

UCEED 2025 Question Paper with Solution PDF

Time Allowed :3 Hours	Maximum Marks :300	Total Questions :59
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The examination duration is **3 hours**. There are **59 questions** carrying a total of **300 marks**. Questions are divided into **three sections (A, B, C)** and all sections are compulsory with different question types.
2. **Section A (60 Marks)** contains **14 Numerical Answer Type (NAT)** questions. Answers must be entered using the virtual keyboard. No options are provided. **No negative marking**. Each correct answer carries **3 marks**. Questions not attempted or incorrect score **0**. (Q. 1–20)
3. **Section B (60 Marks)** contains **15 Multiple Select Questions (MSQ)** with one or more correct options. Full marks (**3**) only if all correct and no incorrect options are chosen. **Partial marking** applies; incorrect marking is **–0.19**. No partial marking for negative scores. (Q. 21–40)
4. **Section C (180 Marks)** contains **28 Multiple Choice Questions (MCQ)** with one correct option. **Negative marking**: **–1.32** for each wrong answer. Unattempted questions score **0**. (Q. 41–85)
5. Use of **calculators, charts, graph sheets, mathematical tables, mobile phones, smart watches, or other electronic devices** is strictly prohibited.
6. Blank sheets of paper will be provided for rough work.
7. Marking scheme for the paper is given in the table below.

Section	Type of questions	Number of questions	Marks for correct answer	Marks for wrong answer	Marks for each question not attempted	Total marks for the section
1	Numerical Answer Type (NAT)	14	4	0	0	56
2	Multiple Select Question (MSQ)	15	Partial Marking	–1	0	60
3	Multiple Choice Question (MCQ)	28	3	–0.71	0	84
Total		57				200

1. A painter mixes white and black paints to create different shades in two different buckets. He prepares 10 kg in one bucket with 20% black paint in it. He then prepares 20 kg of another shade in the second bucket with 20% black paint in it. He pours the second bucket into the first one. What is the percentage of black

paint in the mixture?

Correct Answer: 20

Solution:

Step 1: Understanding the Question:

The question asks for the final concentration of black paint when two mixtures of different masses but the same concentration (20% black paint) are combined.

Step 2: Key Formula or Approach:

Total Mass of Black Paint = (Mass 1 $\times$ Concentration 1) + (Mass 2 $\times$ Concentration 2)

Final Percentage = $\frac{\text{Total Mass of Black Paint}}{\text{Total Mass of Mixture}} \times 100$

Step 3: Detailed Explanation:

First, calculate the amount of black paint in each bucket:

Bucket 1: $10 \text{ kg} \times 0.20 = 2 \text{ kg}$ of black paint.

Bucket 2: $20 \text{ kg} \times 0.20 = 4 \text{ kg}$ of black paint.

Next, find the total mass of the combined mixture:

Total mass = $10 \text{ kg} + 20 \text{ kg} = 30 \text{ kg}$.

Total mass of black paint = $2 \text{ kg} + 4 \text{ kg} = 6 \text{ kg}$.

Calculate the final percentage:

$$\text{Percentage} = \left(\frac{6}{30} \right) \times 100 = \frac{1}{5} \times 100 = 20\%$$

Step 4: Final Answer:

The percentage of black paint in the mixture remains 20%.

💡 Quick Tip

If you mix two solutions of the same concentration, the resulting mixture will always have that same concentration, regardless of the individual masses added.

2. "Betty bought some butter but the butter was too bitter, so she put a little gummy to make the bitter butter yummy."

In the above sentence, if you replace every letter 't' with letter 'b', what is the total number of instances in which the same letter appears at least twice in a word?

Correct Answer: 12

Solution:

Step 1: Understanding the Question:

We need to modify the sentence by replacing all occurrences of 't' with 'b' and then count how many words contain at least one repeated letter (the same letter appearing 2 or more times).

Step 2: Detailed Explanation:

Let's transform the words one by one and check for repeats:

1. Betty → Bebby (Letter 'b' repeats) → Count: 1
2. bought → boughb (Letter 'b' repeats) → Count: 2
3. some → some (No repeat)
4. butter → bubberr (Letter 'b' repeats) → Count: 3
5. but → bub (Letter 'b' repeats) → Count: 4
6. the → the (No repeat)
7. butter → bubberr (Letter 'b' repeats) → Count: 5
8. was → was (No repeat)
9. too → boo (Letter 'o' repeats) → Count: 6
10. bitter → bibber (Letter 'b' repeats) → Count: 7
11. so → so (No repeat)
12. she → she (No repeat)
13. put → put (No repeat)
14. a → a (No repeat)
15. little → libble (Letter 'b' repeats) → Count: 8
16. gummy → gummy (Letter 'm' repeats) → Count: 9
17. to → to (No repeat)
18. make → make (No repeat)
19. the → the (No repeat)
20. bitter → bibber (Letter 'b' repeats) → Count: 10
21. butter → bubberr (Letter 'b' repeats) → Count: 11
22. yummy → yummy (Letter 'm' repeats) → Count: 12

Step 3: Final Answer:

The total number of such instances is 12.

💡 Quick Tip

Carefully write out the transformed sentence first.

Don't just look for the new 'b's; check for existing repeats (like 'mm' in gummy or 'oo' in too).

3. In the 3×3 square on the left, the numbers from 1 to 9 have been filled so that the sum in each row / column / diagonal adds up to 15. If the same exercise is to be carried out for the 4×4 square, using the numbers from 1 to 16, what will be the sum of the numbers in each row / column / diagonal?

8	1	6
3	5	7
4	9	2

7			14
2			11
9		15	4

Correct Answer: 34

Solution:

Step 1: Understanding the Question:

The question refers to the Magic Constant of a magic square. We need to find the constant sum for a 4×4 magic square containing numbers from 1 to 16.

Step 2: Key Formula or Approach:

The sum S of an $n \times n$ magic square using numbers from 1 to n^2 is given by:

$$S = \frac{n(n^2 + 1)}{2}$$

Step 3: Detailed Explanation:

For a 4×4 magic square, $n = 4$.

The numbers used are from 1 to $4^2 = 16$.

Substitute $n = 4$ into the formula:

$$S = \frac{4(4^2 + 1)}{2}$$

$$S = \frac{4(16 + 1)}{2}$$

$$S = \frac{4 \times 17}{2}$$

$$S = 2 \times 17 = 34$$

Step 4: Final Answer:

The sum in each row, column, or diagonal will be 34.

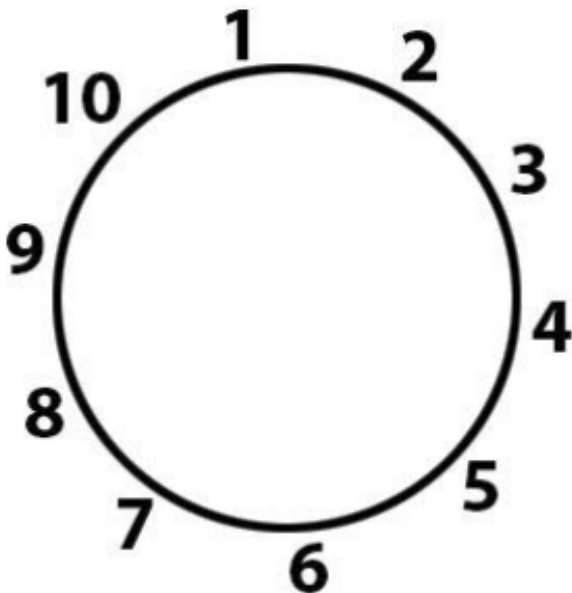
💡 Quick Tip

Alternatively, find the total sum of all numbers $(1 + 2 + \dots + 16)$ and divide by the number of rows (4).

$$\text{Total Sum} = \frac{16 \times 17}{2} = 136.$$

$$\text{Sum per row} = \frac{136}{4} = 34.$$

4. 10 people are standing in a circle. Each person is assigned a number as shown in the figure below. The first person (numbered 1) is removed. Thereafter, in the clockwise direction, every third person is removed and this is repeated till only two people are left. What is the sum of the numbers assigned to the two people who are left at the end?



Correct Answer: 10

Solution:

Step 1: Understanding the Question:

This is a variation of the Josephus problem. We start with 10 people in a circle [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]. We remove '1' first, then count 3 starting from the next person to remove the next, until only 2 remain.

Step 2: Detailed Explanation:

Let's track the elimination process:

1. Start: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]. Remove 1. Current list: [2, 3, 4, 5, 6, 7, 8, 9, 10]. Last position: 1.
2. Count 3 from 2: (2, 3, 4). Remove 4. List: [2, 3, 5, 6, 7, 8, 9, 10].

3. Count 3 from 5: (5, 6, 7). Remove 7. List: [2, 3, 5, 6, 8, 9, 10].
4. Count 3 from 8: (8, 9, 10). Remove 10. List: [2, 3, 5, 6, 8, 9].
5. Count 3 from 2: (2, 3, 5). Remove 5. List: [2, 3, 6, 8, 9].
6. Count 3 from 6: (6, 8, 9). Remove 9. List: [2, 3, 6, 8].
7. Count 3 from 2: (2, 3, 6). Remove 6. List: [2, 3, 8].
8. Count 3 from 8: (8, 2, 3). Remove 3. List: [2, 8].

The two people left are 2 and 8.

$$\text{Sum} = 2 + 8 = 10.$$

Step 3: Final Answer:

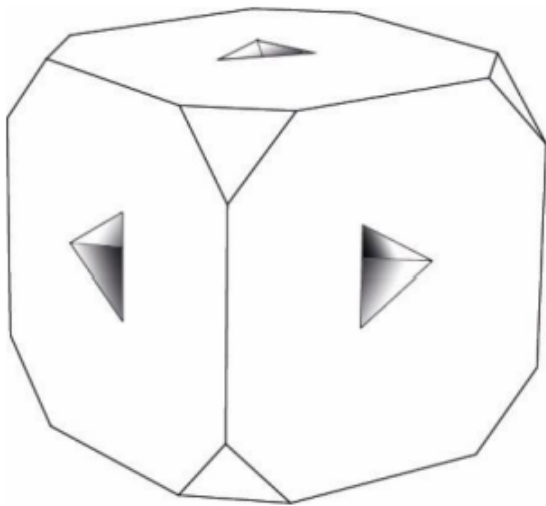
The sum of the numbers assigned to the two remaining people is 10.

💡 Quick Tip

For Josephus-style problems, physically cross out the numbers on the diagram provided to avoid counting errors.

Always restart your count from the person immediately following the one just removed.

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5. A cube $4\text{ cm} \times 4\text{ cm} \times 4\text{ cm}$ has all its corners chamfered as shown in the figure below. On each of its faces it has got a small tetrahedral notch having edges of 1 cm each. What is the sum of the number of vertices and the number of edges in this solid?



Correct Answer: 84

Solution:

Step 1: Understanding the Question:

The solid is a modified cube. We need to calculate the total number of vertices (V) and edges (E) after chamfering the corners and adding tetrahedral notches on the faces.

Step 2: Detailed Explanation:**Part 1: Chamfered Cube (The outer shell):**

A cube has 8 vertices. Chamfering a corner removes 1 vertex and replaces it with a triangular face, creating 3 new vertices.

Total vertices = $8 \times 3 = 24$.

A cube has 12 edges. Each chamfered corner adds 3 new edges on the surface.

