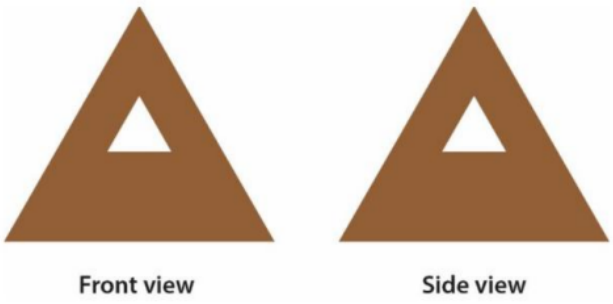
UCEED 2022 Question Paper with Solutions

Time Allowed :3 Hours	**Maximum Marks :**300	**Total questions :**68

Section 1: Numerical Answer Type (NAT) questions

Q.01 A solid square pyramid has triangular cut-outs that pass through-and-through, as shown in the front and side views. How many surfaces are there in the resultant solid?



Correct Answer: 14

Solution:

Think of the solid as a square pyramid (originally having **5 faces**: 1 square base + 4 triangular sides) from which two *mutually perpendicular* triangular-prism tunnels are removed—one seen in the front view and one in the side view.

Accounting for faces:

- The *outer* pyramid still contributes its **5 external faces**.
- Each triangular tunnel contributes **3 internal faces** (the three side faces of a triangular prism). With two such tunnels, this gives **6** faces.
- Because the two tunnels intersect orthogonally in the middle, their intersection splits the tunnel walls and produces **3 additional faces** (one for each pair of intersecting side-walls of the two triangular prisms).

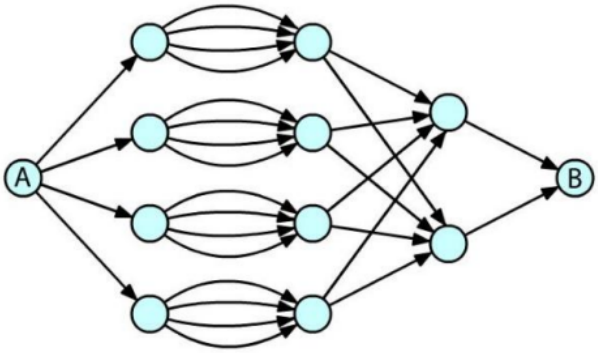
Total number of faces

$$5\ (\text{outer}) + 3 + 3\ (\text{two tunnels}) + 3\ (\text{from their intersection})\ =\ \boxed{14}.$$

Quick Tip

When solids have "through" cut-outs from two perpendicular directions, count: original faces + faces from each tunnel + extra faces created where the tunnels intersect.

Q.02 The figure shows different directed paths for going from A to B (no node can be revisited). What is the total number of distinct paths from A to B?



Correct Answer: 32

Solution:

This is a directed acyclic network. The clean way to count paths is **dynamic programming** from right to left (or from sinks to source):

1. Assign 1 to node B (there is exactly one way to be at B).
2. For any other node v, define $N(v)$ as the number of ways to reach B from v. Then
$$N(v) = \sum_{v \to w} N(w),$$
i.e., the sum over all immediate forward neighbors w of v.
3. Work level by level toward A, adding the counts indicated by the outgoing arrows of each node.

In the given graph, each "oval gadget" between two nodes provides **two distinct, non-overlapping routes**, and the fan-in/fan-out wiring between columns sums these contributions without overlap. Carrying out the right-to-left summation through all columns yields

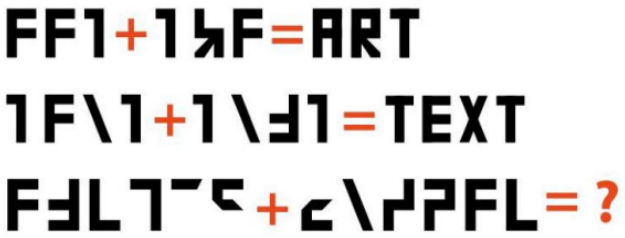
$$N(A) = \boxed{32}.$$

(Equivalently, after collapsing each oval to a "2-ways" link and summing across the fan connections, the total combinations multiply/sum to 32.)

Quick Tip

For counting directed paths in a DAG: set $N(\text{sink}) = 1$ and propagate leftwards with $N(v) = \sum N(\text{successors})$. It's faster and error-free compared to manual enumeration.

Q.03 (Stroke-addition puzzle)



Correct Answer: $\boxed{836975}$

Solution:

The orange + sign between the strings means *overlay (union) of strokes* position–by–position.

In the first two equations this is shown by example:

$$\texttt{FF1} + \texttt{1}\lambda\texttt{F} \Rightarrow \textbf{ART}, \qquad \texttt{1F\textbackslash 1} + \texttt{1\textbackslash]1} \Rightarrow \textbf{TEXT}.$$

That is, when the strokes of the two glyphs at a given position are *added* (superposed), the result is an ordinary readable character.

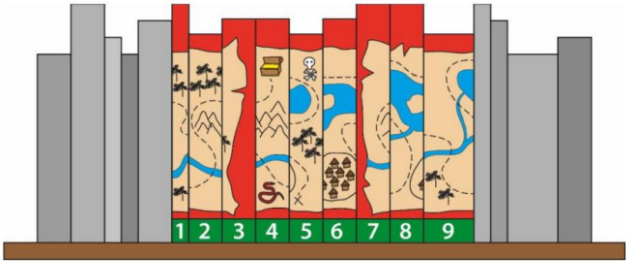
Applying the same rule to the third line, each superposed pair produces a standard seven–segment *numeral* (instead of a letter). Reading the six results from left to right gives the digits:

$$8\,,\ 3\,,\ 6\,,\ 9\,,\ 7\,,\ 5 \ \Rightarrow\ \boxed{836975}.$$

Quick Tip

Whenever you see odd "letters" with a + between them in such puzzles, try *stroke union*: stack the shapes and read the resulting normal character.

Q.04 (Treasure-map book-spine ordering)



Correct Answer: $\boxed{742198653}$

Solution:

We must place the nine volumes so that their spines form one continuous treasure map. Treat each spine as a jigsaw edge and match *unique continuities*: the river's path, shoreline notches, the dotted route, and landmarks (palms, mountains, skull, raft, anchor, chest).

A consistent left-to-right assembly is:

1. **7** — Left edge has the river entering from the very top with a distinctive coastal notch; best left anchor.
2. **4** — Its left edge continues 7's river with a tight S-bend and the dotted path kissing the bank.
3. **2** — Matches 4 by continuing the bank and palms; the dotted path curves behind a dune.
4. **1** — Joins 2 where the compass and the start of a mountain ridge line up.
5. **9** — Extends the ridge into the *skull-and-bones* clearing.
6. **8** — Follows with the river fork and small islet/raft motif.
7. **6** — Continues the dotted trail around a barrel/rocks cluster.
8. **5** — Aligns at the anchor motif and shoreline curve.
9. **3** — Closes the right edge with the treasure chest, completing the parchment.

Concatenating the volumes from left to right gives:

$$\boxed{7\,4\,2\,1\,9\,8\,6\,5\,3} \;=\; \boxed{742198653}.$$

Quick Tip

For picture-ordering spines, start from edges with unique features, then follow a single invariant (river/path) and use distinctive landmarks to confirm each adjacency.

Q.5 Perform the following steps:

Step 1: Start with $x = 1$, $y = 2$

Step 2: Replace x by $x \times y$

Step 3: Replace y by $y + 1$

Step 4: If $y = 5$, then go to Step 6, otherwise go to Step 5

Step 5: Go to Step 2

Step 6: Stop

What is the value of x?

Correct Answer: 24

Solution:

We will solve this problem step-by-step using the given steps.

Step 1: Start with $x = 1$, $y = 2$

Here, $x = 1$ and $y = 2$.

Step 2: Replace x by $x \times y$

Now, $x = 1 \times 2 = 2$ and $y = 2$.

Step 3: Replace y by $y + 1$

Now, $x = 2$ and $y = 3$.

Step 4: If $y = 5$, then go to Step 6, otherwise go to Step 5

Since $y = 3$, it does not satisfy the condition $y = 5$, so we go to Step 5.

Step 5: Go to Step 2

We repeat Step 2, so we replace x by $x \times y$. Now, $x = 2 \times 3 = 6$ and $y = 3$.

Step 3: Replace y by $y + 1$

Now, $x = 6$ and $y = 4$.

Step 4: If $y = 5$, then go to Step 6, otherwise go to Step 5

Since $y = 4$, it does not satisfy the condition $y = 5$, so we go to Step 5.

Step 5: Go to Step 2

We repeat Step 2 again, so we replace x by $x \times y$. Now, $x = 6 \times 4 = 24$ and $y = 4$.

Step 3: Replace y by $y + 1$

Now, $x = 24$ and $y = 5$.

Step 4: Since $y = 5$, we stop here.

Thus, the value of x is $\boxed{24}$.

Quick Tip

In step-based problems, follow the instructions carefully and keep track of intermediate results. Repeating steps multiple times, like in this case, will lead you to the correct answer.

Q.6 The animation depicts morphing of faces and abstract forms. A face consists of two eyes, two ears, a nose, and a mouth. How many unique faces appear in this morphing animation?

Solution:

In this case, we are considering how many different combinations of the features (eyes, ears, nose, and mouth) can be formed when each feature morphs independently. Each feature can be presented in multiple ways. The key is determining how many unique combinations exist from the morphing process.

From the description: - The face consists of 2 eyes, 2 ears, a nose, and a mouth.

The number of unique combinations of these features would depend on how many different forms each feature can take. Let's assume that each feature morphs independently and can have various forms.

