3$, $Q4$ and $Q5$ (not necessarily in that order). When the rods are kept parallel to each other side by side, $P1$ and $Q3$ match, $P4$ matches $Q1$ or $Q2$, and $Q4$ matches $P3$ or $P5$. If $Q3$ and $Q5$ are adjacent, which of the following is/are possible?
I. $Q3$ is marked at the middle portion of the straight rod.
II. $P2$ is marked at one of the extreme portions of the straight rod.
Select the answer using the code given below.

A. I only
B. II only
C. Both I and II
D. Neither I nor II

Answer – C

Explanation

Let's break down the given information step by step:

1. **Understanding the Alignment:**
Two identical straight rods are painted in five distinct colours. Because they are identical, the sequence of colours on both rods is exactly the same. When they are kept parallel side by side and their portions "match", it means they align perfectly and have the same colour.
If they were shifted, none of the distinct colours would match. If they were placed in opposite directions, at most only the middle portion would match in colour. However, the problem gives us three matching pairs, which means the rods must be aligned perfectly in the same direction (Position 1 to 1, Position 2 to 2, etc.).

2. **Analyzing the Conditions:**
Let the 5 positions on the rods be 1, 2, 3, 4, and 5.
At each position, there is one P label (from Rod 1) and one Q label (from Rod 2).
The given matching conditions tell us which labels share the same position:
- $P1$ and $Q3$ are at the same position.
- $P4$ and ($Q1$ or $Q2$) are at the same position.
- $Q4$ and ($P3$ or $P5$) are at the same position.
- $Q3$ and $Q5$ are adjacent (their position numbers differ by 1).

3. **Evaluating the Statements (Checking for Possibility):**
The question asks which of the statements is/are **possible**. We just need to find if there is at least one valid arrangement that satisfies all conditions for each statement.

Let's try to construct an arrangement where $Q3$ **is in the middle (Position 3)** and $P2$ **is at an extreme (Position 1 or 5)**:
- **Position 1:** $P2$ and $Q2$
- **Position 2:** $P3$ and $Q4$
- **Position 3:** $P1$ and $Q3$
- **Position 4:** $P5$ and $Q5$
- **Position 5:** $P4$ and $Q1$

Let's verify if this arrangement violates any rules:
- Does $P1$ match $Q3$? Yes, both are at Position 3.
- Does $P4$ match $Q1$ or $Q2$? Yes, $P4$ matches $Q1$ at Position 5.
- Does $Q4$ match $P3$ or $P5$? Yes, $Q4$ matches $P3$ at Position 2.
- Are $Q3$ and $Q5$ adjacent? Yes, $Q3$ is at Position 3 and $Q5$ is at Position 4.
- Are all labels $P1 - P5$ and $Q1 - Q5$ used exactly once? Yes.

4. **Conclusion:**

In our perfectly valid arrangement:
- $Q3$ is at the middle portion (Position 3). Thus, Statement I is **possible**.
- $P2$ is at an extreme portion (Position 1). Thus, Statement II is **possible**.

Since both scenarios can occur without violating any given conditions, both I and II are possible.

Question 15

Maths

Seven persons A, B, C, D, E, F and G travel by three cars X, Y, Z. A and another two of them travel by X. Only E travels with G. C travels by Z, but B does not travel by Y. Besides, A and B do not travel by the same car. Then which of the following are correct?

I. No one travels alone.

II. Only D travels with F.

III. Only C travels with B.

Select the answer using the code given below.

A. I and II only

B. I and III only

C. II and III only

D. All the three

Answer – B

Explanation

Answer: I and III only

Deduce the seating.

- A is in X (given).
- "Only E travels with G" → E and G share a car *alone* (just the two of them).
- C is in Z.
- $B \notin Y$ and $B \neq A$'s car, so B is in Z.
- E, G cannot be in Z (else C would be with them, contradicting "only E with G"). So E, G are in Y.
- X must hold A + two others. The only people left are D and F, so $X = \{A, D, F\}$.

Final assignment:

- $X = \{A, D, F\}$
- $Y = \{E, G\}$
- $Z = \{B, C\}$

Check the statements.

- **I. No one travels alone.** Smallest car has 2 people. **✓ True**
- **II. Only D travels with F.** F is in X with both A and D, so F has two companions. **✗ False**
- **III. Only C travels with B.** $Z = \{B, C\}$, so B's sole companion is C. **✓ True**

Question 16

Reasoning

There are four statements X, Y, Z and W. Their relations are as follows:
If X is incorrect, then so is Z; if Y is incorrect, then W is correct; if W is correct, then X is incorrect.
Which of the following is/are correct?
I. If X is correct, then so is Y.
II. If Z is correct, then it is not necessary that Y is correct.
Select the answer using the code given below.

A. I only

B. II only

C. Both I and II

D. Neither I nor II

Answer – A

Explanation

Let us represent the statements being correct as X, Y, Z, and W, and the statements being incorrect as $\neg X$, $\neg Y$, $\neg Z$, and $\neg W$.

According to the question, the given relations can be written as logical implications:
1. If X is incorrect, then Z is incorrect: $\neg X \implies \neg Z$
2. If Y is incorrect, then W is correct: $\neg Y \implies W$
3. If W is correct, then X is incorrect: $W \implies \neg X$

By combining these three relations, we can form a continuous chain of implications:
$\neg Y \implies W \implies \neg X \implies \neg Z$

In logic, the contrapositive of a statement $A \implies B$ is $\neg B \implies \neg A$, and both always hold the exact same truth value.
Taking the contrapositive of our entire chain of implications (reversing the order and negating each term), we get:
$Z \implies X \implies \neg W \implies Y$

Now, let us evaluate the given conclusions based on this contrapositive chain:

Statement I: If X is correct, then so is Y.
From our contrapositive chain, we can clearly see that $X \implies Y$. This means that if X is correct, Y must definitely be correct. Therefore, **Statement I is correct**.

Statement II: If Z is correct, then it is not necessary that Y is correct.
From our contrapositive chain, we can see that $Z \implies Y$. This means that if Z is correct, it is absolutely necessary that Y is correct. Therefore, **Statement II is incorrect**.

Since only Statement I is correct, the correct option is A.

Question 17

Maths

X and Y are two runners who run for the same duration of time on the same circular track. They started running at the same time in the same direction with uniform speeds. When X completed 7 rounds, Y did exactly 5. After completing 5 rounds, Y changed his direction and started running in the opposite direction with speed which is double of his earlier speed. On the other hand, X continued to run with the same speed. They stopped running when X completed exactly 21 rounds. How many times did X and Y meet after they had started and before they finally stopped?

A. 35

B. 34

C. 31

D. 29

Answer – A

Explanation

Let's break the problem into two phases: before and after Y changes direction.

Phase 1: Running in the same direction

- We are given that when X completes 7 rounds, Y completes exactly 5 rounds.
- Let this duration be T.
- The speeds of X and Y are $V_X = 7$ rounds per T and $V_Y = 5$ rounds per T.
- Since they are running in the same direction, their relative speed is $V_X - V_Y = 7 - 5 = 2$ rounds per T.
- The number of times they meet is equal to the relative distance covered in rounds. In time T, they cover a relative distance of 2 rounds, meaning they meet exactly 2 **times**.
- These meetings occur at $t = 0.5T$ and $t = 1.0T$. The meeting at $t = 1.0T$ happens exactly when X completes 7 rounds and Y completes 5 rounds (both are at the starting point).

Phase 2: Running in opposite directions

- After $t = 1.0T$, Y changes direction and doubles his speed.
- Y's new speed is $V_Y' = 2 \times 5 = 10$ rounds per T.
- X continues in the same direction with the same speed, $V_X = 7$ rounds per T.
- Because they are now running in opposite directions, their new relative speed is $V_X + V_Y' = 7 + 10 = 17$ rounds per T.
- X stops when he completes exactly 21 rounds. Since he already completed 7 rounds in Phase 1, he must run $21 - 7 = 14$ more rounds in Phase 2.
- The time taken for Phase 2 is the distance X runs divided by his speed: $\frac{14 \text{ rounds}}{7 \text{ rounds per } T} = 2T$.
- In this duration of $2T$, the number of times they meet is their relative speed multiplied by the time: $17 \times 2 = 34$ times.
- These 34 meetings happen strictly after $t = 1.0T$. The very last meeting (the 34th in this phase) occurs exactly at the end of the $2T$ duration (at $t = 3.0T$), which is when X completes his 21st round and they both finally stop.

Total Number of Meetings:

- The question asks for the number of meetings **after they had started** and **before they finally stopped**.
- We exclude the start ($t = 0$) and the final stop ($t = 3.0T$).
- Meetings in Phase 1: 2 (at $t = 0.5T$ and $t = 1.0T$).
- Meetings in Phase 2: $34 - 1 = 33$ (excluding the final stop at $t = 3.0T$).
- Total valid meetings = $2 + 33 = 35$.

Therefore, X and Y met 35 times.

Question 18

Maths

In an objective type question paper, 5 marks are awarded for a correct answer and 2 marks are deducted for a wrong answer. A student attempted all the questions and got a score of 69. Had he been awarded 4 marks for a correct answer and 1 mark deducted for a wrong answer, he would have scored 84. How many questions were there in the question paper?

A. 99

B. 81

C. 84

D. 79

Answer – B

Explanation

Let the number of correctly answered questions be x and the number of wrongly answered questions be y.
Since the student attempted all questions, the total number of questions in the paper is $x + y$.

According to the first condition, 5 marks are awarded for a correct answer and 2 marks are deducted for a wrong answer, resulting in a score of 69:

$$5x - 2y = 69 \quad \text{— (Equation 1)}$$

According to the second condition, if 4 marks were awarded for a correct answer and 1 mark deducted for a wrong answer, the score would be 84:

$$4x - y = 84 \quad \text{— (Equation 2)}$$

From Equation 2, we can express y in terms of x:

$$y = 4x - 84$$

Substitute this value of y into Equation 1:

$$5x - 2(4x - 84) = 69$$

$$5x - 8x + 168 = 69$$

$$-3x = 69 - 168$$

$$-3x = -99$$

$$x = 33$$

Now, substitute the value of x back into the expression for y:

$$y = 4(33) - 84$$

$$y = 132 - 84$$

$$y = 48$$

The student answered 33 questions correctly and 48 questions wrongly.
The total number of questions in the paper is:

$$x + y = 33 + 48 = 81$$

Therefore, there were 81 questions in the question paper.

Question 19

Comprehension

> The Juvenile Justice (Care and Protection of Children) Act, or the JJ Act, 2015 allows for the possibility for trying adolescents above 16 as adults if they are accused of committing a heinous offence. A heinous offence is one with a minimum punishment of seven years. Offences such as culpable homicide and causing death by negligence, which are common in drunken driving cases, are not heinous offences because they do not have a prescribed minimum punishment. The JJ Act, amended in 2021, now categorises an offence that has no minimum sentence, but has a maximum sentence of seven years or more as a serious offence which nonetheless, in the opinion of activists, does not merit the transfer of a case to the adult criminal justice system.

Which of the following conclusions is/are valid?

1. Only a serious offence as categorised by the revised JJ Act, justifies the transfer of a case to the adult judicial system.
2. The JJ Act, 2021, categorises an offence as a serious offence based on the maximum sentence it carries, rather than on the minimum sentence.

Select the answer using the code given below.

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer – B

Explanation

Let us evaluate the given conclusions based on the passage:

Statement 1 is invalid: The passage explicitly states that the JJ Act allows for the possibility of trying adolescents above 16 as adults if they are accused of committing a **heinous offence**, not a serious offence. Furthermore, the passage notes that in the opinion of activists, a serious offence does **not** merit the transfer of a case to the adult criminal justice system. Therefore, the claim that *only* a serious offence justifies this transfer is completely contradictory to the passage.

Statement 2 is valid: The passage mentions, "The JJ Act, amended in 2021, now categorises an offence that has no minimum sentence, but has a maximum sentence of seven years or more as a serious offence." This clearly indicates that for an offence to be classified as a "serious offence," the determining factor is the maximum sentence it carries (seven years or more), given that there is no prescribed minimum sentence.

Since only the second conclusion logically follows from the text, the correct option is **B**.

Question 20

Comprehension

> The Juvenile Justice (Care and Protection of Children) Act, or the JJ Act, 2015 allows for the possibility for trying adolescents above 16 as adults if they are accused of committing a heinous offence. A heinous offence is one with a minimum punishment of seven years. Offences such as culpable homicide and causing death by negligence, which are common in drunken driving cases, are not heinous offences because they do not have a prescribed minimum punishment. The JJ Act, amended in 2021, now categorises an offence that has no minimum sentence, but has a maximum sentence of seven years or more as a serious offence which nonetheless, in the opinion of activists, does not merit the transfer of a case to the adult criminal justice system.

Which of the following statements is/are correct?

1. If an offence has no minimum prescribed punishment, it cannot be considered heinous as per the JJ Act, 2015.
2. As per the JJ Act, 2021, an offence for which there is a provision for a maximum sentence of seven years or more, but no minimum sentence, is to be considered a serious offence.

Select the answer using the code given below.

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer – C

Explanation

Answer: C — Both 1 and 2

Statement 1 is correct: The passage defines a heinous offence as "one with a minimum punishment of seven years," and explicitly cites culpable homicide and death by negligence as offences that "are not heinous offences because they do not have a prescribed minimum punishment." So if an offence has no minimum prescribed punishment, it cannot be classified as heinous under the JJ Act, 2015.

Statement 2 is correct: The passage states, "The JJ Act, amended in 2021, now categorises an offence that has no minimum sentence, but has a maximum sentence of seven years or more as a serious offence." This is exactly what Statement 2 paraphrases.

Since both statements are directly supported by the passage, **Option C** is correct.

Question 21

Maths

An explosion takes place at a certain distance from an army camp. As soon as the sensor in the camp receives the sound of the explosion, a drone starts flying towards the spot of explosion. The drone clicks a picture from the spot and the camp receives it at the same time. Immediately another drone starts flying to the spot and it also sends a picture as soon as it reaches the spot. The two pictures were received at 5:02 PM and 5:05 PM, respectively. If the speed of the drones is 30 m/s, at what time did the explosion take place? Assume that the speed of sound is 300 m/s.

A. 4:59:00 PM

B. 4:59:02 PM

C. 4:58:42 PM

D. 4:56:32 PM

Answer – C

Explanation

Answer: C — 4:58:42 PM

Let T be the time of the explosion and d the distance from the camp to the explosion site.

Time interval between the two pictures.