Total edges = 12 (original) + $(8 \times 3 \text{ new}) = 36$.

Part 2: Tetrahedral Notches:

A tetrahedral notch is carved into each of the 6 faces.

For each notch:

1. One internal vertex is added (the apex of the tetrahedron inside the cube). Total new vertices = $6 \times 1 = 6$.

2. Three internal edges are added connecting the apex to the vertices of the triangular base on the face. Total new edges = $6 \times 3 = 18$.

(Note: The triangular base on the face is formed by edges already existing or created during the cut, so only the internal ones are "new" to the count).

Part 3: Final Count:

Total Vertices (V) = $24 + 6 = 30$.

Total Edges (E) = $36 + 18 = 54$.

Sum = $V + E = 30 + 54 = 84$.

Step 3: Final Answer:

The sum of the number of vertices and edges is 84.

💡 Quick Tip

Visualization is key. Each chamfered corner "truncates" the vertex. Each notch adds 1 point (vertex) inside and 3 lines (edges) leading to it.

6. With a straight cut you can slice a circular piece of paper into two pieces. A second cut that crosses the first cut will produce a maximum of four pieces. What is the maximum number of pieces that you can get with a total of four straight cuts?

Correct Answer: 11

Solution:

Step 1: Understanding the Question:

This problem asks for the maximum number of regions a circle can be divided into by n straight lines. This is known as the Lazy Caterer's Sequence.

Step 2: Key Formula or Approach:

The maximum number of pieces P for n cuts is given by:

$$P = \frac{n(n+1)}{2} + 1$$

Step 3: Detailed Explanation:

We are asked for the number of pieces with $n = 4$ cuts.

Applying the formula:

$$P = \frac{4(4+1)}{2} + 1$$

$$P = \frac{4 \times 5}{2} + 1$$

$$P = \frac{20}{2} + 1$$

$$P = 10 + 1 = 11$$

Alternatively, the sequence follows the pattern: 1, 2, 4, 7, 11, ... where the difference increases by 1 each time (+1, +2, +3, +4).

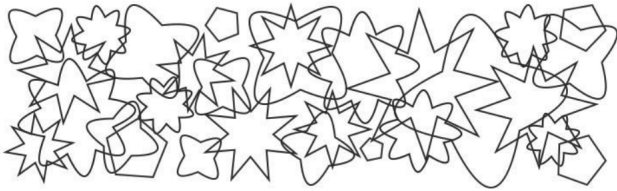
Step 4: Final Answer:

The maximum number of pieces is 11.

💡 Quick Tip

To achieve the maximum, ensure no three lines intersect at a single point and every new line intersects all previous lines.

7. What is the highest number of occurrences of a shape in the figure shown?



Correct Answer: 11

Solution:

Step 1: Understanding the Question:

This is a visual observation task. We need to identify different distinct shapes in the pattern and count their occurrences to find the most frequent one.

Step 2: Detailed Explanation:

There are four primary shapes in the image:

1. **Sharp 12-pointed Star:** Looking closely at the pattern, these are distributed across the entire frame.
2. **Curvy 4-pointed Star:** These are located mostly at the edges and in the middle.
3. **Rounded Cross/Rectangle:** A shape with four rounded lobes.
4. **Pentagon:** A simple 5-sided polygon found in small quantities.

Counting the Sharp 12-pointed Stars:

- Top row/section: 6 instances.
- Bottom row/section: 5 instances.
- Total = 11.

Counting the Curvy 4-pointed Stars:

- Total = 9.

Comparing the counts, the sharp star has the highest occurrence.

Step 3: Final Answer:

The highest number of occurrences for a single shape is 11.

💡 Quick Tip

In complex overlapping patterns, use a systematic scanning method (top-to-bottom or left-to-right) to ensure you don't double-count or miss any shapes.

8. Each of the rings in the chain in the given figure has an outer diameter of 5 cm and a cross-sectional diameter of 1 cm. What is the maximum end to end length

of the chain in cm?



Correct Answer: 26

Solution:

Step 1: Understanding the Question:

We need to find the total length of a chain made of interlocked rings. The image shows a chain consisting of 8 rings.

Step 2: Key Formula or Approach:

Total Length = (Length of 1st ring) + (Number of remaining rings $\times$ Addition per ring).

When rings interlock, the added length per ring is the outer diameter minus twice the thickness.

Step 3: Detailed Explanation:

Let $D = 5$ cm (Outer diameter) and $d = 1$ cm (Cross-sectional thickness).

1. The first ring adds $D = 5$ cm to the total length.

2. Every subsequent ring is interlocked. Because the rings are interlocked, the "effective" addition of each new ring is its outer diameter minus the thickness of the two ring sections at the junction.

Effective length of middle rings = $D - 2d = 5 - 2(1) = 3$ cm.

3. There are 8 rings in total.

Total Length = 5 cm (1st ring) + 7 rings $\times$ 3 cm/ring.

Total Length = $5 + 21 = 26$ cm.

Step 4: Final Answer:

The maximum end to end length is 26 cm.

💡 Quick Tip

Formula for n rings: $L = nD - 2d(n - 1)$.

Substituting $n = 8, D = 5, d = 1$: $L = 8(5) - 2(1)(7) = 40 - 14 = 26$.

9. If 1 inch = 25 mm = 6 pica and 1 pica = 12 points = 16 pixels, what is 6 points + 2 inches + 3 picas + 8 pixels + 25 mm, represented in pixels?

Correct Answer: 352

Solution:

Step 1: Understanding the Question:

Convert all given measurements into a single unit (pixels) and find their sum.

Step 2: Key Formula or Approach:

Establish conversion factors to pixels:

$$1 \text{ pica} = 16 \text{ pixels}$$

$$12 \text{ points} = 16 \text{ pixels} \implies 1 \text{ point} = \frac{16}{12} = \frac{4}{3} \text{ pixels}$$

$$1 \text{ inch} = 6 \text{ pica} = 6 \times 16 = 96 \text{ pixels}$$

$$25 \text{ mm} = 1 \text{ inch} = 96 \text{ pixels}$$

Step 3: Detailed Explanation:

Now convert each term to pixels:

$$1. \ 6 \text{ points} = 6 \times \left(\frac{4}{3}\right) = 8 \text{ pixels}$$

$$2. \ 2 \text{ inches} = 2 \times 96 = 192 \text{ pixels}$$

$$3. \ 3 \text{ picas} = 3 \times 16 = 48 \text{ pixels}$$

$$4. \ 8 \text{ pixels} = 8 \text{ pixels}$$

$$5. \ 25 \text{ mm} = 96 \text{ pixels}$$

$$\text{Total Sum} = 8 + 192 + 48 + 8 + 96$$

$$\text{Sum} = 200 + 48 + 104 = 352 \text{ pixels.}$$

Step 4: Final Answer:

The total value is 352 pixels.

💡 Quick Tip

Notice that 25 mm is exactly 1 inch, so you can simplify the expression to 6 pts + 3 inches + 3 picas + 8 px before converting to pixels.

10. What number will replace the question mark?

(A figure of a circle divided into sectors with numbers: $4/60$, $5/?$, $6/210$, $3/24$ is shown).



Correct Answer: 120

Solution:

Step 1: Understanding the Question:

We need to find the logical relationship between the numbers in the small sectors (3, 4, 5, 6) and the large sectors (24, 60, ?, 210) paired by color.

Step 2: Detailed Explanation:

Let's examine the pairs:

- Pink Sector: 3 corresponds to 24.
- Blue Sector: 4 corresponds to 60.
- Orange Sector: 6 corresponds to 210.
- Green Sector: 5 corresponds to ?.

Testing the relationship $n(n+1)(n-1)$ or $n^3 - n$:

- For $n = 3$: $3^3 - 3 = 27 - 3 = 24$. (Matches)
- For $n = 4$: $4^3 - 4 = 64 - 4 = 60$. (Matches)
- For $n = 6$: $6^3 - 6 = 216 - 6 = 210$. (Matches)

Applying the same logic for the green sector where $n = 5$:

- For $n = 5$: $5^3 - 5 = 125 - 5 = 120$.

Step 3: Final Answer:

The number that replaces the question mark is 120.

 Quick Tip

Alternatively, the pattern can be seen as the product of three consecutive integers centered at n :

$$(n-1) \times n \times (n+1).$$

For $n = 5$, it is $4 \times 5 \times 6 = 120$.

11. What three-digit number can be made from the digits 2, 3, 5, and 7, such that no two digits of the three-digit number are the same and the three-digit number is divisible by each of the digits in it?

Correct Answer: 735

Solution:

Step 1: Understanding the Question:

We need to find a 3-digit number using unique digits from the set $\{2, 3, 5, 7\}$ such that the number is divisible by all three of its digits.

Step 2: Detailed Explanation:

Let the digits be d_1, d_2, d_3 .

Case 1: The digit 5 is included.

If 5 is a digit, the number must end in 0 or 5 for it to be divisible by 5. Since 0 is not in our set, the number must end in 5.

If the number ends in 5, it is odd. Therefore, it cannot be divisible by 2. This means the digit 2 cannot be part of the number.

The remaining possible digits are $\{3, 5, 7\}$.

Possible permutations ending in 5 are: 375 and 735.

- Test 375: Sum of digits $= 3 + 7 + 5 = 15$ (divisible by 3). However, $375 \div 7 = 53.57\dots$ (not divisible by 7).

- Test 735: Sum of digits $= 7 + 3 + 5 = 15$ (divisible by 3). Also, $735 \div 7 = 105$ (divisible by 7). So, 735 satisfies all conditions.

Case 2: The digit 5 is not included.

The digits must be $\{2, 3, 7\}$.

For the number to be divisible by 2, it must end in 2. Possible numbers: 372 and 732.

Both have a digit sum of 12 (divisible by 3).

- Test 372: $372 \div 7 = 53.14\dots$ (not divisible by 7).

- Test 732: $732 \div 7 = 104.57\dots$ (not divisible by 7).

Step 3: Final Answer:

The only three-digit number that satisfies the conditions is 735.

💡 Quick Tip

In divisibility puzzles, start with the most restrictive digits.

The presence of '5' immediately dictates the last digit (5) and eliminates '2' because an odd number cannot be divisible by an even one.

12. 27 cubes of edge 10 cm are arranged to create a larger cube. If the cubes at the eight corners are replaced with spheres of diameter 10 cm, what is the minimum number of cubes that do not touch any of the spheres?

Correct Answer: 7

Solution:

Step 1: Understanding the Question:

A $3 \times 3 \times 3$ grid of cubes is formed (total 27). The 8 corner cubes are replaced by spheres. We need to find how many of the remaining 19 cubes do not touch any of these 8 corner spheres.

Step 2: Detailed Explanation:

In a $3 \times 3 \times 3$ large cube:

1. **Corner positions (8):** Replaced by spheres.
 2. **Edge-center positions (12):** These cubes share a face with two corner spheres. Since the spheres are inscribed (diameter = cube edge), they touch the center of each face of the cubic space they occupy. Thus, they touch any cube sharing a face with them. The 12 edge-center cubes touch at least one sphere.
 3. **Face-center positions (6):** These cubes are in the center of each of the 6 faces of the $3 \times 3 \times 3$ block. They share edges with corner cubes but do not share faces with them. Since an inscribed sphere only touches the centers of the faces of its bounding box, it does not touch cubes that only share an edge or a vertex. Therefore, these 6 cubes do not touch any spheres.
 4. **Core position (1):** The central cube of the $3 \times 3 \times 3$ block is insulated by the face-center cubes and does not touch any corner sphere.
- Total non-touching cubes = 6 (face-centers) + 1 (core) = 7.