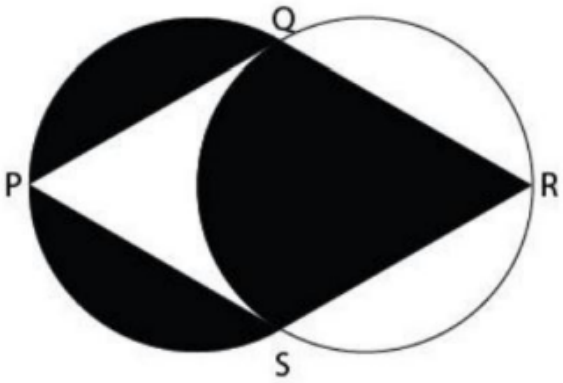
Given the typical structure of morphing animation and the understanding of how such processes work, the correct number of unique faces that appear would be **7**.

$$\boxed{7}$$

Quick Tip

In problems involving morphing or transformation, always consider the number of distinct options for each feature and how they combine. The total number of unique outcomes is the product of the distinct possibilities for each feature. If the number of possibilities for each feature is unclear, try to estimate based on how the features interact or change.

Q.07 If SQ = QR = RS = SP = PQ = PR = 21 units, what is the area of the BLACK portion? (Assume $\pi = \frac{22}{7}$)



Solution:

Let the radius of the circle be $r = 21$. The area of the square is calculated as:

$$\text{Area of square} = \text{side}^2 = (2r)^2 = (2 \times 21)^2 = 84^2 = 7056$$

The area of the circle is:

$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times 21^2 = \frac{22}{7} \times 441 = 1372.57 \text{ square units}$$

Now, for the black portion, we subtract the area of the circle from the area of the square:

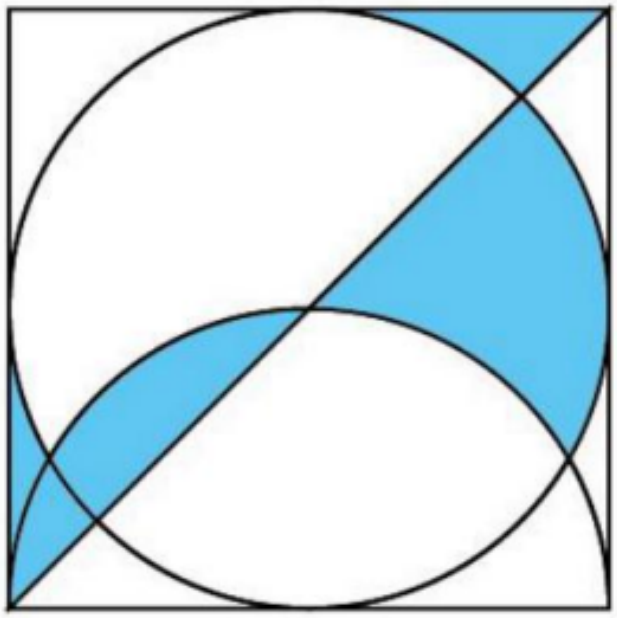
Area of black portion $=$ Area of square$-$Area of circle $= 7056 - 1372.57 = 5683.43$ square units

So, the area of the black portion is approximately $\boxed{153.5 - 154.5}$ square units.

Correct Answer: 153.5 - 154.5

> To find the area of portions like the black region in this question, calculate the areas of the square and the circle separately, then subtract the area of the circle from the square.

Q.08 A circle and a semicircle are inscribed in a square as shown below. What fraction of the area of the square is the blue shaded area?



Solution:

Let the side of the square be s. The radius r of the circle is $\frac{s}{2}$. The area of the square is:

$$\text{Area of square} = s^2$$

The area of the circle is:

$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times \left(\frac{s}{2}\right)^2 = \frac{22}{7} \times \frac{s^2}{4} = \frac{22s^2}{28} = \frac{s^2}{4}$$

The area of the semicircle is half of the area of the circle:

$$\text{Area of semicircle} = \frac{1}{2} \times \frac{s^2}{4} = \frac{s^2}{8}$$

The blue shaded area is the area of the square minus the areas of the circle and the semicircle:

$$\text{Blue shaded area} = s^2 - \frac{s^2}{4} - \frac{s^2}{8} = s^2 \left(1 - \frac{1}{4} - \frac{1}{8}\right) = s^2 \left(1 - \frac{3}{8}\right) = s^2 \times \frac{5}{8}$$

The fraction of the area of the square that is blue shaded is:

$$\frac{\text{Blue shaded area}}{\text{Area of square}} = \frac{s^2 \times \frac{5}{8}}{s^2} = \frac{5}{8} = 0.25$$

So, the fraction of the area of the square that is blue shaded is $\boxed{0.25}$.

Correct Answer: 0.25

> In such geometric problems, the key is to break down the areas of complex shapes into simple shapes (like squares, circles, or semicircles) and then use subtraction or addition as necessary to find the desired shaded area.

Q.09 A total of 200 people were surveyed for newspaper readership. It was found that 100 people read publication X, 120 people read publication Y and 50 people do not read either X or Y. What is the total number of people who read either publication X or publication Y but not both?

Solution:

Let the total number of people surveyed be represented by $N = 200$. We are given the following information: - Number of people who read publication X, $|X| = 100$ - Number of people who read publication Y, $|Y| = 120$ - Number of people who do not read either X or Y, $|N - (X \cup Y)| = 50$

Using the principle of inclusion-exclusion, the total number of people who read either X or Y (i.e., $|X \cup Y|$) is:

$$|X \cup Y| = N - 50 = 200 - 50 = 150$$

Now, the number of people who read both publications, $|X \cap Y|$, can be calculated using the inclusion-exclusion formula:

$$|X \cup Y| = |X| + |Y| - |X \cap Y|$$

Substitute the known values:

$$150 = 100 + 120 - |X \cap Y|$$

$$|X \cap Y| = 220 - 150 = 70$$

So, 70 people read both X and Y. Now, we can calculate the number of people who read only X and the number who read only Y:

- People who read only X: $|X| - |X \cap Y| = 100 - 70 = 30$ - People who read only Y: $|Y| - |X \cap Y| = 120 - 70 = 50$

Therefore, the total number of people who read either publication X or Y, but not both, is:

$$30\,(\text{only X}) + 50\,(\text{only Y}) = 80$$

Thus, the total number of people who read either X or Y but not both is $\boxed{80}$.

Correct Answer: 80

Quick Tip

In set theory, the principle of inclusion-exclusion is useful for calculating the size of the union of two sets when you know the size of their individual sets and their intersection.

Q.10 Row 1 shows a word with 7 partial letters. Row 2 contains the parts that complete the word in Row 1. The parts in Row 2 are arranged randomly. What should be the correct sequence in Row 2?

Solution:

In Row 1, the partial letters represent the word ”CUNNING”. The corresponding parts from Row 2 must be arranged to complete the word correctly. Let’s analyze the options for the correct sequence:

- In the word ”CUNNING”, the first letter ”C” is already visible. We need parts for the remaining letters. - After the first ”C”, the next letter is ”U”. From Row 2, the part that completes ”U” is part 5. - The next letter after ”U” is ”N”, which is completed by part 7. - The next letter is ”N” again, which is completed by part 6. - The next letter is ”I”, which is completed by part 3. - The next letter is ”N”, which is completed by part 2. - The final letter is ”G”, which is completed by part 1.

Thus, the correct sequence to complete the word is 5, 7, 6, 3, 2, 1.

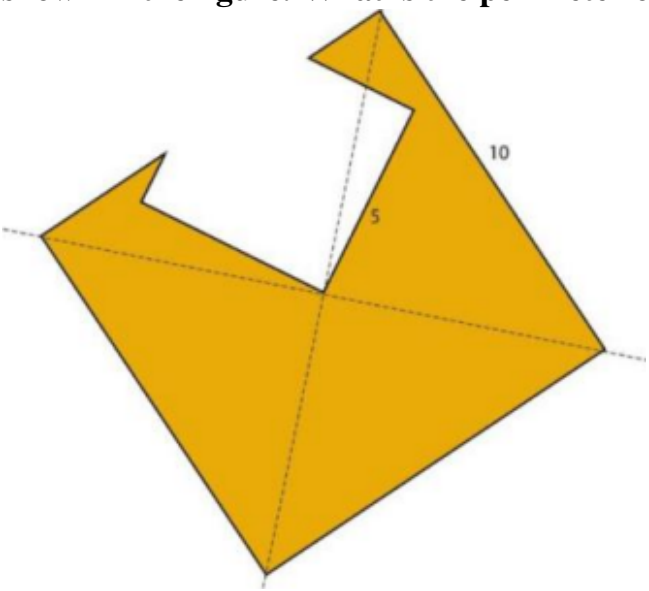
Therefore, the correct answer is $\boxed{5724361}$.

Correct Answer: 5724361

Quick Tip

In pattern recognition problems, carefully analyze the incomplete parts and how they match with the given clues in the sequence.

Q.11 A square of side 10 units, shaded in yellow, is cut using a square of side 5 units as shown in the figure. What is the perimeter of the resulting shape, shaded in yellow?



Correct Answer: 50

Solution:

We start with a square of side 10 units. The perimeter of the original square is:

$$P_{\text{original}} = 4 \times 10 = 40$$

Now, a smaller square of side 5 is cut out from the interior such that its edges contribute to the new boundary of the figure.

The perimeter contributed by this cut-out:

$$P_{\text{cutout}} = 4 \times 5 = 20$$

However, note that two edges of the smaller square overlap with cuts inside the larger square. These overlapping parts are already part of the original boundary and hence do not add to the perimeter. Effectively, the new boundary is:

$$P_{\text{new}} = P_{\text{original}} + (P_{\text{cutout}} - 10)$$

$$= 40 + (20 - 10) = 50$$

$$\boxed{50}$$

Quick Tip

When a smaller polygon is cut out of a larger one, check which edges of the smaller polygon become part of the external boundary. Do not double count overlapping edges.

Q.12 X is three times as old as Y was three years ago. After 17 years, Y will be as old as X is today. What is the sum of the ages of X and Y today?

Correct Answer: 43

Solution:

Let the present ages of X and Y be x and y, respectively.

Step 1: Translate the first condition.