The second drone leaves at 5:02 PM (when the first picture arrives) and reaches the spot in $\frac{d}{30}$ seconds, with its picture received the moment it lands. So:

$$\frac{d}{30} = (5{:}05 - 5{:}02) = 180 \text{ s} \;\Rightarrow\; d = 5400 \text{ m}$$

Working backward from the first picture (5:02 PM).

After the explosion at T:
- Sound takes $\frac{d}{300} = 18$ s to reach the camp.
- The first drone then takes $\frac{d}{30} = 180$ s to reach the spot (picture received instantly).

Total: $18 + 180 = 198$ s $= 3$ min 18 s.

$$T = 5{:}02{:}00 - 0{:}03{:}18 = 4{:}58{:}42 \text{ PM}$$

Question 22

Maths

The digit in the unit place of the number $6^{129} \times 7^{307}$ is

A. 2

B. 4

C. 8

D. 6

Answer – C

Explanation

To find the unit digit of the expression $6^{129} \times 7^{307}$, we need to determine the unit digits of 6^{129} and 7^{307} separately and then multiply them.

Step 1: Find the unit digit of 6^{129}

The unit digit of any positive integer power of 6 is always 6. This is because $6 \times 6 = 36$, $36 \times 6 = 216$, and so on.
Therefore, the unit digit of 6^{129} is 6.

Step 2: Find the unit digit of 7^{307}

The unit digits of powers of 7 follow a repeating cycle of 4:
- $7^1 = 7$ (unit digit is 7)
- $7^2 = 49$ (unit digit is 9)
- $7^3 = 343$ (unit digit is 3)
- $7^4 = 2401$ (unit digit is 1)
- $7^5 = 16807$ (unit digit is 7, and the cycle repeats)

To find where 7^{307} falls in this cycle, we divide the exponent 307 by the cycle length, which is 4:

$$307 \div 4 = 76 \text{ with a remainder of } 3$$

A remainder of 3 means the unit digit corresponds to the 3rd position in the cycle, which is the same as the unit digit of 7^3.
Therefore, the unit digit of 7^{307} is 3.

Step 3: Multiply the unit digits

Now, we multiply the unit digits obtained from both parts:

$$6 \times 3 = 18$$

The unit digit of this product is 8.

Thus, the digit in the unit place of the number $6^{129} \times 7^{307}$ is 8.

Question 23

Maths

A person saves 10% of his salary every month. If his salary increases by 12% and the expenditure increases by 10%, then what will be the change in his saving per month?

A. 20% increase

B. 30% increase

C. 03% decrease

D. 02% decrease

Answer – B

Explanation

Let the initial salary of the person be 100.

Given that the person saves 10% of his salary:
- Initial saving = 10% of $100 = 10$
- Initial expenditure = Initial salary - Initial saving = $100 - 10 = 90$

Now, the salary increases by 12% and the expenditure increases by 10%:
- New salary = $100 + 12\%$ of $100 = 100 + 12 = 112$
- New expenditure = $90 + 10\%$ of $90 = 90 + 9 = 99$

The new saving will be the difference between the new salary and the new expenditure:
- New saving = New salary - New expenditure = $112 - 99 = 13$

Now, we calculate the change in his saving:
- Increase in saving = New saving - Initial saving = $13 - 10 = 3$
- Percentage increase in saving = $\left(\frac{\text{Increase in saving}}{\text{Initial saving}}\right) \times 100\%$
- Percentage increase = $\left(\frac{3}{10}\right) \times 100\% = 30\%$

Therefore, there is a 30% **increase** in his saving per month.

Question 24

Reasoning

P has a son and a daughter. S is the mother of T. S is R's spouse. Q and R are children of P. Then how is Q related to S?

A. Q is a sister of S

B. Q is a daughter of S

C. Q is the mother of S

D. Q is a sister of the husband of S

Answer – D

Explanation

Let us break down the given information step-by-step to determine the relationship between Q and S:

Step 1: Determine the genders of S and R

- We are given that S is the mother of T. This means S is a female.
- We are also given that S is R's spouse. Since S is a female, her spouse R must be a male (husband of S).

Step 2: Determine the gender of Q

- We are given that Q and R are the children of P.
- The first statement says P has exactly one son and one daughter.
- Since we already established that R is a male, R is the son of P.
- Therefore, the other child, Q, must be the daughter of P. This makes Q a female and the sister of R.

Step 3: Find the relationship between Q and S

- Q is the sister of R.
- R is the husband of S.
- Hence, Q is the sister of the husband of S (which also means Q is the sister-in-law of S).

Comparing this conclusion with the given options, Option D perfectly matches our deduction.

Question 25

Maths

How many three-digit numbers can be expressed as an integral power of 2?

A. 1

B. 2

C. 3

D. 4

Answer – C

Explanation

To find how many three-digit numbers can be expressed as an integral power of 2, we need to evaluate numbers of the form 2^n (where n is an integer) and check which ones fall in the range of 100 to 999.

Let us list the positive integral powers of 2:

- $2^1 = 2$
- $2^2 = 4$
- $2^3 = 8$
- $2^4 = 16$
- $2^5 = 32$
- $2^6 = 64$
- $2^7 = 128$ (**Three-digit number**)
- $2^8 = 256$ (**Three-digit number**)
- $2^9 = 512$ (**Three-digit number**)
- $2^{10} = 1024$ (Four-digit number)

As we can see, the powers of 2 continue to grow, and any power greater than 9 will result in a number with four or more digits. Negative integral powers of 2 result in fractions (e.g., $2^{-1} = 0.5$), which are not three-digit numbers.

Thus, the only three-digit numbers that are integral powers of 2 are 128, 256, and 512.

There are exactly 3 such numbers.

Question 26

Comprehension

> The key source of the battle for clean skies and clear lungs is the fuel we burn—from household chulhas to the thermal power plants. In most cases, it is biomass or coal. The Supreme Court banned the use of pet coke—the dirtiest of such fuels. The Delhi Government banned the use of coal, which was later extended to the entire National Capital Region. It was also agreed that the thermal power plants would clean up or shut down. Action on this has been patchy to say the least. The lesson from the transition to CNG is that people need alternatives for a ban to be effective. When diesel buses were stopped, CNG supply had to be assured. It also had to be feasible in terms of cost. The Supreme Court agreed that fiscal measures were needed to keep clean fuel cheaper than dirty fuel. Now even as coal is banned, the price of natural gas makes industry uncompetitive.

Which of the following inferences is/are correct?

1. The source of the energy we consume is the key to the battle for cleaner air.
2. Bans are effective where the will is strong and the people are convinced that such bans are for the greater good of society.
3. There is judicial approval for a policy that intervenes fiscally to facilitate benevolent pricing for cleaner fuel.

Select the answer using the code given below.

A. 1 and 2

B. 2 and 3

C. 1 and 3

D. 1 only

Answer – C

Explanation

Answer: C — 1 and 3

Statement 1 — Correct. The passage opens: "The key source of the battle for clean skies and clear lungs is the fuel we burn—from household chulhas to the thermal power plants." This directly supports the inference that the source of energy we consume is key to the battle for cleaner air.

Statement 2 — Incorrect. The passage states that for a ban to be effective, "people need alternatives" (citing CNG availability after diesel buses were stopped, and fiscal measures to keep clean fuel cheaper than dirty fuel). The argument is about *practical alternatives*, not about public will or conviction. The statement misattributes the cause of effectiveness.

Statement 3 — Correct. The passage says: "The Supreme Court agreed that fiscal measures were needed to keep

clean fuel cheaper than dirty fuel." This is exactly judicial approval for fiscal intervention to facilitate benevolent pricing for cleaner fuel.

Question 27

Comprehension

> The key source of the battle for clean skies and clear lungs is the fuel we burn—from household chulhas to the thermal power plants. In most cases, it is biomass or coal. The Supreme Court banned the use of pet coke—the dirtiest of such fuels. The Delhi Government banned the use of coal, which was later extended to the entire National Capital Region. It was also agreed that the thermal power plants would clean up or shut down. Action on this has been patchy to say the least. The lesson from the transition to CNG is that people need alternatives for a ban to be effective. When diesel buses were stopped, CNG supply had to be assured. It also had to be feasible in terms of cost. The Supreme Court agreed that fiscal measures were needed to keep clean fuel cheaper than dirty fuel. Now even as coal is banned, the price of natural gas makes industry uncompetitive.

Which of the following statements is/are correct?

1. Thermal power stations in Delhi were required to summarily shut down.
2. CNG supplies had to be assured once diesel vehicles were prohibited from plying.
3. The Supreme Court banned the use of coal across the National Capital Region.

Select the answer using the code given below.

A. 1 and 2

B. 3 only

C. 2 only

D. 2 and 3

Answer – C

Explanation

Answer: C — 2 only

Statement 1 — Incorrect. The passage says thermal power plants "would clean up *or* shut down" — shutting down was one of two options. It then notes that "action on this has been patchy". So they were not "required to summarily shut down"; the requirement was either clean up or shut down, and even that has not been fully enforced.

Statement 2 — Correct. The passage explicitly states: "When diesel buses were stopped, CNG supply had to be assured." This matches the statement directly.

Statement 3 — Incorrect. Per the passage, the Supreme Court banned **pet coke**, while the **Delhi Government** banned coal (later extended to the rest of NCR). The coal ban is therefore attributable to the Delhi Government, not the Supreme Court.

Question 28

Reasoning

Consider the following statements:
Every red is blue. Every blue is green. Every green is yellow.

Which of the following statements denoted by P, Q and R are correct?
P. Every blue is yellow.
Q. Every red is green.
R. Every red is yellow.

Select the answer using the code given below.

A. P and Q only
B. Q and R only
C. P and R only
D. P, Q and R

Answer – D

Explanation

Based on the given statements, we can establish a logical chain of relationships using set theory or syllogism:

1. **Every red is blue**: This means the set of Red (R) is a subset of Blue (B). So, $R \subset B$.
2. **Every blue is green**: This means the set of Blue (B) is a subset of Green (G). So, $B \subset G$.
3. **Every green is yellow**: This means the set of Green (G) is a subset of Yellow (Y). So, $G \subset Y$.

Combining these premises, we get a continuous chain of subsets:

$$R \subset B \subset G \subset Y$$

Now, let us evaluate the given conclusions:
- **Statement P (Every blue is yellow)**: Since $B \subset G$ and $G \subset Y$, it logically follows that $B \subset Y$. Thus, statement P is correct.
- **Statement Q (Every red is green)**: Since $R \subset B$ and $B \subset G$, it logically follows that $R \subset G$. Thus, statement Q is correct.
- **Statement R (Every red is yellow)**: Since $R \subset B$, $B \subset G$, and $G \subset Y$, it logically follows that $R \subset Y$. Thus, statement R is correct.

Since all three statements P, Q, and R are logically deduced from the premises, the correct option is **D**.

Question 29

Maths

How many times does 5 appear in all two-digit positive integers?

A. 18

B. 19

C. 20

D. 21

Answer – B

Explanation

Answer: B — 19

Count the digit 5 separately in tens and units places of two-digit numbers 10–99.

Tens place. The tens digit is 5 in $50, 51, \ldots, 59$ — that's 10 occurrences.

Units place. The units digit is 5 in $15, 25, 35, 45, 55, 65, 75, 85, 95$ — that's 9 occurrences.

Total: $10 + 9 = 19$.

Question 30

Maths

X travels 6 km on a bicycle with average speeds of 5 km per hour, 10 km per hour and 4 km per hour during the first 1 km, the next 2 km and the remaining 3 km, respectively. Y travels the same distances with average speeds of 4 km per hour, 10 km per hour and 5 km per hour, respectively. How many minutes early will Y complete the journey if both X and Y start at the same time?

A. 3

B. 4

C. 5

D. 6

Answer – D

Explanation

Answer: D – 6

For X, the time taken is:

$$T_X = \frac{1}{5} + \frac{2}{10} + \frac{3}{4}$$

Since $\frac{2}{10} = \frac{1}{5}$, we get:

$$T_X = \frac{1}{5} + \frac{1}{5} + \frac{3}{4}$$

$$T_X = \frac{2}{5} + \frac{3}{4}$$

Taking LCM as 20:

$$T_X = \frac{8}{20} + \frac{15}{20} = \frac{23}{20}$$

So, X takes $\frac{23}{20}$ hours.

For Y, the time taken is:

$$T_Y = \frac{1}{4} + \frac{2}{10} + \frac{3}{5}$$

Since $\frac{2}{10} = \frac{1}{5}$, we get:

$$T_Y = \frac{1}{4} + \frac{1}{5} + \frac{3}{5}$$

Taking LCM as 20:

$$T_Y = \frac{5}{20} + \frac{4}{20} + \frac{12}{20} = \frac{21}{20}$$

So, Y takes $\frac{21}{20}$ hours.

The time saved by Y is:

$$T_X - T_Y = \frac{23}{20} - \frac{21}{20} = \frac{2}{20} = \frac{1}{10}$$

Thus, the time saved is $\frac{1}{10}$ hour.

Converting hours into minutes:

$$\frac{1}{10} \times 60 = 6$$

Therefore, Y completes the journey 6 minutes earlier than X.

Question 31

Reasoning

Seven cubes are identical in shape. Out of these, the weight of each of the six cubes is equal and the weight of the remaining cube is less than the weight of any other cube. A balance is used to identify the lightest cube. What is the minimum number of attempts required to distinguish the odd cube with certainty?

A. 2

B. 3

C. 4

D. 1

Answer – A

Explanation

To find the minimum number of attempts required to identify the lightest cube with certainty, we must consider the worst-case scenario using an optimal weighing strategy.

Step 1: First Weighing

Divide the 7 cubes into three groups: two groups of 3 cubes each, and one group of 1 cube. Place the two groups of 3 cubes on either pan of the balance.

- **Case 1:** The balance is equal. This means all 6 cubes on the balance are of equal weight. The lightest cube is the 1 cube that was left out. Here, we find it in 1 attempt.
- **Case 2:** The balance is unequal. One pan will be lighter, meaning the lightest cube is among the 3 cubes on that lighter pan.

Step 2: Second Weighing

Take the 3 cubes from the lighter pan (from Case 2). Select any 2 cubes and place one on each pan of the balance, leaving the 3rd cube aside.

- **Case 2a:** The balance is equal. The lightest cube is the 1 cube left aside.
- **Case 2b:** The balance is unequal. The cube on the lighter pan is the lightest cube.

In every possible scenario, a maximum of 2 weighings is sufficient to guarantee finding the lightest cube. Therefore, the minimum number of attempts required to distinguish the odd cube with certainty is 2.