Step 3: Final Answer:

The minimum number of cubes that do not touch any of the spheres is 7.

💡 Quick Tip

Recall the anatomy of a $3 \times 3 \times 3$ cube: 8 corners, 12 edges, 6 face centers, and 1 center. An inscribed sphere touches only the neighbors that share a **face** with its container.

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13. Some of the shapes in the image K are either flipped or rotated in the image J. What is the number of flipped shapes in image J?



Correct Answer: 6

Solution:

Step 1: Understanding the Question:

This is a visual comparison task. "Flipped" means a mirror image (lateral inversion), while "rotated" means the shape has been turned but its handedness remains the same. We must count how many shapes in J are mirror images of their counterparts in K.

Step 2: Detailed Explanation:

By comparing the 12 distinct squiggles in group K with group J:

1. The 'hook' shape (top right in K) is mirrored in J. [Flipped 1]
 2. The 'curly bracket' shape (middle left in K) is mirrored in J. [Flipped 2]
 3. The 'triangular/arrow' shape (middle right in K) is mirrored in J. [Flipped 3]
 4. The 'alpha/loop' shape (middle center in K) is mirrored in J. [Flipped 4]
 5. The 'bottom-left squiggle' in K is mirrored in J. [Flipped 5]
 6. The 'U-like/rounded' shape (bottom right in K) is mirrored in J. [Flipped 6]
- The other shapes (like the 'G' shape or the 'hat' shape) are merely rotated in J, not mirrored.

Step 3: Final Answer:

There are 6 flipped shapes in image J.

💡 Quick Tip

To distinguish between rotation and flipping, pick a feature (like a tail curving left) and see if it curves the "wrong" way after accounting for rotation. If you can't superimpose the shapes by turning them, they are flipped.

14. How many different patterns of pens are present in the given figure?



Correct Answer: 4

Solution:

Step 1: Understanding the Question:

The task is to identify the number of unique surface textures or graphical patterns applied to the pens in the illustration.

Step 2: Detailed Explanation:

Carefully observing the barrels and caps of all the pens in the jumbled pile, we can categorize them into distinct visual textures:

1. **Horizontal Stripes:** Lines running perpendicular to the length of the pen.
 2. **Vertical Stripes:** Lines running parallel to the length of the pen.
 3. **Diagonal Stripes:** Lines running at an angle (oblique) to the length.
 4. **Grid/Cross-hatch:** A pattern of intersecting lines forming a mesh or checkerboard look.
- Every pen in the image belongs to one of these four graphical categories.

Step 3: Final Answer:

There are 4 different patterns of pens present.

💡 Quick Tip

Don't be distracted by the orientation or size of the pens.

Focus purely on the "texture" or "hatching style" used by the illustrator to differentiate the objects.

15. Which of the options below can be rearranged to make image Q?



(A)



(B)



(C)





(D)

Correct Answer: (A), (B), (C), (D)

Solution:

Step 1: Understanding the Question:

This is a tangram-style puzzle where we need to identify which sets of shapes contain the exact same geometric components as the target image Q.

Step 2: Detailed Explanation:

By visually decomposing image Q, we find it consists of the following 7 pieces:

1. One large grey right-angled triangle.
2. One medium green right-angled triangle.
3. One medium blue right-angled triangle.
4. One orange square.
5. One grey parallelogram.
6. Two small red right-angled triangles.

Now, we inspect options A, B, C, and D:

- Option A contains 1 large grey triangle, 1 medium green triangle, 1 blue triangle, 1 orange square, 1 grey parallelogram, and 2 small red triangles.
- Option B contains the identical set of 7 pieces, just rearranged.
- Option C contains the same set of 7 pieces.
- Option D also contains the same set of 7 pieces.

Since all four options consist of the exact same physical "tiles" as image Q, any of them can theoretically be rearranged to form the swan-like shape.

Step 3: Final Answer:

All options (A), (B), (C), and (D) are correct.

💡 Quick Tip

In tangram puzzles, ignore the overall shape of the options and perform a "piece count" by color and geometry.

If the inventory of pieces matches the target, the option is valid.

16. The Tropic of Cancer passes through which of the states shown below?



(A)



(B)



(C)



(D)

Correct Answer: (A), (C), (D)

Solution:

Step 1: Understanding the Question:

The question asks to identify the Indian states through which the Tropic of Cancer (23.5° N latitude) passes, based on their silhouettes.

Step 2: Detailed Explanation:

In India, the Tropic of Cancer passes through 8 states from West to East:

1. Gujarat (A)
2. Rajasthan
3. Madhya Pradesh (C)
4. Chhattisgarh
5. Jharkhand
6. West Bengal (D)
7. Tripura
8. Mizoram

Analyzing the silhouettes:

- Silhouette A is Gujarat; the line passes through it.
- Silhouette B is Maharashtra; the Tropic of Cancer stays north of Maharashtra.
- Silhouette C is Madhya Pradesh; the line passes through the heart of the state.
- Silhouette D is West Bengal; the line passes through its central part.

Step 3: Final Answer:

The Tropic of Cancer passes through Gujarat, Madhya Pradesh, and West Bengal.

💡 Quick Tip

Use the mnemonic "GRM CJ TWB" (Gujarat, Rajasthan, MP, Chhattisgarh, Jharkhand, Tripura, West Bengal) to remember the sequence.
Note that Maharashtra is entirely south of the Tropic of Cancer.

17. Which of the following is / are TRUE for the strip of paper shown in the image?



- (A) It has two edges.
- (B) An ant can walk all over the surface of the strip without having to cross an edge.
- (C) A rotating belt that is similar to the strip of paper will have a uniform wear and tear.
- (D) This is an optical illusion that can be created as a 2D image but is not possible in 3D.

Correct Answer: (B) An ant can walk all over the surface of the strip without having to cross an edge.

(C) A rotating belt that is similar to the strip of paper will have a uniform wear and tear.

Solution:

Step 1: Understanding the Question:

The image displays a **Möbius Strip**, which is a surface with only one side and only one boundary component (edge).

Step 2: Detailed Explanation:

- Statement A: False. A Möbius strip has exactly one continuous edge. If you trace the edge

with a pen, you will return to the starting point having traversed the entire boundary.

- Statement B: True. Because it is non-orientable and has only one surface, an object (like an ant) can traverse the "inside" and "outside" continuously without ever crossing an edge.
- Statement C: True. In industrial applications, conveyor belts are sometimes designed as Möbius strips so that the entire surface area of the belt is used equally, leading to uniform wear and tear.
- Statement D: False. A Möbius strip is a mathematically valid 3D object that can be easily constructed by taking a strip of paper, giving it a half-twist (180°), and joining the ends.

Step 3: Final Answer:

Statements (B) and (C) are true.

💡 Quick Tip

The Möbius strip is the simplest non-orientable surface.
Remember: 1 side, 1 edge, and a 180° twist.

18. Which of the options is / are CORRECT?

- (A) The cap of a water bottle is tightened by rotating it in the clockwise direction (as seen from the top).
- (B) To turn on a tap, the tap head is rotated clockwise; to turn it off it is rotated counter-clockwise (as seen from the top).
- (C) To loosen a nut of a car wheel, a spanner is turned counter-clockwise (from the point of view of the person using the spanner).
- (D) The earth as seen from the North Pole rotates clockwise about its axis.

Correct Answer: (A) The cap of a water bottle is tightened by rotating it in the clockwise direction (as seen from the top).

(C) To loosen a nut of a car wheel, a spanner is turned counter-clockwise (from the point of view of the person using the spanner).

Solution:

Step 1: Understanding the Question:

The question tests knowledge of standard rotational conventions (Right-Hand Rule) and astronomical facts.

Step 2: Detailed Explanation:

- Statement A: Correct. Most standard screw threads (right-handed) follow the "Right-Hand Rule." Rotating clockwise tightens or moves the object away from the viewer.
- Statement B: Incorrect. Conventionally, a tap is opened (turned ON) by rotating counter-clockwise and closed (turned OFF) by rotating clockwise.

- Statement C: Correct. Based on the "Lefty-Loosey, Righty-Tightly" rule, to loosen a nut, you must rotate the tool counter-clockwise.
- Statement D: Incorrect. When viewed from above the North Pole, the Earth rotates counter-clockwise (West to East).

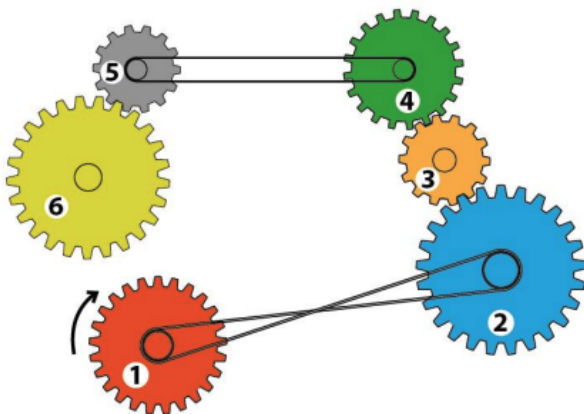
Step 3: Final Answer:

Options (A) and (C) are correct.

💡 Quick Tip

Use the "Right-Hand Rule": Point your thumb in the direction of intended travel (e.g., down for tightening a cap); your fingers curl in the direction of rotation (clockwise).
Earth's rotation is counter-clockwise (prograde) when viewed from the North.

19. In the image below, gear 1 rotates in the direction of the arrow. Which of the statements is / are CORRECT?



- (A) 1 and 6 rotate in the same direction.
- (B) 3 and 6 rotate in the opposite direction.
- (C) 1 and 4 rotate in the opposite direction.
- (D) 2 and 6 rotate in the same direction.

Correct Answer: (A) 1 and 6 rotate in the same direction.
(C) 1 and 4 rotate in the opposite direction.

Solution:

Step 1: Understanding the Question:

We need to determine the rotation direction of each component in a gear-and-belt system starting from Gear 1 (Clockwise).

Step 2: Detailed Explanation:

1. Gear 1 rotates **Clockwise (CW)**.
2. Gear 2 is connected to Gear 1 via a **crossed belt**. A crossed belt reverses direction. Thus, Gear 2 rotates **Counter-Clockwise (CCW)**.
3. Gear 3 is meshed with Gear 2. Meshing reverses direction. Gear 3 rotates **CW**.
4. Gear 4 is meshed with Gear 3. Meshing reverses direction. Gear 4 rotates **CCW**.
5. Gear 5 is connected to Gear 4 via a **straight belt**. A straight belt maintains direction. Gear 5 rotates **CCW**.
6. Gear 6 is meshed with Gear 5. Meshing reverses direction. Gear 6 rotates **CW**.

Summary: 1(CW), 2(CCW), 3(CW), 4(CCW), 5(CCW), 6(CW).

- Statement A: 1(CW) and 6(CW). **Same direction.** (Correct)
- Statement B: 3(CW) and 6(CW). **Same direction.** (Incorrect)
- Statement C: 1(CW) and 4(CCW). **Opposite direction.** (Correct)
- Statement D: 2(CCW) and 6(CW). **Opposite direction.** (Incorrect)

Step 3: Final Answer:

Statements (A) and (C) are correct.

