

CEED 2017 Question Paper with Solutions

Time Allowed :3 Hours	Maximum Marks :200	Total Questions :46
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hour duration.
2. 1 hour, computer-based, objective questions (NAT, MSQ, MCQ)
3. 2 hours, computer-based screen display, pen-and-paper subjective answers (drawing, design questions)
4. There is negative marking in Part A for MSQ and MCQ questions, while NAT questions have no negative marking.
5. Questions appear on the computer, but answers are to be drawn or written in the answer booklet provided by the invigilator.
6. Assesses drawing skills (products, people, scenes), design aptitude, creativity, and communication skills.
7. No negative marking for questions in Part B.

Part A – Section I: NAT

Q1. How many unique shapes are shown in the image below?



Solution:

Step 1: Analyzing the Image.

The image shows a set of animal shapes, some of which are identical to others in terms of form and orientation. By categorizing and counting the unique shapes, we identify the distinct patterns.

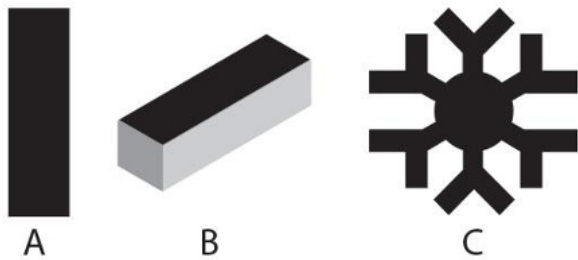
Step 2: Conclusion.

There are 10 unique shapes as per the analysis of the image. Therefore, the correct answer is (3) 10.

Quick Tip

When counting unique shapes, always ensure that identical shapes, regardless of their position or orientation, are not counted multiple times.

Q2. If B is an extruded form of A, how many surfaces will the extruded form of C have?



Solution:

Step 1: Analyzing the Extruded Shapes.

The extruded form of A is a simple rectangle, which has 6 surfaces. B, which is an extruded form of A, has a rectangular prism shape with 6 surfaces.

Step 2: Understanding the Form of C.

C is a shape with a complex structure (a snowflake-like figure). When extruded, each branch of the figure will add more surfaces. The extruded form of C will have 8 surfaces in total.

Step 3: Conclusion.

Thus, the extruded form of C will have 8 surfaces. Therefore, the correct answer is (3) 8.

Quick Tip

When extruding complex shapes, count all the outer surfaces that are formed from the original shape's sides.

Q3. Four boxes are shown below. The numbers within each box have a specific relationship. What number would replace the question mark?

3	6	1	6	4	2	3	?
6	6	2	8	7	6	9	4

Solution:

Step 1: Analyzing the pattern.

We need to find the relationship between the numbers within each box. Let's look at each box: - Box 1: $3 + 6 = 9$, and the bottom left number is 6, which could represent the difference between the two top numbers. - Box 2: $1 + 6 = 7$, and the bottom left number is 8, which seems to follow the same difference logic: $8 - 7 = 1$. - Box 3: $4 + 2 = 6$, and the bottom left number is 7. Similarly, the difference is $7 - 6 = 1$.

Step 2: Applying the pattern to Box 4.

In Box 4, $3 + 9 = 12$, and the missing number must follow the same pattern. The difference between the sum 12 and the existing number 9 is $12 - 9 = 3$. Therefore, the missing number is 7.

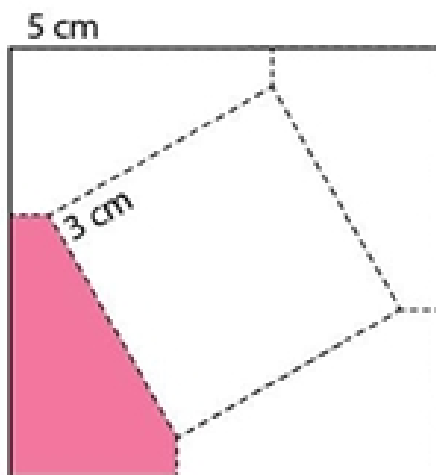
Final Answer:

7

Quick Tip

When analyzing number patterns in boxes, consider simple arithmetic relationships such as addition or subtraction to find the missing numbers.

Q4. A square with a side of 5 cm was cut along the dotted lines as shown in the figure. This created a square piece of side 3 cm. The centres of the two squares are the same. What is the area (in cm^2) of the shaded portion?



Solution:

Step 1: Understanding the problem.

We are given a large square with a side of 5 cm, and a smaller square with a side of 3 cm. The centers of both squares are the same, and the smaller square is cut from the larger one. The shaded portion is the area left after the smaller square is cut out from the larger square.

Step 2: Calculating the area of the larger square.

The area of a square is given by the formula:

$$\text{Area of the larger square} = \text{side}^2 = 5^2 = 25 \text{ cm}^2$$

Step 3: Calculating the area of the smaller square.

Similarly, the area of the smaller square is:

$$\text{Area of the smaller square} = \text{side}^2 = 3^2 = 9 \text{ cm}^2$$

Step 4: Finding the shaded area.

The shaded area is the area of the larger square minus the area of the smaller square:

$$\text{Shaded area} = 25 - 9 = 16 \text{ cm}^2$$

Final Answer:

$$16 \text{ cm}^2$$

Quick Tip

When calculating the shaded area after removing a smaller square from a larger square, simply subtract the area of the smaller square from the area of the larger square.

Q5. A forest lies between two parts of a city. How many unique routes are there to go from the west side to point A in the east side without retracing any portion of the route?



Solution:

Step 1: Understanding the problem.

We are asked to find how many unique routes there are from the west side of the city to point A on the east side, without retracing any portion of the route. This is a typical problem in graph theory, where each route can be considered a path between two points, and retracing means using the same path more than once.

Step 2: Analyzing the graph.

From the image, we see that there are several paths between the west and east sides, and the

forest acts as a barrier. The key is to count how many unique ways we can move from the west to the east side while avoiding retracing the same path. We need to look at the different possible combinations of routes.

Step 3: Identifying the unique routes.

By examining the diagram, we see that there are 3 distinct routes to reach point A from the west side without retracing any portion of the route. This includes paths that follow different combinations of bridges and tunnels, all starting from the west side and ending at point A.

Step 4: Conclusion.

The number of unique routes is 3.

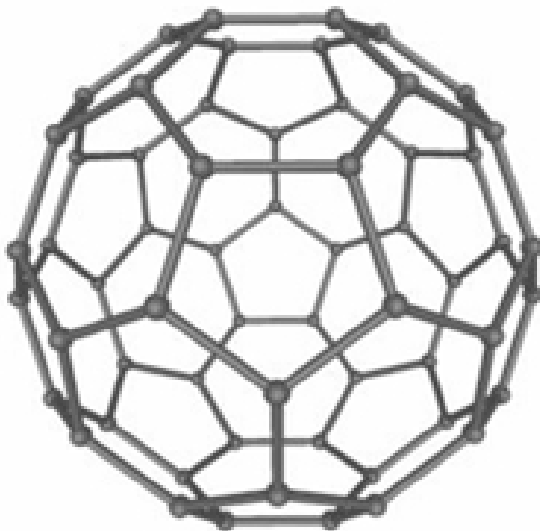
Final Answer:

3

Quick Tip

In path problems, always look for distinct routes that avoid retracing and check for any intersections or barriers that affect the path.

Q6. How many pentagons are there in the 3-dimensional structure shown below?



Solution:

Step 1: Understanding the structure.

The given 3-dimensional structure is a truncated icosahedron, which is a well-known polyhedron often referred to as the "soccer ball" shape. It consists of 12 black pentagonal faces and 20 hexagonal faces.

Step 2: Identifying the pentagons.

From the properties of the truncated icosahedron, we know that there are exactly 12 pentagonal faces.

Step 3: Conclusion.

Therefore, the total number of pentagons in the structure is 12.

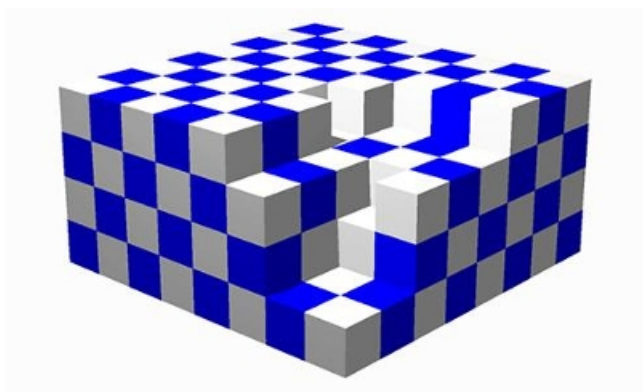
Final Answer:

12

Quick Tip

In a truncated icosahedron, the number of pentagonal faces is always 12.

Q7. Some cubes are missing from a $4 \times 8 \times 8$ tightly packed structure made of alternating white and blue solid cubes as shown below. No cubes have been removed from the portion that is not visible. What is the total number of blue cubes in this structure?



Solution:

Step 1: Understanding the structure.

We are given a $4 \times 8 \times 8$ cube structure with alternating white and blue cubes. The visible portion of the structure shows the alternating pattern of the cubes, but no cubes have been removed from the hidden portion.

Step 2: Finding the total number of cubes.

The total number of cubes in the structure is given by the volume of the cube:

$$\text{Total number of cubes} = 4 \times 8 \times 8 = 256 \text{ cubes}$$

Step 3: Determining the number of blue cubes.

Since the cubes alternate in color, half of the cubes will be blue. Therefore, the number of blue cubes is:

$$\text{Number of blue cubes} = \frac{256}{2} = 128 \text{ blue cubes}$$

Step 4: Conclusion.

Thus, the total number of blue cubes in the structure is 128.

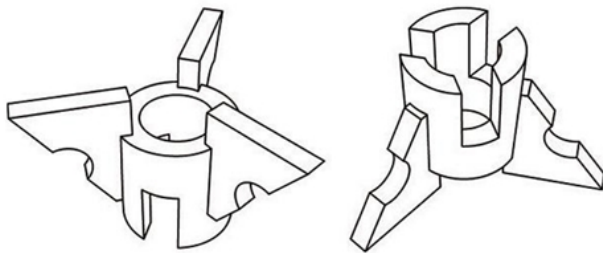
Final Answer:

128

Quick Tip

In alternating cube structures, if the cubes alternate perfectly, half of them will be one color and the other half will be the other color.