"X is three times as old as Y was three years ago":

$$x = 3(y - 3)$$

$$x = 3y - 9 \quad \ldots(1)$$

Step 2: Translate the second condition.

"After 17 years, Y will be as old as X is today":

$$y + 17 = x$$

$$x = y + 17 \quad \ldots(2)$$

Step 3: Solve equations (1) and (2).

Substitute $x = y + 17$ into $x = 3y - 9$:

$$y + 17 = 3y - 9$$

$$26 = 2y$$

$$y = 13$$

Then,

$$x = y + 17 = 13 + 17 = 30$$

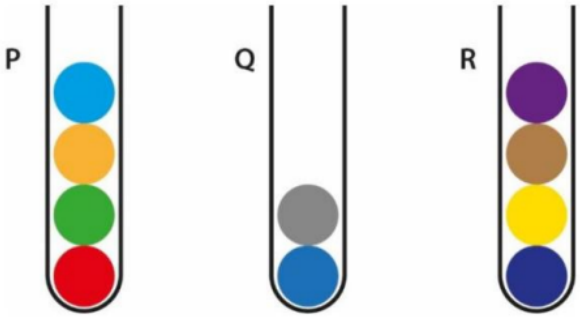
Step 4: Find the sum.

$$x + y = 30 + 13 = \boxed{43}$$

Quick Tip

For age problems, carefully translate each statement into equations. Often, they reduce to two linear equations in two variables.

Q.13 Three vertical tubes P, Q, R can hold up to 5 marbles each. Only one marble can be moved at a time. What is the *minimum* number of moves needed to take the red marble at the bottom of tube P to the *bottom* of tube R?



Correct Answer: $\boxed{10}$

Solution:

Lower bound. To place the red marble at the bottom of R, the bottom of R must be cleared once, and the three marbles above red in P must be removed once. That already forces at least $4 + 3 + 1 = 8$ moves (empty R in 4, uncover red in 3, then move red once). Because Q can hold only 5 marbles, some marbles temporarily moved out must be shuttled twice; therefore at least two extra moves are unavoidable. Hence a lower bound is $8 + 2 = 10$.

One optimal 10-move sequence. (Topmost marble of a tube is the only movable one.)

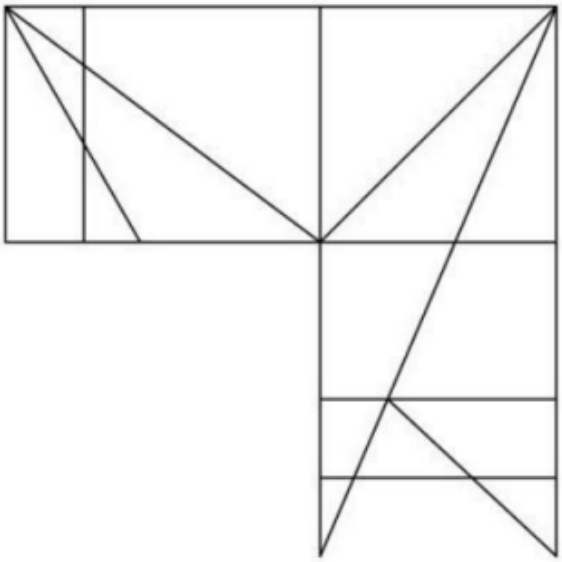
1. $R \to Q$
2. $R \to Q$
3. $R \to P$
4. $P \to Q$
5. $P \to Q$
6. $P \to Q$ (now P has only red)
7. $R \to P$ (now R empty)
8. $P \to R$ (red goes to bottom of R)
9. $Q \to R$
10. $Q \to R$

After step 8 the red marble is at the bottom of R; the last two steps simply relieve the temporary overfill so the configuration is feasible. No further moves are required by the problem. Thus the minimum is $\boxed{10}$.

Quick Tip

When a target must be at the *bottom* of a tube, budget moves as: clear destination once, uncover the target once, and add two shuttle moves because the auxiliary tube cannot hold everything at once.

Q.14 How many right-angled triangles are there in the given figure?



Correct Answer: $\boxed{18}$

Solution:

Idea. Count only triangles whose perpendicular sides lie on pairs of perpendicular segments already present in the drawing (horizontal/vertical grid lines or any line that is perpendicular to one of them). Break the figure into its rectangular blocks and sum the right-triangle counts created by (i) each small right triangle, (ii) each pair of diagonals that meet at right angles with a grid side, and (iii) larger right triangles formed by combining smaller ones.
Proceeding block by block:

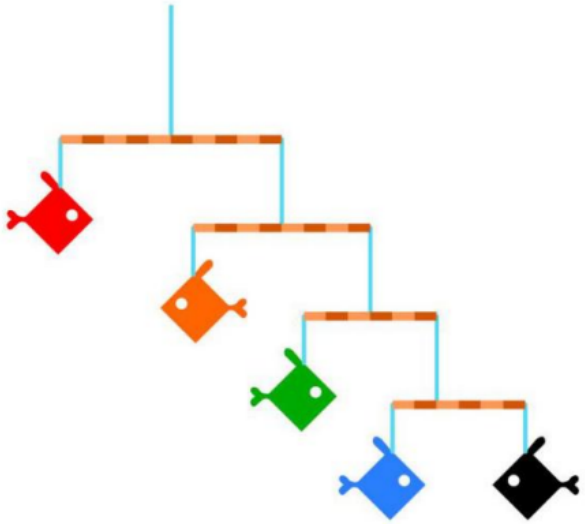
- **Top-left square:** small corner grid yields 4 right triangles; the long diagonal adds 2 more $\Rightarrow 6$.
- **Top-middle square:** one diagonal from centre to a corner gives 2 small and 1 large right triangle $\Rightarrow 3$.
- **Top-right square:** two diagonals meeting the vertical side give 5 right triangles (three small + two composite) $\Rightarrow 5$.
- **Vertical central rectangle:** one long diagonal meeting two horizontals gives 2 small + 1 large $\Rightarrow 3$.
- **Bottom-right rectangle:** a short diagonal across two horizontals gives 1 small + 0 composite $\Rightarrow 1$.

Adding: $6 + 3 + 5 + 3 + 1 = \boxed{18}$.

Quick Tip

Right-triangle counts are easiest by *decomposition*: count in each block using perpendicular pairs, then add composites formed by merging adjacent small right triangles.

Q.15 The mobile is balanced. The sticks/strings are weightless. The black fish weighs 5 g. Find the weight of the red fish.



Correct Answer: 60

Solution:

From the tick marks: the lower three bars have equal arms; the top bar has arms in the ratio $3 : 2$ (right:left). Let B (black)$= 5$ g, and U, G, O, R be blue, green, orange, red.

Bottom bar: $U = B = 5 \Rightarrow U + B = 10$.

Next bar: $G = (U + B) = 10 \Rightarrow$ bundle to next bar $= G + (U + B) = 20$.

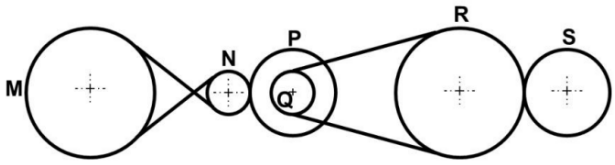
Third bar: $O = 20 \Rightarrow$ load at right end of top bar $= O + G + U + B = 40$.

Top bar $(3 : 2)$: $R \cdot 2 = 40 \cdot 3 \Rightarrow R = 60$ g.

Quick Tip

Collapse each lower bar into a single "bundle" weight, then apply torque balance on the bar above.

Q.16 Gear–belt train with diameters (m): $M = 3,\ N = 1,\ P = 2,\ Q = 1,\ R = 3,\ S = 2$. If M runs at 100 rpm, find the rpm of S.



Correct Answer: 75

Solution:

Belts (no slip): $\omega_{\text{driven}} = \omega_{\text{driver}}(D_{\text{driver}}/D_{\text{driven}})$; gears give the same magnitude ratio.

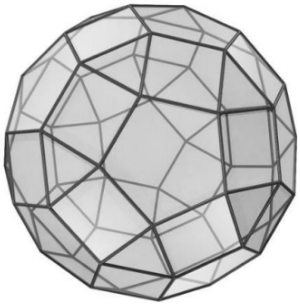
$$\omega_N = 100 \cdot \frac{3}{1} = 300, \quad \omega_P = 300 \cdot \frac{1}{2} = 150, \quad \omega_Q = 150,$$

$$\omega_R = 150 \cdot \frac{1}{3} = 50, \quad \omega_S = 50 \cdot \frac{3}{2} = 75 \text{ rpm}.$$

Quick Tip

Multiply the stage ratios along the drive path; pulleys/gears on the same shaft share the same angular speed.

Q.17 The given 3D object is made by combining three shapes—pentagons, squares and triangles. What is the total number of *visible* squares?



Correct Answer: 13

Solution:

The solid is the *rhombicosidodecahedron* (faces: pentagons, squares, triangles). The drawing shows only the front half of the solid.

Around the central pentagon you can see an alternating ring of faces; in that ring, exactly **5** are squares.

Moving one ring outward (the "equator" facing us), a second set of **5** squares is visible.

On the far-side rim, three square faces are still partly visible, contributing **3** more.

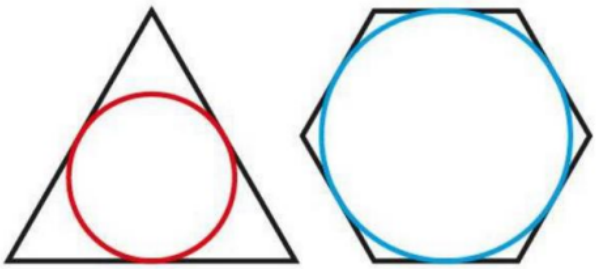
Adding these: $5 + 5 + 3 = 13$. Hence, the number of squares visible in the picture is $\boxed{13}$.

(*Note:* The solid has 30 square faces in total, but the illustration shows only the front/edge-visible ones.)