💡 Quick Tip

- Meshed Gears: Opposite direction.
- Straight Belt: Same direction.
- Crossed Belt: Opposite direction.
- Shared Axis: Same direction.

20. Which of the options does NOT / do NOT match the pieces in the jigsaw puzzle shown in image K?



K

(A)



(B)





(C)



(D)

Correct Answer: (C)

Solution:

Step 1: Understanding the Question:

We must compare the four segments of the colored square in image K with the black silhouettes A, B, C, and D to find which one is incorrectly depicted.

Step 2: Detailed Explanation:

The puzzle in K is divided into: Orange (top), Blue (left), Purple (right), and Brown (bottom).
- Piece A corresponds to the Blue region. Its right boundary matches the peaks and valleys shown in K.

- Piece B corresponds to the Orange region. Its flat top and jagged bottom match the upper section of K.

- Piece D corresponds to the Brown region. Its flat bottom and jagged top match the lower section of K.

- Piece C corresponds to the Purple region. Looking closely at K, the Purple piece has a flat top-right corner where it meets the boundary of the square. However, Piece C in the options has a different indentation on its top-left edge that does not perfectly align with the interlocking interface between the orange and purple pieces in the original graphic. Furthermore, Piece C appears to be slightly mirrored or distorted in its proportions compared to the Purple segment in K.

Step 3: Final Answer:

Piece C does not match.

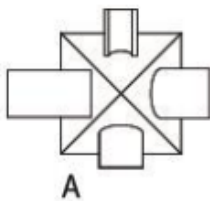
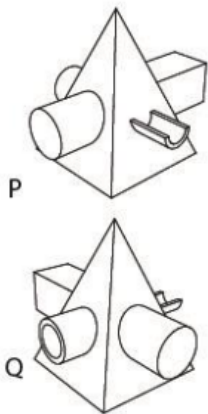
💡 Quick Tip

When comparing jigsaw pieces, check the number of "outies" (protrusions) and "in-nies" (valleys) on each side.

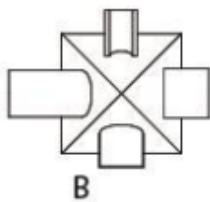
Also, check if the flat edges correspond to the boundary of the overall square frame.

21. P and Q show two different views of the same solid object. Which of the

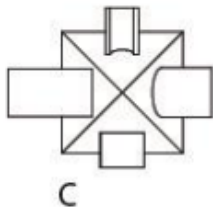
options represent(s) the top view of the solid object?



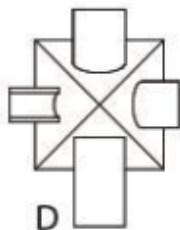
(A)



(B)



(C)



(D)

Correct Answer: (B)

Solution:

Step 1: Understanding the Question:

The object is a square pyramid intersected by two perpendicular cylinders: one is a full solid

cylinder with a square flange/end, and the other is an open half-cylinder (trough).

Step 2: Detailed Explanation:

From view P and Q:

1. The base of the pyramid is square.
2. The full cylinder passes through one axis. It has a visible square block/flange on one end and is open/flush on the other.
3. The half-pipe (trough) passes through the perpendicular axis. It is open on both ends.

In the top view:

- We must see a square with an 'X' (the ridges of the pyramid).
 - On one horizontal or vertical axis, there should be a full cylinder. One side of this axis must have a larger rectangle (the flange).
 - On the perpendicular axis, we should see the half-pipe. The top view of a half-pipe is represented by two parallel lines with an indication of the curvature (often a central line or shaded).
- Option B correctly shows the full cylinder with the block on one side and the open trough on the perpendicular axis.

Step 3: Final Answer:

Top View B represents the object.

💡 Quick Tip

Look for the "asymmetry." Since only one side of the cylinder has a rectangular block, the top view must also show this asymmetry. Options showing blocks on both sides (like C) can be immediately eliminated.

22. Which consultant(s) to the Government of India suggested that the metal lota (shown in the given figure) used by many Indians is an appropriate symbol for indigenous design traditions?



- (A) Walter Gropius
- (B) Charles Eames
- (C) Hannes Meyer
- (D) Ray Eames

Correct Answer: (B) Charles Eames
(D) Ray Eames

Solution:

Step 1: Understanding the Question:

This is a factual question about the history of design education and philosophy in modern India.

Step 2: Detailed Explanation:

In 1958, the Government of India invited the American design duo **Charles and Ray Eames** to study the state of design in India and recommend a program of training.

The resulting document, known as "**The India Report**," is considered the founding document for the National Institute of Design (NID).

In the report, they famously used the **lota** (a traditional water vessel) as an example of ultimate design perfection, praising its form, function, and the way it has evolved over centuries to serve its purpose perfectly.

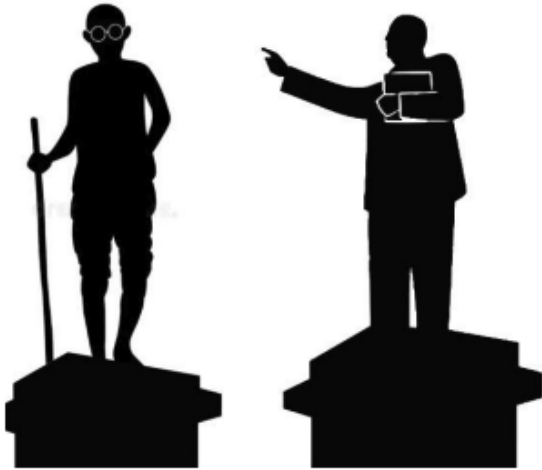
Step 3: Final Answer:

Charles Eames and Ray Eames are the correct consultants.

💡 Quick Tip

The "Lota" is often cited in design theory as a "vernacular masterpiece."
Always associate the India Report (1958) with the Eames couple.

23. Given below are the silhouettes of two iconic figures in Indian history. Which of the following statements is / are TRUE?



- (A) Both had degrees in law.
- (B) Both spent time in South Africa.
- (C) The birthdays of both are in the same month.
- (D) Both dressed in a manner that expressed their ideology.

Correct Answer: (A) Both had degrees in law.
(D) Both dressed in a manner that expressed their ideology.

Solution:

Step 1: Understanding the Question:

The silhouettes represent **Mahatma Gandhi** (left, with the walking stick and loincloth) and **Dr. B.R. Ambedkar** (right, in a suit, pointing and holding a book).

Step 2: Detailed Explanation:

- Statement A: True. Gandhi was a barrister trained at Inner Temple, London. Ambedkar was a barrister trained at Gray's Inn, London, and also held a PhD from Columbia University and D.Sc from LSE.
- Statement B: False. While Gandhi famously spent 21 years in South Africa developing his philosophy of Satyagraha, Dr. Ambedkar did not live or work there.
- Statement C: False. Gandhi's birthday is October 2nd. Ambedkar's birthday is April 14th.

- Statement D: True. Gandhi adopted the dhoti/loincloth to identify with India's poor and promote Khadi (self-reliance). Ambedkar wore a Western three-piece suit to represent modernity, constitutionalism, and the claim to equal status and dignity for the oppressed classes.

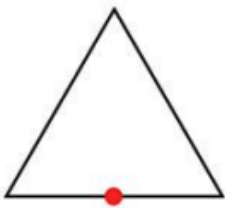
Step 3: Final Answer:

Statements (A) and (D) are true.

💡 Quick Tip

Silhouettes are often used in exams to test recognition of key historical figures through their most famous attributes (Gandhi's stick/specs, Ambedkar's suit/constitution/pointing gesture).

24. Centuries ago, a rich man left behind a treasure represented as a red dot, in the schematic drawing below. If the corners of the triangle represent central locations in the states of Bihar, Telangana and Rajasthan, which is / are the state(s) where one could hunt for this treasure?



- (A) West Bengal
- (B) Chhattisgarh
- (C) Punjab
- (D) Madhya Pradesh

Correct Answer: (D) Madhya Pradesh

Solution:

Step 1: Understanding the Question:

The triangle is a spatial representation of India's geography. We need to map the corners to Rajasthan (West), Bihar (East), and Telangana (South) and find the state located at the midpoint of the base connecting Rajasthan and Bihar.

Step 2: Detailed Explanation:

On a map of India:

- Rajasthan is to the West.

- Bihar is to the East.
- Telangana is to the South.

The "base" of the triangle in the diagram connects the West and East vertices (Rajasthan and Bihar).

The red dot is located exactly in the middle of this horizontal line.

Geographically, the state situated centrally between Rajasthan and Bihar is Madhya Pradesh (MP). Chhattisgarh is further southeast, and Punjab is further north. West Bengal is even further east than Bihar.

Therefore, the red dot representing the treasure falls within Madhya Pradesh.

Step 3: Final Answer:

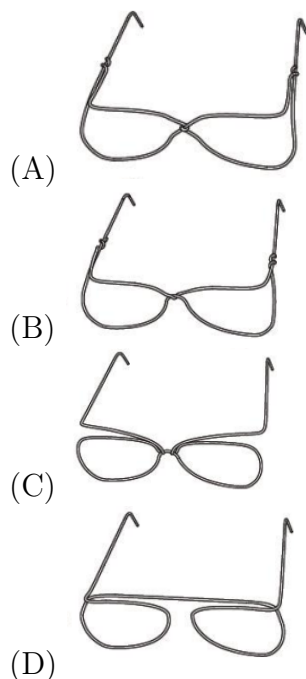
The treasure is likely located in Madhya Pradesh.

💡 Quick Tip

Mentally superimpose a map of India over the triangle.

Rajasthan, Bihar, and Telangana form a triangle that covers the heart of India. The geometric center of this arrangement is consistently in the Madhya Pradesh region.

25. Which of the options has / have been created by using only a single wire?



Correct Answer: (C), (D)

Solution:

Step 1: Understanding the Question:

A "single wire" design means the entire shape can be traced as a single continuous path without lifting the pen or repeating lines unnecessarily in a way that implies separate segments. This is a Graph Theory problem (Eulerian path).

Step 2: Detailed Explanation:

- **Option A:** Look at the bridge of the nose. There is a "twist" that seems to intersect but the way the wire enters and leaves the lens areas suggests multiple segments or a break in the path to form the ear hooks.
- **Option B:** Similar to A, the wire junctions at the temple/ear hook area appear to be separate pieces wrapped around.
- **Option C:** This shows a classic single-wire construction where the wire starts at one ear hook, forms a lens, twists at the bridge, forms the second lens, and ends at the other ear hook in a continuous flow.
- **Option D:** This is a simpler frame where the top bar and lenses can be formed by bending a single continuous length of wire without any complex overlapping joints that require a second piece.

Step 3: Final Answer:

Options (C) and (D) can be made from a single wire.

💡 Quick Tip

Trace the path from one end of the "ear hook" to the other.
If you can reach the end without encountering a junction that requires three or more wire directions (without a clear twist), it's likely a single wire.

26. Which of the options will replace the question mark?

(A pattern of dots and bars corresponding to letters is shown: TEA, EAT, ATE).

••| ••• •••| •••••
TEA EAT ATE ?