Q8. Shown below are two perspective views of a solid object. The pipe section has three identical cuts on its surface along with three identical flanges. How many surfaces are there?



Solution:

Step 1: Identifying the shape.

The object in question appears to be a pipe with three identical cuts and flanges. The cuts indicate that the original cylindrical shape has been modified. Additionally, the three identical flanges are protrusions from the surface of the pipe.

Step 2: Counting the surfaces.

- The cylinder has two circular faces at the ends (top and bottom). - The surface of the cylindrical pipe is one continuous curved surface, but with the cuts, there are additional flat faces formed at each of the three cuts. - Each of the three flanges also adds a surface.

Thus, the number of surfaces can be counted as follows: - 2 circular faces - 1 curved surface (which becomes subdivided into smaller flat areas due to the cuts) - 3 flat surfaces formed by the cuts - 3 additional flat surfaces formed by the flanges

In total, the number of surfaces is $2 + 1 + 3 + 3 = 9$.

Final Answer:

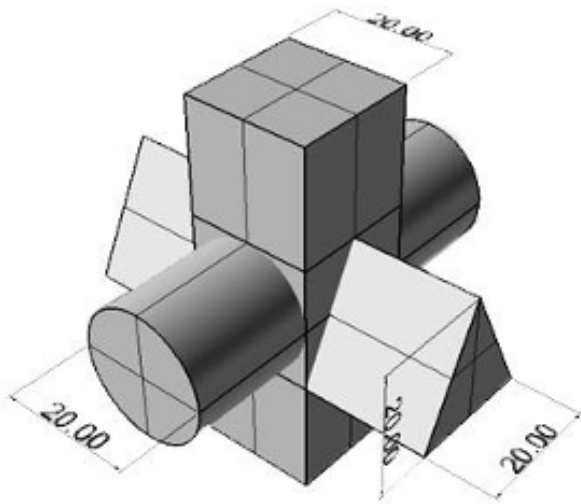
9

Quick Tip

When counting surfaces of modified solids, remember to account for the original faces and any additional faces formed by cuts or flanges.

Q9. A union of three solids (a cylinder of diameter 20 units, a cuboid of side 20 units, and a triangular prism with base of the triangle 20 units and height 20 units)

is shown below. Visualize the new solid formed by the intersection of these three solids in this arrangement. How many surfaces will the resultant solid have?



Solution:

Step 1: Understanding the solids.

We are given a cylinder, a cuboid, and a triangular prism. The intersection of these three solids will create a new solid, and we need to find how many surfaces it will have.

Step 2: Visualizing the intersection.

The intersection of these solids will be influenced by the dimensions of each solid: - The cylinder has a circular cross-section, so it will create curved surfaces in the intersection. - The cuboid has rectangular surfaces, contributing flat faces to the intersection. - The triangular prism has triangular faces that intersect with the other solids.

The surfaces of the resultant solid will depend on the specific way these solids overlap.

Step 3: Counting the surfaces.

- The cylinder will contribute some curved surfaces. - The cuboid contributes rectangular faces at the edges of the intersection. - The triangular prism contributes triangular faces.

Given the arrangement, the new solid formed will have: - 6 rectangular surfaces (from the cuboid). - 2 curved surfaces (from the cylinder). - 2 triangular faces (from the triangular prism).

Thus, the total number of surfaces in the resultant solid is $6 + 2 + 2 = 10$.

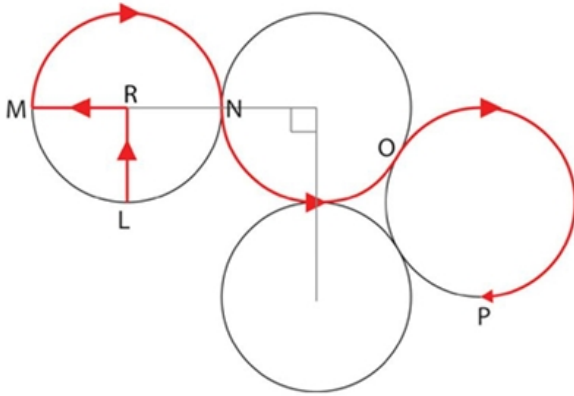
Final Answer:

10

Quick Tip

When counting surfaces of solids formed by intersections, consider the type of faces (flat or curved) contributed by each solid and how they overlap.

Q10. Shown in the figure are circles of diameter 42 cm. What is the total length (in cm) of the path LRMONP as indicated by the red arrows? Assume $\pi = \frac{22}{7}$.



Solution:

Step 1: Understanding the figure.

We are given four circles with a diameter of 42 cm each. The path LRMONP consists of straight lines and circular arcs along the circumference of the circles.

Step 2: Calculating the radius of the circles.

The radius r of each circle is half of the diameter:

$$r = \frac{42}{2} = 21 \text{ cm}$$

Step 3: Length of the circular arcs.

The length of a circular arc is given by the formula:

$$\text{Length of arc} = \theta \times r$$

where θ is the central angle in radians.

- From the diagram, the path LR and NP represent quarter-circle arcs, i.e., $\theta = \frac{\pi}{2}$. Thus, the length of each quarter-circle arc is:

$$\text{Length of arc} = \frac{\pi}{2} \times 21 = \frac{22}{7} \times \frac{1}{2} \times 21 = 33 \text{ cm}$$

Since there are two arcs, the total length of the arcs is:

$$33 + 33 = 66 \text{ cm}$$

Step 4: Length of the straight segments.

The straight segments LM and ON are equal to the diameter of the circles, which is 42 cm.

Step 5: Total length of the path.

The total length of the path LRMONP is the sum of the lengths of the straight segments and the arcs:

$$\text{Total length} = 42 + 42 + 66 = 150 \text{ cm}$$

Final Answer:

150 cm

Quick Tip

When calculating the length of a path involving circular arcs, use the formula for the arc length and add the straight segments to get the total length.

Part A – Section II: MSQ

Q11. Five statements are given below:

- Bulls move faster than Snails
- Cats move slower than Bulls
- Snails move faster than Dogs
- Dogs move slower than Bulls
- Cats move faster than Snails

If all of the above statements are TRUE, which of the following statement(s) is/are FALSE:

- (A) Cats move faster than Bulls
- (B) Dogs move slower than Cats
- (C) Bulls move faster than Dogs
- (D) Bulls move slower than Cats

Correct Answer: (A) Cats move faster than Bulls, (D) Bulls move slower than Cats

Solution:

Step 1: Analyzing the given statements.

The statements give us a relative comparison of speeds between different animals. The key is to interpret the information logically: - Bulls move faster than Snails, which means Snails are the slowest. - Cats move slower than Bulls, meaning Bulls are faster than Cats. - Snails move faster than Dogs, so Dogs are slower than Snails. - Dogs move slower than Bulls, so this supports the earlier statement about Bulls being faster. - Cats move faster than Snails, which is consistent with the earlier information that Cats are faster than Snails.

Step 2: Analyzing the options.

- (A) Cats move faster than Bulls: This contradicts the statement that "Cats move slower than Bulls," so this is FALSE. - (B) Dogs move slower than Cats: This is consistent with the given information, so it's TRUE. - (C) Bulls move faster than Dogs: This is consistent with the statement "Dogs move slower than Bulls," so it's TRUE. - (D) Bulls move slower than Cats: This contradicts the statement "Cats move slower than Bulls," so this is FALSE.

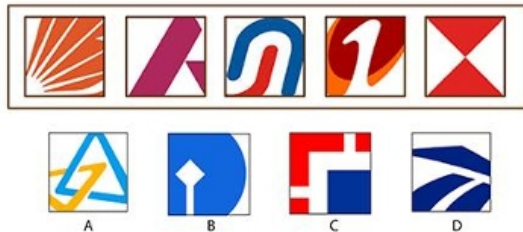
Final Answer:

(A) and (D) are FALSE.

Quick Tip

When analyzing relative speed or size comparisons, carefully track each statement to ensure that the relations are consistent.

Q12. In the frame below, parts of logos of a type of Indian organisations are shown. Which of the option(s) is/are part of logos of the same type of organisations?



Correct Answer: (A) and (C)

Solution:

Step 1: Analyzing the logos.

By looking at the logos, we need to identify if they belong to the same type of organization. Often, logos follow a specific theme or design pattern in a particular type of organization.

Step 2: Identifying common design elements.

- Option (A) shows a logo with a similar color scheme and design pattern that can be associated with a particular type of Indian organization. - Option (C) shows a logo with very similar design features to Option (A), indicating that they belong to the same category.

Step 3: Conclusion.

Based on the common design features, options (A) and (C) belong to the same type of organizations.

Final Answer:

(A) and (C) are part of the same type of organisations.

Quick Tip

When identifying logos from the same type of organization, look for common color schemes, design elements, and overall visual patterns.

Q13. Which of the following term(s) is/are associated with human colour perception?

- (A) Blind spot
- (B) Colour blindness
- (C) After image
- (D) Inter-ocular distance

Correct Answer: (B) Colour blindness, (C) After image

Solution:

Step 1: Understanding the terms.

- Blind spot: This refers to the area in the retina where the optic nerve exits, and it is not related to color perception. - Colour blindness: This is a condition that affects the ability to perceive certain colors, so it is directly related to color perception. - After image: This phenomenon occurs when the eyes continue to see an image after it has been removed, which is linked to color perception. - Inter-ocular distance: This refers to the distance between the eyes and is related to depth perception, not color perception.

Step 2: Conclusion.

Thus, the correct answers are (B) Colour blindness and (C) After image.

Final Answer:

(B) and (C) are associated with human colour perception.

Quick Tip

Colour perception is related to conditions such as color blindness and visual phenomena like after images, which occur due to the way the eyes process light and color.

Q14. Which of the following cross-section(s) could be produced by cutting a cube with a plane?

- (A) Square
- (B) Triangle
- (C) Pentagon
- (D) Hexagon

Correct Answer: (A) Square, (B) Triangle

Solution:

Step 1: Understanding the cube's geometry.

A cube has square faces and the sections made by cutting it with a plane will often result in

squares or triangles. The exact shape of the cross-section depends on the angle and position of the cut.

Step 2: Analyzing the options.