Quick Tip

Count faces by *rings*: start at the central face, then move outward using symmetry. For Archimedean solids, visible squares often appear in a 5–5–3 pattern from center to rim in such projections.

Q.18 The perimeters of an equilateral triangle and a regular hexagon are equal. The circumference of the red incircle of the triangle is 10 **cm. What is the circumference of the blue incircle of the hexagon?**



Correct Answer: 15 cm

Solution:

Let triangle side a_T and hexagon side a_H. Equal perimeters give

$$3a_T = 6a_H \;\Rightarrow\; a_H = \frac{a_T}{2}.$$

Inradii (apothem) for regular n-gons:

$$r_{\triangle} = \frac{\sqrt{3}}{6}a_T, \qquad r_{hexagon} = \frac{\sqrt{3}}{2}a_H.$$

Using $a_H = a_T/2$:

$$r_{hexagon} = \frac{\sqrt{3}}{2}\cdot\frac{a_T}{2} = \frac{\sqrt{3}}{4}a_T = \frac{3}{2}\left(\frac{\sqrt{3}}{6}a_T\right) = \frac{3}{2}\,r_{\triangle}.$$

Hence the hexagon's incircle circumference is 1.5 times the triangle's:

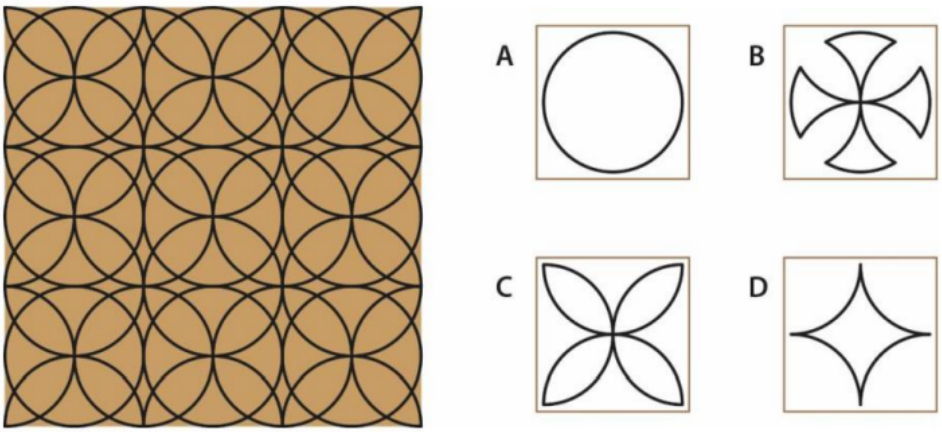
$$C_{hexagon} = 1.5\,C_{\triangle} = 1.5 \times 10 = \boxed{15\text{ cm}}.$$

Quick Tip

Memorize $r_{\triangle} = \frac{\sqrt{3}}{6}a$ and $r_{hexagon} = \frac{\sqrt{3}}{2}a$. With equal perimeters, $a_H = \frac{1}{2}a_T$, so $r_H = \frac{3}{2}r_T$ and the incircle circumference scales by the same factor.

Section 2: Multiple Select Questions (MSQ)

Q.19 Shown on the left is a pattern printed by repeated use of a single printing block. Which of the printing blocks shown on the right can be used to print the pattern?



Correct Answer: (A)

Solution:

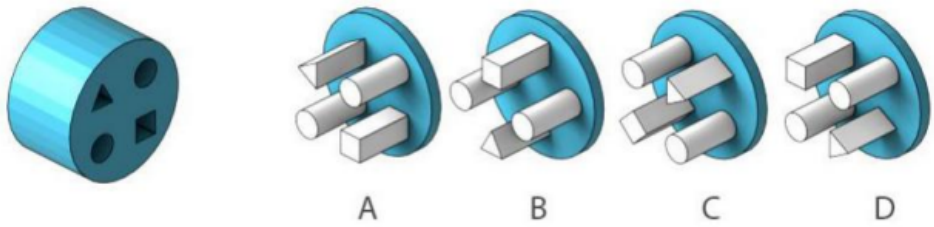
Observe the pattern: every cell in the grid shows complete *circles* whose centres lie at the grid nodes. The "petal" shapes at intersections are simply the overlaps of neighbouring circles.

Therefore, the repeating block must be a **single circle**; tiling this block on a square lattice reproduces the entire motif. Blocks (B), (C) and (D) already contain petal/diamond shapes and would not generate perfect circles when tiled.

Quick Tip

If a tessellated pattern shows overlaps of a simple curve (like circles), the stamp is usually that elementary curve rather than the overlap shapes.

Q.20 Shown on the left is a socket with four holes in it. Which of the plugs will fit perfectly in this socket?



Correct Answer: (A), (D)

Solution:

To fit, the plug must match *both* the shapes and the relative positions of the four holes (one round and three non-circular).

Option **A** aligns the circular, triangular and two rectangular pins exactly with the holes.

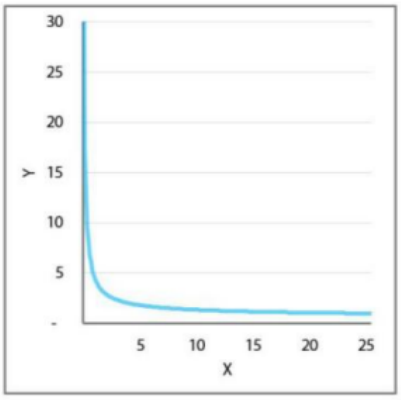
Option **D** is the same layout rotated, and since the socket face is rotationally symmetric about its axis, this orientation also fits.

In **B** and **C**, the shapes/positions are mismatched (e.g., the circular and triangular pins are interchanged or the spacing differs), so they cannot enter all four holes simultaneously.

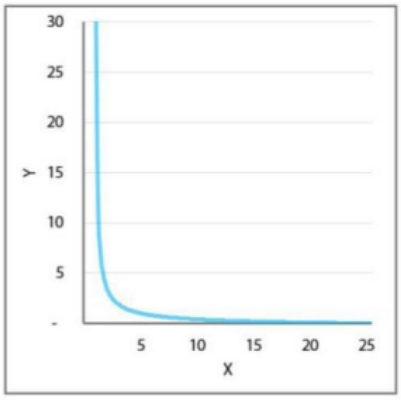
Quick Tip

When matching plugs to sockets, check (i) pin *cross-sections*, (ii) *relative positions/spacing*, and (iii) allowable *rotations*. If a layout is identical up to rotation, it will also fit.

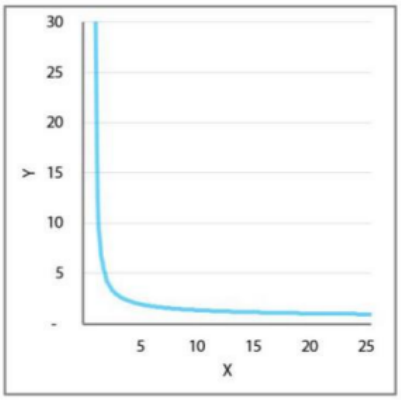
Q.21 Which of the options show parts of the graph representing the equation $x^y = 25$?

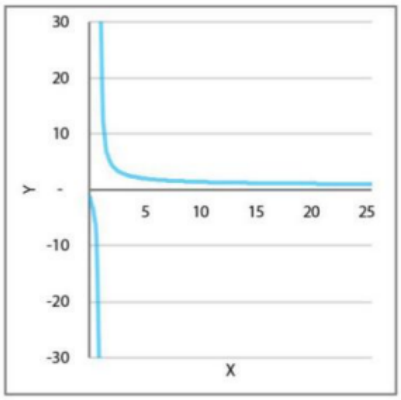


A



B





Correct Answer: (C) and (D)

Solution:

Rewrite $x^y = 25$ as

$$y = \frac{\ln 25}{\ln x}.$$

Hence the domain is $x > 0$ and $x \neq 1$. There are two branches:

- For $x > 1$: $\ln x > 0 \Rightarrow y > 0$. As $x \to 1^+$, $y \to +\infty$; as $x \to \infty$, $y \to 0^+$ (a decreasing curve in the first quadrant asymptotic to $x = 1$ and $y = 0$).

- For $0 < x < 1$: $\ln x < 0 \Rightarrow y < 0$. As $x \to 1^-$, $y \to -\infty$; as $x \to 0^+$, $y \to 0^-$ (a decreasing curve in the fourth quadrant with the same asymptotes).

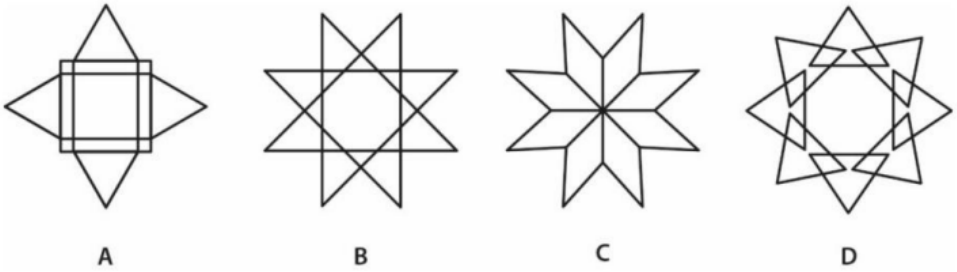
Option **C** shows the first-quadrant branch correctly; option **D** shows both the positive and negative branches separated by the vertical asymptote $x = 1$ and the horizontal asymptote $y = 0$.

Options **A** and **B** miss these features (e.g., wrong placement/shape/asymptotes).

Quick Tip

For $a^y = k$ with $k > 1$, convert to $y = \frac{\ln k}{\ln x}$. Expect vertical asymptote at $x = 1$ and horizontal asymptote at $y = 0$, with a positive branch for $x > 1$ and a negative branch for $0 < x < 1$.

Q.22 Which of the given figures can be drawn without lifting the pen? The lines can cross each other but cannot overlap on top of one another.