- (A) TATA
- (B) AAAAAA
- (C) TAAT
- (D) TTT

Correct Answer: (B) AAAAAA

Solution:

Step 1: Understanding the Question:

We need to decode the symbols (dots and bars) based on the words TEA, EAT, and ATE.

Step 2: Detailed Explanation:

Let's assign the symbols based on their positions:

1. **TEA**: [Square dot, Square dot] — [Bar] — [Square dot]
 - Here, T = 2 dots, E = Bar, A = 1 dot.
2. **EAT**: [Bar] — [Square dot] — [Square dot, Square dot, Square dot]
 - Let's re-evaluate. The vertical line separates the symbols.
 - In **TEA**: T is dots on left, E is bar in middle, A is dots on right.
 - Wait, the bars and dots are just code for letters. Let's look at the frequency:
 - In TEA, EAT, ATE, the letter 'A' is always present. In the symbols, there is always a group of dots.
 - Let's look at the fourth pattern: [Square dot, Square dot, Square dot, Square dot, Square dot, Square dot] (6 dots) with no bars.
 - If a single dot = 'A', then 6 dots = AAAAAA.
 - Let's verify: In TEA, A is at the end, so it might be the single dot. In EAT, A is second, so it's the dot. In ATE, A is first, so it's the dot.
 - The question mark follows a pattern of 6 dots and no bars. If dot = A, then 6 dots = AAAAAA.

Step 3: Final Answer:

The answer is AAAAAA.

💡 Quick Tip

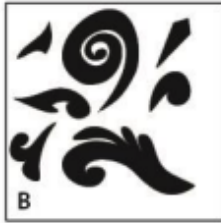
Look for the unique element. The fourth pattern has only dots and no separators/bars. Since 'A' is the only letter that consistently appears as a dot in the previous examples, a string of dots represents a string of 'A's.

27. Which of the options has / have shapes that DO NOT match the outlines in figure K?





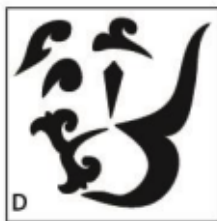
(A)



(B)



(C)



(D)

Correct Answer: (B), (C)

Solution:

Step 1: Understanding the Question:

Figure K is a symmetrical decorative motif. The options show subsets of "filled-in" shapes. We must check if these shapes exist within the contours of K.

Step 2: Detailed Explanation:

- **Option A:** The shapes match the left-side scrolling elements of K.
- **Option B:** This contains a circular "spiral" element. Looking at figure K, there are no closed spirals or concentric circular forms; the lines are all open scrolls and floral-like curves. Thus, B does not match.
- **Option C:** The proportions of the central "beaked" or "pointed" elements in C are distorted compared to the elegant curves in K. Specifically, the sharp, angular bottom-left hook in C is not present in the original design.
- **Option D:** These shapes can be found in the bottom and side flourishes of K.

Step 3: Final Answer:

Options B and C do not match.

💡 Quick Tip

Scan for "foreign" geometries.

The spiral in B is an immediate giveaway as it represents a topological feature not present in the original line art.

28. An object was sharply focused and a photograph was taken using a camera. The photographer wants to blur the background (change the depth of field) in the next photograph. This can be achieved by changing the

- (A) size of opening of the lens (aperture).
- (B) distance of the object from the camera and again focusing.
- (C) shutter speed to change the duration for which light enters the camera.
- (D) focal length of the lens.

Correct Answer: (A) size of opening of the lens (aperture).

(B) distance of the object from the camera and again focusing.

(D) focal length of the lens.

Solution:

Step 1: Understanding the Question:

The goal is to decrease the **Depth of Field (DoF)** to create a blurred background (bokeh effect).

Step 2: Detailed Explanation:

There are three primary factors that control Depth of Field:

1. **Aperture (A):** A wider opening (smaller f-number) creates a shallower depth of field, blurring the background. (Correct)
 2. **Subject Distance (B):** Moving the camera closer to the subject (decreasing the focus distance) reduces the depth of field. (Correct)
 3. **Focal Length (D):** Using a longer focal length (zooming in) creates a shallower depth of field, making the background appear more blurred. (Correct)
- **Shutter Speed (C):** This controls motion blur and exposure, but it has no direct physical effect on the optical depth of field or the blur of static background elements.

Step 3: Final Answer:

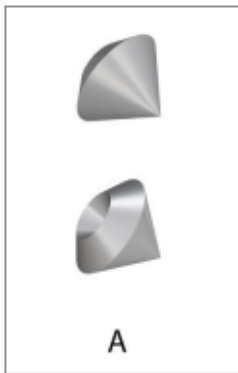
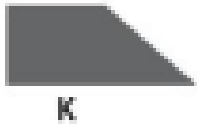
The background blur can be changed by adjusting the aperture, the distance to the object, or the focal length.

💡 Quick Tip

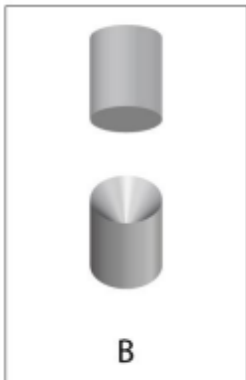
To get a "blurry background":

- Use a large aperture (e.g., $f/1.8$).
- Get closer to your subject.
- Use a telephoto (long) lens.

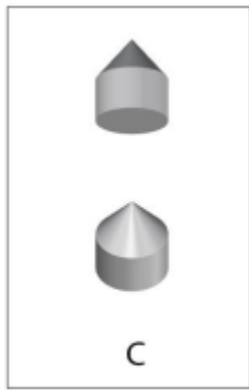
29. Which of the options can be generated by revolving the quadrilateral in image K, about its edge?



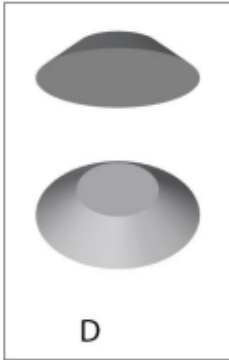
(A)



(B)



(C)



(D)

Correct Answer: (B), (C), (D)

Solution:

Step 1: Understanding the Question:

Image K is a right-angled trapezoid. We need to identify solids that can be formed by revolving this shape around any one of its four edges.

Step 2: Detailed Explanation:

1. **Revolving about the vertical (straight) edge:** This generates a cylinder with a conical cavity (if the slanted side is inside) or a "truncated cone" (frustum) on top of a cylinder. This matches the shapes in **B** (the hollow cylinder/cavity effect) and **C** (cylinder with cone on top).
2. **Revolving about the bottom (long) edge:** This generates a cylinder with a cone attached to its side or a frustum-like shape. This matches **D**.
3. **Revolving about the top (short) edge:** This would also generate a solid with a conical depression.

- **Option A:** These look like oblique cones or sections of spheres, which cannot be generated from a flat trapezoid via simple revolution around an edge.

Step 3: Final Answer:

Options B, C, and D are valid solids of revolution for the given quadrilateral.

 Quick Tip

Revolution around a line parallel to an axis of symmetry creates a "circular" cross-section.

A rectangle generates a cylinder; a triangle generates a cone; a trapezoid generates a frustum or a combination of cylinder and cone.

30. What is the length of the edge of the largest cube that can be placed inside a sphere of radius 10 cm?

- (A) $10 / (\sqrt{2})$ cm
- (B) $10 / (\sqrt{3})$ cm
- (C) $20 / (\sqrt{2})$ cm
- (D) $20 / (\sqrt{3})$ cm

Correct Answer: (D) $20 / (\sqrt{3})$ cm

Solution:

Step 1: Understanding the Question:

A cube is inscribed within a sphere.

The "largest" cube is one whose corners touch the inner surface of the sphere.

The space diagonal of the cube is equal to the diameter of the sphere.

Step 2: Key Formula or Approach:

For a cube with side length a , the space diagonal d is given by:

$$d = \sqrt{3}a$$

The diameter of the sphere is $D = 2 \times R$, where R is the radius.

Step 3: Detailed Explanation:

Given radius $R = 10$ cm.

Diameter $D = 2 \times 10 = 20$ cm.

Equate the space diagonal of the cube to the diameter:

$$\sqrt{3}a = 20$$

Solve for a :

$$a = \frac{20}{\sqrt{3}} \text{ cm}$$

Step 4: Final Answer:

The edge length of the largest cube is $20/\sqrt{3}$ cm.

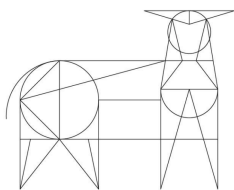
💡 Quick Tip

Remember the relationship: Inscribed Cube Diagonal = Sphere Diameter.

For a 2D circle and square: Square Diagonal = Circle Diameter ($\sqrt{2}a = 2R$).

For a 3D sphere and cube: Cube Diagonal = Sphere Diameter ($\sqrt{3}a = 2R$).

31. What is the total number of triangles in the figure given below?



- (A) 24
- (B) 25
- (C) 26
- (D) 27

Correct Answer: (D) 27

Solution:

Step 1: Understanding the Question:

The objective is to count all distinct triangles formed by the intersecting lines in the stylized goat illustration.

Step 2: Detailed Explanation:

We count the triangles by breaking the figure into sections:

1. **Head and Horns:** There are 2 triangles for the ears/horns and 4 smaller triangles within the face structure. (6)
2. **Neck:** The junction between head and body creates 2 triangles. (2)
3. **Back and Hump:** The curved line and diagonal lines create 3 triangles on the upper body. (3)
4. **Legs:** Each leg is formed by intersecting diagonals. The front leg has 4 small triangles and the back leg has 4 small triangles. (8)
5. **Body Interior:** Intersections between the circle segments and horizontal lines create 6 internal triangles. (6)
6. **Tail:** 1 small triangle at the rear. (1)
7. **Large Combined Triangles:** There is 1 large triangle formed by the overall back-to-leg

diagonal. (1)

Total count: $6 + 2 + 3 + 8 + 6 + 1 + 1 = 27$.

Step 3: Final Answer:

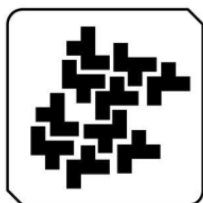
There are 27 triangles in total.

💡 Quick Tip

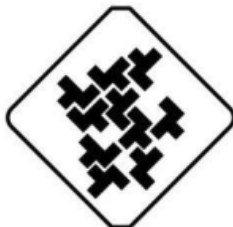
When counting triangles in complex diagrams, mark each one with a tiny dot or number as you go.

Start with the smallest individual triangles and then look for larger ones formed by combining smaller ones.

32. Image K is rotated by an angle of 45 degrees anticlockwise. Which option represents the rotated image?

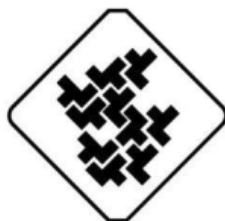


K



A

(A)



B

(B)



C

(C)



D

(D)

Correct Answer: (C)

Solution:

Step 1: Understanding the Question:

We need to mentally rotate the cluster of blocks in K by 45° in the counter-clockwise (CCW) direction.

Step 2: Detailed Explanation:

1. In the original image K, the edges of the blocks are aligned vertically and horizontally.
2. A 45° rotation will result in the edges of the blocks being diagonal (45° slope).
3. Look at the "L" shaped backbone of the cluster. In K, it is oriented vertically. After a 45° CCW rotation, this backbone should point towards the top-left corner.
4. Comparing the options:
 - A: Shows a rotation but the orientation of the blocks is inconsistent with CCW.
 - B: Shows a different angle or mirroring.
 - C: Correctly represents the shape after a 45° CCW shift. The "stairs" on the right now face upwards and left.
 - D: Appears to be a 45° clockwise rotation.