Question 32

Comprehension

> Previous waves of customer-service technology, including email and those pesky voice menus, stoked concerns of job losses, only for them to fail to materialise. AI could yet prove different. And if it does, its effects may be salutary. Human agents could be freed up to spend more time on creative and rewarding tasks, like using feedback to make products and services better—and thereby spend less time listening to irate customers!

Which one among the following statements most appropriately reflects the point of view of the given passage?

A. If AI were to take over customer service, there would be no work left for human subjects to do.

B. Irritating voice menus and email could not achieve human redundancy to the extent that AI might.

C. The value of human intervention in the workplace affected by AI might be enhanced through redirection towards more fulfilling tasks.

D. Unlike previous waves in customer-service technology, AI has raised the alarm of worker replacement.

Answer – C

Explanation

To determine the most appropriate reflection of the passage's point of view, let us evaluate each option based on the text:

Option A: The passage explicitly states that human agents could be "freed up to spend more time on creative and rewarding tasks." Therefore, it is incorrect to say there would be no work left for humans to do.

Option B: While the passage does suggest that AI might succeed in replacing certain human tasks where previous technologies failed, this option misses the author's core message. The author's main point of view is optimistic, focusing on the *salutary* (beneficial) effects of this shift, rather than just the redundancy itself.

Option C: This statement perfectly captures the central theme of the passage. The author argues that if AI takes over certain customer-service roles, its effects "may be salutary" because human workers can be redirected toward "creative and rewarding tasks" (more fulfilling tasks), thereby enhancing the value of their intervention (e.g., "using feedback to make products and services better").

Option D: The passage explicitly states that previous waves of technology *also* "stoked concerns of job losses." Therefore, it is incorrect to claim that AI has raised the alarm of worker replacement *unlike* previous waves.

Conclusion: Option C is the only statement that accurately and comprehensively reflects the author's optimistic point of view regarding AI in the workplace.

Question 33

Comprehension

> Previous waves of customer-service technology, including email and those pesky voice menus, stoked concerns of job losses, only for them to fail to materialise. AI could yet prove different. And if it does, its effects may be salutary. Human agents could be freed up to spend more time on creative and rewarding tasks, like using feedback to make products and services better—and thereby spend less time listening to irate customers!

Which of the following conclusions, made on the basis of the given passage, is/are correct?
1. The advent of new customer-service technology had invariably sparked fears about job losses.
2. Often it is found that instead of job losses, alternative channels for employee engagement are discovered while certain tasks are replaced by technology.
3. The advent of technology inevitably leads to stressful outcomes.

Select the answer using the code given below.

A. 1 and 3

B. 2 only

C. 3 only

D. 1 and 2

Answer – D

Explanation

Answer: D — 1 and 2

Statement 1 — Correct. The passage opens with: "Previous waves of customer-service technology, including email and those pesky voice menus, stoked concerns of job losses…" and then says "AI could yet prove different." The pattern of fears being sparked applies across previous waves *and* the current one — supporting the claim that this has happened invariably with new customer-service technology.

Statement 2 — Correct. The passage notes that earlier fears of job loss "fail[ed] to materialise," and that AI could free human agents up to "spend more time on creative and rewarding tasks." So technology has historically replaced specific tasks while opening up alternative channels of employee engagement, exactly as the statement says.

Statement 3 — Incorrect. The passage's tone is the opposite — the author thinks AI's effects "may be salutary" because workers can shift to "rewarding tasks." Nothing in the passage supports the sweeping claim that technology *inevitably* leads to stressful outcomes

Question 34

Comprehension

> Cattle from the nearby villages came to the common ground to graze, and there was still a cool freshness in the air. Hori took several deep breaths and thought of sitting down for a while, since he'd be dying of heat in the scorching 'loo' wind the rest of the day. A number of farmers were eager to lease this bit of land and had offered a good price, but Rai Sahib—God bless him—had plainly told them it was reserved for grazing and would not be relinquished for any price. If he'd been one of those selfish Zamindars, he'd have said the cattle could go to hell, that there was no reason for him to miss the chance to make a little money. But the Rai Sahib still held to the old values, feeling that any landlord who didn't look after his tenants was less than human.

Which of the following conclusions is/are correct?

1. All landlords essentially have some goodness trapped within them.
2. The common grazing grounds of a village are intended for use by the cattle of that village.
3. Landlords who believe in tradition tend to be more concerned about their tenants.
4. Winds later in the day tend to be cooler post the hot winds of the morning.

Select the answer using the code given below.

A. 1 and 3

B. 2 and 4

C. 3 only

D. 2 only

Answer – C

Explanation

Answer: C — 3 only

Let us examine each conclusion in the context of the passage:

1. **All landlords essentially have some goodness trapped within them.**
- This is not supported by the passage. The passage praises Rai Sahib specifically and contrasts him with selfish Zamindars. It does not say that all landlords have goodness within them.

2. **The common grazing grounds of a village are intended for use by the cattle of that village.**
- This does not follow exactly from the passage. The passage says that cattle from nearby villages came to the common ground to graze. It does not say that the grazing ground was meant only for the cattle of that particular village.

3. **Landlords who believe in tradition tend to be more concerned about their tenants.**
- This follows from the passage. Rai Sahib is described as holding to the old values, and these old values include the

belief that a landlord should look after his tenants.

4. **Winds later in the day tend to be cooler post the hot winds of the morning.**
- This is incorrect. The passage says there was cool freshness in the air at that time, but Hori expected the rest of the day to be hot because of the scorching loo wind.

Therefore, only conclusion 3 is correct.

Question 35

Comprehension

> Cattle from the nearby villages came to the common ground to graze, and there was still a cool freshness in the air. Hori took several deep breaths and thought of sitting down for a while, since he'd be dying of heat in the scorching 'loo' wind the rest of the day. A number of farmers were eager to lease this bit of land and had offered a good price, but Rai Sahib—God bless him—had plainly told them it was reserved for grazing and would not be relinquished for any price. If he'd been one of those selfish Zamindars, he'd have said the cattle could go to hell, that there was no reason for him to miss the chance to make a little money. But the Rai Sahib still held to the old values, feeling that any landlord who didn't look after his tenants was less than human.

Which of the following statements are **not** correct?

1. The landholdings of Rai Sahib were currently not being used for farming.
2. Temperamentally, Rai Sahib was as greedy as other landlords.
3. It cannot be ascertained that Rai Sahib could have made some money by leasing out the grazing land.
4. It may be asserted that Rai Sahib valued his tenants and wanted to protect their livelihood.

Select the answer using the code given below.

A. 1 and 2 only

B. 1 and 3 only

C. 3 and 4

D. 1, 2 and 3

Answer – D

Explanation

Answer: D — 1, 2 and 3

The question asks which statements are **not** correct based on the passage.

Statement 1 — Not correct. The passage refers specifically to a single common grazing ground reserved by Rai Sahib. It says nothing about whether the rest of his landholdings are or aren't used for farming. The sweeping claim about "the landholdings" (all of them) cannot be drawn from the passage.

Statement 2 — Not correct. The passage explicitly contrasts Rai Sahib with "selfish Zamindars" and notes that he held to "the old values" of looking after tenants. Far from being "as greedy as other landlords," he is presented as an exception to that greed.

Statement 3 — Not correct. The passage states that "a number of farmers were eager to lease this bit of land and had offered a good price." So we *can* ascertain that Rai Sahib could have made money by leasing it out — he simply

chose not to.

Statement 4 — Correct. The line "any landlord who didn't look after his tenants was less than human" supports this assertion directly.

Since statements 1, 2 and 3 are the ones that are not correct, **Option D** is correct.

Question 36

Reasoning

A person facing the East travels 4 km straight and then turns right and travels 3 km, then further turns left and travels 2 km and finally turns left and travels 3 km. The minimum distance between the final point and the initial point, and the direction in which the person is facing at the final point are, respectively

A. 12 km, East

B. 6 km, East

C. 8 km, North

D. 6 km, North

Answer – D

Explanation

Let the starting point be the origin $(0, 0)$.

1. The person faces East and travels 4 km straight.
Current position: $(4, 0)$. Facing: East.
2. The person turns right. Since they were facing East, a right turn means they are now facing South. They travel 3 km.
Current position: $(4, -3)$. Facing: South.
3. The person turns left. Since they were facing South, a left turn means they are now facing East. They travel 2 km.
Current position: $(4 + 2, -3) = (6, -3)$. Facing: East.
4. The person turns left again. Since they were facing East, a left turn means they are now facing North. They travel 3 km.
Current position: $(6, -3 + 3) = (6, 0)$. Facing: North.

The final point is $(6, 0)$ and the initial point is $(0, 0)$.
The minimum distance between the final and initial point is the straight-line distance:

$$Distance = \sqrt{(6 - 0)^2 + (0 - 0)^2} = \sqrt{36} = 6 \text{ km}$$

At the final point, the person is facing North.

Therefore, the minimum distance is 6 km and the direction the person is facing is North. This matches Option D.

Question 37

Maths

In a sequence of numbers, each number other than the first two is the sum of the two immediately preceding numbers from it. If the first two numbers in the sequence are 4 and 7, then the sixth number is

A. 29

B. 37

C. 43

D. 47

Answer – D

Explanation

Answer: 47

Each term is the sum of the two preceding terms.

- $a_1 = 4$
- $a_2 = 7$
- $a_3 = 4 + 7 = 11$
- $a_4 = 7 + 11 = 18$
- $a_5 = 11 + 18 = 29$
- $a_6 = 18 + 29 = 47$

Question 38

Maths

The ratio of male to female workers in two companies A and B is $13:10$ and $7:5$, respectively. If both the companies have the same number of female workers, then what is the ratio of the total number of workers in A to those in B?

A. $24:23$

B. $23:24$

C. $18:17$

D. $27:18$

Answer – B

Explanation

Let the number of male and female workers in company A be $13x$ and $10x$, respectively.
Let the number of male and female workers in company B be $7y$ and $5y$, respectively.

Given that both companies have the same number of female workers, we can equate the two:

$$10x = 5y$$

$$y = 2x$$

Now, let's find the total number of workers in each company.
Total workers in company $A = 13x + 10x = 23x$
Total workers in company $B = 7y + 5y = 12y$

Substitute $y = 2x$ into the total for company B:
Total workers in company $B = 12(2x) = 24x$

The ratio of the total number of workers in company A to those in company B is:

$$\frac{23x}{24x} = 23:24$$

Alternative Method:
Ratio of male to female workers in $A = 13:10$
Ratio of male to female workers in $B = 7:5$

To make the number of female workers equal in both ratios, we can multiply the ratio for company B by 2:

New ratio for company $B = (7 \times 2) : (5 \times 2) = 14 : 10$

Now, the number of female workers is 10 units in both companies.
Total workers in company $A = 13 + 10 = 23$ units
Total workers in company $B = 14 + 10 = 24$ units

Ratio of total workers in A to $B = 23 : 24$.

Question 39

Maths

If the product of the HCF and LCM of two distinct numbers is the cube of one of the numbers, then which of the following statements is/are correct?

I. The difference of the numbers is an even number.
II. One of the numbers is a perfect square.

Select the answer using the code given below.

A. I only

B. II only

C. Both I and II

D. Neither I nor II

Answer – C

Explanation

Answer: Both I and II

Set up using HCF × LCM = product of the two numbers.

Let the numbers be a and b (distinct). We know:

$$\text{HCF}(a, b) \times \text{LCM}(a, b) = a \cdot b$$

Given this product equals the cube of one of the numbers, say a^3:

$$a \cdot b = a^3 \Rightarrow b = a^2$$

So the two numbers are a and a^2 (with $a \geq 2$ for them to be distinct positive integers).

Check the statements.

- **I. Difference is even.** $a^2 - a = a(a-1)$, the product of two consecutive integers, which is always even. ✓ **True**
- **II. One of the numbers is a perfect square.** $b = a^2$ is a perfect square. ✓ **True**

Sanity check: $a = 2 \Rightarrow$ numbers $2, 4$; HCF $= 2$, LCM $= 4$, product $= 8 = 2^3$. Difference $= 2$ (even), and 4 is a perfect square. ✓

Question 40

Maths

If x and y are two digits and the number $4x5y790$ is divisible by 11, then what is the remainder, if $x + y$ is divided by 11?

A. 1

B. 3

C. 5

D. 7

Answer – D

Explanation

Answer: D – 7

For the 7-digit number $4x5y790$, label digit positions from the right: position $1 = 0, 2 = 9, 3 = 7, 4 = y, 5 = 5, 6 = x, 7 = 4$.

Apply the divisibility rule for 11.

(Sum of digits at odd positions) − (sum of digits at even positions) must be divisible by 11.

- Odd-position sum: $0 + 7 + 5 + 4 = 16$
- Even-position sum: $9 + y + x = x + y + 9$

So we need $16 - (x + y + 9) = 7 - (x + y)$ to be a multiple of 11.

Solve.

x, y are digits, so $0 \leq x + y \leq 18$, giving $7 - (x + y) \in [-11, 7]$. Multiples of 11 in this range: 0 and -11.

- $7 - (x + y) = 0 \Rightarrow x + y = 7$
- $7 - (x + y) = -11 \Rightarrow x + y = 18$

In both cases, $(x + y) \bmod 11 = 7$.

Question 41

Comprehension

Was it the sun-dappled ambience, the strawberries and cream, the frustration of Flavio Cobolli's unforced errors against Serbian Novak Djokovic on Centre Court or simply the crushing weight of being a 64-year-old man in the third act of a very public life? Whatever the reason, Hugh Grant, the actor, deserves empathy. There he was, in the Royal Box at Wimbledon, flanked by Britain's well-dressed and well-rested spectators, watching the men's singles quarterfinals, when the actor did something quietly radical : head at a tilt, eyes closed, utterly unbothered, he took a nap. So praise be to Grant for serving up an unexpected ace. In that small, delicious moment, he didn't merely catch forty winks, he made an elegant case for surrender. Not to laziness, but to limits. To the body's quiet wisdom over society's relentless performance metrics. Wimbledon had its tennis. The perpetually sleep-deprived discovered a leading man, not of action, but of rest.

Which of the following statements is/are correct?
1. Radical action can also be attributed to mild surrender where one acts against societal expectations.
2. Submitting to one's limitations, given the effect of age and other factors, ought not to be conflated with laziness.
3. 'Leading man' usually refers to one who plays the lead role in a movie; in this instance the implication is that Hugh Grant is performing the role of not an action hero, but that of a resting one!

Select the answer using the code given below.

A. 1 and 2 only

B. 2 and 3 only

C. 1, 2 and 3

D. 3 only

Answer – C

Explanation

Let us evaluate each statement based on the passage:

Statement 1 is correct: The passage describes Hugh Grant's nap as "quietly radical" and an "elegant case for surrender... to the body's quiet wisdom over society's relentless performance metrics." This directly supports the idea that a radical action can be a form of mild surrender against societal expectations.