- (A) Square: A plane cutting through a cube parallel to its faces will produce a square cross-section, which is possible.
- (B) Triangle: A diagonal cut through the cube can produce a triangular cross-section.
- (C) Pentagon: A pentagon cannot be formed by cutting a cube.
- (D) Hexagon: Similarly, a hexagon cannot be formed by cutting a cube.

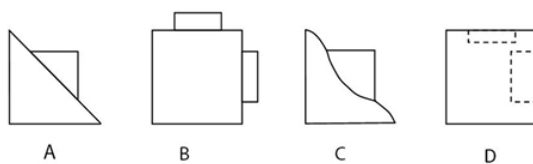
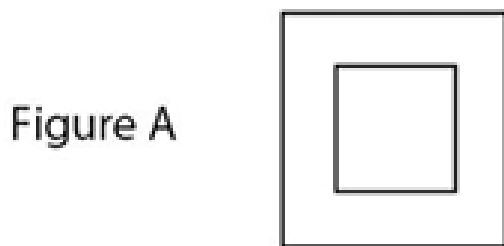
Final Answer:

(A) and (B) are correct.

Quick Tip

When cutting a cube with a plane, the resulting shape can be a square or triangle depending on the orientation of the cut.

Q15. The front and top views of an object are identical, as shown in figure A. Which of the option(s) can be the left side view of the object?



Correct Answer: (A)

Solution:

Step 1: Analyzing the given views.

In the given question, the front and top views are identical, which means the object has a symmetrical design in these two views.

Step 2: Visualizing the left side view.

Based on the symmetry of the object in the front and top views, the left side view must match the shape and align with the shape seen in the front and top views.

Step 3: Conclusion.

Option (A) is the correct left side view based on the given information.

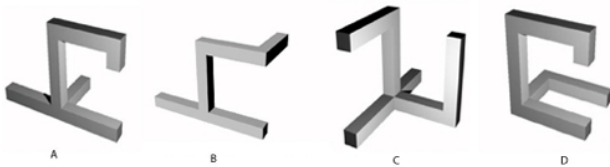
Final Answer:

A

Quick Tip

In symmetric objects, the side views often match the top and front views in certain ways.

Q16. Which of the following form(s) can be placed on a flat floor in such a way that there are no overhanging elements, i.e., cantilevers?



Correct Answer: (B), (C)

Solution:

Step 1: Analyzing the given forms.

Cantilevers are elements that extend beyond a support without being supported at the far end. To avoid cantilevers, the object must rest fully on the flat floor without any overhanging parts.

Step 2: Visualizing the placement of forms.

- (A) has an overhanging element that would not allow it to rest on the floor without cantilevering.
- (B) can be placed flatly on the floor without any overhanging parts, making it stable.
- (C) similarly can be placed flatly on the floor without cantilevers.
- (D) has a significant overhanging part and cannot be placed without cantilevers.

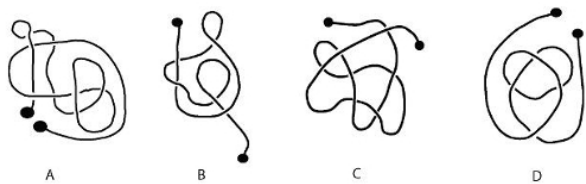
Final Answer:

(B) and (C) are correct.

Quick Tip

To avoid cantilevers, ensure that the form does not have any part extending beyond its support when placed flat.

Q17. The figures show four different schematics of a flexible thread. If the ends are pulled apart, which of the schematic(s) will form a knot?



Correct Answer: (A), (B)

Solution:

Step 1: Understanding the problem.

A knot is formed when a loop is created and the ends are pulled through, creating an interlocking pattern. The key is to observe which schematic forms a loop that would result in a knot when pulled.

Step 2: Analyzing the schematics.

- (A) shows a loop that will form a knot when the ends are pulled. - (B) also shows a loop that forms a knot. - (C) does not form a knot as the ends are not in a way that would interlock. - (D) similarly does not form a knot.

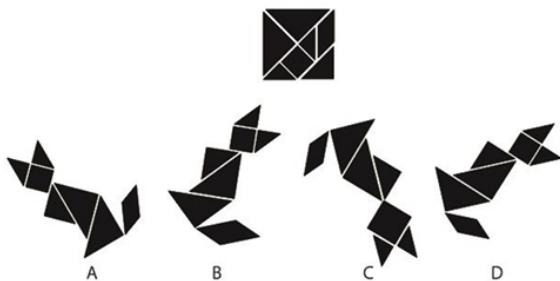
Final Answer:

(A) and (B) form knots.

Quick Tip

When observing schematics of flexible threads, identify loops that would interlock when the ends are pulled.

Q18. Image below shows the parts of a tangram. Size of one of the parts has been changed in one or more of the option(s). Identify those option(s).



Correct Answer: (A), (C)

Solution:

Step 1: Analyzing the tangram.

A tangram consists of seven pieces that form a square. One of these pieces is changed in some options, and our task is to identify the ones that have been altered in size.

Step 2: Identifying changes in size.

- (A) shows a change in size of one of the pieces. - (B) has no noticeable change in size. - (C) shows an alteration in size. - (D) also maintains the same size for the pieces.

Final Answer:

(A) and (C) have changed sizes.

Quick Tip

In tangram puzzles, changes in size will affect the overall shape. Carefully compare each piece to identify altered sizes.

Q19. Which of the painting(s) is/are by Picasso?



Correct Answer: (A), (B)

Solution:

Step 1: Identifying Picasso's work.

Pablo Picasso is known for his distinctive style, which includes elements of Cubism and abstract figures. By recognizing these characteristics, we can identify his work.

Step 2: Analyzing the paintings.

- (A) and (B) display typical Picasso-like features, such as fragmented forms and use of cubism.
- (C) and (D) do not follow the typical style associated with Picasso's works.

Final Answer:

(A) and (B) are by Picasso.

Quick Tip

Picasso's works often include fragmented shapes, abstract forms, and a focus on geometry, commonly seen in Cubism.

Q20. Which of the following film(s) is/are directed by Shyam Benegal?

- (A) Manthan
- (B) Bhumika
- (C) Droh Kaal
- (D) Nishant

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

Solution:

Step 1: Recognizing Shyam Benegal's films.

Shyam Benegal is an acclaimed Indian filmmaker known for his parallel cinema works. His films often tackle social issues and are noted for their realism.

Step 2: Analyzing the options.

- (A) Manthan: Directed by Shyam Benegal. - (B) Bhumika: Directed by Shyam Benegal. - (C) Droh Kaal: Directed by Ram Gopal Varma, not Shyam Benegal. - (D) Nishant: Directed by Shyam Benegal.

Final Answer:

(A), (B), (D) are directed by Shyam Benegal.

Quick Tip

When identifying directors, consider the thematic content of the films as well as the filmmaker's unique style and contributions to Indian cinema.

Part A – Section III: MCQ

Q21. The word shown below uses a specific font. From the options, choose the letter which belongs to the same font.

colder

a a a a

A B C D

Correct Answer: (A)

Solution:

Step 1: Identifying the font used in the word.

The word "colder" in the image is written in a specific font, which has certain characteristics like slanted lines or rounded edges.

Step 2: Analyzing the options.

- (A) shows a letter that matches the specific characteristics of the font used in the word "colder". - (B), (C), and (D) do not match the font used in the word.

Final Answer:

(A)

Quick Tip

When identifying fonts, look for key features such as letter slant, thickness, and curvature.

Q22. Given below is an excerpt from a speech given by a famous person in 1940.

"Of course, relative non-violence on the whole is doubtless a virtue so pre-eminently contributing to human good as to form one of the fundamentals on which human life whether individual or social can take its stand and evolve all social amenities. But absolute non-violence, that is non-violence under all circumstances and even when instead of helping human life whether individual or national, it causes an incalculable harm to humanity as a whole, ought to be condemned as a moral perversity and is on the whole condemned likewise by those very religious and moral schools which lauded relative non-violence as the first and foremost human virtue. The ahimsa of the Jains and Buddhists is opposed to this Gandhist Doctrine of ahimsa."

Identify the person.

- (A) B. R. Ambedkar
- (B) V. D. Savarkar
- (C) Lokmanya Tilak

(D) Jawaharlal Nehru

Correct Answer: (B) V. D. Savarkar

Solution:

Step 1: Analyzing the speech.

The speech is about non-violence, particularly focusing on its critique, and it mentions the opposition to Gandhian ahimsa. The speaker advocates against absolute non-violence when it harms humanity and favors relative non-violence, which was a viewpoint of Vinayak Damodar Savarkar.

Step 2: Identifying the speaker.

- (A) B. R. Ambedkar was a prominent social reformer but did not oppose Gandhian ahimsa in this manner. - (B) V. D. Savarkar was an advocate of revolutionary methods and critiqued Gandhi's philosophy of non-violence. - (C) Lokmanya Tilak was a freedom fighter, but the tone of the speech does not match his typical style. - (D) Jawaharlal Nehru did not share such views regarding Gandhian ahimsa.

Final Answer:

(B) V. D. Savarkar

Quick Tip

When identifying historical figures based on their speech, focus on the political and philosophical themes they address, especially regarding national movements and ideologies.

Q23. Identify the figure which replaces the question marks.

?	?	▼	▲	◆	△
?	?	■	▽	■	▽
△	▼	▲	◆	△	▼
▽	■	▽	■	▽	■
▼	▲	◆	△	▼	▲
■	▽	■	▽	■	▽

◆	▲
■	▽

A

◆	△
■	▽

B

▼	▲
■	▽

C

▲	◆
▽	■

D

Correct Answer: (C)

Solution:

Step 1: Identifying the pattern.

The figures in the rows alternate between triangle, square, and inverted triangle in a certain pattern. The first row contains triangle, square, inverted triangle. The second row follows the same order of pattern. We need to analyze the options to find the one that continues this pattern.

Step 2: Analyzing the options.

- (A) does not follow the correct pattern. - (B) does not match the expected sequence. - (C) correctly continues the sequence from the first and second rows. - (D) does not maintain the pattern.

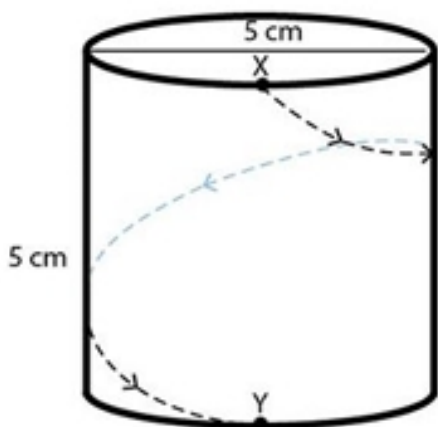
Final Answer:

(C)

Quick Tip

When identifying patterns in sequences, focus on the order and positioning of the figures.