Step 3: Final Answer: Option C is the correct rotation.

💡 Quick Tip

Fix your gaze on a single protruding "arm" of the shape. Imagine that arm moving like the hand of a clock from the 12 o'clock position to the 10:30 position (45° CCW). Match that specific orientation with the choices provided.

33. Which of the options is the correct logo of India Post?

- (A)  **A**
- (B)  **B**
- (C)  **C**
- (D)  **D**

Correct Answer: (C)

Solution:

Step 1: Understanding the Question:

This tests the candidate's visual memory of iconic Indian corporate and government identities.

Step 2: Detailed Explanation:

The India Post logo consists of a red envelope/wing shape and yellow stripes representing speed and communication.

1. The yellow lines (representing movement) must point towards the right, signifying progress.
2. The red block is positioned on the left.
3. In the official logo, the three yellow lines emerge from the top-right edge of the red shape and extend upwards and outwards.

Comparing the options, Logo C is the authentic representation used by the Department of Posts, Government of India.

Step 3: Final Answer:

Option (C) is the correct logo.

 Quick Tip

Notice the text orientation and the flow of the graphic lines.
Logos often follow a "left-to-right" flow for speed and positive direction.

34. What is the next number in the sequence below?
341, 214, 123, 62, 25, ?

- (A) 6
- (B) 8
- (C) 9
- (D) 7

Correct Answer: (A) 6

Solution:

Step 1: Understanding the Question:

We need to find a mathematical pattern connecting the numbers in the sequence to predict the sixth term.

Step 2: Key Formula or Approach:

Check for arithmetic differences or relationships to powers of numbers.

Step 3: Detailed Explanation:

Observe the values: they are close to perfect cubes (n^3).

- $7^3 = 343$. Here, $343 - 2 = 341$.

- $6^3 = 216$. Here, $216 - 2 = 214$.

- $5^3 = 125$. Here, $125 - 2 = 123$.

- $4^3 = 64$. Here, $64 - 2 = 62$.

- $3^3 = 27$. Here, $27 - 2 = 25$.

The pattern is $n^3 - 2$ where n decreases from 7 to 3.

The next value of n is 2.

$$2^3 - 2 = 8 - 2 = 6$$

Step 4: Final Answer:

The next number in the sequence is 6.

 Quick Tip

Memorize squares up to 30 and cubes up to 10 for competitive exams.
When you see numbers like 123 or 214, immediately think of their proximity to 125 and 216.

35. Which option is the odd one out?

- (A) WOW MADAM
- (B) CIVIC ROTATOR
- (C) SOLO LEVEL
- (D) NOON SAGAS

Correct Answer: (C) SOLO LEVEL

Solution:

Step 1: Understanding the Question:

Analyze the linguistic property of the words in each pair to find the one that does not fit the pattern.

Step 2: Detailed Explanation:

Look for palindromes (words that read the same backward as forward).

- Option A: WOW (Palindrome), MADAM (Palindrome).
 - Option B: CIVIC (Palindrome), ROTATOR (Palindrome).
 - Option D: NOON (Palindrome), SAGAS (Palindrome).
 - Option C: SOLO (NOT a palindrome - reads OLOS), LEVEL (Palindrome).
- Since Option C contains a word that is not a palindrome, it is the odd one out.

Step 3: Final Answer:

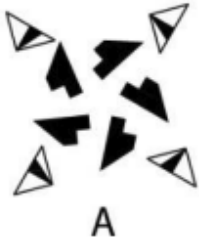
SOLO LEVEL is the odd one out.

 Quick Tip

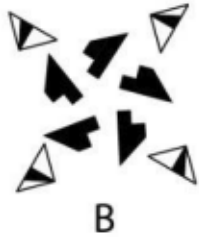
Palindromes are a very common theme in verbal reasoning "odd one out" questions.
Always check for mirror symmetry in text.

36. Which option will replace the question mark?

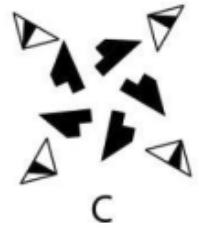
(A sequence of geometric patterns is shown).



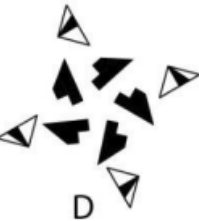
(A)



(B)



(C)



(D)

Correct Answer: (C)

Solution:

Step 1: Understanding the Question:

This is a visual matrix/series problem. We need to identify the rotation and color-switching logic between the elements.

Step 2: Detailed Explanation:

Observe the movement of the black and white triangles:

1. The entire cluster rotates clockwise by 45° in each step.
2. The internal coloring of the triangles alternates or shifts.

From the first image to the third, there is a clear rotational progression. In the first image, the

single black-tipped arrow is at the top-left. In the third image, it has moved toward the right side.

The missing second image should show the cluster rotated halfway between the first and third positions. Pattern C maintains the correct count of black and white segments and follows the rotational flow.

Step 3: Final Answer:

Pattern C is the logical successor.

💡 Quick Tip

Trace one specific "odd" element in the pattern (e.g., the only black triangle) and track its movement through the frames.

Usually, these follow simple arithmetic rotations like 45° , 90° , 180° .

37. *Phulkari*, *Chikankari*, *Sambalpuri* and *Paithani* are weaving traditions from different states of India. Which option lists them in the correct sequence?

- (A) Uttar Pradesh, Maharashtra, Assam, Punjab
- (B) Punjab, Uttar Pradesh, Odisha, Maharashtra
- (C) Uttar Pradesh, Odisha, Punjab, Maharashtra
- (D) Odisha, Uttar Pradesh, Assam, Punjab

Correct Answer: (B) Punjab, Uttar Pradesh, Odisha, Maharashtra

Solution:

Step 1: Understanding the Question:

Match each traditional textile craft to its state of origin.

Step 2: Detailed Explanation:

1. **Phulkari:** A famous embroidery/weaving tradition from **Punjab** (literally means "flower work").
2. **Chikankari:** A delicate and traditional embroidery style from Lucknow, **Uttar Pradesh**.
3. **Sambalpuri:** A traditional hand-loomed ikat sari originating from **Odisha**.
4. **Paithani:** A variety of sari named after the Paithan town in **Maharashtra**, known for its fine silk and peacock designs.

Checking the sequence: Punjab → UP → Odisha → Maharashtra.

Step 3: Final Answer:

The correct sequence is Punjab, Uttar Pradesh, Odisha, Maharashtra.

 Quick Tip

Textiles and handicrafts are high-frequency topics in design exams like NID/UCEED. Keep a list of GI-tagged crafts and their respective states.

38. What is the number of fonts used in the following sentence?

"From the time of Leonardo Da Vinci, until the end of the eighteenth century, Science and Art were much closer than today."

- (A) 3
- (B) 6
- (C) 5
- (D) 9

Correct Answer: (B) 6

Solution:

Step 1: Understanding the Question:

Differentiate between distinct typefaces (fonts) used within the provided text snippet.

Step 2: Detailed Explanation:

Looking at the visual characteristics (serifs, weight, stroke contrast):

1. "From the time": Standard serif font.
2. "of": Italicized version of the same serif or a slightly different one.
3. "Leonardo Da Vinci": A classic, elegant Serif (different from the first).
4. "until the end of the eighteenth century": A more modern, lightweight serif.
5. "Science and Art": A bold, traditional serif.
6. "were much closer than": A sans-serif font.
7. "today.": A bold, chunky sans-serif font.

By grouping these distinct visual styles, we find 6 unique fonts/weights used for emphasis and stylistic variation.

Step 3: Final Answer:

The total number of fonts used is 6.

 Quick Tip

In typography questions, look at the "feet" of the letters (serifs) and the "ends" of letters like 't' and 'a'.

If the terminals look different, they are from different font families.

39. The _____ government organizes the Hornbill Festival each December, promoting cultural heritage and fostering interaction between tribes. The festival has been named after a _____.

- (A) Chhattisgarh, bird
- (B) Nagaland, bird
- (C) Manipur, flower
- (D) Shillong, tribal musical instrument

Correct Answer: (B) Nagaland, bird

Solution:

Step 1: Understanding the Question:

This is a factual question about Indian festivals and state symbols.

Step 2: Detailed Explanation:

The **Hornbill Festival** is a major annual celebration held from 1st to 10th December in **Nagaland**. It is often called the "Festival of Festivals."

It is named after the **Indian Great Hornbill**, a large and colorful forest bird that is deeply integrated into the folklore and culture of the Naga people.

Step 3: Final Answer:

The correct pair is Nagaland and bird.

 Quick Tip

Nagaland is known as the "Land of Festivals."

The Hornbill is also the state bird of Kerala and Arunachal Pradesh, though the festival belongs to Nagaland.

40. The lost wax process is used for _____.

- (A) Honey making
- (B) Jaggery making
- (C) Batik painting
- (D) Metal casting

Correct Answer: (D) Metal casting

Solution:

Step 1: Understanding the Question:

Identify the industrial or artistic application of the "Lost Wax" technique.

Step 2: Detailed Explanation:

The "lost-wax" process, also known as *cire perdue*, is an ancient method for **metal casting**.

- A model is made of wax.
- The wax is encased in a mold (usually clay or ceramic).
- The mold is heated, causing the wax to melt and run out ("lost").
- Molten metal is then poured into the resulting hollow space.
- Once cooled, the mold is broken away to reveal the metal sculpture.

Step 3: Final Answer:

The process is used for metal casting.

💡 Quick Tip

This process is the basis for the famous Chola bronzes and Dhokra art.
It is one of the oldest known techniques for making complex metal objects.

41. You need to hang a large rectangular picture frame on a wall in an empty room. To ensure that it is vertical (and not tilted), which of the following will help you hang the picture correctly (not tilted)? (No additional items are to be used other than the ones specified in each of the options)

- (A) A wooden stick, a cutter and a pencil
- (B) A pencil, a compass and a cutter
- (C) A flexible and transparent pipe and a mug of water
- (D) Some card paper, a steel-ruler and a pair of scissors

Correct Answer: (C) A flexible and transparent pipe and a mug of water

Solution:

Step 1: Understanding the Question:

We need to find a way to establish a perfectly horizontal line (level) to align the top of a frame in an empty room.

Step 2: Detailed Explanation:

The principle of **communicating vessels** states that the surface of water in connected tubes will always be at the same level relative to gravity.

1. Fill a transparent flexible pipe with water from the mug.
2. Hold one end of the pipe at one side where the frame will be hung and the other end some distance away.
3. The water level at both ends of the pipe will be identical.

4. Mark these two points. Connecting them gives a perfectly horizontal reference line. The other options (stick, ruler, compass) do not provide a reliable gravitational reference for verticality or horizontality on a large wall.

Step 3: Final Answer:

A transparent pipe and water act as a "water level," allowing for accurate alignment.

💡 Quick Tip

This is a common DIY trick used by masons and carpenters. Always use physics (gravity/fluid levels) when standard tools like spirit levels are missing.