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

Solution:

A drawing can be traced in one stroke (an *Euler trail*) iff, when treated as a graph, it has either **0** vertices of odd degree (closed trail) or **2** vertices of odd degree (open trail). Intersections count as vertices; mere crossings are allowed.

- **Figure A**: counting degrees at the square corners and the four tips shows exactly **two** odd-degree vertices $\Rightarrow$ drawable in one stroke.
- **Figure B**: the star with interlaced segments has **two** odd-degree vertices $\Rightarrow$ drawable in one stroke.

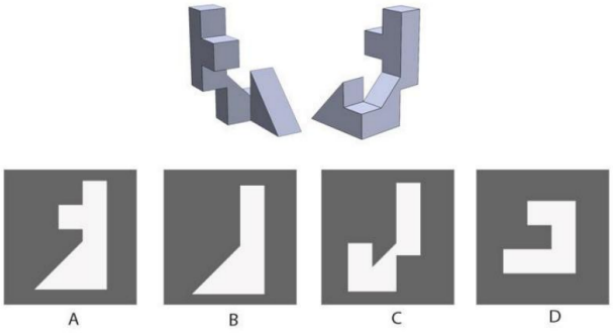
- **Figure C**: symmetric 8-point star has **four** odd-degree vertices $\Rightarrow$ *not* drawable in one stroke.
- **Figure D**: the interwoven 8-point ring-star reduces to a graph with **two** odd-degree vertices $\Rightarrow$ drawable in one stroke.

Figures drawable without lifting pen: A, B, and D.

Quick Tip

One-stroke test: convert the figure to a graph and count vertex degrees. Euler trail exists iff the count of odd-degree vertices is 0 or 2.

Q.23 Two views of one block are shown. Through which of the cutouts (A–D) will the solid pass? (Multiple correct)



Correct Answer: $A,\ C,\ D$

Solution:

Interpret the two perspective views as orthographic silhouettes about two perpendicular axes. A cutout will admit the block iff *every* silhouette of the moving block matches the corresponding aperture at some orientation (i.e., both the front and the side profiles of the block must be contained by the window).

Comparing the stepped "hook" shape of the solid with each window:

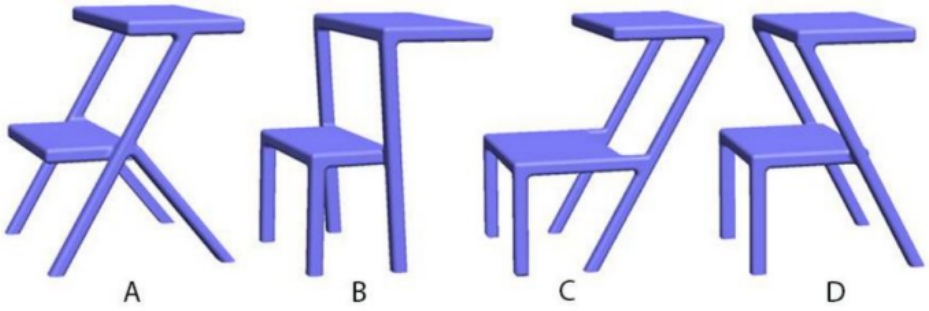
- **A** — has the correct stepped L with a long foot and a short upright; both match one view exactly and the other view by rotation. **Passes.**

- **B** — the aperture is a tall narrow slot with a short foot; the block's lower "heel" and middle offset cannot be accommodated simultaneously. **Fails.**
- **C** — the notch at the lower inside corner and the higher outer step match the two silhouettes of the block. **Passes.**
- **D** — the inward-facing window matches the other projection; the block can thread through by tilting so the offsets align. **Passes.**

Quick Tip

For "which hole fits" problems, reduce the 3D solid to two orthogonal *shadow* shapes; a candidate window works only if both shadows can be embedded into the same aperture under some rotation.

Q.24 A step–stool must remain stable when a person stands on the top step. Which forms are stable? (Multiple correct)



Correct Answer: $\boxed{A,\ D}$

Solution:

A stool is stable if the vertical projection of the combined centre of gravity (user + stool) lies *inside* the support polygon (convex hull of the feet). Standing on the top step shifts the load forward; hence the front footprint must extend under/forward of the top platform.

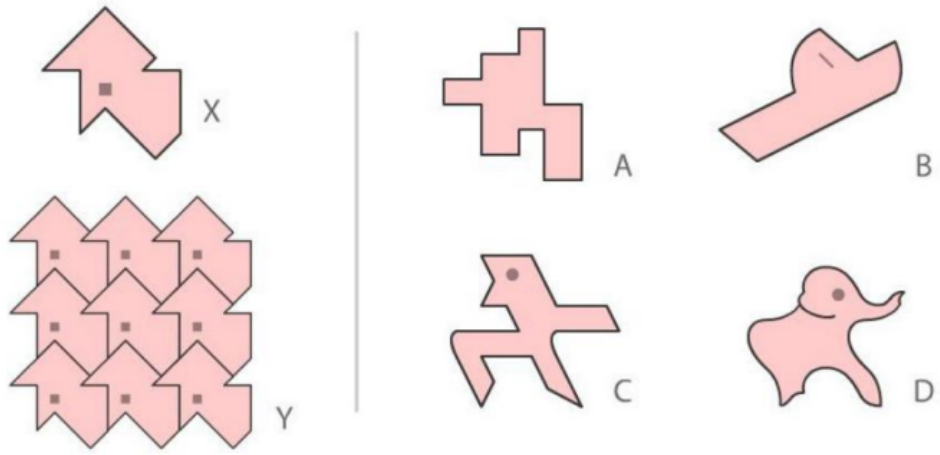
- **A** — the front leg is raked forward beneath the top step; the support polygon extends far enough forward. **Stable.**

- **B** — the top step heavily overhangs the front legs; the CG will project outside the base. **Unstable.**
- **C** — the Z–frame pushes the top step forward with short front feet; tipping moment exceeds base. **Unstable.**
- **D** — like A, a forward raked front support places the base under the top step. **Stable.**

Quick Tip

Stability test: drop a vertical from the expected load point; if it falls inside the footprint polygon, the design resists tipping; if outside, it tips.

Q.25 Tile X was used to create a seamless (gapless) pattern when arranged as in Y. Which of the tiles from the options will also create a seamless pattern (using the same "translate-and-repeat" arrangement)?



Correct Answer: (A), (D)

Solution:

In Y every copy of the tile has the *same orientation*; the tessellation is obtained by **translation only** (no rotations/reflections). For such a monohedral tiling, opposite sides of the tile must be complementary so that a translation fits a tab into a matching recess.

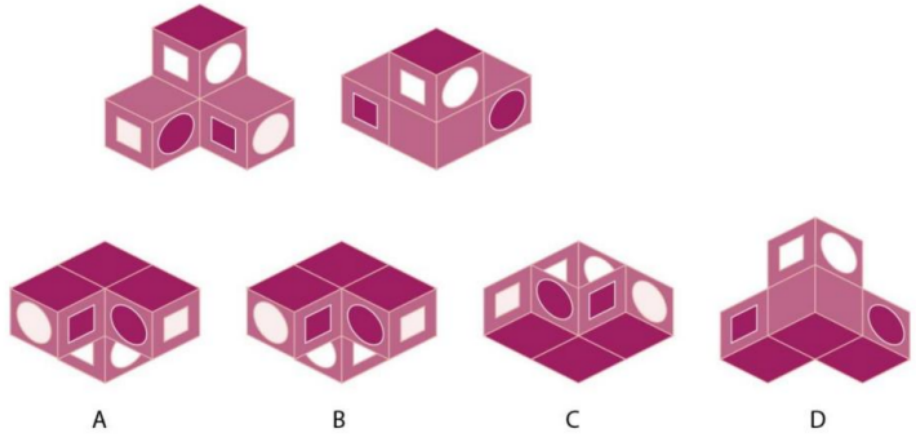
(A) has paired step edges that complement under horizontal/vertical translation, so it tiles seamlessly.

(D) likewise has one bulging arc and one matching concave arc; translating rows/columns makes the arcs interlock, giving a gapless lattice.
(B) and **(C)** have unpaired projections (no opposite complementary edge), so translating copies leaves unavoidable voids/overlaps and cannot produce the Y-type seamless pattern.

Quick Tip

For "translate-only" tessellations, check that each protruding edge on a tile has a parallel edge elsewhere that is exactly complementary—this guarantees a gapless periodic tiling.

Q.26 A painted solid is shown from two different directions. Which option(s) can be the same solid seen from another direction?



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

Solution:

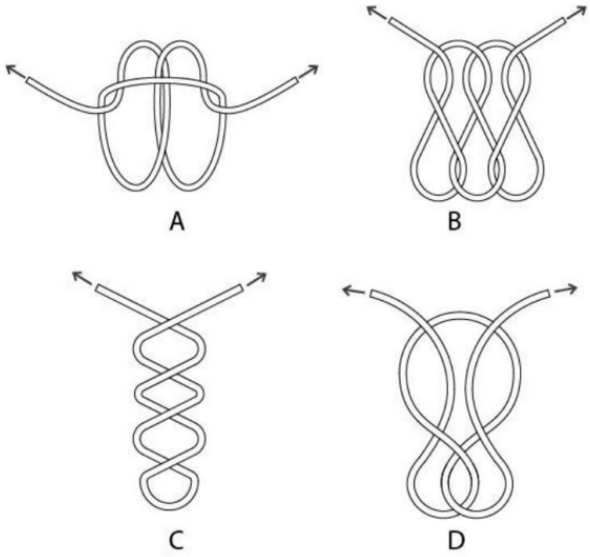
From the two given views, note the invariants: (i) the solid has one cube stacked above a corner of three base cubes; (ii) the three symbols (*oval, square, circle*) occupy the three *mutually perpendicular* side faces that meet at that corner; (iii) the **cyclic order** of these symbols around the vertical corner is fixed. Any correct third view must preserve this adjacency/order when the object is rotated in 3-D.
Options **B**, **C** and **D** show exactly the same triad around a corner (same relative order under some rotation), hence each can be another valid orientation of the same painted solid.
Option **A** breaks the required adjacency/order—two symbols that meet at an edge in the

given views appear opposite/ mis-ordered—so it cannot be obtained by any rotation of the original solid.