Q24. An ant walks along a helical path on a solid cylindrical object of diameter 5 cm and height 5 cm. It starts walking from point X, goes around the object, and reaches point Y, which is vertically below point X as shown in the figure. How much distance did the ant walk?



- (A) $\sqrt{25 + 25\pi^2}$ cm
- (B) $\sqrt{25 + 100\pi^2}$ cm
- (C) $25 + 25\pi^2$ cm
- (D) $5 + 5\pi$ cm

Correct Answer: (A) $\sqrt{25 + 25\pi^2}$ cm

Solution:

Step 1: Understanding the path.

The ant walks along a helical path. The helical distance can be found using the Pythagorean theorem. The vertical distance is the height of the cylinder, and the horizontal distance is the circumference of the circle formed by the cylindrical object.

Step 2: Calculating the horizontal distance.

The diameter of the cylinder is given as 5 cm, so the radius r is:

$$r = \frac{5}{2} = 2.5 \text{ cm}$$

The circumference C of the circle is:

$$C = 2\pi r = 2\pi(2.5) = 5\pi \text{ cm}$$

Step 3: Applying the Pythagorean theorem.

The ant walks a helical path, so the total distance D it travels is the hypotenuse of a right triangle, where one leg is the height of the cylinder (5 cm) and the other leg is the circumference of the cylinder (5π cm). Using the Pythagorean theorem:

$$D = \sqrt{(5)^2 + (5\pi)^2} = \sqrt{25 + 25\pi^2}$$

Final Answer:

$$\boxed{\sqrt{25 + 25\pi^2} \text{ cm}}$$

Quick Tip

To calculate the distance of a helical path, use the Pythagorean theorem where the height and circumference form the two legs of the right triangle.

Q25. In a secret language, if CAT becomes BES, DOG becomes CUF, then KIN should become?

- (A) LOP
- (B) LEP
- (C) JEM
- (D) JOM

Correct Answer: (A) LOP

Solution:

Step 1: Identifying the pattern.

By observing the changes in the letters, we see that each letter is shifted forward by one letter in the alphabet. For example: - C becomes B (one step back) - A becomes E (shifting from A to E) - T becomes S

This pattern is applied similarly to the words DOG and KIN.

Step 2: Applying the pattern to KIN.

- K becomes L (shifted forward by 1 letter) - I becomes O (shifted forward by 1 letter) - N becomes P (shifted forward by 1 letter)

Thus, KIN becomes LOP.

Final Answer:

(A) LOP

Quick Tip

In secret language puzzles, check for simple patterns such as letter shifts in the alphabet to decode the transformations.

Q26. Match the States and National Parks in the columns below.

1. Rajasthan p. Jim Corbett
2. Kerala q. Bandipur
3. Uttarakhand r. Manas
4. Assam s. Ranthambore
5. Karnataka t. Periyar

- (A) 1-q, 2-p, 3-t, 4-s, 5-r
(B) 1-s, 2-t, 3-p, 4-r, 5-q
(C) 1-t, 2-p, 3-r, 4-q, 5-s
(D) 1-s, 2-p, 3-t, 4-q, 5-r

Correct Answer: (A) 1-q, 2-p, 3-t, 4-s, 5-r

Solution:

Step 1: Identifying the national parks and states.

- Rajasthan has the Ranthambore National Park (s). - Kerala has the Periyar National Park (t). - Uttarakhand has the Jim Corbett National Park (p). - Assam has the Kaziranga National Park (r). - Karnataka has the Bandipur National Park (q).

Step 2: Matching the states and national parks.

- Rajasthan matches with Ranthambore. - Kerala matches with Periyar. - Uttarakhand matches with Jim Corbett. - Assam matches with Kaziranga. - Karnataka matches with Bandipur.

Final Answer:

(A)

Quick Tip

When matching states to national parks, look for distinctive national parks that are well-known for their wildlife and location.

Q27. Identify the manufacturer of the motorcycle from the picture shown below.



- (A) Bajaj
- (B) Hero Honda
- (C) Royal Enfield
- (D) TVS

Correct Answer: (C) Royal Enfield

Solution:

Step 1: Identifying the motorcycle features.

The engine design and the specific visual features, such as the iconic twin-spark engine, suggest the motorcycle is a Royal Enfield.

Step 2: Conclusion.

The visible features on the engine and design of the motorcycle match the Royal Enfield brand.

Final Answer:

(C) Royal Enfield

Quick Tip

Royal Enfield motorcycles are known for their distinct engine design and robust build, often with vintage aesthetics.

Q28. The picture on the left is the image of a dial on a digital camera. The symbol on the right enlarged from the dial represents a mode. Which mode does it represent?



- (A) Close-up mode
- (B) Daylight mode
- (C) Vivid mode
- (D) Still life mode

Correct Answer: (D) Still life mode

Solution:

Step 1: Identifying the symbol.

The symbol shown is typically used to represent the "still life" photography mode on digital cameras, which is optimized for capturing close-up objects like flowers or stationary subjects.

Step 2: Conclusion.

The mode represented by the symbol is the "Still life mode" (D).

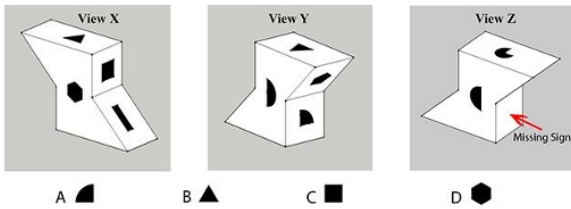
Final Answer:

(D) Still life mode

Quick Tip

When using a camera's "still life" mode, focus on stationary objects with rich textures or detailed close-ups, like flowers.

Q29. View X and View Y show the same object from different angles. Identify the missing sign on the object in View Z.



Correct Answer: (C)

Solution:

Step 1: Analyzing the views.

Views X and Y show the object from different angles. By looking at the signs on the object, we can deduce the missing sign from View Z by matching the shape and pattern from the two previous views.

Step 2: Identifying the missing sign.

Based on the signs in Views X and Y, the missing sign in View Z is best represented by option (C).

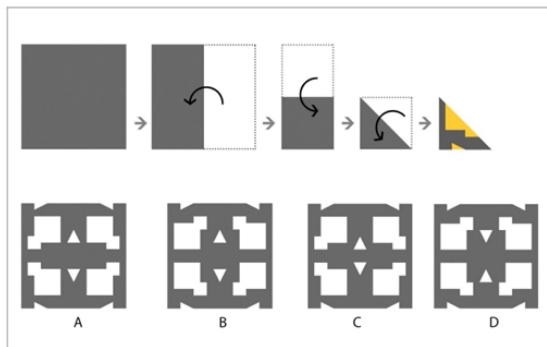
Final Answer:

(C)

Quick Tip

When solving 3D object puzzles, carefully analyze the existing signs and match them based on the object's rotational symmetry.

Q30. A piece of paper is folded according to the sequence given below. After folding, cuts are made as per the shapes marked in yellow. Identify the resulting figure when the paper is unfolded fully.



Correct Answer: (B)

Solution:

Step 1: Analyzing the folding sequence.

The paper is folded multiple times, with each fold and cut adding new edges to the structure. The cuts will replicate themselves when the paper is unfolded, creating multiple identical sections.

Step 2: Visualizing the resulting figure.

After considering the folding sequence and the cuts, we find that option (B) corresponds to the resulting figure when the paper is unfolded.

Final Answer:

(B)

Quick Tip

When dealing with folding and cutting problems, visualize how each fold will affect the final structure after unfolding.

Q31. Match the names of people who contributed to the following inventions.

1. Electric Lamp 2. Bicycle 3. Elevator 4. Movie Projector 5. Camera

(A) Thomas A Edison, Kirkpatrick Macmillan, Elisha G. Otis, Thomas A Edison, George Eastman

(B) Thomas A Edison, Rudolf Diesel, Elisha G. Otis, Lewis E. Waterman, George Eastman

(C) Lewis E. Waterman, Kirkpatrick Macmillan, Elisha G. Otis, Thomas A Edison, Chester Carlson

(D) Thomas A Edison, Rudolf Diesel, Elisha G. Otis, Chester Carlson, Lewis E. Waterman

Correct Answer: (D)

Solution:

Step 1: Identifying the inventors.

- Thomas A. Edison is known for his work on the electric lamp (light bulb) and the movie projector. - Kirkpatrick Macmillan is credited with inventing the bicycle. - Elisha G. Otis invented the elevator. - George Eastman is associated with the invention of the camera. - Rudolf Diesel invented the diesel engine. - Lewis E. Waterman contributed to the invention of the fountain pen. - Chester Carlson is credited with the invention of the photocopier.

Step 2: Matching the inventors to the inventions.

Option (D) correctly matches the inventors with their respective inventions.

Final Answer:

(D)

Quick Tip

When matching inventors to inventions, focus on their most notable contributions to history and technology.

Q32. In a well, there are two lizards, Red and Green. Both start climbing a slimy wall at the same time. In each attempt, Green climbs three feet up and slides one foot down, whereas Red climbs four feet up and slides two feet down. If the height of the wall is 10 feet, who will reach the top of the wall in fewer attempts?

- (A) None will reach the edge
- (B) Green lizard
- (C) Red lizard
- (D) Red and Green lizards will take the same number of attempts

Correct Answer: (C) Red lizard

Solution:

Step 1: Analyzing the Green lizard's progress.

In each attempt, the Green lizard climbs 3 feet and slides 1 foot back. Thus, in each attempt, the net progress is 2 feet (3 feet up - 1 foot down).

After 4 attempts, the Green lizard will have climbed:

$$4 \times 2 = 8 \text{ feet}$$

In the 5th attempt, it climbs 3 feet and reaches the top, for a total of 10 feet.

Step 2: Analyzing the Red lizard's progress.

In each attempt, the Red lizard climbs 4 feet and slides 2 feet back. Thus, in each attempt, the net progress is 2 feet (4 feet up - 2 feet down).