Statement 2 is correct: The author explicitly mentions the "crushing weight of being a 64-year-old man" (effect of age) and states that his nap was a surrender "Not to laziness, but to limits." This means submitting to one's physical limitations should not be mistaken for laziness.

Statement 3 is correct: The passage concludes with a clever play on words: "The perpetually sleep-deprived discovered a leading man, not of action, but of rest." Since Hugh Grant is a famous actor, the term "leading man" usually refers to a movie's main star (often an action hero). Here, the author implies that by napping publicly, Grant metaphorically performed the role of a "resting hero" for sleep-deprived people to look up to.

Since all three statements accurately reflect the passage's contents and tone, **Option C** is the correct answer.

Question 42

Comprehension

Was it the sun-dappled ambience, the strawberries and cream, the frustration of Flavio Cobolli's unforced errors against Serbian Novak Djokovic on Centre Court or simply the crushing weight of being a 64-year-old man in the third act of a very public life? Whatever the reason, Hugh Grant, the actor, deserves empathy. There he was, in the Royal Box at Wimbledon, flanked by Britain's well-dressed and well-rested spectators, watching the men's singles quarterfinals, when the actor did something quietly radical : head at a tilt, eyes closed, utterly unbothered, he took a nap. So praise be to Grant for serving up an unexpected ace. In that small, delicious moment, he didn't merely catch forty winks, he made an elegant case for surrender. Not to laziness, but to limits. To the body's quiet wisdom over society's relentless performance metrics. Wimbledon had its tennis. The perpetually sleep-deprived discovered a leading man, not of action, but of rest.

Which of the following statements is/are correct?
1. Hugh Grant was watching, from the Royal Box, the men's semifinal match on Centre Court between Flavio Cobolli and Novak Djokovic.
2. The phrase 'unexpected ace' in the context uses a term from the game of tennis to highlight Hugh Grant's somewhat uncharacteristic act of catching 'forty winks'; an act that is viewed with opprobrium.
3. Grant subjects the demands of society to the wisdom of his body.

Select the answer using the code given below.

A. 1 and 2

B. 3 only

C. 2 and 3

D. 2 only

Answer – B

Explanation

Answer: B — 3 only

Let us evaluate each statement based on the passage:

1. **Hugh Grant was watching, from the Royal Box, the men's semifinal match on Centre Court between Flavio Cobolli and Novak Djokovic.**
- This is incorrect. The passage clearly says that Hugh Grant was watching the men's singles **quarterfinals**, not the semifinals.

2. **The phrase 'unexpected ace' uses a term from tennis to highlight Hugh Grant's act of catching 'forty winks'; an**

act that is viewed with opprobrium.

- This is incorrect. The phrase **'unexpected ace'** does use a tennis term to describe Grant's unexpected nap, but the act is not viewed with opprobrium in the passage. The author praises Grant and says he deserves empathy.

3. **Grant subjects the demands of society to the wisdom of his body.**

- This is correct. The passage says Grant's nap was a surrender **not to laziness, but to limits**, and to **the body's quiet wisdom over society's relentless performance metrics**.

Therefore, only statement 3 is correct.

Question 43

Comprehension

> The process by which countries close their labour-productivity gap with the technology leader is based on convergence theory. The convergence model divides economic eras into three phases : the breakaway, the catch-up, and the fine-tuning phase. It also divides economic entities into two categories : the technology leaders and the technology followers. The process begins with the development of a new technology, such as scavenging three million years ago (MYA), hunting—one MYA, farming—12 thousand years ago, and industrial technology—a little more than 200 years ago. During the breakaway phase, the per capita income of the technology leaders (e.g., Western Europe and North America in the industrial era) rises, but is unchanged for the technology followers. In the catch-up phase, the followers adopt the new technology and close their per capita income gap with the technology leaders. In the fine-tuning phase, where participants try to extract the remaining benefits from an increasingly exhausted technology, leaders and followers have similar per capita incomes.

Which of the following conclusions are correct?

1. In the breakaway phase, economic progress is slow for the technology followers.
2. In the catch-up phase, leaders stagnate and followers, therefore, close the gap between them and the leaders.
3. In the fine-tuning phase, technology is exhausted, as it were, and both leaders and followers attempt to extract leftover benefits, leading to more or less similar per capita income levels.
4. Industrial technology followed scavenging, which preceded hunting, which itself was followed by farming.

Select the answer using the code given below.

A. 3 and 4 only

B. 1, 2, 3 and 4

C. 1 and 2 only

D. 2, 3 and 4 only

Answer – A

Explanation

Let us evaluate the given statements based on the passage:

Statement 1 is incorrect: The passage explicitly states that during the breakaway phase, the per capita income is **"unchanged for the technology followers."** "Unchanged" implies zero economic progress, not "slow" progress.

Statement 2 is incorrect: The passage mentions that in the catch-up phase, **"the followers adopt the new**

technology and close their per capita income gap with the technology leaders." It does not state that the leaders stagnate; leaders might still be experiencing economic growth, but the followers grow at a faster rate to close the gap.

Statement 3 is correct: The passage clearly states that in the fine-tuning phase, **"participants try to extract the remaining benefits from an increasingly exhausted technology, leaders and followers have similar per capita incomes."** This perfectly matches the phrasing of the statement.

Statement 4 is correct: The passage provides a clear chronological timeline of technological development: Scavenging (3 million years ago) → Hunting (1 million years ago) → Farming (12 thousand years ago) → Industrial technology (200 years ago).
Breaking down the statement:
- *"Industrial technology followed scavenging"*: True, as the industrial era (200 years ago) came long after scavenging (3 million years ago).
- *"which preceded hunting"*: True, scavenging (3 MYA) came before hunting (1 MYA).
- *"which itself was followed by farming"*: True, hunting (1 MYA) was followed by farming (12,000 years ago).

Since only statements 3 and 4 are correct, **Option A** is the correct answer.

Question 44

Comprehension

> The process by which countries close their labour-productivity gap with the technology leader is based on convergence theory. The convergence model divides economic eras into three phases : the breakaway, the catch-up, and the fine-tuning phase. It also divides economic entities into two categories : the technology leaders and the technology followers. The process begins with the development of a new technology, such as scavenging three million years ago (MYA), hunting—one MYA, farming—12 thousand years ago, and industrial technology—a little more than 200 years ago. During the breakaway phase, the per capita income of the technology leaders (e.g., Western Europe and North America in the industrial era) rises, but is unchanged for the technology followers. In the catch-up phase, the followers adopt the new technology and close their per capita income gap with the technology leaders. In the fine-tuning phase, where participants try to extract the remaining benefits from an increasingly exhausted technology, leaders and followers have similar per capita incomes.

Which of the following statements is/are correct?

1. The convergence model divides nations into three phases of economic progress.
2. At the heart of the convergence theory is the closing of the gap between labour and productivity.
3. Technology leaders typically have arrived earlier at different economic eras.
4. The time period covered by the convergence theory presented herein encompasses, as mentioned, 4012200 years.

Select the answer using the code given below.

A. 2 and 4

B. 2 and 3

C. 3 only

D. 1, 3 and 4

Answer – B

Explanation

Answer: B — 2 and 3

Statement 1 — Incorrect. The passage says that the convergence model divides **economic eras** into three phases: the breakaway phase, the catch-up phase, and the fine-tuning phase. It does not say that it divides **nations** into three phases of economic progress.

Statement 2 — Correct. The passage begins by saying that convergence theory explains the process by which

countries close their **labour-productivity gap** with the technology leader. Hence, the idea of closing this productivity gap is central to the theory.

Statement 3 — Correct. Technology leaders are the ones that move ahead first when a new technology develops. The passage says that during the breakaway phase, the per capita income of technology leaders rises while that of followers remains unchanged. This supports the idea that technology leaders typically arrive earlier at different economic eras.

Statement 4 — Incorrect. The passage mentions technologies such as scavenging three million years ago, hunting one million years ago, farming twelve thousand years ago, and industrial technology a little more than two hundred years ago. These are separate reference points in history and should not be added together to get 4012200 years.

Therefore, statements 2 and 3 are correct.

Question 45

Maths

An alloy P contains 20% copper and 80% zinc by weight. Another alloy Q contains 60% copper and 40% zinc by weight. A third alloy R is to be prepared from P and Q so that it contains equal amount of copper and zinc. In what ratio, amounts of P and Q be mixed in order to get R?

A. $1:3$

B. $3:1$

C. $2:3$

D. $3:2$

Answer – A

Explanation

Let the quantity of alloy P to be mixed be x and the quantity of alloy Q to be mixed be y.

In alloy P, the percentage of copper is 20%.
In alloy Q, the percentage of copper is 60%.
In the final alloy R, the amounts of copper and zinc are equal, which means the percentage of copper in R must be 50%.

Method 1: Using Algebra

The total amount of copper in the mixture is the sum of the copper from P and Q:
Total copper = $0.20x + 0.60y$

The total weight of the new alloy R is $(x + y)$. Since copper makes up 50% of alloy R, we can set up the following equation:

$$0.20x + 0.60y = 0.50(x + y)$$

Expanding and solving for the ratio of x to y:

$$0.20x + 0.60y = 0.50x + 0.50y$$

$$0.60y - 0.50y = 0.50x - 0.20x$$

$$0.10y = 0.30x$$

$$\frac{x}{y} = \frac{0.10}{0.30} = \frac{1}{3}$$

Method 2: Using the Rule of Alligation

We can apply the rule of alligation directly to the concentration of copper in the alloys:

- Concentration of copper in P = 20%
- Concentration of copper in Q = 60%
- Desired mean concentration in R = 50%

The ratio of P to Q is calculated by taking the cross-differences:

Ratio = $(60 - 50) : (50 - 20)$

Ratio = $10 : 30 = 1 : 3$

Thus, the amounts of P and Q must be mixed in the ratio $1 : 3$.

Question 46

Maths

A is a 2-digit number with different digits. B is also a 2-digit number and is obtained by reversing the digits of A. If $A - B$ is a multiple of 27, where $A > B$, how many such different A's are possible?

A. 6

B. 9

C. 12

D. 18

Answer – B

Explanation

Answer: B — 9

Let the two-digit number A be $10a + b$, where a and b are digits and $a \neq b$.

Since B is obtained by reversing the digits of A, we have:

$$B = 10b + a$$

Since B is also a two-digit number, $b \neq 0$.

Now,

$$A - B = (10a + b) - (10b + a) = 9a - 9b = 9(a - b)$$

It is given that $A - B$ is a multiple of 27. Therefore:

$$9(a - b) \text{ is a multiple of } 27$$

So, $a - b$ must be a positive multiple of 3.

Since $A > B$, we have $a > b$. The possible values of $a - b$ are:

$$3, 6, 9$$

Now count the valid digit pairs with $a > b$ and $b \neq 0$:

For $a - b = 3$:

$$(a, b) = (4, 1), (5, 2), (6, 3), (7, 4), (8, 5), (9, 6)$$

This gives 6 numbers.

For $a - b = 6$:

$$(a, b) = (7, 1), (8, 2), (9, 3)$$

This gives 3 numbers.

For $a - b = 9$, the only possible pair is $(9, 0)$, but this is not allowed because B would not be a two-digit number.

Hence, the total number of possible values of A is:

$$6 + 3 = 9$$

Therefore, the correct answer is 9.

Question 47

Reasoning

If ZERO is encoded as ADSN, then how do you encode STOP?

A. SPOT

B. TSPO

C. TSOP

D. POST

Answer – B

Explanation

Answer: B — TSPO

In the given code, ZERO is encoded as ADSN.

Observe the pattern:

- Z is changed to A.
- E is changed to D.
- R is changed to S.
- O is changed to N.

So, the pattern is:

- 1st letter: next letter
- 2nd letter: previous letter
- 3rd letter: next letter
- 4th letter: previous letter

Applying the same pattern to STOP:

- S becomes T.
- T becomes S.
- O becomes P.
- P becomes O.

Therefore, STOP is encoded as TSPO.

Question 48

Maths

There are three types of rectangular tiles : $3' \times 3', 3' \times 7'$ and $3' \times 11'$. An area of rectangular shape of dimensions $3' \times 100'$ is to be covered using these tiles without breaking them. If x and y are the maximum and minimum numbers of tiles of various sizes, respectively, that can be used to cover the area exactly, then $x - y$ is

A. 20

B. 12

C. 10

D. 7

Answer – A

Explanation

The problem requires us to cover a rectangular area of $3' \times 100'$ using tiles of sizes $3' \times 3', 3' \times 7'$, and $3' \times 11'$.

Since the width of the area is $3'$ and all the available tiles also have a width of $3'$, the tiles must be placed end-to-end along the $100'$ length. They cannot be rotated because a width of $7'$ or $11'$ would not fit inside the $3'$ wide area.

Thus, the problem simplifies to finding the number of tiles of lengths $3'$, $7'$, and $11'$ that add up exactly to $100'$.
Let a, b, and c be the number of $3'$, $7'$, and $11'$ tiles used, respectively. We need to find non-negative integers a, b, c such that:

$$3a + 7b + 11c = 100$$

We need to find the maximum (x) and minimum (y) total number of tiles ($a + b + c$).

Step 1: Find the maximum number of tiles (x)

To maximize the total number of tiles, we should use as many of the smallest tiles ($3'$) as possible.
- If we use 33 tiles of $3'$, the length covered is $33 \times 3 = 99'$, leaving $1'$, which cannot be filled by $7'$ or $11'$ tiles.
- If we use 32 tiles of $3'$, the length covered is $32 \times 3 = 96'$, leaving $4'$, which cannot be filled.
- If we use 31 tiles of $3'$, the length covered is $31 \times 3 = 93'$, leaving $7'$. This remaining length can be exactly filled by one $7'$ tile.

So, a valid combination is $a = 31, b = 1, c = 0$.
The maximum number of tiles is $x = 31 + 1 + 0 = 32$.

Step 2: Find the minimum number of tiles (y)

To minimize the total number of tiles, we should use as many of the largest tiles ($11'$) as possible.
- If we use 9 tiles of $11'$, the length covered is $9 \times 11 = 99'$, leaving $1'$, which cannot be filled.
- If we use 8 tiles of $11'$, the length covered is $8 \times 11 = 88'$, leaving $12'$. This remaining length can be exactly filled

by four $3'$ tiles ($4 \times 3 = 12'$).

So, a valid combination is $a = 4, b = 0, c = 8$.
The minimum number of tiles is $y = 4 + 0 + 8 = 12$.