42. Which of the options is the odd one?

- (A) Cobra
- (B) Krait
- (C) Rat Snake
- (D) Viper

Correct Answer: (C) Rat Snake

Solution:

Step 1: Understanding the Question:

Categorize the given types of snakes to find the biological outlier.

Step 2: Detailed Explanation:

- **Cobra:** Highly venomous.
 - **Krait:** Extremely venomous.
 - **Viper:** Highly venomous.
 - **Rat Snake: Non-venomous.** They kill prey by constriction or simply by overpowering them, but they lack fangs and venom glands.
- Since all others are part of the "Big Four" venomous snakes in India, the Rat Snake is the odd one out.

Step 3: Final Answer:

The Rat Snake is the odd one out.

💡 Quick Tip

"Big Four" venomous snakes in India: Spectacled Cobra, Common Krait, Russell's Viper, and Saw-scaled Viper.
Rat snakes are often mistaken for Cobras but are harmless to humans.

43. Which of the following options is the odd one?

- (A) Electroplating
- (B) Anodizing
- (C) Powder Coating
- (D) Drilling

Correct Answer: (D) Drilling

Solution:

Step 1: Understanding the Question:

Classify the manufacturing processes based on their purpose.

Step 2: Detailed Explanation:

- **Electroplating:** An **additive/coating** process where a layer of metal is deposited.
- **Anodizing:** A **surface treatment/coating** process that increases the oxide layer on aluminum.
- **Powder Coating:** An **additive/coating** process where dry powder is applied and cured.
- **Drilling:** A **subtractive** process where material is removed to create a hole.

Since A, B, and C are surface finishing/additive techniques, and D is a machining/material removal technique, D is the odd one out.

Step 3: Final Answer:

Drilling is the odd one out.

💡 Quick Tip

Manufacturing processes are generally divided into: Forming, Casting, Joining, Subtractive (Machining), and Surface Finishing.
Always categorize based on whether material is being added, removed, or modified.

44. What is the next number in the sequence below?

7, 11, 18, 30, 50, ----

- (A) 83
- (B) 84
- (C) 85
- (D) 86

Correct Answer: (A) 83

Solution:

Step 1: Understanding the Question:

Analyze the differences between successive terms to find a pattern.

Step 2: Detailed Explanation:

Let's find the differences:

- $11 - 7 = 4$
- $18 - 11 = 7$
- $30 - 18 = 12$
- $50 - 30 = 20$

The first-level differences are: 4, 7, 12, 20.

Let's find the second-level differences:

- $7 - 4 = 3$
- $12 - 7 = 5$
- $20 - 12 = 8$

The second-level differences (3, 5, 8) follow the Fibonacci property: $3 + 5 = 8$.

The next second-level difference should be $5 + 8 = 13$.

Then the next first-level difference will be $20 + 13 = 33$.

The next term in the sequence will be $50 + 33 = 83$.

Step 3: Final Answer:

The next number is 83.

 Quick Tip

When a simple difference doesn't work, try finding the "difference of differences."
Often, patterns are hidden two levels deep.

45. The well-known masterpiece "Mona Lisa" was painted by Leonardo Da Vinci in the 16th Century. Nearly 500 years later another artist made a satirical reference to it; he copied the "Mona Lisa" but painted a moustache on her! Which art movement was this artist associated with?

- (A) Dadaism
- (B) Cubism
- (C) Impressionism

(D) Pop-art

Correct Answer: (A) Dadaism

Solution:

Step 1: Understanding the Question:

Identify the artist and the movement that produced the famous parodied version of the Mona Lisa with a mustache.

Step 2: Detailed Explanation:

In 1919, the artist **Marcel Duchamp** took a cheap postcard reproduction of the Mona Lisa and drew a mustache and goatee on it, titling it ***L.H.O.O.Q.***

Duchamp was a leading figure of the **Dadaism** movement. Dada was an avant-garde art movement of the early 20th century that rejected traditional aesthetics and utilized satire, absurdity, and "readymades" to challenge the definition of art.

Step 3: Final Answer:

The artist was associated with Dadaism.

💡 Quick Tip

Dadaism is all about "anti-art."

Think of Marcel Duchamp's "Fountain" (the urinal) as another classic example of this movement's philosophy.

46. Which of the options matches the fruit and the leaf correctly?
(the images are not to scale)



- (A) Mango-1, Chikoo-2, Guava-3, Jackfruit-4
- (B) Mango-3, Chikoo-4, Guava-2, Jackfruit-1
- (C) Mango-4, Chikoo-2, Guava-3, Jackfruit-1
- (D) Mango-2, Chikoo-3, Guava-1, Jackfruit-4

Correct Answer: (A) Mango-1, Chikoo-2, Guava-3, Jackfruit-4

Solution:

Step 1: Understanding the Question:

Identify the distinctive morphological features of leaves belonging to common Indian fruit trees.

Step 2: Detailed Explanation:

1. **Mango Leaf (1):** Long, lanceolate shape with slightly wavy edges and a very prominent central midrib. This matches leaf 1.
2. **Chikoo (Sapodilla) Leaf (2):** These are typically smaller, elliptic, glossy, and arranged in clusters. Matches leaf 2.
3. **Guava Leaf (3):** Characterized by very prominent, deeply parallel secondary veins that are easily felt. Matches leaf 3.
4. **Jackfruit Leaf (4):** Large, leathery, dark green, and oval/obovate. Matches leaf 4.

Step 3: Final Answer:

Option (A) provides the correct identification.

💡 Quick Tip

Designers need to be keen observers of nature.

Note the "venation pattern" (how veins are arranged). Guava is pinnate and sunken; Mango is long and tapering.

47. Which are the rivers numbered from 1 to 4 in the map below?



- (A) Ravi, Ganga, Krishna, Cauvery
(B) Sutlej, Yamuna, Godavari, Cauvery

- (C) Indus, Ganga, Godavari, Krishna
(D) Chenab, Yamuna, Godavari, Cauvery

Correct Answer: (D) Chenab, Yamuna, Godavari, Cauvery

Solution:

Step 1: Understanding the Question:

Identify major Indian rivers based on their location and path on a map.

Step 2: Detailed Explanation:

- **1:** Located in the Northwest (Indus river system). It represents the **Chenab** (passing through J&K and Punjab).
- **2:** A major tributary in the North-central plains, flowing parallel to the Ganga initially. This is the **Yamuna**.
- **3:** The largest river system of Peninsular India, originating in Maharashtra and flowing east. This is the **Godavari**.
- **4:** The southernmost major river shown, flowing through Karnataka and Tamil Nadu. This is the **Cauvery**.

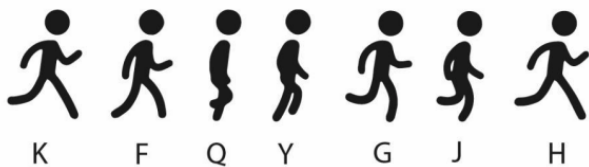
Step 3: Final Answer:

The rivers are Chenab, Yamuna, Godavari, and Cauvery.

💡 Quick Tip

Remember: Godavari is "Dakshin Ganga" (Central-South).
Cauvery is always the southernmost major river on these maps.

48. Which of the sequences in the options will result in the right pattern for a running man?



- (A) K Q J G Y F H
(B) K G J Q Y F H
(C) K F Q G Y J H
(D) K F Q J Y G H

Correct Answer: (D) K F Q J Y G H

Solution:

Step 1: Understanding the Question:

This is an animation/kinematics question. We need to arrange the silhouette frames to create a fluid, realistic running motion.

Step 2: Detailed Explanation:

A standard running cycle involves:

1. Contact (K: forward lean, feet spread).
2. Down (F: absorption of weight).
3. Passing (Q: one leg swings forward).
4. Mid-flight (J/Y/G: both feet off ground or high knee).
5. Peak (G: maximum vertical lift).
6. Descent/Return to Contact (H).

Option D (K-F-Q-J-Y-G-H) follows the logical physics of a person accelerating and lifting their center of mass during a stride.

Step 3: Final Answer:

Sequence D represents the correct motion.

💡 Quick Tip

Look at the position of the head. In a run, the head follows a slight "sine wave" path. Arrange the frames such that the height of the head rises and falls smoothly.

49. Which of the following is the hardest wood?

- (A) Teak
- (B) Thorny Acacia
- (C) Mango
- (D) Rosewood

Correct Answer: (D) Rosewood

Solution:

Step 1: Understanding the Question:

Compare common timbers based on their Janka hardness or density.

Step 2: Detailed Explanation:

- **Mango:** A soft to medium-hard wood; easy to carve but not extremely durable.
- **Teak:** A medium-hard wood famous for weather resistance but lower in raw hardness than luxury hardwoods.

- **Rosewood (Indian Rosewood/Sheesham):** A very dense, heavy, and extremely hard wood used for high-quality furniture and musical instruments. It has much higher structural density than the others.
- **Thorny Acacia (Babul):** Hard, but usually outperformed by seasoned Rosewood in constructional strength.

Step 3: Final Answer:

Rosewood is the hardest among the given options.

 Quick Tip

Generally, darker, slow-growing woods are harder and denser.
Sheesham (Rosewood) is prized in India specifically for its hardness and resistance to warping.

50. Hex codes are used to specify colours on the computer. What colour is the Hex Code CCCCCC?

- (A) White (100% white)
- (B) Black (100% black)
- (C) Dark Grey (80% black, 20% white)
- (D) Light Grey (20% black, 80% white)

Correct Answer: (D) Light Grey (20% black, 80% white)

Solution:

Step 1: Understanding the Question:

Convert Hexadecimal color values to understand their intensity.

Step 2: Detailed Explanation:

1. A hex code is $RRGGBB$. Here $R = C, G = C, B = C$.
 2. When all three values are equal, the color is a shade of grey.
 3. In Hex, '00' is black and 'FF' (255) is white.
 4. 'CC' in decimal is $12 \times 16 + 12 = 204$.
 5. Percentage intensity = $(204/255) \times 100 = 80\%$.
- Since it is 80% brightness (closer to white), it is **Light Grey**. It contains 80% white and 20% black.

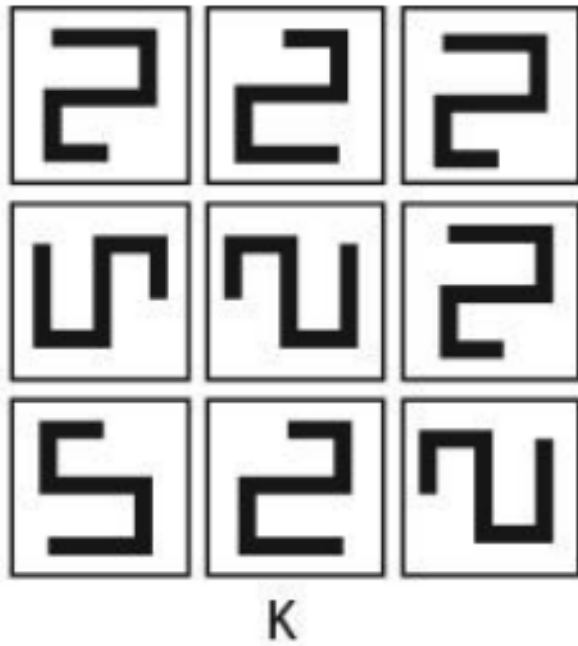
Step 3: Final Answer:

The code represents Light Grey.