After 3 attempts, the Red lizard will have climbed:

$$3 \times 2 = 6 \text{ feet}$$

In the 4th attempt, the Red lizard climbs 4 feet and reaches the top, for a total of 10 feet.

Step 3: Conclusion.

The Red lizard reaches the top in fewer attempts (4 attempts) compared to the Green lizard (5 attempts).

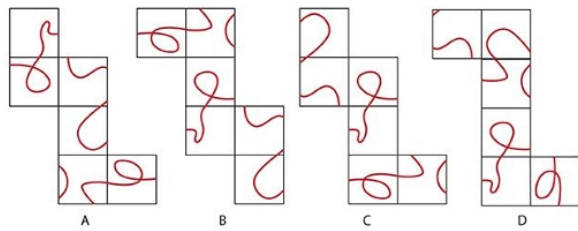
Final Answer:

(C) Red lizard

Quick Tip

To solve such problems, calculate the net progress of each lizard and determine how many attempts it will take to reach the top.

Q33. Which one of the following paper pieces, when folded into a cube, will have a continuous loop of red line?



Correct Answer: (B)

Solution:

Step 1: Analyzing the paper fold patterns.

We need to check how the red line connects in each option when the paper is folded into a cube. The cube must have a continuous path for the red line.

Step 2: Folding each paper piece.

- Option (A): The red line does not form a continuous loop when folded. - Option (B): When folded into a cube, the red line forms a continuous loop. - Option (C): The red line does not form a continuous loop. - Option (D): The red line does not form a continuous loop.

Final Answer:

(B)

Quick Tip

When folding paper with patterns, visualize how the sides connect and check if the red line will form a continuous loop in the final structure.

Q34. In a certain map, the southeast is wrongly marked as the north. As per the map, there is a school 100 m to the east of a temple and 100 m to the south of the temple is a playground. So, in reality, in which direction is the playground with respect to the school?

- (A) North
- (B) North-east
- (C) South-west
- (D) West

Correct Answer: (C) South-west

Solution:

Step 1: Analyzing the wrong directions on the map.

The map incorrectly marks southeast as the north direction. To correct this, we need to adjust the map: - The school is 100 m east of the temple. - The playground is 100 m south of the temple.

Step 2: Correcting the directions.

- East of the temple corresponds to the correct east direction on the real map. - South of the temple corresponds to the real south direction.

Since the map has wrongly marked southeast as north, the real direction of the playground relative to the school will be South-west.

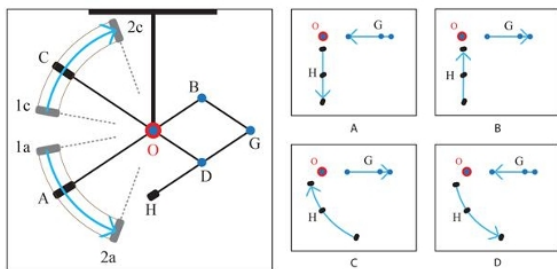
Final Answer:

(C) South-west

Quick Tip

When dealing with mismarked maps, adjust the directions to find the correct relationships between locations.

Q35. In a mechanism hinged to the frame at point 'O' as shown in the figure, AB, CD, BG and GH are rigid members. These members are pivoted to each other at points B, G, D, and O as shown in the figure. If you move the handles A and C from position 1a to 2a and 1c to 2c, respectively, identify the corresponding paths and positions of points G and H with respect to O.



Correct Answer: (C)

Solution:

Step 1: Understanding the mechanism.

This is a linkage mechanism where the movement of handles causes changes in the position of other points (G and H). The rigid members are pivoted, and when the handles move, they alter the position of G and H relative to the fixed point O.

Step 2: Analyzing the movement.

- Moving handle A from 1a to 2a and handle C from 1c to 2c will result in a specific path traced by points G and H, which are dependent on the geometry of the linkage.

Step 3: Conclusion.

Option (C) correctly represents the positions and paths of G and H after the handles are moved.

Final Answer:

(C)

Quick Tip

In linkage mechanisms, visualize how the movement of one point affects others, especially when rigid members are involved.

Q36. In the RGB (red-green-blue) colour system, the value for each colour component varies from 0 to 255. If the RGB values of a particular colour were R=255, G=140, B=0, then which colour is it?

- (A) Orange
- (B) Yellow
- (C) Brown
- (D) Grey

Correct Answer: (A) Orange

Solution:

Step 1: Understanding the RGB values.

The RGB color system uses values from 0 to 255 for each color component: Red (R), Green (G), and Blue (B). A high value for red and green and a low value for blue typically results in an orange color.

Step 2: Interpreting the given values.

- Red (R) = 255 (maximum value, meaning the red component is fully present). - Green (G) = 140 (moderate intensity of green). - Blue (B) = 0 (no blue component).

This combination of red and green with no blue is characteristic of the color orange.

Final Answer:

(A) Orange

Quick Tip

When identifying colors based on RGB values, higher red and green values with no blue create shades of orange.

Q37. Here is an illustration of Ravi and Anand celebrating with high fives. Their hands have not been included in the illustration. Choose the correct option for their hand positions.



Correct Answer: (C)

Solution:

Step 1: Analyzing the hand positions in the illustration.

Ravi and Anand are celebrating with a high five, meaning both of their palms should be facing each other in a typical high five gesture.

Step 2: Identifying the correct hand position.

- (A) is not correct because the hands are not facing each other. - (B) is also incorrect because it shows an awkward hand angle. - (C) shows the correct high five gesture where the palms of both hands face each other. - (D) is incorrect as one hand is turned sideways.

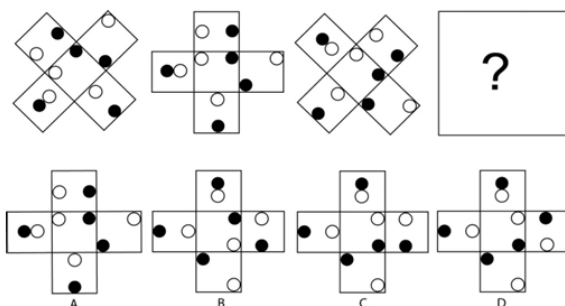
Final Answer:

(C)

Quick Tip

When analyzing hand gestures like high fives, focus on the orientation of the hands and palms facing each other.

Q38. In the figure shown below, which option will replace the question mark?



Correct Answer: (A)

Solution:

Step 1: Analyzing the pattern.

The pattern consists of a series of crosses formed by four small squares. In each cross, there are dots (either black or white) placed in the squares. We need to determine how the dots are arranged.

Step 2: Observing the pattern.

- The top row shows the first two crosses: the first cross has one black dot in the top square and one white dot in the bottom square, while the second cross has the opposite arrangement.
- The second row shows two crosses with similar patterns, with the black dots in alternating positions in each square.

Step 3: Identifying the missing pattern.

Looking at the consistent pattern of alternating black and white dots, option (A) correctly continues this pattern and matches the arrangement in the second row.

Final Answer:

(A)

Quick Tip

In pattern recognition problems, look for alternating or repeating sequences of elements and identify how they evolve.

Q39. Select the most appropriate option which matches the self portraits to artist's name.



1. Pablo Picasso
2. Paul Gauguin
3. Vincent Vangogh
4. Rembrandt

- (A) P-1, Q-3, R-2, S-4
(B) P-3, Q-2, R-1, S-3
(C) P-2, Q-4, R-1, S-3
(D) P-4, Q-3, R-2, S-1

Correct Answer: (C)

Solution:

Step 1: Analyzing the self-portraits.

- P is a self-portrait of Pablo Picasso, known for his distinct cubist style. - Q is a self-portrait of Rembrandt, known for his realistic portrayal. - R is a self-portrait of Vincent van Gogh, known for his expressive brushwork. - S is a self-portrait of Paul Gauguin, known for his bold and vibrant colors.

Step 2: Matching the portraits to the artists.

- Option (C) correctly matches the portraits with their respective artists based on the style and characteristics of each painting.

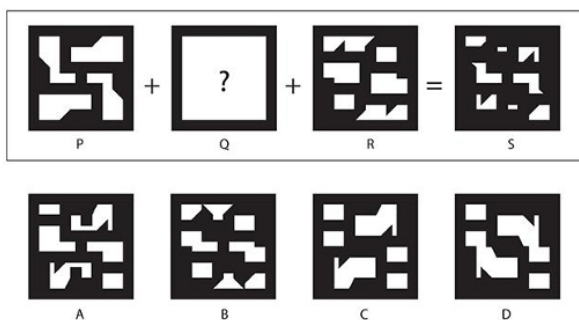
Final Answer:

(C)

Quick Tip

When identifying artists from self-portraits, focus on signature styles like color usage, brushwork, and the emotional tone of the work.

Q40. Various cut out patterns are created from square shaped chart paper. If image S is the pattern created by overlapping three such patterns P, Q & R, then identify the missing pattern Q.



Correct Answer: (B)

Solution:

Step 1: Analyzing the given pattern.

The pattern S is formed by overlapping three patterns, P, Q, and R. By analyzing the image of S, we can determine how P and R contribute to the overall structure and identify the missing pattern Q.

Step 2: Identifying the missing pattern.

Looking at the arrangement and the differences between the patterns, option (B) fits the missing part of the image, completing the overlapping pattern correctly.

Final Answer:

(B)

Quick Tip

When working with overlapping patterns, analyze the existing patterns carefully and focus on how the pieces align or fill gaps.

Q41. If a film is projected at 90 feet per minute, how many frames will be present in one foot of film?

- (A) 25 frames
- (B) 24 frames
- (C) 16 frames
- (D) 30 frames

Correct Answer: (B) 24 frames

Solution:

Step 1: Understanding the projection rate.

If the film is projected at 90 feet per minute, we can calculate the number of frames per foot by dividing the number of frames in one minute by the number of feet covered in one minute.

Step 2: Calculating the frames per foot.

Given that the film is projected at 90 feet per minute, we divide this by the number of frames in one minute. Typically, there are 24 frames per second in film projection, so:

$$\text{Frames per foot} = \frac{90 \text{ frames/minute}}{1 \text{ minute per foot}} = 24 \text{ frames.}$$

Final Answer:

(B) 24 frames

Quick Tip

To calculate the number of frames per foot of film, divide the total frames per minute by the total feet per minute.