(Note: We can mathematically verify that no combination yields fewer than 12 tiles. If $a + b + c = 11$, the maximum possible length is $11 \times 11 = 121$. To get exactly 100, we check the equation $11(a + b + c) - (3a + 7b + 11c) = 8a + 4b$. Substituting the sums gives $121 - 100 = 21$, which means $8a + 4b = 21$. Since $8a + 4b$ is always even and 21 is odd, 11 tiles is impossible.)

Step 3: Calculate $x - y$
The difference between the maximum and minimum number of tiles is:

$$x - y = 32 - 12 = 20$$

Question 49

Maths

A train has to complete a journey of 800 km. If it meets a minor accident, its speed becomes half of the existing speed. If there is a mechanical defect, the speed becomes one-fourth of the existing speed. On its way, the train meets with a minor accident after 200 km; and 400 km thereafter, it develops a mechanical defect. Had the train developed the mechanical defect after 200 km and met the minor accident 400 km thereafter, it would have taken 4 more hours to reach its destination. What was the original speed of the train in km per hour?

A. 200

B. 190

C. 150

D. 100

Answer – A

Explanation

Let the original speed of the train be v km/h.

The phrase **"existing speed"** means the speed of the train at that specific moment. Therefore, if the train suffers a second incident, the new speed will be calculated based on its current reduced speed (the effects compound).

The total journey is 800 km. We can divide the journey into three parts: the first 200 km, the middle 400 km, and the final 200 km.

Case 1: Minor accident first, then mechanical defect

- **0 to 200 km:** The train travels at its original speed v.

Time taken = $\frac{200}{v}$

- **200 to 600 km:** After the minor accident, the speed becomes half of the existing speed, i.e., $\frac{v}{2}$.

Time taken = $\frac{400}{v/2} = \frac{800}{v}$

- **600 to 800 km:** After the mechanical defect, the speed becomes one-fourth of the existing speed ($\frac{v}{2}$), i.e., $\frac{v}{2} \times \frac{1}{4} = \frac{v}{8}$.

Time taken = $\frac{200}{v/8} = \frac{1600}{v}$

Total Time (T_1) = $\frac{200}{v} + \frac{800}{v} + \frac{1600}{v} = \frac{2600}{v}$

Case 2: Mechanical defect first, then minor accident

- **0 to 200 km:** The train travels at its original speed v.

Time taken = $\frac{200}{v}$

- **200 to 600 km:** After the mechanical defect, the speed becomes one-fourth of the existing speed, i.e., $\frac{v}{4}$.

Time taken = $\frac{400}{v/4} = \frac{1600}{v}$

- **600 to 800 km:** After the minor accident, the speed becomes half of the existing speed ($\frac{v}{4}$), i.e., $\frac{v}{4} \times \frac{1}{2} = \frac{v}{8}$.

Time taken = $\frac{200}{v/8} = \frac{1600}{v}$

Total Time (T_2) = $\frac{200}{v} + \frac{1600}{v} + \frac{1600}{v} = \frac{3400}{v}$

Notice that the time taken for the first 200 km and the last 200 km is identical in both cases. The difference in time comes entirely from the middle 400 km.

Calculating the Original Speed:

The problem states that Case 2 takes 4 more hours than Case 1.

$$T_2 - T_1 = 4$$

$$\frac{3400}{v} - \frac{2600}{v} = 4$$

$$\frac{800}{v} = 4$$

$$v = \frac{800}{4} = 200 \text{ km/h}$$

The original speed of the train was 200 km/h.

Question 50

Maths

In a recruitment process, the selection of candidates is based on their performance in three components. The weightages of the components 1, 2 and 3 are 0.2, 0.3 and 0.5, respectively. Use the data given below and find the cutoff score if exactly three candidates are to be selected :

Candidate	Score in component 1	Score in component 2	Score in component 3
1	5	4	6
2	4	6	5
3	3	2	8
4	9	4	3
5	8	8	2

A. 5.1

B. 5.2

C. 5.3

D. 5.4

Answer – A

Explanation

To find the cutoff score, we first need to calculate the total weighted score for each candidate. The formula for the total score is:

Total Score = $(\text{Score in component } 1 \times 0.2) + (\text{Score in component } 2 \times 0.3) + (\text{Score in component } 3 \times 0.5)$

Let's compute the total score for each candidate step-by-step:

- Candidate 1:

$5 \times 0.2 + 4 \times 0.3 + 6 \times 0.5 = 1.0 + 1.2 + 3.0 = 5.2$

- Candidate 2:

$4 \times 0.2 + 6 \times 0.3 + 5 \times 0.5 = 0.8 + 1.8 + 2.5 = 5.1$

- Candidate 3:

$3 \times 0.2 + 2 \times 0.3 + 8 \times 0.5 = 0.6 + 0.6 + 4.0 = 5.2$

- Candidate 4:

$9 \times 0.2 + 4 \times 0.3 + 3 \times 0.5 = 1.8 + 1.2 + 1.5 = 4.5$

- Candidate 5:

$$8 \times 0.2 + 8 \times 0.3 + 2 \times 0.5 = 1.6 + 2.4 + 1.0 = 5.0$$

Now, let's arrange the total scores of all candidates in descending order to identify the top performers:

1. Candidate 1: 5.2
2. Candidate 3: 5.2
3. Candidate 2: 5.1
4. Candidate 5: 5.0
5. Candidate 4: 4.5

The recruitment process requires exactly three candidates to be selected. This means we must select the top three scorers.

The top three scores are 5.2, 5.2, and 5.1.

To ensure exactly three candidates make the list, the cutoff score (the minimum score required to be selected) must be set at the score of the third-highest candidate.

Therefore, the cutoff score is 5.1.

Question 51

Maths

Consider the following three statements, namely S1, S2 and S3 :

S1. Protecting the environment is an existential exigency for humans, given the impact of environmental degradation on climate change.

S2. Scientific consensus has not been achieved with regard to the extent of the contribution of human intervention to climate change.

S3. Environmental activism includes climate alarmism and other extremist points of view that often become the focus of climate change deniers.

Which of the following relationships based on the statements given above is/are correct?

1. S3 is a counterpoint to S1
2. S3 is unconnected to S1 and S2
3. S2 could be the reason for S3

Select the answer using the code given below.

A. 2 and 3 only

B. 1, 2 and 3

C. 1 and 2 only

D. 3 only

Answer – D

Explanation

To determine the correct relationships between the statements, let us analyze them individually and logically:

Understanding the Statements:

- **S1** asserts that protecting the environment is an absolute necessity (existential exigency) because of climate change.
- **S2** points out a lack of scientific consensus regarding exactly how much humans contribute to climate change.
- **S3** observes that environmental activism sometimes includes extreme views or alarmism, which climate change deniers then use as a target to discredit the movement.

Evaluating the Given Relationships:

1. S3 is a counterpoint to S1:

A counterpoint to S1 would need to argue that protecting the environment is *not* an existential necessity. S3 merely

comments on the nature of some environmental activism and the tactics of climate deniers; it does not negate the need to protect the environment. Therefore, **Relationship 1 is incorrect**.

2. S3 is unconnected to S1 and S2:
If S3 were unconnected, it would share no logical or causal link with the other statements. However, S3 is directly related to S2. The lack of definitive scientific consensus (S2) creates an environment of uncertainty. This uncertainty is exactly why some activists might resort to alarmism to force urgent action, and why deniers exploit those extreme views to justify their skepticism (S3). Because a clear link exists, **Relationship 2 is incorrect**.

3. S2 could be the reason for S3:
As established above, the absence of a precise scientific consensus on the extent of human intervention (S2) provides the very breeding ground for both climate alarmism (to compensate for the lack of consensus) and climate denial (exploiting the lack of consensus). Thus, S2 acts as a logical catalyst or reason for the phenomena described in S3. Therefore, **Relationship 3 is correct**.

Logical Shortcut (Elimination Method):
Notice the inherent logical contradictions in the options:
- Relationship 2 claims S3 is **unconnected** to S1 and S2.
- Relationship 1 claims S3 is a **counterpoint** to S1 (a connection).
- Relationship 3 claims S2 is the **reason** for S3 (a connection).

Relationship 2 is mutually exclusive with both 1 and 3. A statement cannot be "unconnected" to another while simultaneously being its "counterpoint" or having it as a "reason".
- Option A (2 and 3) is logically contradictory.
- Option B (1, 2, and 3) is logically contradictory.
- Option C (1 and 2) is logically contradictory.

By pure logic, Options A, B, and C eliminate themselves, leaving **Option D (3 only)** as the only valid choice.

Question 52

Reasoning

Match List-I with List-II and select the answer using the code given below the Lists :

List-I (Relationship category)

A. Between cricket captain and team members

B. Between judge and lawyers in court

C. Between Vice Chancellor and Deputy Registrar

D. Between peers and coworkers

List-II (Communication type)

1. Informal and firm
2. Informal and open-ended
3. Formal and open-ended
4. Formal and firm

Code :

A. A-1, B-3, C-4, D-2

B. A-1, B-4, C-3, D-2

C. A-2, B-4, C-3, D-1

D. A-2, B-3, C-4, D-1

Answer – B

Explanation

To determine the correct matching, let us analyze the nature of each relationship and its corresponding communication type:

1. **Between cricket captain and team members (A):** The relationship among sports teammates is generally **informal**. However, the captain must lead, set fields, and make strategic decisions, which requires the communication to be **firm**. Thus, A matches with 1 (Informal and firm).

2. **Between judge and lawyers in court (B):** A courtroom is a highly structured and **formal** environment. The judge acts as the ultimate authority, enforcing rules, sustaining or overruling objections, and giving verdicts. Therefore, the communication from the judge is **firm**. Thus, B matches with 4 (Formal and firm).

3. **Between Vice Chancellor and Deputy Registrar (C):** This is a **formal** hierarchical relationship within a university's administration. However, unlike a courtroom, their day-to-day communication involves discussing policies, administrative planning, and collaborative problem-solving, which makes it **open-ended**. Thus, C matches with 3 (Formal and open-ended).

4. **Between peers and coworkers (D):** Coworkers operating at the same hierarchical level typically share an **informal** relationship. Their communication involves brainstorming, sharing ideas, and casual discussions, making it **open-ended**. Thus, D matches with 2 (Informal and open-ended).

Matching these up, we get **A-1, B-4, C-3, D-2**.

Therefore, the correct option is B.

Question 53

Reasoning

Match List-I with List-II and select the answer using the code given below the Lists :

List-I (Tool of communication)

A. Memorandum

B. Flyer

C. Bcc

D. Minutes

List-II (Purpose)

1. To record decisions
2. To inform confidentially
3. To intimate a directive
4. To disseminate non-targeted information

A. A-1, B-4, C-2, D-3

B. A-1, B-2, C-4, D-3

C. A-3, B-4, C-2, D-1

D. A-3, B-2, C-4, D-1

Answer – C

Explanation

Let us evaluate the purpose of each communication tool given in List-I to find its correct match in List-II:

- **A. Memorandum (Memo):** A memorandum is a written message used in a professional setting, typically to communicate policies, procedures, or to **intimate a directive** within an organization. Thus, A matches with 3.
- **B. Flyer:** A flyer is a paper advertisement intended for wide distribution, typically handed out to individuals or posted in public places. Its primary purpose is to **disseminate non-targeted information** to a general audience. Thus, B matches with 4.
- **C. Bcc (Blind Carbon Copy):** This is an email feature used to send a copy of a message to someone without the other recipients knowing. It is used to **inform confidentially**. Thus, C matches with 2.
- **D. Minutes:** Minutes are the official written record of a meeting. Their primary purpose is **to record decisions**, discussions, and action items agreed upon during the meeting. Thus, D matches with 1.

Combining these deductions, the correct matching is **A-3, B-4, C-2, D-1**.

This corresponds to Option C.

Question 54

Reasoning

Which among the following actions would constitute the most appropriate directive(s) in resolving interpersonal conflict in an office with culturally diverse personnel?

1. Direct personnel to practise activities that are the cultural markers of diverse groups
2. Allow conflicts to resolve naturally over time to set an appropriate precedent of leadership
3. Encourage personnel to seek each other's perspectives

Select the answer using the code given below.

A. 1 and 3

B. 2 only

C. 3 only

D. 2 and 3

Answer – C

Explanation

To resolve interpersonal conflicts in a culturally diverse workplace, a leader must adopt proactive and empathetic strategies.

Statement 1 is incorrect: Directing personnel to practice activities that are cultural markers of diverse groups is an artificial and forced approach. It does not address the root cause of any conflict and can even lead to resentment or be perceived as cultural appropriation. True cultural harmony comes from understanding, not forced participation in cultural practices.

Statement 2 is incorrect: Allowing conflicts to "resolve naturally" is a laissez-faire approach that often backfires. In a diverse workplace, unaddressed conflicts can escalate, breed toxicity, and negatively impact team morale and productivity. Effective leadership requires timely and constructive intervention, not avoidance.

Statement 3 is correct: Encouraging personnel to seek each other's perspectives is a cornerstone of effective conflict resolution. It fosters empathy, active listening, and mutual respect. By understanding different cultural viewpoints and personal perspectives, employees can bridge communication gaps and resolve misunderstandings collaboratively.

Therefore, only Statement 3 constitutes an appropriate directive.

Question 55

Reasoning

Match List-I with List-II and select the answer using the code given below the Lists :

List-I (Barrier to communication)

A. Semantic

B. Cognitive

C. Organisational

D. Affective

List-II (Example)

1. Lack of feedback
2. Misunderstanding the meaning of a word
3. Fear of social stigma
4. Information overload

A. A-3, B-1, C-4, D-2

B. A-3, B-4, C-1, D-2

C. A-2, B-1, C-4, D-3

D. A-2, B-4, C-1, D-3

Answer – D

Explanation

To find the correct match, let us analyze the meaning of each communication barrier:

- **Semantic barrier (A)**: 'Semantic' refers to the meaning of language, words, or symbols. Therefore, **misunderstanding the meaning of a word (2)** is a classic example of a semantic barrier.
- **Cognitive barrier (B)**: 'Cognitive' relates to mental processes such as thinking, understanding, and memory. **Information overload (4)** overwhelms an individual's mental processing capacity, making it a cognitive barrier.
- **Organisational barrier (C)**: These barriers arise from the structure, rules, policies, and culture of a workplace. A **lack of feedback (1)** is an organisational barrier because it typically stems from poor communication channels or rigid hierarchical structures within an organisation.
- **Affective barrier (D)**: 'Affective' refers to emotions, feelings, and attitudes. **Fear of social stigma (3)** is an emotional response that prevents a person from communicating openly, making it an affective barrier.