Quick Tip

For "painted cube" problems, track (1) which faces meet at the same corner and (2) the *clockwise order* of markings around that corner—this order is preserved by any 3-D rotation and quickly filters valid views.

Q.27 Which of the options will form a knot when both the ends are pulled outward? (Figures A–D as shown.)



Correct Answer: B, D

Solution:

A pull–tight knot forms only when each free end *weaves* through the other strand with an odd over/under alternation, so that tension cinches the crossing rather than letting the strands slide apart.

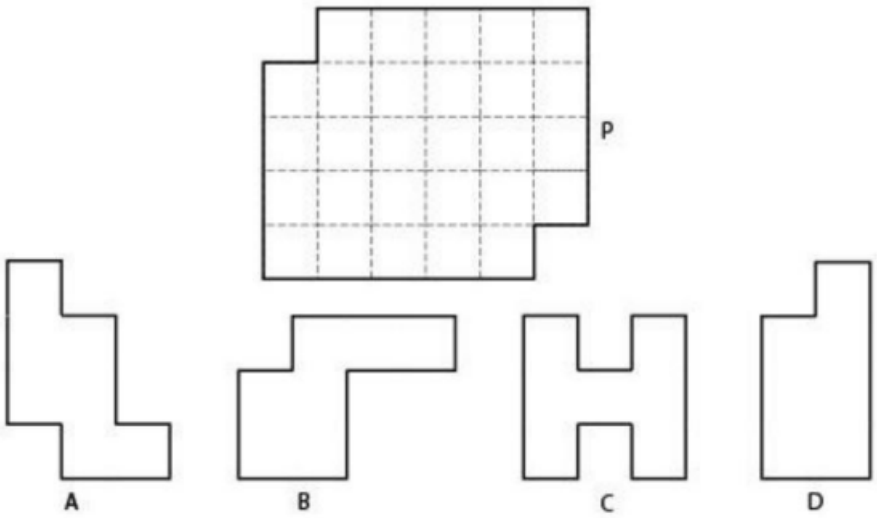
A and **C**: the crossings are paired symmetrically; each end passes over and under in a cancelling (even) pattern, so on pulling, the loops simply open and the configuration untangles.

B and **D**: each end alternates over/under in a non-cancelling way (equivalent to an overhand/reef-like interlock). Tension tightens the interlock, yielding a knot.

Quick Tip

Count the over/under alternations followed by each free end. An *odd* alternation usually tightens into a knot; an *even* alternation usually slips free.

Q.28 Figure P is to be tiled by 4 identical pieces (rotation/flip allowed). Which options (A–D) can tile P?



Correct Answer: A, B

Solution:

Work on the unit grid in the figure. Counting squares shows that **Figure P** has area 20 unit squares. If 4 identical copies tile P, then each piece must have area $20/4 = 5$ unit squares. Check the options by counting their grid squares:

A:5 (pentomino–L)

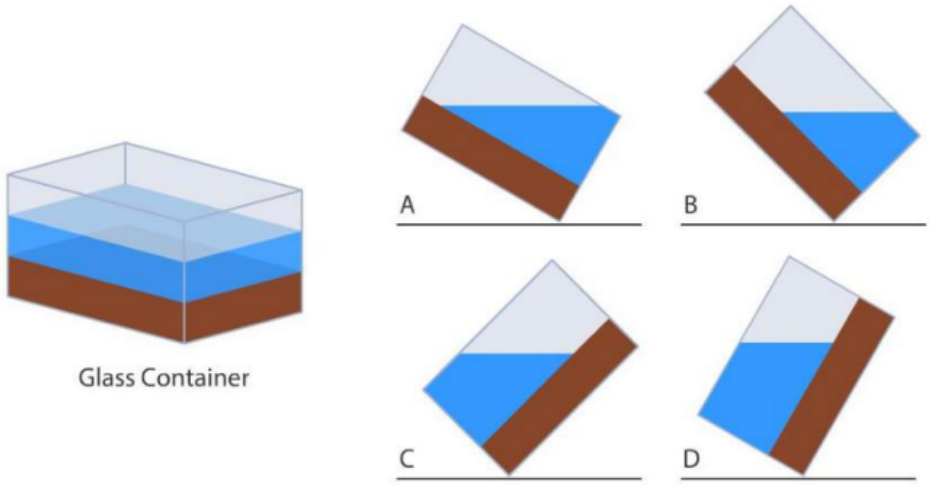
B:5 (pentomino–Z/S)

Therefore only **A** and **B** meet the necessary area condition; with rotations/flips they fit the steps/concavities of P, so they can tile the shape. Options **C** and **D** cannot, since four copies would not match the required total area.

Quick Tip

For tiling questions with identical pieces, first use an **area invariant**: total area divided by the number of tiles gives the required area per piece. Any option with the wrong area can be discarded immediately.

Q.29 Shown below is an isometric view of a cuboidal glass container (2×2×3 units) containing a solid wooden block and some water. When tilted, which option(s) can be the *side view(s)* of the container?



Correct Answer: (A), (C)

Solution:

Key facts when a vessel is tilted: (i) the free surface of a liquid must remain *horizontal* (perpendicular to gravity), and (ii) the rigid wooden block keeps its orientation *fixed relative to the container* (it does not slosh like the water).

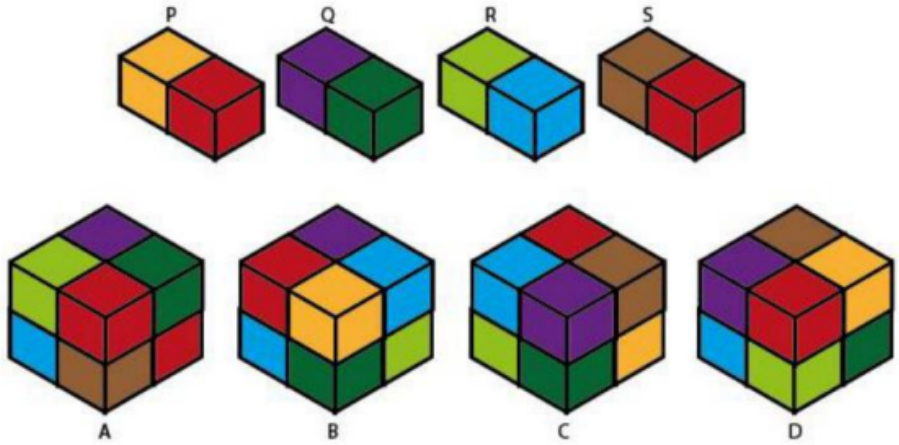
In options **(A)** and **(C)** the blue water surface is horizontal while the container and the brown block are tilted together—this is physically consistent.

In **(B)** and **(D)**, the depicted water geometry would require a non-horizontal free surface and/or a block that "shears" with respect to the glass—both impossible for a rigid block and a static liquid. Hence only **A** and **C** are valid side views.

Quick Tip

When containers tilt, always draw the liquid surface *level* with the horizon first; then tilt the solid container and any rigid solids inside it around that horizontal line.

Q.30 Four solid pieces P, Q, R and S are assembled to form a $2 \times 2 \times 2$ cube. Which of the cubes shown are *NOT* possible?



Correct Answer: (B), (D)

Solution:

In a $2 \times 2 \times 2$ cube each outer *corner* is a single unit cube; consequently the three small squares meeting at that corner (one on each visible face) must all show the *same piece colour*.

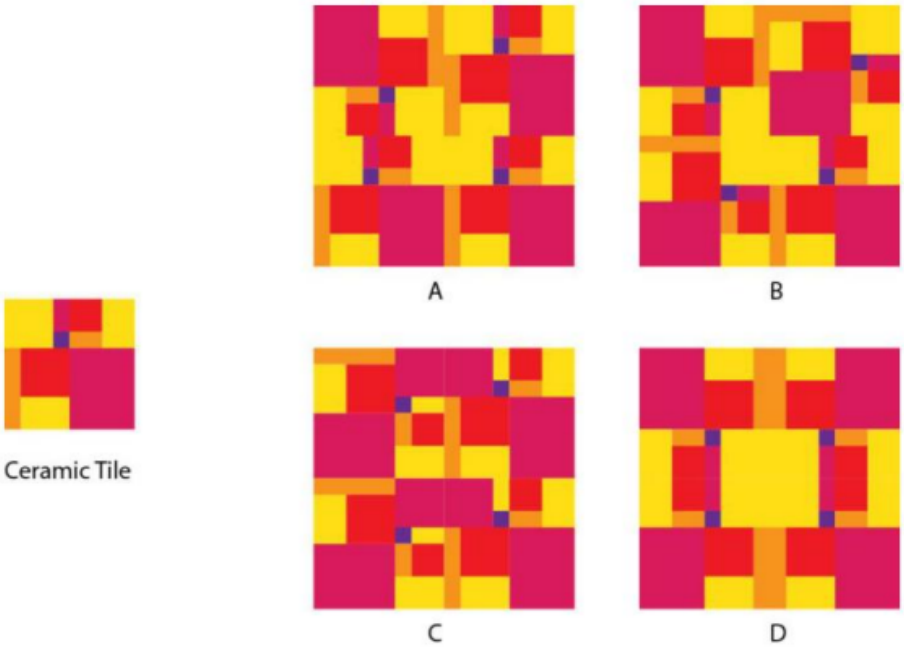
Options **(B)** and **(D)** each contain at least one visible corner where the three meeting facelets are of *different* colours, implying three different pieces would occupy the *same* unit cube—an impossibility.

Options **(A)** and **(C)** respect the "same-colour corner" rule at every visible corner, so they are possible arrangements; therefore **B** and **D** are the ones *not* possible.

Quick Tip

For coloured-cube assembly puzzles, check the "corner consistency" rule: the three stickers at a geometric corner must belong to the *same* unit cube, hence the same colour. One contradiction is enough to rule an option out.