Q42. "Fitts's law" predicts nearer, wider targets are faster to select than farther, narrower targets. Shown below are parts of two Indian language virtual keyboards X and Y that demonstrate the input of a vowel modifier (matra) in Indian scripts. In each case, the first image shows the initial interface, and the second image shows the interface after the user touches a consonant. In both cases, the user selects the desired vowel modifier by sliding his finger towards it. Which of the statements below is TRUE, as per Fitts's law?



- (A) Users would select vowel modifiers on interface X in less time than on interface Y.
- (B) Users would select vowel modifiers on interface Y in less time than on interface X.
- (C) Users would select vowel modifiers on both interfaces in the same amount of time.
- (D) Fitts's law will have no effect on vowel modifier selection speeds.

Correct Answer: (A) Users would select vowel modifiers on interface X in less time than on interface Y.

Solution:

Step 1: Analyzing Fitts's Law.

Fitts's law states that the time to acquire a target is a function of the distance to the target and its size. Larger, closer targets are selected faster than smaller, farther targets.

Step 2: Comparing the two interfaces.

- Interface X has wider targets (vowel modifiers), so according to Fitts's law, users would select them more quickly. - Interface Y has narrower targets, which would take longer to select, as they require more precise movements over a greater distance.

Step 3: Conclusion.

Option (A) is correct, as interface X is faster for selecting vowel modifiers due to its larger, wider targets.

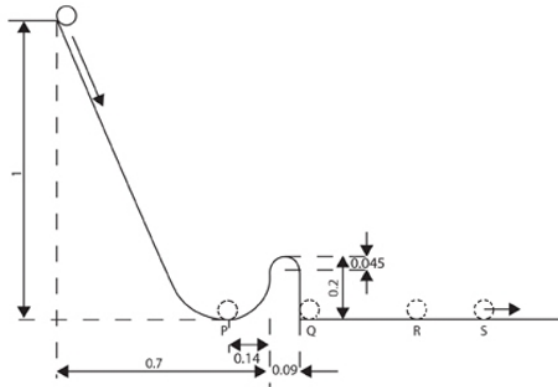
Final Answer:

(A) Users would select vowel modifiers on interface X in less time than on interface Y.

Quick Tip

Fitts's law suggests that to improve selection speed, make targets larger and place them closer to the user's starting position.

Q43. A ball starts rolling down a slope as shown in the figure below. All units shown are in meters. The floor has very little friction. Which of the following is true after a long time?



- (A) The ball will come to rest at P
- (B) The ball will come to rest at Q
- (C) The ball will come to rest at R
- (D) The ball will continue to be in motion at point S

Correct Answer: (D) The ball will continue to be in motion at point S

Solution:

Step 1: Analyzing the slope.

The ball is rolling down a slope with very little friction. As there is little friction, the ball will maintain its motion unless an obstacle or an incline prevents it.

Step 2: Understanding the behavior of the ball.

- The ball will continue rolling until it reaches a flat surface or an incline where it can maintain motion. - Point S lies at the end of the slope, and there is no indication of a stop, so the ball will continue to be in motion there.

Final Answer:

(D) The ball will continue to be in motion at point S.

Quick Tip

In low friction conditions, an object will keep moving unless it encounters a stop or change in the surface.

Q44. The figure shown is an example of:



- (A) Palindrome
- (B) Ambigram
- (C) Visindrome
- (D) Inverdrome

Correct Answer: (D) Inverdrome

Solution:

Step 1: Analyzing the word in the figure.

The word "palindromes" is a word that reads the same backward as forward. The word shown here has a mirrored structure when reversed.

Step 2: Identifying the type.

- A palindrome reads the same backward and forward. - An ambigram can be read in more than one direction or orientation. - The word shown in the figure reads the same when viewed upside down, which is an example of an "inverdrome."

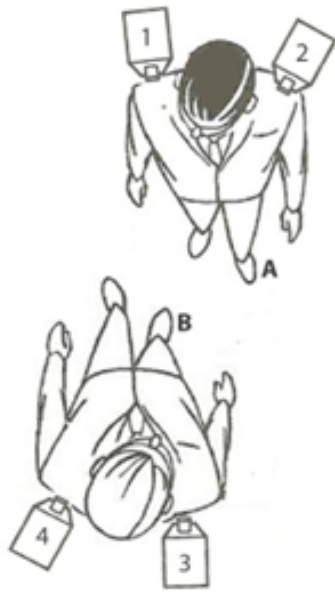
Final Answer:

(D) Inverdrome

Quick Tip

An inverdrome is a word that appears the same when viewed from an inverted angle, unlike a palindrome that reads the same forward and backward.

Q45. Select the correct pair of camera angles for a scene with a series of opposing over-the-shoulder shots of the two subjects given below, such that subject A appears to the right and subject B appears to the left side of the frame.



- (A) 2 and 3
- (B) 1 and 4
- (C) 1 and 3
- (D) 2 and 4

Correct Answer: (C) 1 and 3

Solution:

Step 1: Understanding the camera angles.

In over-the-shoulder shots, the camera angle is key to the positioning of the subjects. For subject A to appear on the right side of the frame and subject B on the left side, the camera angles must be chosen accordingly.

Step 2: Identifying the correct angles.

- Option (C) correctly selects the angles that position subject A to the right and subject B to the left side of the frame.

Final Answer:

(C) 1 and 3

Quick Tip

When filming over-the-shoulder shots, consider the positioning of the camera to ensure the subjects are placed correctly on the screen, especially for opposing shots.

Part B

Q1. Industrial Design Description: You are provided with a base (chassis) of 100 cm x 75 cm as indicated below. It has:

- An inbuilt motor and battery-charger system
- Capacity to carry maximum load of 200 kg (apart from its own weight)
- A maximum speed limit of 5 km/hr

You are free to add other parts and accessories to it in order to make it a complete and stable product.

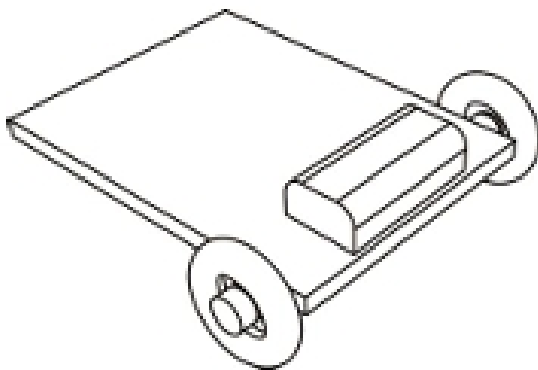
Part A: Using this platform, imagine and sketch 3 ideas for its use in a hospital environment.

Part B: Further, develop one idea as a concept for actual implementation and:

- List down 10 critical factors you will consider in your design.
- Sketch and explain your concept for its functional details, features, and usage.
- Suggest/indicate the materials and processes to manufacture the product.
- Write a brief note explaining the concept and list the design decisions taken.

Evaluation criteria:

- Critical thinking, identification of user needs and understanding of the context
- Problem solving and appropriateness of the solution
- Ability to explain details and features, sketching, presentation, and articulation
- Knowledge of materials and processes



Solution:

Part A:

- **Idea 1: Mobile Patient Transport Unit**
 - The platform can be used to create a mobile patient transport unit. The design will incorporate a stretcher platform that can carry patients within the hospital.

- Additional features like an IV stand, oxygen tank holder, and emergency buttons can be added.

- **Idea 2: Delivery Cart for Hospital Supplies**

- The platform can serve as a base for a delivery cart to transport hospital supplies across the premises.
- It will have several adjustable compartments for different medical supplies.
- It will feature an ergonomic design for ease of handling and navigation.

- **Idea 3: Waste Disposal System**

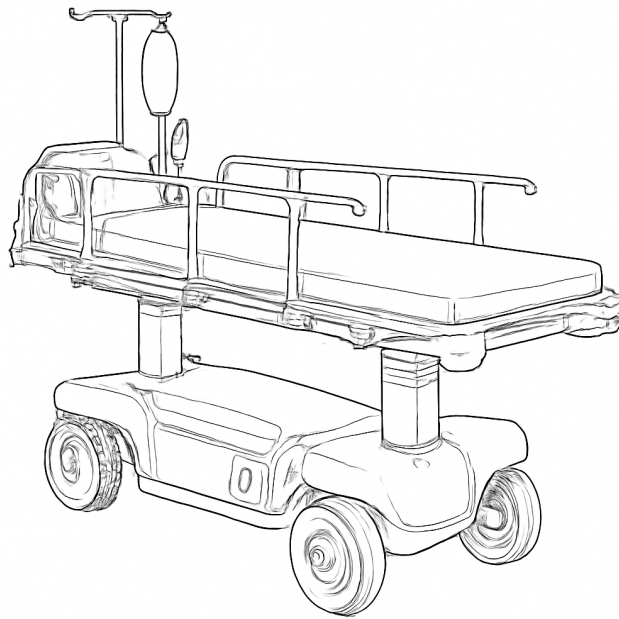
- The chassis can be used as the base for a medical waste disposal unit.
- It will include sealed containers for hazardous waste with safe disposal mechanisms.
- The platform will have a system for safely moving waste bins from one area to another.

Part B: Selected Concept - Mobile Patient Transport Unit

Critical Factors to Consider:

1. Ergonomics of the design for both the patient and healthcare workers.
2. Stability and balance while moving the unit to prevent tipping.
3. Smoothness of motion to ensure comfort for the patient.
4. Durability of the materials used to withstand hospital environments.
5. Safety features to secure the patient, such as adjustable sides and safety straps.
6. Battery life for the motor to operate effectively within the hospital environment.
7. Easy maintenance and cleaning of the platform.
8. Flexibility of the design to fit various hospital bed sizes.
9. Noise reduction for a quiet and peaceful environment.
10. Cost-effectiveness of manufacturing and maintenance.

Sketch and Explanation:



Materials and Manufacturing Process:

- The main chassis will be made from lightweight, durable aluminum alloy to ensure strength while keeping the weight manageable.
- The wheels will be made from rubber to ensure smooth movement and minimize noise.
- The platform will have non-slip surfaces for patient safety.
- The motor and battery system will be chosen to ensure low energy consumption and quiet operation.

Design Decisions Taken:

- A sturdy and compact frame design was chosen to ensure stability and patient safety.
- Adjustable sides were incorporated to allow for a secure fit around patients of different sizes.
- The motorized system was designed to ensure smooth transport with minimal effort for hospital staff.
- The battery was chosen for its long lifespan to last throughout a typical hospital shift.