Matching these gives **A-2, B-4, C-1, D-3**, which corresponds to Option D.

Question 56

Reasoning

You are required to design a 'questionnaire' to be filled on-location by visitors, based on the following objective while writing a report :

"To determine the feasibility of setting up a family-oriented vacation resort in the vicinity of a lake destination in the mountains"

Which of the following heads would you include in the questionnaire to make it most appropriate for your purpose?

1. Size of family
2. Budget
3. Number of earners in the family
4. Food allergies and dietary restrictions

Select the answer using the code given below.

A. 1 and 3

B. 1, 2 and 4

C. 1 and 2 only

D. 2 and 3

Answer – C

Explanation

To determine the correct heads for the questionnaire, we must align them with the objective: determining the **feasibility** of setting up a **family-oriented** vacation resort.

Let us evaluate each given head:

- **1. Size of family**: Highly relevant. Since the proposed resort is "family-oriented", knowing the average family size of the visitors is essential for planning room layouts, amenities, and recreational activities. This directly impacts the feasibility and design of the project.
- **2. Budget**: Highly relevant. Understanding the visitors' vacation budget is crucial for determining the financial viability of the resort, deciding the pricing strategy, and identifying whether the target demographic can sustain the business.
- **3. Number of earners in the family**: Irrelevant. The actual vacation budget (Head 2) is a direct and sufficient indicator of a family's spending capacity. Asking for the number of earners is unnecessarily intrusive and does not provide direct value for a feasibility study.
- **4. Food allergies and dietary restrictions**: Irrelevant at this stage. This is micro-level operational data collected from guests when they actually book a stay or dine at the restaurant. It does not help in determining the macro-level feasibility of setting up the resort itself.

Therefore, only **Size of family** and **Budget** are appropriate for the feasibility questionnaire.

Hence, the correct option is **1 and 2 only**.

Question 57

Reasoning

With reference to 'circular letters', which of the following statements is/are correct?

1. Circular letters are usually addressed to a group of people.
2. Non-standard and customized content is typical of circular letters.
3. Circular letters are used to intimate appraisals and increments of employees within organisations.
4. Circular letters are less cost-effective than personalised and specific recipient-directed letters.

Select the answer using the code given below.

A. 1 and 2

B. 2 and 4

C. 1, 3 and 4

D. 1 only

Answer – D

Explanation

Let us evaluate the given statements regarding 'circular letters':

Statement 1 is correct: A circular letter is a formal document intended for mass communication. It is usually addressed to a large group of people (such as employees, customers, or shareholders) to disseminate general information, announcements, or updates.

Statement 2 is incorrect: Because circular letters are meant for a wide audience, their content is standard and uniform. Customized or non-standard content is a feature of personalized letters, not circulars.

Statement 3 is incorrect: Appraisals, increments, and performance reviews are highly confidential and individualized matters. They are communicated through personalized, specific recipient-directed letters, never through a general circular.

Statement 4 is incorrect: Circular letters are highly cost-effective and time-saving. Since the same message is duplicated and distributed to multiple recipients without the need for individual customization, it costs much less in terms of time and resources compared to personalized letters.

Since only Statement 1 is correct, the correct option is **D**.

Question 58

Maths

Three partners A, B and C entered into a business. A invested one-third of the capital for one-third duration. B invested one-fourth of the capital for one-fourth duration. C invested the remaining capital for the whole duration. Out of a profit of ₹ $17,000$, how much profit will C get?

A. ₹ $12,000$

B. ₹ $10,000$

C. ₹ $12,500$

D. ₹ $10,750$

Answer – A

Explanation

To find the profit share of each partner, we need to calculate the ratio of the product of their invested capital and the duration of their investment.

Let the total capital be K and the total duration be T.

1. Investment and Duration of A:
- Capital invested by A = $\frac{1}{3}K$
- Duration of A's investment = $\frac{1}{3}T$
- Equivalent investment of A = $\frac{1}{3}K \times \frac{1}{3}T = \frac{1}{9}KT$

2. Investment and Duration of B:
- Capital invested by B = $\frac{1}{4}K$
- Duration of B's investment = $\frac{1}{4}T$
- Equivalent investment of B = $\frac{1}{4}K \times \frac{1}{4}T = \frac{1}{16}KT$

3. Investment and Duration of C:
- Capital invested by C = Remaining capital = $K - \left(\frac{1}{3}K + \frac{1}{4}K\right) = K - \frac{7}{12}K = \frac{5}{12}K$
- Duration of C's investment = Whole duration = T
- Equivalent investment of C = $\frac{5}{12}K \times T = \frac{5}{12}KT$

4. Ratio of Profits:
The profit-sharing ratio of A, B, and C is the ratio of their equivalent investments:

$$A : B : C = \frac{1}{9} : \frac{1}{16} : \frac{5}{12}$$

To simplify this ratio, we multiply by the Least Common Multiple (LCM) of the denominators 9, 16, and 12, which is

144.
- A's share in ratio = $\frac{1}{9} \times 144 = 16$
- B's share in ratio = $\frac{1}{16} \times 144 = 9$
- C's share in ratio = $\frac{5}{12} \times 144 = 60$

The simplified profit ratio is $16 : 9 : 60$.

5. Calculating C's Profit:
- Total parts in the ratio = $16 + 9 + 60 = 85$ parts
- Total profit = ₹ $17,000$
- Value of 1 part = $\frac{17,000}{85} = 200$

C's profit share = $60 \text{ parts} \times 200 = ₹\ 12,000$

Therefore, C will get a profit of ₹ $12,000$.

Question 59

Maths

There are two chemicals which do not react with each other. A container contains 10 litres of the chemical A. One litre of this chemical is removed from it and one litre of the chemical B is poured. Then one litre of the mixture is removed from the container and one litre of B is poured. If this process of replacing one litre of the mixture by one litre of B is performed once more, then what is the volume of B that is present in the container approximately (in percentage)?

A. 25

B. 27

C. 29

D. 31

Answer – B

Explanation

To find the final volume of chemical B, we can first calculate the remaining volume of chemical A after the replacement process is completed.

Step 1: Understand the given parameters

- Initial volume of chemical A (V) = 10 litres.
- Total volume of the mixture in the container remains constant at 10 litres.
- Volume replaced in each step (x) = 1 litre.
- Number of times the process is performed (n) = 3 (The first replacement, then a second replacement, and then performed "once more").

Step 2: Apply the replacement formula

The formula for the amount of the original liquid remaining after n replacements is given by:

$$\text{Final Amount of } A = \text{Initial Amount} \times \left(1 - \frac{x}{V}\right)^n$$

Substitute the values into the formula:

$$A_3 = 10 \times \left(1 - \frac{1}{10}\right)^3$$

$$A_3 = 10 \times \left(\frac{9}{10}\right)^3$$

$$A_3 = 10 \times \frac{729}{1000}$$

$$A_3 = 7.29 \text{ litres}$$

Step 3: Calculate the volume and percentage of chemical B

Since the total volume of the mixture is always 10 litres, the volume of chemical B present in the container after 3 operations is:

$$\text{Volume of } B = \text{Total Volume} - \text{Final Amount of } A$$

$$\text{Volume of } B = 10 - 7.29 = 2.71 \text{ litres}$$

Now, convert this volume into a percentage of the total mixture:

$$\text{Percentage of } B = \left(\frac{2.71}{10}\right) \times 100 = 27.1\%$$

Approximately, the percentage of chemical B is 27%.

Therefore, the correct option is **B**.

Question 60

Maths

A shopkeeper employs a delivery boy and gives him a motorcycle for home delivery. For every delivery, the boy is given ₹ 5. At the end of the day, he also gets ₹ 2 for every kilometre of the distance covered in the day. The boy wants to earn more than ₹ 500 a day, but does not want to travel more than 100 km. Which of the following numbers of deliveries would definitely meet his target?

A. 80

B. 85

C. 90

D. The question cannot be answered due to insufficient data

Answer – D

Explanation

Answer: D — The question cannot be answered due to insufficient data

Earnings $E = 5d + 2k$ where d = deliveries and k = km. We need $E > 500$ to "definitely" hold for the given d.

Why d alone is not enough.

The number of kilometres k depends on the routes the boy actually takes; the only constraint stated is $k \leq 100$. To *guarantee* $E > 500$ from the value of d alone, the inequality must hold even in the worst case $k = 0$, i.e. $5d > 500 \Rightarrow d > 100$.

Check each option.

For $d = 80, 85, 90$, taking $k = 0$:
- $d = 80$: $E = 400$
- $d = 85$: $E = 425$
- $d = 90$: $E = 450$

None of these exceed 500 in the worst case, so none of A, B, or C "definitely" meets the target. The number of kilometres travelled is essential information that the question does not pin down.

Question 61

Maths

X receives three coins of different denominations : $1, 2, 5, 10$ and 20. If the total amount received by X is m, does X receive a coin of denomination 5?

Statement I :

m is not a prime number.

Statement II :

The sum of the digits of m is greater than 5.

A. Select this option if the question can be answered using one of these statements alone, but cannot be answered using other statement

B. Select this option if the question can be answered using either statement alone

C. Select this option if the question can be answered using both the statements together, but cannot be answered using either statement alone

D. Select this option if the question cannot be answered even using any of the statements

Answer – A

Explanation

Answer: A

The possible selections of three different coins from $1, 2, 5, 10$ and 20 are:

$$1 + 2 + 5 = 8$$

$$1 + 2 + 10 = 13$$

$$1 + 2 + 20 = 23$$

$$1 + 5 + 10 = 16$$

$$1 + 5 + 20 = 26$$

$$1 + 10 + 20 = 31$$

$$2 + 5 + 10 = 17$$

$$2 + 5 + 20 = 27$$

$$2 + 10 + 20 = 32$$

$$5 + 10 + 20 = 35$$

Statement I: m is not a prime number.

The possible non-prime values of m are $8, 16, 26, 27, 32$ and 35.

Here, $8, 16, 26, 27$ and 35 involve a coin of denomination 5, but 32 comes from $2 + 10 + 20$, which does not involve a coin of denomination 5.

So, Statement I alone is not sufficient.

Statement II: The sum of the digits of m is greater than 5.

The values of m whose digit sum is greater than 5 are $8, 16, 17, 26, 27$ and 35.

Each of these sums is obtained from a combination that includes the coin of denomination 5.

So, Statement II alone is sufficient to answer the question.

Therefore, the question can be answered using one statement alone, but not using the other statement.

Question 62

Maths

For two distinct real numbers x and y, which of them is bigger?

Statement I :

$x^2 < y < 1$

Statement II :

$y < \sqrt{x} < 1$

A. Select this option if the question can be answered using one of these statements alone, but cannot be answered using other statement

B. Select this option if the question can be answered using either statement alone

C. Select this option if the question can be answered using both the statements together, but cannot be answered using either statement alone

D. Select this option if the question cannot be answered even using any of the statements

Answer – D

Explanation

Answer: The question cannot be answered even using both statements together.

Statement I alone: $x^2 < y < 1$

This gives $-1 < x < 1$ and $y < 1$, but doesn't pin down which is bigger.

- $x = 0.5,\ y = 0.3$: satisfies $0.25 < 0.3 < 1 \rightarrow x > y$
- $x = 0.5,\ y = 0.9$: satisfies $0.25 < 0.9 < 1 \rightarrow y > x$

Insufficient.

Statement II alone: $y < \sqrt{x} < 1$

This gives $0 \leq x < 1$ and $y < 1$, again ambiguous.

- $x = 0.25,\ y = 0.4$: $0.4 < 0.5 < 1$ ✓ $\rightarrow y > x$
- $x = 0.81,\ y = 0.1$: $0.1 < 0.9 < 1$ ✓ $\rightarrow x > y$

Insufficient.

Both together: $x^2 < y < \sqrt{x}$, with $x \in (0, 1)$.

Note that for $x \in (0, 1), x^2 < x < \sqrt{x}$, so y can lie on either side of x.

- $x = 0.25,\ y = 0.1$: $x^2 = 0.0625 < 0.1 < 1$ ✓ and $0.1 < \sqrt{x} = 0.5 < 1$ ✓ → $x > y$
- $x = 0.25,\ y = 0.4$: $0.0625 < 0.4 < 1$ ✓ and $0.4 < 0.5 < 1$ ✓ → $y > x$

Both statements together still fail to determine which is bigger.

Question 63

Maths

If x and y are integers, then is x even?

Statement I :

x^2y^2 is even.

Statement II :

$1 + x^2 + y^2$ is odd.

A. Select this option if the question can be answered using one of these statements alone, but cannot be answered using other statement

B. Select this option if the question can be answered using either statement alone

C. Select this option if the question can be answered using both the statements together, but cannot be answered using either statement alone

D. Select this option if the question cannot be answered even using any of the statements

Answer – C

Explanation

Answer: C

We need to determine whether x is even.

Statement I: x^2y^2 is even.

This means at least one of x^2 or y^2 is even. Hence, at least one of x or y is even.

But this does not definitely tell us whether x is even. For example, x could be odd and y could be even.

So, Statement I alone is not sufficient.

Statement II: $1 + x^2 + y^2$ is odd.

For $1 + x^2 + y^2$ to be odd, $x^2 + y^2$ must be even.

This means x^2 and y^2 have the same parity. Therefore, x and y have the same parity: either both are even or both are odd.

So, Statement II alone is not sufficient.

Using both statements together:

From Statement I, at least one of x or y is even.

From Statement II, x and y have the same parity.

Therefore, both x and y must be even.

Hence, x is definitely even.

So, the question can be answered using both statements together, but not using either statement alone.

Question 64

Reasoning

X is a collection of certain odd numbers whereas Y is a collection of certain even numbers. T consists of the numbers all of which are either from X or from Y. Is every number of T from Y?
Statement I :
The sum of any two numbers belonging to T is even.
Statement II :
If both p and q are picked from T, then $(p-1)q$ is even.

A. Select this option if the question can be answered using one of these statements alone, but cannot be answered using other statement

B. Select this option if the question can be answered using either statement alone

C. Select this option if the question can be answered using both the statements together, but cannot be answered using either statement alone

D. Select this option if the question cannot be answered even using any of the statements

Answer – D

Explanation

Answer: D

We need to determine whether every number of T is from Y, that is, whether every number of T is even.

Statement I: The sum of any two numbers belonging to T is even.

This means that all numbers in T must have the same parity. They may all be even, or they may all be odd.

For example:

- If $T = \{2, 4\}$, then the sum of any two numbers is even, and every number is from Y.
- If $T = \{1, 3\}$, then the sum of any two numbers is also even, but every number is from X, not from Y.