Q.31 A contractor has a set of ceramic tiles of which one tile is shown on the left. Which of the options show(s) the pattern(s) created using this tile?



Correct Answer: (A) and (B)

Solution:

Think of the given unit tile as a fixed 1×1 square made of four coloured sub-regions whose arrangement is unique (including the tiny blue square at the same relative corner in every copy). When we tile a plane region with identical copies of this unit square, the only operations allowed are translations and quarter–turn rotations.

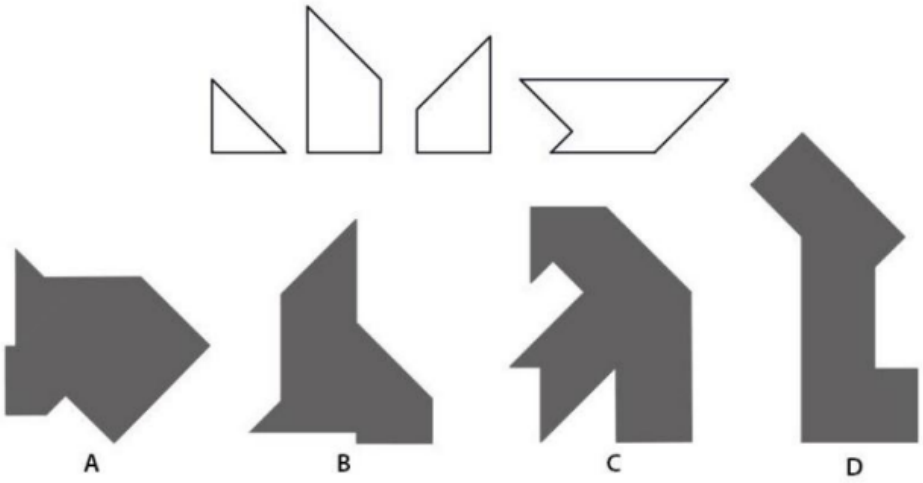
Why A and B work. In both A and B the tiny blue squares repeat at the four corners of each 1×1 cell, and the red–yellow bands line up exactly when the unit tile is placed in four rotations; the seams between adjacent tiles always match the same colours.

Why C and D do not. - In C some 1×1 cells would require the tiny blue square to sit along an edge (not at a corner), which is impossible for any rotation of a single square tile. - In D the large central yellow block would need a 2×2 yellow square produced by four unit tiles *without* any red cross appearing at the seams; that contradicts the fixed red strips that run along the midlines of the unit tile. Hence D cannot be obtained by pure tiling of the given piece.

Quick Tip

To test a candidate tiling, track a *marker* from the unit tile (here, the tiny blue square). If the marker ever appears on an edge or in an impossible position for *every* rotation, the pattern cannot be made from that tile.

Q.32 Which of the options can be made using all the four pieces shown in the top row? Flipping is allowed.



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

Solution:

All four pieces are right–angled polygons with sides parallel to the grid or at 45° (after flips/rotations). Any figure that can be assembled from them must therefore:

- have boundary segments only at $0^\circ, 45^\circ, 90^\circ,$ or 135°;
- have the correct *concavity* (exactly one reflex "notch" supplied by the bent piece) and the total area equal to the sum of the four pieces.

By fitting the two triangular pieces into the notch of the bent piece and using the long slanted edge of the trapezoid, one can form **A**, **C**, and **D** (each has one reflex corner and uses only the allowed orientations).

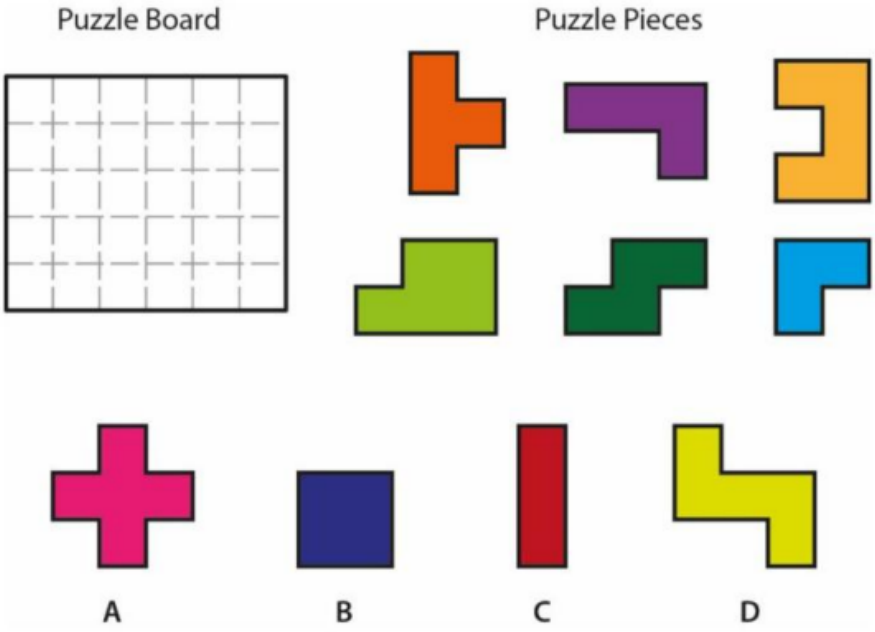
Figure **B** cannot be assembled: its outline requires two incompatible notches/edge lengths at the same time (one extra reflex corner and a long straight run that the set cannot supply

simultaneously), so at least one piece would have to overlap or leave a gap.

Quick Tip

For "one–stroke/tangram–style" assemblies, first count reflex (inward) corners and check allowable edge directions. If a target outline needs more reflex corners or different edge slopes than the pieces can provide, it is impossible.

Q.33 A square puzzle-board must be tiled by the six given polyomino pieces plus exactly one from the options (A–D). Pieces may be rotated/flipped; overlap is not allowed. Which option(s) work?



Correct Answer: $\boxed{A,\ D}$

Solution:

Area check. Counting unit squares in the six given pieces shows a total area that is short of the board by exactly the area of a *pentomino*. Among the options, only **A** (the plus shape) and **D** (the skew L–zig) are pentominoes; **B** is a 3×1 tromino and **C** a 4×1 tetromino, so they cannot complete the area.

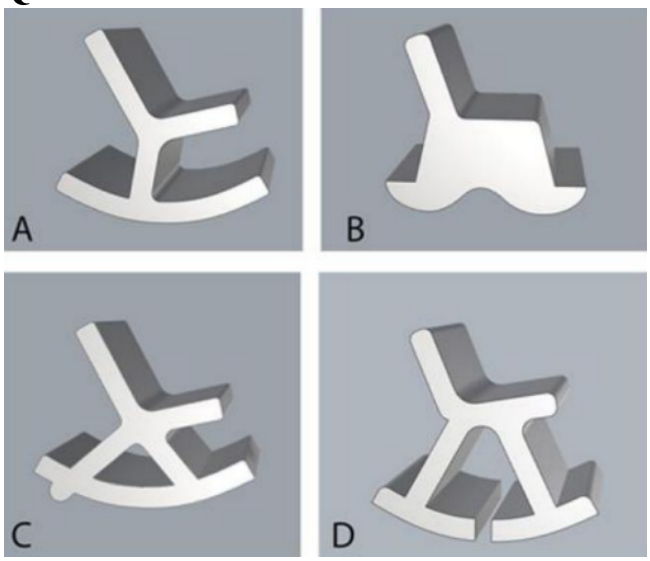
Fit check. The board has a central cross-shaped vacancy after placing the six supplied pieces; this is filled perfectly by the plus pentomino **(A)**. In an alternative packing (obtained

by rotating two of the green/orange pieces), the leftover cells form a zig pentomino cavity that matches **(D)** exactly. Hence both **A** and **D** can complete a full tiling, while **B** and **C** cannot, even by rotation/flip, because of the area mismatch and parity constraints.

Quick Tip

For tiling puzzles, **count area first**. If the board deficit equals only certain polyomino sizes, eliminate all options of the wrong area before worrying about geometry.

Q.34 Which of the chairs will rock to and fro? (Multiple correct)



Correct Answer: $\boxed{A,\ D}$

Solution:

A chair rocks if its base provides a *continuous smooth curved runner* with contact moving forward/backward while keeping the instantaneous centre of curvature below the seat—so that small fore–aft shifts of the centre of mass create restoring moments.

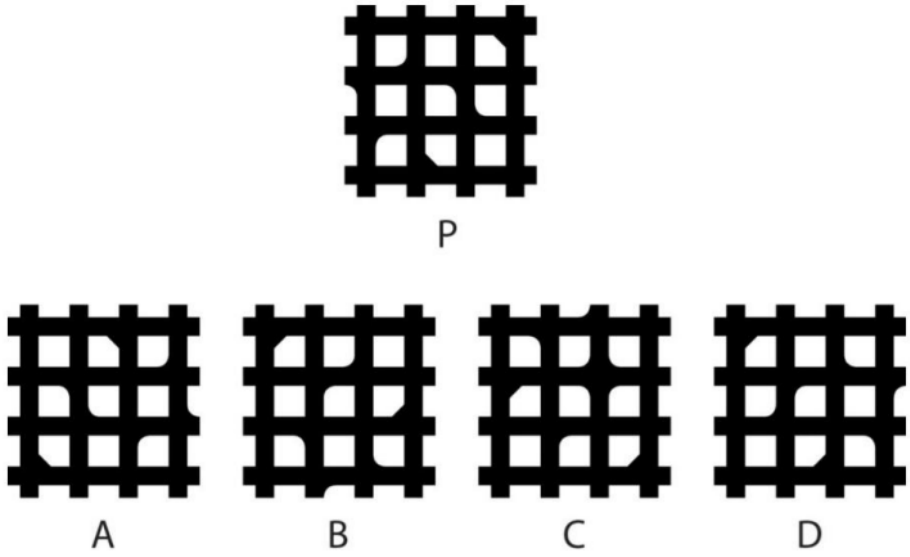
- **A**: Two long, smooth convex runners—classic rocking profile. **Rocks.**
- **B**: Base is a shallow *double-hump*; the contact point is near a local maximum and does not allow continuous roll; it tends to settle without true rocking. **Does not rock.**
- **C**: The runner is segmented with a flat/pointed joint; rolling is blocked by the sharp transition. **Does not rock.**

- **D**: Continuous circular-arc runners like a traditional rocker. **Rocks.**

Quick Tip

Rockers need a **single, smooth, convex arc** on the ground. Any break, flat, or multiple-hump profile prevents true to-and-fro rocking.