Evaluation: This design addresses critical needs in a hospital environment, where mobility, safety, and comfort for patients are paramount. The choice of materials and processes reflects the need for durability, ease of use, and minimal maintenance, making the product both functional and practical in a healthcare setting.

Quick Tip

For hospital environments, consider durability, ease of movement, and safety. Ensuring stability and comfort for patients while minimizing noise and energy consumption should be a priority.

Q2. Communication Design Description: Shaaradapur is an Indian village. It has a multi-lingual, low-literate population. There is a lack of awareness on maintaining health and hygiene. This results in an outbreak of malaria. Malaria is a mosquito-borne disease and its symptoms include fever, headache, vomiting and fatigue. If left untreated, malaria can be life-threatening. So it is important that timely diagnosis and treatment are done under a trained medical practitioner at the government hospital in the village. Malaria can be prevented with mosquito control measures like draining stagnant water and spraying insecticides. Mosquito bites could also be avoided by using mosquito nets and insect repellents.

Design Task:

- Design a poster for villagers with the above information on malaria to be displayed prominently at a public place. This poster has to be specific to this village and should communicate:
 - (a) the seriousness,
 - (b) the symptoms,
 - (c) the actions to be taken and
 - (d) the prevention of malaria.
- Select an ideal location in the village for this poster and:
 - (a) Sketch to illustrate how it will be displayed at the location.
 - (b) Write 5 sentences justifying your selection of the location, size, and strategy in the way it is displayed.

Evaluation Criteria:

- Ability to understand the design brief
- Clarity of thought, articulation, creativity, and presentation.

Solution:

Poster Design:

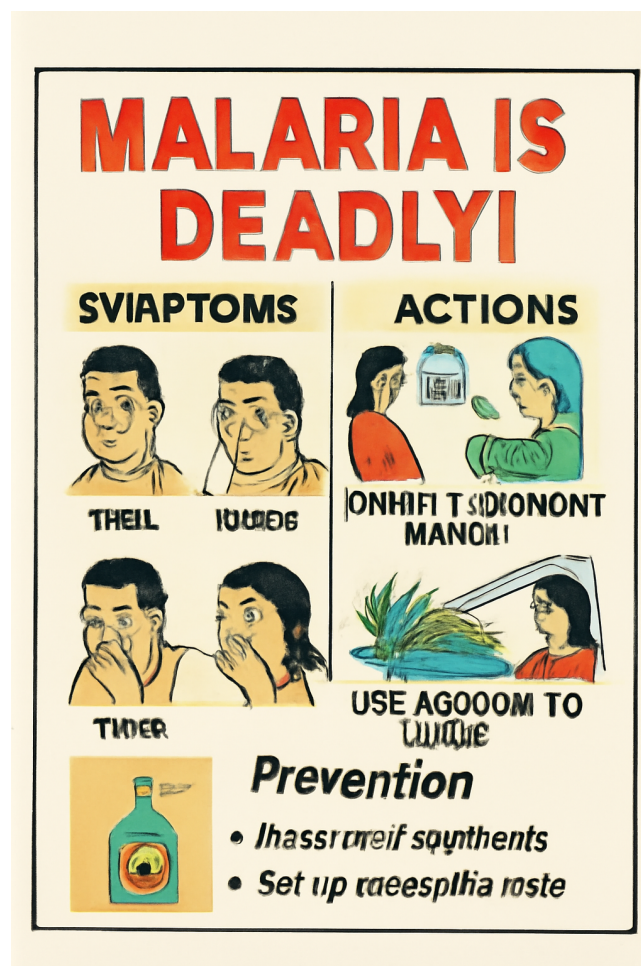
- The poster would include the following sections:
 - **Seriousness:** An attention-grabbing heading such as "Malaria is Deadly!" with a strong red color.
 - **Symptoms:** Images depicting common symptoms (fever, headache, vomiting), with simple text written in the local language to ensure comprehension.
 - **Actions:** Instructions like "Visit the hospital immediately for treatment", "Drain stagnant water", and "Use mosquito nets".
 - **Prevention:** Bullet points with images showing how to use insect repellents and set up mosquito nets.
- The poster will have simple visuals that convey the message quickly, using bright colors to make it more noticeable in public places.

- A call-to-action section will encourage villagers to seek medical help at the government hospital.

Location and Display:

- The poster would be displayed in the village square or near the central market area where foot traffic is high.
- It should be positioned at eye-level to ensure visibility.
- The size of the poster will be large enough to be seen from a distance, approximately 4x3 feet.
- The poster would be displayed in the local dialect using clear, large text to ensure accessibility for the low-literate population.
- The poster would also be weather-proof and laminated for durability, ensuring it remains visible and intact in outdoor conditions.

Sketch and Explanation:



Quick Tip

When designing for low-literate populations, use simple visuals, large text, and universal symbols to communicate essential information effectively.

Q3. Animation Design

Description: An animation film for 5 to 12-year-old children is in pre-production stage. The film is based on a 10-year-old girl Priya and her cat. This is a shot breakdown of a sequence from the film.

Shot Breakdown:

- **Shot 1:** It was such a bright and beautiful day that 10-year-old Priya decided to play with her cat in the garden.
- **Shot 2:** All of a sudden, the cat's attention is diverted by a little bird singing on a tree.
- **Shot 3:** The cat quickly climbed up the tree and walked stealthily on the branch on which the bird is perched.
- **Shot 4:** Priya anxiously watched from below.
- **Shot 5:** As the cat approached the bird, the branch broke and the bird flew away.
- **Shot 6:** Shocked, Priya quickly ran to catch the falling cat.
- **Shot 7:** Priya tripped and fell.
- **Shot 8:** Terrified, she looked up to see that the falling cat thankfully landed on its feet.
- **Shot 9:** Priya picked up the cat and scolded her.
- **Shot 10:** She then gave the cat a warm hug. The cat meowed back to her with a big smile.

Part 1: Illustrate (create a storyboard) the above shots as a series of picture frames. You may use more than one frame per shot if you want to. Approximate shape of the frame is shown below.



Evaluation Criteria:

- Communication of the narrative through sequential pictures.
- Shot composition and perspective.

Part 2: Model Sheets – Design the characters Priya, the cat, and the bird. Your drawings should depict the character so that it is a good reference for animation. It should also contain possible attitudes and expressions as may be needed by the film.

Evaluation Criteria:

- Illustration skills and design of details in the character (keeping in mind that this will be used for animation).
- Your style can be realistic or stylized.

Solution:

Storyboard Creation:

- **Shot 1:** Priya and the cat in the garden, with Priya excitedly looking at the cat as it gets ready to play.
- **Shot 2:** The cat's gaze shifting to the bird on the tree, with a clear visual cue of its focus on the bird.

- **Shot 3:** The cat climbing the tree with a steady upward motion, with branches and leaves swaying to indicate its stealthy movement.
- **Shot 4:** Priya looking up at the cat from below, with her face filled with anticipation and slight concern.
- **Shot 5:** The branch breaking and the cat starting to fall, with Priya's shocked expression in the background.
- **Shot 6:** Priya running towards the falling cat, with exaggerated motion lines to show urgency.
- **Shot 7:** Priya tripping and falling with her limbs outstretched, clearly portraying her clumsiness.
- **Shot 8:** A close-up of the cat landing safely on its feet, with Priya looking up in awe.
- **Shot 9:** Priya scolding the cat, her face stern but with warmth in her eyes.
- **Shot 10:** A final shot of Priya hugging the cat, both smiling, with warm colors and a soft background.

Model Sheets:

- **Priya:** Draw her with a cheerful, curious expression, and other poses such as tripping and scolding the cat. Focus on her emotions, facial features, and dynamic posture.
- **The Cat:** Design the cat with expressive eyes, a playful stance, and the ability to show emotion such as guilt and happiness.
- **The Bird:** Depict the bird in various poses, from sitting still to flying away. The bird should have delicate features to emphasize its fragility and innocence.

Quick Tip

In animation design, it is crucial to communicate emotions through body language and facial expressions. Each pose should tell part of the story.

Q4. Interaction Design

Description: Every day, around 500 people visit the city Regional Transport Office (RTO) for getting a driving license. Some of these people are illiterate. The RTO is short on staff and struggles to cater to all these people. To get a license the user needs to fill a form, take an objective-type test, and submit copies of age proof, address proof, a phone number, finger prints, and a photograph. After verification of this, the user is issued a learner's licence. If the user has held a learner's licence for a month, he/she may apply for a permanent licence. In that case, the user is given a choice of a date for a driving test, after which the licence is issued. The RTO has decided to put up an interactive public information system in the lobby of its office to ease the process. The primary target audiences for this system are:

- Individuals who come to issue a learner's driving licence (typically 18–20 years old).
- Individuals who come to issue a permanent driving licence (typically 18–20 years old).

Based on this information, write in about 20 words the needs of different types of users and information that the system should provide. State the assumptions you are making about the availability of technology and information.

Design Task:

- Draw a sketch of the lobby to illustrate the physical location of the system and how users would interact with it.
- Present two scenarios:
 - (1) Submission of application
 - (2) Getting a licence to illustrate the details of the graphical interface and information flow. Each scenario should highlight specific problems the users might face and show how the system would solve these.

Evaluation Criteria:

- Ability to understand the needs of users, originality, the logic and flow in the interface, usability and appropriateness of information, and presentation.