So, Statement I alone is not sufficient.

Statement II: If both p and q are picked from T, then $(p-1)q$ is even.

If all numbers in T are even, then q is even, so $(p-1)q$ is even.

If all numbers in T are odd, then $p-1$ is even, so $(p-1)q$ is also even.

Thus, Statement II is satisfied when all numbers are even and also when all numbers are odd. Hence, Statement II alone is not sufficient.

Using both statements together:

Even together, the statements allow both possibilities:

- T may contain only even numbers, in which case every number of T is from Y.
- T may contain only odd numbers, in which case no number of T is from Y.

Therefore, the question cannot be answered even using both statements together.

Question 65

Maths

If x, y and z are integers, each greater than 1, then is x a prime number?

Statement I :

$xy^2 = 116$

Statement II :

$xz = 261$

A. Select this option if the question can be answered using one of these statements alone, but cannot be answered using other statement

B. Select this option if the question can be answered using either statement alone

C. Select this option if the question can be answered using both the statements together, but cannot be answered using either statement alone

D. Select this option if the question cannot be answered even using any of the statements

Answer – A

Explanation

Step 1: Analyze the given information

We are given that x, y, and z are integers, and each is greater than 1. We need to determine if x is a prime number.

Step 2: Evaluate Statement I

Statement I says: $xy^2 = 116$

Let us find the prime factorization of 116:

$$116 = 2 \times 58 = 2 \times 2 \times 29 = 2^2 \times 29$$

Since y is an integer greater than 1, y^2 must be a perfect square greater than 1 that divides 116.

Looking at the prime factorization, the only perfect square factor of 116 greater than 1 is $2^2 = 4$.

Therefore, $y^2 = 4$, which means $y = 2$.

Substituting $y^2 = 4$ into the equation:

$$x \times 4 = 116$$

$$x = 29$$

Since 29 is a prime number, we can definitively answer "Yes" to the question.

Thus, Statement I alone is sufficient.

Step 3: Evaluate Statement II

Statement II says: $xz = 261$

Let us find the prime factorization of 261:

$$261 = 3 \times 87 = 3 \times 3 \times 29 = 3^2 \times 29$$

Since x and z are integers greater than 1, x can be any factor of 261 other than 1 and 261.
The possible values for x are 3, 9, 29, and 87.
- If $x = 3$ or $x = 29$, then x is a prime number.
- If $x = 9$ or $x = 87$, then x is a composite number.
Because x can be either prime or composite, we cannot definitively answer the question.
Thus, Statement II alone is not sufficient.

Conclusion

The question can be answered using Statement I alone, but cannot be answered using Statement II alone.
Therefore, the correct option is A.

Question 66

Comprehension

> 'Kalagram', the cultural village set up at the Maha Kumbh Mela, unfolded as a mosaic of India's diverse regions, each represented by seven meticulously crafted 'Sanskriti Angans'—stepping through the grand portal was like entering another world. These thematic zones, inspired by iconic temples like the Dakshineshwar Kali Temple and the Brahma Mandir, were treasure troves of regional artistry. Bengal's Pattachitra paintings, Assam's bamboo crafts, Tamil Nadu's Thanjavur paintings, and Madhya Pradesh's tribal sculpture—all were showcased in these living galleries where 230 master artisans breathed life into them using age-old techniques, their hands shaping India's ancient history into creations to behold.

Which of the following conclusions are valid?

1. Seven Sanskriti Angans, representing different regions of India, had been showcased in Kalagram.
2. Regional artistry was recognised via the inspiration drawn from iconic temples.
3. India's ancient history had been crafted by the contemporary craftsmanship of 230 artisans into creations to behold.
4. Art forms from all regions of India had been showcased in these living galleries.

Select the answer using the code given below.

A. 1 and 2 only

B. 2, 3 and 4

C. 1, 2 and 4

D. 1 and 3

Answer – A

Explanation

Answer: A — 1 and 2 only

Statement 1 — Valid. The passage says that Kalagram represented India's diverse regions through seven meticulously crafted **Sanskriti Angans**. Hence, it is valid to conclude that seven Sanskriti Angans representing different regions of India were showcased in Kalagram.

Statement 2 — Valid. The passage states that the thematic zones were inspired by iconic temples such as the Dakshineshwar Kali Temple and the Brahma Mandir, and that these zones displayed regional artistry. Thus, regional artistry was presented through zones whose design drew inspiration from iconic temples.

Statement 3 — Invalid. The passage says that 230 master artisans shaped India's ancient history into creations using age-old techniques. However, it does not say that India's ancient history itself was crafted by contemporary craftsmanship. This statement overstates the idea.

Statement 4 — Invalid. The passage gives examples from Bengal, Assam, Tamil Nadu, and Madhya Pradesh, but it does not say that art forms from **all** regions of India were showcased. Therefore, this is an overgeneralisation.

Therefore, only statements 1 and 2 are valid.

Question 67

Comprehension

'Kalagram', the cultural village set up at the Maha Kumbh Mela, unfolded as a mosaic of India's diverse regions, each represented by seven meticulously crafted 'Sanskriti Angans'—stepping through the grand portal was like entering another world. These thematic zones, inspired by iconic temples like the Dakshineshwar Kali Temple and the Brahma Mandir, were treasure troves of regional artistry. Bengal's Pattachitra paintings, Assam's bamboo crafts, Tamil Nadu's Thanjavur paintings, and Madhya Pradesh's tribal sculpture—all were showcased in these living galleries where 230 master artisans breathed life into them using age-old techniques, their hands shaping India's ancient history into creations to behold.

Which one of the following statements is **not** correct?

A. Paintings from four States of India have been mentioned.

B. Stepping into Kalagram is likened to stepping into another world.

C. The Angans have been described as living galleries.

D. Kalagram is divided into thematic zones, inspired by well-known temples of India.

Answer – A

Explanation

Answer: A — Paintings from four States of India have been mentioned.

Option A — Not correct. The passage names art forms from four states, but only two of them are *paintings*: Bengal's Pattachitra paintings and Tamil Nadu's Thanjavur paintings. The other two are Assam's bamboo crafts and Madhya Pradesh's tribal sculpture — neither is a painting. So "paintings from four States" is factually inconsistent with the passage.

Option B — Correct. The passage says: "stepping through the grand portal was like entering another world." So Kalagram is indeed likened to another world.

Option C — Correct. The passage explicitly calls the Angans "living galleries" — "...showcased in these living galleries..."

Option D — Correct. The passage says: "These thematic zones, inspired by iconic temples like the Dakshineshwar Kali Temple and the Brahma Mandir..." — directly supporting that Kalagram is divided into thematic zones inspired by well-known temples.

Since Option A is the only statement not correct, **Option A** is the answer.

Question 68

Maths

The weight of X, in kg, is denoted by X. The weights of A, B, C, D, P, Q, R and S are measured. Given :

$$A + B + C + D = 17$$

$$A + C = 6$$

$$P + Q + S + D = 15$$

$$P + Q + R + B = 17$$

$$P = R \text{ and } Q = S$$

Which one of the following statements is correct?

A. B and D together weigh less than the total weight of P and Q.

B. P and Q together weigh more than the total weight of A and C.

C. P weighs more than Q.

D. Q weighs more than P.

Answer – B

Explanation

Let's write down the given equations based on the problem statement:

1) $A + B + C + D = 17$

2) $A + C = 6$

3) $P + Q + S + D = 15$

4) $P + Q + R + B = 17$

5) $P = R$ and $Q = S$

Step 1: Find the value of $B + D$

Substitute equation (2) into equation (1):

$$(A + C) + B + D = 17$$

$$6 + B + D = 17$$

$$B + D = 11$$

Step 2: Simplify equations (3) and (4)

Using the given relations $P = R$ and $Q = S$, we can rewrite equations (3) and (4):

From equation (3):

$$P + Q + Q + D = 15$$

$$P + 2Q + D = 15$$

--- (Equation 6)

From equation (4):

$$P + Q + P + B = 17$$

$$2P + Q + B = 17$$

--- (Equation 7)

Step 3: Find the value of $P + Q$

Add Equation (6) and Equation (7) together:

$$(P + 2Q + D) + (2P + Q + B) = 15 + 17$$

$$3P + 3Q + B + D = 32$$

We already know from Step 1 that $B + D = 11$. Substitute this into the equation:

$$3(P + Q) + 11 = 32$$

$$3(P + Q) = 21$$

$$P + Q = 7$$

Step 4: Evaluate the given options

- **Option A:** States that $B + D < P + Q$. We found $B + D = 11$ and $P + Q = 7$. Since 11 is not less than 7, this statement is **incorrect**.

- **Option B:** States that $P + Q > A + C$. We found $P + Q = 7$ and we are given $A + C = 6$. Since $7 > 6$, this statement is **correct**.

- **Options C and D:** We only know that $P + Q = 7$. The individual weights of P and Q cannot be uniquely determined from the given information (e.g., P could be 4 and Q could be 3, or vice versa). Thus, we cannot definitively say whether $P > Q$ or $Q > P$.

Therefore, the only correct statement is Option B.

Question 69

Maths

How many words can one form by shuffling the letters of the word QUEUE, if Q is always followed by U? The words thus formed need not necessarily have any meaning.

A. 6

B. 8

C. 10

D. 12

Answer – D

Explanation

Answer: D — 12

We need arrangements of the letters of QUEUE (one Q, two U's, two E's) such that Q is immediately followed by U.

Glue Q to a U.

Treat "QU" as a single block. The remaining letters are one U and two E's. So we are arranging four objects: $\{QU, U, E, E\}$.

Count arrangements with the repeated E.

$$\frac{4!}{2!} = \frac{24}{2} = 12$$

(The two E's are identical; the U inside the QU-block is distinguishable from the lone U by the constraint that one is preceded by Q and the other isn't.)

Question 70

Maths

X, Y and Z jump forward $4', 6'$ and $5'$, respectively. At 8 AM, they all land on mark $199'$. How many times will they all land on the same mark (need not be at the same moment) between mark $195'$ and $1000'$, if all of them cross mark $1000'$ by 9 AM?

A. 11

B. 12

C. 13

D. 14

Answer – D

Explanation

Answer: 14

Set up the common landing marks.

At 8 AM all three are on mark 199. After that:

- X lands on $199, 203, 207, \ldots$ (step 4)
- Y lands on $199, 205, 211, \ldots$ (step 6)
- Z lands on $199, 204, 209, \ldots$ (step 5)

A mark m is a common landing iff $m - 199$ is a multiple of $\mathrm{lcm}(4, 6, 5) = 60$.

List common landings in the range $195 < m < 1000$.

$$m = 199 + 60k$$

$$199,\ 259,\ 319,\ 379,\ 439,\ 499,\ 559,\ 619,\ 679,\ 739,\ 799,\ 859,\ 919,\ 979$$

The next one, 1039, exceeds 1000.

Count: $\dfrac{979 - 199}{60} + 1 = 13 + 1 = 14$

Question 71

Comprehension

> Sport is not just about winning medals or getting jobs through a sports quota. Today's generation is struggling with issues like depression and anxiety. Parents often say that their children are inactive and rarely leave the house. Sport can help tackle these problems. From sport you can learn time management, fitness, teamwork, coordination, and so much more. We need to develop a culture in which sport is seen as a way of life—a path to building a healthier, happier society.

Which of the following conclusions are valid?

1. Sport is more than just games; it is a way of life.
2. Sport can help mitigate the problems of seclusion among the young.
3. Earning laurels in sport can help one secure a job on the basis of an assigned quota.
4. Standard corporate sector skills cannot be learnt through sport.

Select the answer using the code given below.

A. 1 and 3 only

B. 2 and 4 only

C. 1, 2 and 4

D. 1, 2 and 3

Answer – D

Explanation

Based on the passage, let us evaluate each conclusion:

- **Statement 1 is valid:** The passage explicitly states that "Sport is not just about winning medals" and emphasizes the need to develop a culture where sport is "seen as a way of life."
- **Statement 2 is valid:** The passage highlights that today's youth are "inactive and rarely leave the house" (which implies seclusion) and directly states that "Sport can help tackle these problems."
- **Statement 3 is valid:** The opening line, "Sport is not just about winning medals or getting jobs through a sports quota," acknowledges that securing a job through a sports quota is indeed a reality and a benefit of sports, even though it is not the *only* benefit.
- **Statement 4 is invalid:** The passage mentions that sport teaches "time management, fitness, teamwork, coordination," which are quintessential skills required in the standard corporate sector. Therefore, the claim that these skills *cannot* be learnt through sport contradicts the passage.

Since statements 1, 2, and 3 are valid conclusions, the correct option is **D**.

Question 72

Comprehension

> Sport is not just about winning medals or getting jobs through a sports quota. Today's generation is struggling with issues like depression and anxiety. Parents often say that their children are inactive and rarely leave the house. Sport can help tackle these problems. From sport you can learn time management, fitness, teamwork, coordination, and so much more. We need to develop a culture in which sport is seen as a way of life—a path to building a healthier, happier society.

Which of the following statements is/are correct?

1. Parents are not encouraging enough when it comes to children playing sport.
2. Participation in sporting activities can help develop life skills.
3. Sport as a way of life can help evolve the very nature of society itself.

Select the answer using the code given below.

A. 1 and 3

B. 2 and 3

C. 2 only

D. 3 only

Answer – B

Explanation

Answer: B — 2 and 3

Statement 1 — Incorrect. The passage notes that "parents often say that their children are inactive and rarely leave the house" — this is parents *reporting* their observations, not the passage criticising parents for being unsupportive. The claim that parents are not encouraging is not made in the passage.

Statement 2 — Correct. The passage explicitly says that "from sport you can learn time management, fitness, teamwork, coordination, and so much more" — these are life skills, so participation in sport helping develop life skills is directly supported.

Statement 3 — Correct. The passage closes with: "We need to develop a culture in which sport is seen as a way of life—a path to building a healthier, happier society." Treating sport as a way of life is presented as a path that reshapes society, which matches the statement.

Question 73

Maths

A toy T jumps forward or backward. In each forward jump, it moves $5'$ forward whereas in each backward jump, it moves $2'$ backward. If in 31 jumps, T moves exactly $15'$ forward, then what is the difference of the number of forward and backward jumps?

A. 6

B. 7

C. 8

D. 9

Answer – D

Explanation

Answer: D — 9

Let f = forward jumps, b = backward jumps.

Set up.

- Total jumps: $f + b = 31$
- Net displacement: $5f - 2b = 15$

Solve.

Substitute $b = 31 - f$:

$$5f - 2(31 - f) = 15 \;\Rightarrow\; 7f - 62 = 15 \;\Rightarrow\; f = 11$$

So $b = 20$. The difference is $|f - b| = |11 - 20| = 9$.