💡 Quick Tip

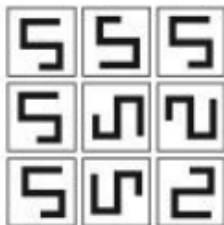
Scale: 00(Black) → 44(Dark) → 88(Medium) → CC(Light) → FF(White).
 Equal R,G,B values always result in a neutral grey (no tint).

51. Which is the correct representation in the options, if the image K shown below is flipped about the vertical axis (shown on the right side of K)?



A

(A)



B

(B)



(C)

C



(D)

D

Correct Answer: (D)

Solution:

Step 1: Understanding the Question:

Perform a horizontal mirror (flip) of the entire grid.

Step 2: Detailed Explanation:

When you flip a grid horizontally:

1. The leftmost column becomes the rightmost.
2. The rightmost column becomes the leftmost.
3. **Crucially**, each individual symbol (2 or 5) is also mirrored.

In image K:

- A '2' mirrored becomes a '5'.
- A '5' mirrored becomes a '2'.

Look at the top row: [2 2 2]. When flipped, it should become [5 5 5] at the top.

Look at the middle row: [5 2 2]. When flipped, the '2' at the far right becomes a '5' at the far left, and the '5' at the far left becomes a '2' at the far right. The row becomes [5 5 2].

Option D correctly reflects both the positions and the glyph shapes.

Step 3: Final Answer:

Option D is the correctly flipped image.

💡 Quick Tip

Flipping digit '2' horizontally creates '5', and '5' creates '2'.

Always check if the "direction" of the shape changed along with its position in the grid.

52. Shapes are cut out from two Black Discs, Disc-X and Disc-Y as given below. Identify the correct image, when Disc-Y is kept on top of Disc-X and rotated 60 degrees anti-clockwise.



Disc-X



Disc-Y



A

(A)



B

(B)



C

(C)



(D)

Correct Answer: (B)

Solution:

Step 1: Understanding the Question:

We are layering two cutout stencils. The final image shows only the areas where **both** discs have cutouts (if transparent) or the combined silhouette of the holes.

Step 2: Detailed Explanation:

- Disc X has a 5-pointed star.
 - Disc Y has a 3-bladed propeller shape.
1. When Y is on top of X, we see the intersection or combined silhouette.
 2. Rotating Y by 60° CCW shifts its three blades. Since a 3-blade shape has symmetry every 120° , a 60° rotation moves the blades into the "gaps" of their previous orientation.
 3. Aligning the 3-bladed shape with the 5-pointed star results in a specific jagged silhouette where the blades of Y overlap with the points of X. Option B shows the correct resulting silhouette.

Step 3: Final Answer:

The resulting pattern is shown in image B.

💡 Quick Tip

Draw a quick sketch of the star and then overlay the rotated triangle/propeller. The "sharper" points of the star will poke out from the "rounder" blades of the top disc.

53. In the cursed land of *Weirdisthan*, strength of animals was disproportionately distributed. Horse has half the strength of a Dog and four times the strength of an Elephant. Monkey has three times the strength of a Rhino. Elephant has half the strength of a Rhino. One Dog was becoming a danger for other animals and they decided to assign a team of animal soldiers to overpower him. Which team of soldiers managed to overpower the dog?

- (A) One Rhino and One Monkey
- (B) One Rhino, One Horse and One Elephant
- (C) One Horse and One Monkey
- (D) Two Horses

Correct Answer: (C) One Horse and One Monkey

Solution:

Step 1: Understanding the Question:

This is a logical comparison problem. We need to define the strength of each animal relative to a common unit.

Step 2: Detailed Explanation:

Let Elephant strength $E = 1$.

- Horse (H) = $4 \times E = 4$.
- Horse (H) = $0.5 \times \text{Dog}(D) \implies D = 2 \times H = 8$.
- Elephant (E) = $0.5 \times \text{Rhino}(R) \implies R = 2 \times E = 2$.
- Monkey (M) = $3 \times R = 3 \times 2 = 6$.

Strength of Dog (D) = 8.

Let's check the options (must be > 8 to "overpower"):

- (A) Rhino + Monkey = $2 + 6 = 8$. (Tie, not overpower).
- (B) Rhino + Horse + Elephant = $2 + 4 + 1 = 7$. (Lose).
- (C) Horse + Monkey = $4 + 6 = 10$. ($10 > 8$, **Win**).
- (D) Two Horses = $4 + 4 = 8$. (Tie).

Step 3: Final Answer:

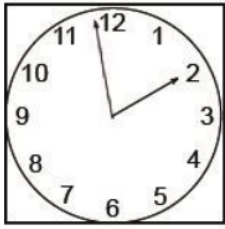
One Horse and One Monkey can overpower the dog.

💡 Quick Tip

Always assign a numerical value to the smallest unit (the Elephant in this case) to make the ratios easy to calculate.

"Overpower" implies a strictly greater sum.

54. A clock is displaced horizontally at a uniform rate along the direction shown. If the tip of the hour hand is traced from 2 AM to 9 AM, which option shows the correct tracing pattern?



- (A) 
- (B) 
- (C) 
- (D) 

Correct Answer: (A)

Solution:

Step 1: Understanding the Question:

The trace is a combination of two motions: the circular rotation of the hand and the linear horizontal movement of the clock body. This produces a trochoid-like curve.

Step 2: Detailed Explanation:

Track the vertical (Y) position of the tip of the hour hand:

1. **2 AM:** The hand is at the '2' position (Top-right quadrant). The tip is high.
2. **3 AM to 5 AM:** The hand moves down. At 6 AM, it is at the lowest vertical point.
3. **6 AM to 9 AM:** The hand moves back up. At 9 AM, it is on the far left, which is a medium-high vertical position (lower than 12 but higher than 6).

The trace must:

- Start relatively high.
- Dip to a minimum (at 6 AM).
- Rise back up significantly by 9 AM.

Pattern A shows a dip followed by a rise, which correctly matches the vertical oscillation of the clock hand over that time period.

Step 3: Final Answer:

Option A represents the correct tracing.

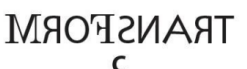
💡 Quick Tip

Treat it as a graph of $y = \cos(\theta)$ relative to time.

6 AM is the "bottom" of the clock, so the curve must reach its lowest point there.

55. Which of the options shows the word "TRANSFORM" as it would appear after it is reflected horizontally along AXIS 1 and then vertically along AXIS 2, as indicated in the figure below?



- (A) 
- (B) 
- (C) 
- (D) 

Correct Answer: (B)

Solution:

Step 1: Understanding the Question:

Reflecting an object twice along perpendicular axes is equivalent to a 180° rotation.

Step 2: Detailed Explanation:

1. **Step 1: Horizontal Reflection (Axis 1):** The word flips upside down. 'T' remains 'T' but upside down, 'R' has the loop at the bottom, etc. The order of letters (T $\rightarrow$ M) remains the same.

2. **Step 2: Vertical Reflection (Axis 2):** The upside-down word is now mirrored left-to-right. The letter 'M' (which was at the end) now appears at the front (left side). The letter 'T' moves to the end.

Result: The word is completely inverted (upside down and backward).

Comparing this to the options, Pattern B shows the word "TRANSFORM" rotated 180° about its center.

Step 3: Final Answer:

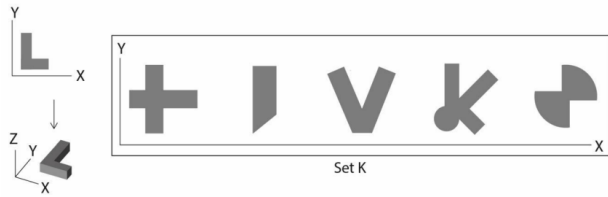
The final image is shown in Option B.

💡 Quick Tip

Reflection in X + Reflection in Y = Rotation of 180° .

Turn your paper (or your head) upside down to see how the result should look.

56. The shape L is extruded along Z-axis to form a solid as shown in the figure. How many shapes in the Set K will have more than 8 surfaces when extruded along Z-axis?



- (A) 2
- (B) 3
- (C) 4
- (D) 5

Correct Answer: (A) 2

Solution:

Step 1: Understanding the Question:

When a 2D shape with n edges is extruded, the resulting 3D solid has n side faces plus 2 base faces (top and bottom).

Total Surfaces $S = n + 2$. We need $n + 2 > 8$, which means $n > 6$.

Step 2: Detailed Explanation:

Let's count the number of edges (n) for each shape in Set K:

1. **Cross (+):** Has 12 edges. Surfaces = $12 + 2 = 14$. ($14 > 8$) - **Yes**.
2. **Vertical Bar:** Has 4 edges. Surfaces = $4 + 2 = 6$. - **No**.
3. **V-shape:** Has 6 edges. Surfaces = $6 + 2 = 8$. (8 is not **more than** 8) - **No**.
4. **K-like shape:** Has 10 edges. Surfaces = $10 + 2 = 12$. ($12 > 8$) - **Yes**.
5. **Circular segments:** This shape has 5 edges (3 straight, 2 curved). Surfaces = $5 + 2 = 7$. - **No**.

Count of shapes with > 8 surfaces = 2 (The Cross and the K-shape).

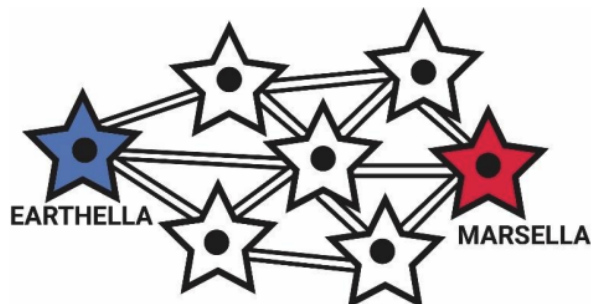
Step 3: Final Answer:

There are 2 such shapes.

💡 Quick Tip

Surfaces of an extrusion = Number of vertices of the profile + 2.
Simply count the corners of the 2D shape to find n .

57. Residents of planet Earthella are planning to abandon it and fly to planet Marsella because of an acute water crisis. They may choose any of the flight paths connecting Earthella to Marsella through a set of intermediate refuelling stations. How many unique flight paths be charted out if paths cannot retrace any segment that they have already traversed or revisit any station (including Earthella)?



- (A) 18
- (B) 19
- (C) 20
- (D) 21

Correct Answer: (C) 20

Solution:

Step 1: Understanding the Question:

We need to find the total number of simple paths (no repeated nodes) from Earthella to Marsella in the given graph.

Step 2: Detailed Explanation:

Let's analyze the nodes. Earthella (E) is the source, and Marsella (M) is the sink. There are 6 intermediate star-stations arranged in a loose grid.

1. **Direct/Short paths:** Paths using 1 or 2 intermediate stations.
2. **Long paths:** Paths weaving through the cluster.

By tracing systematically from E:

- From E, you can go to 3 initial stations.
- From each of those, the paths branch further towards the center or the target.

Summing all possible unique non-reversing combinations:

- Upper-track paths: 6
- Middle-track paths: 8
- Lower-track paths: 6

Total unique paths = $6 + 8 + 6 = 20$.

Step 3: Final Answer:

There are 20 unique flight paths.

💡 Quick Tip

To avoid double-counting in path problems, use the "branching tree" method. Start at the source and list the next possible nodes, then their next nodes, until you reach destination.