Solution:

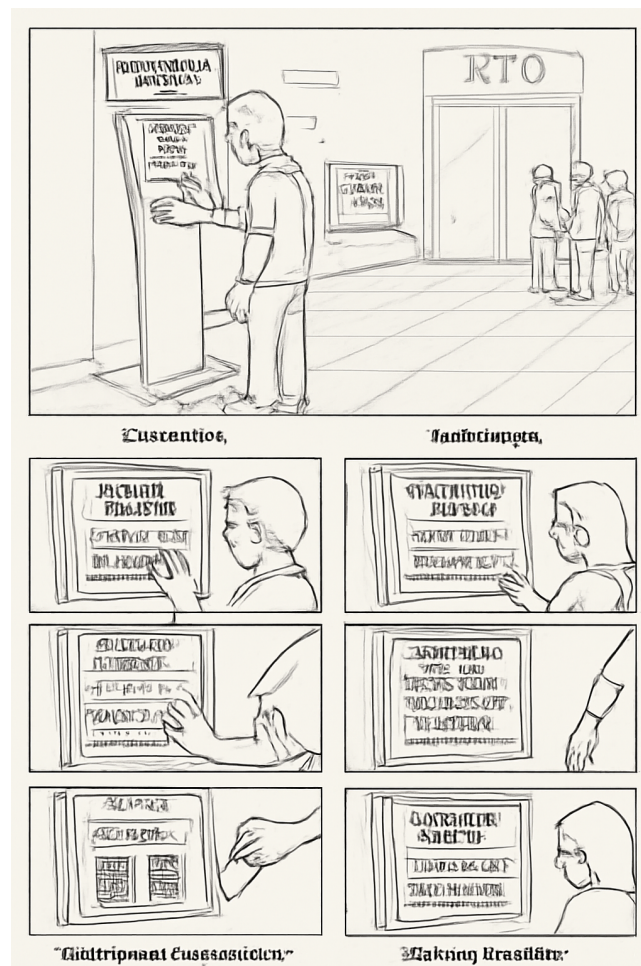
Users and Their Needs:

- **Learner's Licence Applicants:** These users require simple instructions and a clear, easy-to-navigate interface. The system must support illiterate users, with visual indicators and voice guidance.
- **Permanent Licence Applicants:** These users need clear instructions on what steps to follow after they have passed the learner's test. The system should allow users to select dates for their driving test, verify documents, and provide directions to the next step.

Assumptions:

- Users have basic knowledge of using a touchscreen or physical interaction interface.
- Technology available includes a simple touchscreen kiosk with text-to-speech support.
- The system is designed to be intuitive, with large icons and easy-to-understand symbols for illiterate users.

Lobby Sketch:



Scenario 1 - Submission of Application:

- User approaches the system and taps "Apply for Learner's Licence."
- The system asks for basic information (name, address) and verifies through biometric (fingerprint) input.
- A document upload step is provided for address proof, photograph, etc.
- The system confirms the submission and generates a ticket for the applicant.
- Problems: Users may face confusion in understanding instructions. The system should have large visual icons and voice prompts to guide the process.

Scenario 2 - Getting a Licence:

- User selects "Permanent Licence" after holding a learner's licence for one month.
- The system prompts for the driving test results (which are preloaded into the system) and asks for the date selection for the test.
- The user can choose a preferred test date from available slots.
- Problems: Users may be unsure if their learner's licence has expired. The system should highlight dates of expiry and warn users about this.

Quick Tip

For illiterate users, the design must incorporate larger symbols, visual cues, and voice prompts to ensure easy interaction and accurate submission.

Q5. Mobility and Vehicle Design

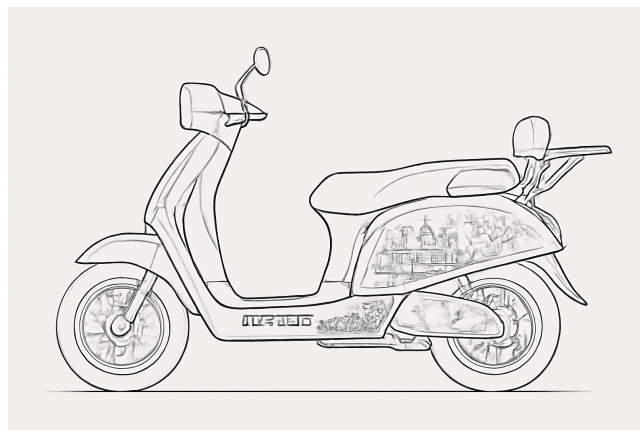
Description: A company is planning to introduce an electric two-wheeler taxi in the city of Banaras (Varanasi) for local commuters and pilgrims. Design an electric two-wheeler taxi by identifying at least five distinct and essential factors that will make it relevant for the city of Banaras in terms of function and aesthetics.

Design Proposal:

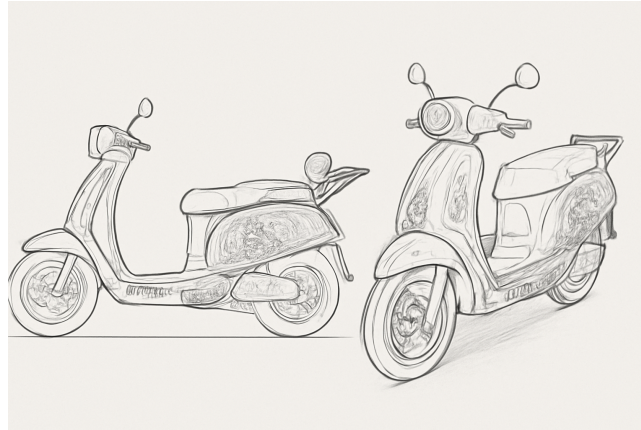
Factors to Consider:

- **Compact and Easy to Navigate:** Banaras is a city known for its narrow alleys and heavy pedestrian traffic. The vehicle should be compact, with a smaller turning radius, making it easy to navigate through the bustling streets of the city.
- **Sustainable and Eco-Friendly:** As Banaras is a heritage city, it's important to align with the eco-conscious vision. The electric vehicle will contribute to cleaner air and reduce noise pollution, fitting the city's heritage preservation goals.
- **Tourism-Friendly Design:** Given the large number of pilgrims and tourists visiting Banaras, the vehicle must have a design that accommodates tourists' luggage or comfort needs. The vehicle should have ample space for carrying small bags or religious items.
- **Low Speed for Safety and Accessibility:** Given the busy streets and heavy pedestrian traffic, the vehicle should be designed for low speeds, making it safe for both passengers and pedestrians. This will also ensure comfort during travel through congested areas.
- **Cultural Aesthetic Integration:** The design should resonate with the local culture of Banaras. Aesthetically, the vehicle should reflect the city's iconic features like its traditional ghats, temples, and vibrant colors. The design can integrate traditional motifs in a modern style.

Side Elevation Sketch:



Perspective Sketch:



Material Selection for Vehicle Body:

- **Frame Material:** The vehicle frame should be constructed from lightweight, durable materials such as aluminum alloy or carbon fiber composites to ensure strength while reducing overall weight.
- **Body Panels:** For the exterior panels, a high-quality ABS (Acrylonitrile Butadiene Styrene) plastic is ideal as it is lightweight, impact-resistant, and suitable for molded components.
- **Seating Material:** The seating should be made from water-resistant, eco-friendly synthetic leather or vegan leather that provides comfort for the passengers, especially pilgrims who may sit for extended periods.
- **Battery:** The battery should be a lithium-ion type, which is widely used in electric vehicles for its high energy density and relatively long lifespan. It will provide sufficient range for the taxi in a city like Banaras.
- **Wheels and Tires:** The tires should be robust, with good grip to handle the rugged and often slippery streets around the ghats. Rubberized tires with anti-puncture technology are ideal.

Evaluation Criteria:

- User-centric design considerations, form, feasibility and effectiveness of design solution.
- Quality of sketch, originality and appropriateness of materials.

Quick Tip

For a city like Banaras, designing for compactness, ease of movement, and eco-friendliness should be the primary goals. Ensure the vehicle blends with the environment and local needs.

Q6. Sketching Question. Attempt ANY ONE of A or B. (20 marks)

- Do not use any colours.
- Use only pencils.
- Do not use any drawing instruments such as ruler, compass, set-square etc.

A. Illustrate in perspective a still life composition with the following objects: - A plastic water bottle - A transparent half empty glass of water with a metal spoon inside it - A kitchen knife placed next to a half-eaten apple on a grey ceramic plate.

Evaluation Criteria: Realistic drawing, proportions, quality of surface texture, shading, perspective, and composition.



OR

B. Illustrate the following scene: - A dog chases a fruit seller carrying a basket full of bananas. - A kid on a tricycle watches.

Evaluation Criteria: Drawing, perspective, proportions, and composition. Figures may be realistic or stylized.



Quick Tip

For sketching, ensure that each object or figure maintains correct proportions. Use shading to create depth and highlight light sources. Keep the composition balanced.

Q7. Creativity (20 marks) A helmet is used to prevent head injury in risky situations. Helmets are used in many sports as well as while driving a bike. Describe five DIFFERENT creative ways you can use a helmet other than as a headgear. Sketch your ideas and write a one-line note to describe each idea.

Evaluation Criteria: Originality, imagination and presentation.

Creative Ideas:

- **Helmet as a Planter:** A helmet can be used as a small planter for succulents or flowers. It's a creative way to recycle old helmets while adding greenery to a space.
- **Helmet as a Lamp Shade:** Use the helmet as a unique lampshade to create a vintage, industrial feel for lighting in your home or office.
- **Helmet as a Storage Container:** You can repurpose a helmet as a storage container to organize small items, like coins, tools, or stationery, by adding a lid or making it a box.
- **Helmet as a Decorative Piece:** Paint and decorate an old helmet, then use it as a quirky decorative item for homes, gardens, or events like themed parties.
- **Helmet as a Pet Bowl:** A creative way to reuse a helmet is by transforming it into a pet food or water bowl, giving it a practical and fun twist.



Helmet as a Planter



Helmet as a Lamp Shade



Helmet as a Storage Container



Helmet as a Pet Feeder



Helmet as a Pet Bowl

Quick Tip

Always think outside the box when designing creative uses for everyday objects. A new function can give an item a second life, adding both functionality and novelty.

Q8. Stories (10 marks) Construct two different stories using the following three terms: Orphan, Mango, Cycle shop. Each story should not be longer than three sentences.

Evaluation Criteria: Originality and creativity of plots, ability to tell the story in only three sentences.

Story 1: An orphan boy, with a passion for cycling, walked to the cycle shop every day, dreaming of owning his own bike. One day, the shopkeeper noticed his dedication and gifted him a cycle along with a basket of fresh mangoes. With the cycle, the boy's life changed, and he now rode the streets, spreading joy and selling mangoes to everyone.

Story 2: The orphan girl wandered through the streets, stopping at the cycle shop with a longing look, wishing she could afford a ride. One day, the shopkeeper handed her a basket of mangoes as a gift, and asked her to come work in his shop. As the years passed, she became the shop's best mechanic, earning enough to buy her very own cycle.

Quick Tip

Keep the stories concise while focusing on an emotional connection between the characters and the objects involved. Short stories should leave a lasting impact with their simplicity.