Question 74

Reasoning

Eight persons P, Q, R, S, T, U, V and W sit around a round table in eight different seats placed with equal distance between any two consecutive seats. Both P and R are adjacent to Q. Both T and R are adjacent to S. Both U and W are adjacent to V. S and W are on opposite chairs. If while going in the clockwise direction around the table from P, one meets R before T, then how many persons shall Q cross while moving in the clockwise direction around the table before meeting W?

A. 5

B. 4

C. 2

D. 1

Answer – A

Explanation

Let's break down the given conditions step by step to determine the seating arrangement of the 8 persons around the circular table.

1. **Both P and R are adjacent to Q**: This means Q is sitting exactly between P and R. The sequence is either $P - Q - R$ or $R - Q - P$.
2. **Both T and R are adjacent to S**: This means S is sitting exactly between T and R. The sequence is either $T - S - R$ or $R - S - T$.

Combining the first two conditions, since R is common to both, the 5 persons must sit together in a contiguous block. The sequence of these 5 persons is either $P - Q - R - S - T$ or $T - S - R - Q - P$.

3. **Both U and W are adjacent to V**: This means V is sitting exactly between U and W. The sequence is $U - V - W$ or $W - V - U$. This forms a block of 3 persons.

Since there are 8 seats in total, these two blocks (one of 5 persons and one of 3 persons) will complete the circle.

4. **S and W are on opposite chairs**: In a circular arrangement of 8 seats, opposite chairs have exactly 3 seats between them on either side.
Let's assign position numbers 1 to 8 in a clockwise direction.
If we place the block $P - Q - R - S - T$ at positions 1 to 5 respectively, S is at position 4. For W to be opposite to S, W must be at position 8 (since $8 - 4 = 4$).
This leaves positions 6 and 7 for U and V. Since V must be between U and W, V takes position 7 and U takes position 6.

Let's verify the clockwise condition:
- **"While going in the clockwise direction around the table from P, one meets R before T"**.

In our arrangement (1:P, 2:Q, 3:R, 4:S, 5:T, 6:U, 7:V, 8:W), moving clockwise from P(1), we meet R(3) before T(5). This perfectly satisfies the condition!

(Note: If the arrangement was placed counter-clockwise, we would meet T before R, which would violate the rule).

Finding the final answer:

The question asks: *"How many persons shall Q cross while moving in the clockwise direction around the table before meeting W?"*

- Q is at position 2.
- W is at position 8.
- Moving clockwise from Q(2) to W(8), Q will pass by the persons sitting at positions 3, 4, 5, 6, and 7.
- These positions are occupied by R, S, T, U, and V.

Therefore, Q crosses exactly **5** persons before meeting W.

Question 75

Maths

The top of a table is rectangular and its dimensions are $6' \times 10'$. Two rectangular portions of the table top are painted in blue colour; both these portions have dimensions $2.5' \times 8'$ and each of them has exactly two sides common with two edges of the table top. If the table is fixed to the ground and the remaining portion of the table top is painted in white, how many different patterns are possible when observed from above?

A. 2

B. 4

C. 6

D. 8

Answer – B

Explanation

Answer: B – 4

Let the table top have dimensions $10' \times 6'$. Each blue rectangular portion has dimensions $8' \times 2.5'$.

Since each blue rectangle has exactly two sides common with two edges of the table top, each blue rectangle must be placed at a corner of the table. Also, its $8'$ side must lie along the $10'$ side of the table, and its $2.5'$ side must lie along the $6'$ side of the table.

Thus, there are four possible corner positions for a blue rectangle: bottom-left, bottom-right, top-left and top-right.

However, the two blue rectangular portions cannot overlap. Now check the possible pairs of corner placements:

- Bottom-left and bottom-right overlap, so this is not possible.
- Top-left and top-right overlap, so this is not possible.
- Bottom-left and top-left do not overlap, so this is possible.
- Bottom-right and top-right do not overlap, so this is possible.
- Bottom-left and top-right do not overlap, so this is possible.
- Bottom-right and top-left do not overlap, so this is possible.

Hence, the number of possible patterns is:

$$4$$

Therefore, the correct answer is 4.

Question 76

Comprehension

> How is deflation done? Most countries use a method called 'double deflation', where input and output prices are deflated separately. Consider a manufacturer importing oil for use in production. If oil prices fall, output prices do not and quantities remain the same, real value added should not change. But if the same deflator is used for inputs and outputs, as in India, it would look as if the manufacturer had become more productive.

Which of the following statements is/are correct?

1. Real value should not change in the instance of static output cost and unchanged quantities against falling oil prices.
2. Deflators are to be used separately for inputs and outputs, and this is a practice universally adopted by all economies.

Select the answer using the code given below.

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer – D

Explanation

Answer: D — Neither 1 nor 2

Statement 1 — Incorrect. The passage says that if oil prices fall, output prices do not change, and quantities remain the same, **real value added** should not change. However, the statement says **real value** should not change. The passage is specifically about real value added after deflating inputs and outputs, not about real value in general. Hence, the statement is not accurately framed.

Statement 2 — Incorrect. The passage says that **most countries** use double deflation, where input and output prices are deflated separately. It does not say that this practice is universally adopted by all economies. In fact, the passage states that India uses the same deflator for inputs and outputs, which shows that the practice is not universal.

Therefore, neither statement 1 nor statement 2 is correct.

Question 77

Comprehension

> How is deflation done? Most countries use a method called 'double deflation', where input and output prices are deflated separately. Consider a manufacturer importing oil for use in production. If oil prices fall, output prices do not and quantities remain the same, real value added should not change. But if the same deflator is used for inputs and outputs, as in India, it would look as if the manufacturer had become more productive.

Which of the following assumptions is/are valid?

1. Deflation strategies can be used to make manufacturers appear to be doing better than they actually are.
2. When input and output prices are both deflated against a single input price, it is referred to as 'double deflation'.

Select the answer using the code given below.

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer – A

Explanation

Statement 1 is valid. In economic accounting, the choice of deflation strategy (such as single deflation versus double deflation) can significantly impact the calculated real value added. For instance, if input prices fall sharply and a single deflator is used instead of separate ones, the real value added might be overestimated, making manufacturers appear to be performing better than they actually are.

Statement 2 is invalid. **Double deflation** is a method where gross output and intermediate inputs are deflated separately using their own distinct price indices (an output price index for output and an input price index for inputs). Deflating both against a single price index is contrary to the concept of double deflation.

Therefore, only assumption 1 is valid.

Question 78

Reasoning

A pattern formed by two characters a and b is repeated more than once in the following string :

$x\ b\ x\ a\ x\ a\ x\ x\ a\ x\ a\ x\ b\ a\ b$

What is $x\ x$ in the 7th and 8th positions from the left in the above string?

A. aa

B. ab

C. ba

D. bb

Answer – D

Explanation

Answer: D — bb

The given string is:

$$x\ b\ x\ a\ x\ a\ x\ x\ a\ x\ a\ x\ b\ a\ b$$

There are 15 positions, so a pattern repeated more than once can have length 5, repeated 3 times.

The last five positions are:

$$a\ x\ b\ a\ b$$

Using the fixed letters in the string, the repeating pattern is:

$$a\ b\ b\ a\ b$$

Repeating this pattern three times gives:

$$a\ b\ b\ a\ b\ a\ b\ b\ a\ b\ a\ b\ b\ a\ b$$

Now, the 7th and 8th positions are:

$$b\,b$$

Therefore, $xx = bb$.

Question 79

Maths

If $10^m \times 1000 \times n = 75^{25} \times 25^{32} \times 32^{75}$, where n is not divisible by 10, then the value of m is

A. 101

B. 111

C. 121

D. 131

Answer – B

Explanation

To find the value of m, we need to determine the total power of 10 present in the prime factorization of the right-hand side (RHS) of the equation.

Step 1: Prime factorize the terms on the RHS

- $75^{25} = (3 \times 25)^{25} = (3 \times 5^2)^{25} = 3^{25} \times 5^{50}$
- $25^{32} = (5^2)^{32} = 5^{64}$
- $32^{75} = (2^5)^{75} = 2^{375}$

Step 2: Combine the prime factors

Multiplying these together, we get:

$$RHS = 3^{25} \times 5^{50} \times 5^{64} \times 2^{375}$$

$$RHS = 2^{375} \times 3^{25} \times 5^{114}$$

Step 3: Determine the maximum power of 10 in the RHS

A factor of 10 is formed by multiplying a 2 and a 5. The number of 10s we can form is limited by the smaller of their exponents.

- The power of 2 is 375.
- The power of 5 is 114.

The minimum of these is 114. Therefore, we can factor out 10^{114}:

$$RHS = (2^{114} \times 5^{114}) \times 2^{375-114} \times 3^{25}$$

$$RHS = 10^{114} \times 2^{261} \times 3^{25}$$

Step 4: Compare with the left-hand side (LHS)

The LHS of the equation is given as:

$$LHS = 10^m \times 1000 \times n$$

$$LHS = 10^m \times 10^3 \times n = 10^{m+3} \times n$$

Equating LHS and RHS:

$$10^{m+3} \times n = 10^{114} \times (2^{261} \times 3^{25})$$

The problem states that n is not divisible by 10, which means n cannot contain both 2 and 5 as prime factors. The remaining term $(2^{261} \times 3^{25})$ has no factors of 5, so it is indeed not divisible by 10. This means all the powers of 10 have been completely factored out into the 10^{114} term.

Thus, we can equate the powers of 10:

$$m + 3 = 114$$

$$m = 114 - 3$$

$$m = 111$$

Conclusion:

The value of m is 111.

Question 80

Maths

The speed of a train T is 100 km per hour and the speed of a person P is 4 km per hour. T crosses P in 15 seconds, if P travels along the direction of motion of T. If P travels along the opposite direction of T, then in how much time does T cross P, in seconds, approximately?

A. 13.51

B. 13.65

C. 13.85

D. 14.05

Answer – C

Explanation

Answer: C — 13.85 s (approx)

Find the length of the train using the same-direction crossing.

Relative speed when P moves in the same direction as T:

$$v_{\text{same}} = 100 - 4 = 96 \text{ km/h} = \frac{96000}{3600} = \frac{80}{3} \text{ m/s}$$

Length of train $L = v_{\text{same}} \times 15 = \frac{80}{3} \times 15 = 400$ m.

Time to cross when moving in opposite directions.

Relative speed:

$$v_{\text{opp}} = 100 + 4 = 104 \text{ km/h} = \frac{104000}{3600} = \frac{260}{9} \text{ m/s}$$

Time to cross:

$$t = \frac{L}{v_{\text{opp}}} = \frac{400}{260/9} = \frac{400 \times 9}{260} = \frac{3600}{260} \approx 13.846 \text{ s}$$

So $t \approx 13.85$ s.

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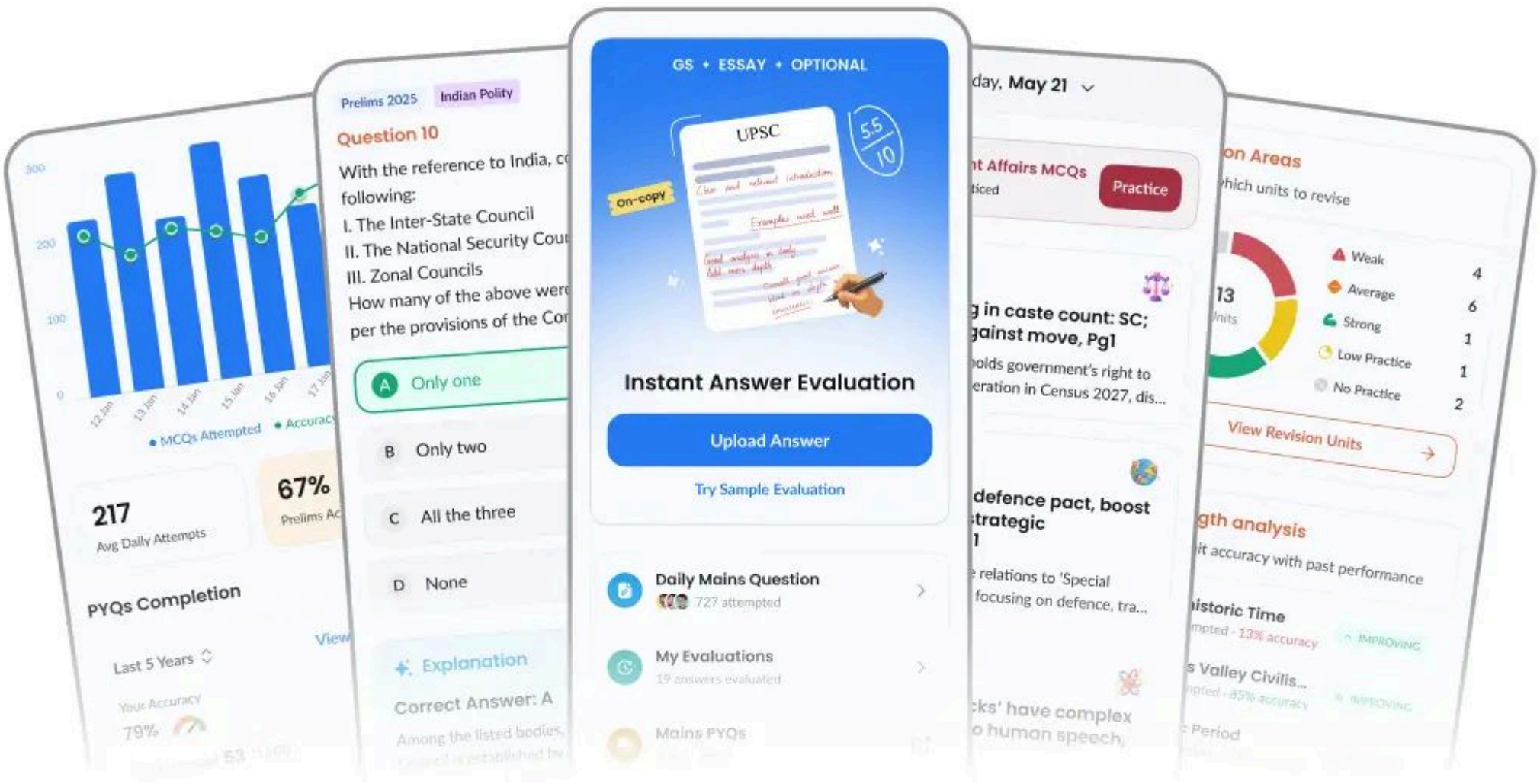

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