Q.35 Which of the options is/are simple rotation(s) of the image P?



(A) First rotated option

(B) Second rotated option

(C) Third rotated option

(D) Fourth rotated option

Correct Answer: (A), (B)

Solution:

To determine which options are simple rotations of image P, we look for identical configurations of lines, though rotated by 90°, 180°, or 270° degrees.

Step 1: Understand the given image P

Image P has horizontal and vertical lines that intersect in a grid-like structure, with some curved lines intersecting the grid. The task is to identify if any of the options show identical

patterns rotated.

Step 2: Examine each option

- **Option A:** The pattern is identical to image P, rotated by 90° clockwise. This is a valid rotation.

- **Option B:** This is a valid 180° rotation of image P.

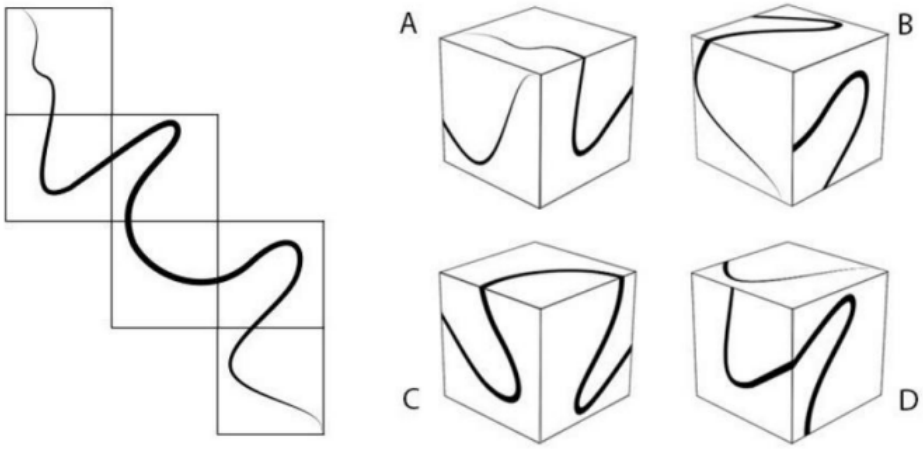
- **Option C:** This option shows a different pattern and cannot be obtained by rotating image P.

- **Option D:** Similar to Option C, this is not a valid rotation.

Quick Tip

To identify rotations, focus on the relationships between the lines and shapes. Rotate the original mentally and match it with the options.

Q.36 Shown on the left is the development of a cube. Which of the options can be created when the shown development is folded?



Correct Answer: (A), (C)

Solution:

The given development represents a net of a cube, and the goal is to identify which of the folded options match the given net.

Step 1: Analyze the net

The net is made of six squares, with a continuous wavy line drawn across three of them. We need to visualize how the net folds into a cube and check the corresponding wavy lines on the folded cubes.

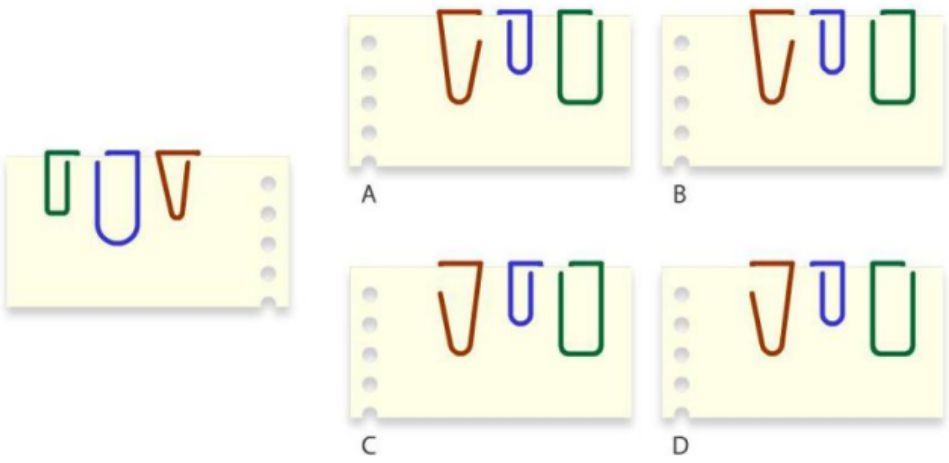
Step 2: Examine each option

- **Option A:** This folded cube correctly matches the placement of the wavy lines as expected when folded from the given net.
- **Option B:** This cube does not correctly match the wavy lines and cannot be created by folding the given net.
- **Option C:** This cube shows the correct alignment of wavy lines and is a valid option.
- **Option D:** Similar to Option B, this is not a valid folding based on the net.

Quick Tip

When dealing with nets of solids, visualize how the faces fold into the final 3D shape. Pay attention to the positioning of unique features, such as patterns or lines.

Q.37 Three paper clips are attached to a paper as shown on the left. Which of the options shows the back side of the paper?



Correct Answer: A, B

Solution:

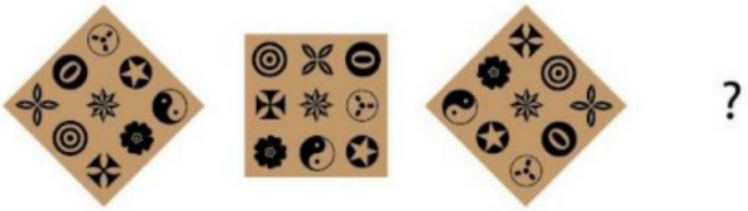
The orientation of the paper clips on the front side of the paper will determine how the back side looks. The clips that are facing downward on the front side will appear at the top of the

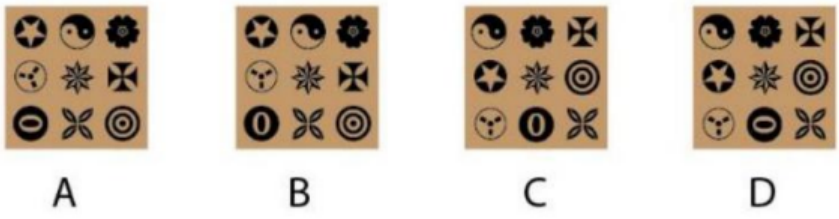
paper when viewed from the back. Similarly, clips facing upwards will appear at the bottom.
On the front side of the paper, we see:
- The green paperclip is at the top left.
- The blue paperclip is at the top right.
- The red paperclip is at the bottom right.
So, when we look at the back side of the paper, the green paperclip will be at the bottom left, the blue paperclip will be at the bottom right, and the red paperclip will be at the top right.
Hence, the correct answers are options A and B.

Quick Tip

Focus on how the clips are oriented on the front side and mentally reverse their positions to determine their arrangement on the back side of the paper.

Q.38 Three paper clips are attached to a paper as shown on the left. Which of the options shows the back side of the paper?





Correct Answer: A, B

Solution:

Work on the unit grid in the figure. Counting squares shows that **Figure P** has area 20 unit squares. If 4 identical copies tile P, then each piece must have area $20/4 = 5$ unit squares.

Check the options by counting their grid squares:

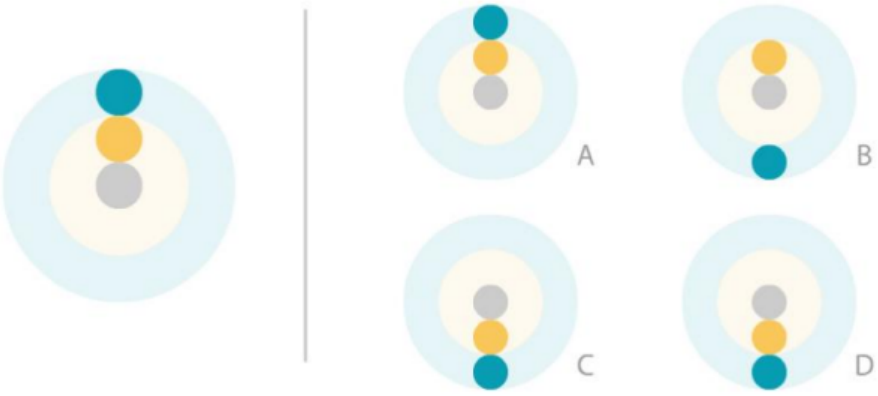
$$\textbf{A} : 5 \quad \text{(pentomino–L)} \qquad \textbf{B} : 5 \quad \text{(pentomino–Z/S)} \qquad \textbf{C} :\neq 5 \qquad \textbf{D} :\neq 5$$

Therefore only **A** and **B** meet the necessary area condition; with rotations/flips they fit the steps/concavities of P, so they can tile the shape. Options **C** and **D** cannot, since four copies would not match the required total area.

Quick Tip

For tiling questions with identical pieces, first use an **area invariant**: total area divided by the number of tiles gives the required area per piece. Any option with the wrong area can be discarded immediately.

Q.39 An animation of revolving circles is shown on the left. If it is flipped horizontally and then flipped vertically, what will be the resulting animation?



Correct Answer: (D)

Solution:

First, let's understand what happens when the animation is flipped horizontally: this would swap the left and right elements of the image, but it will maintain the relative orientation. Then, flipping the image vertically will reverse the top and bottom elements while maintaining the order of their orientation. Thus, the resulting image will match the pattern shown in option **(D)**.

Quick Tip

When manipulating shapes or objects in an animation, be sure to carefully follow the sequence of flips—first horizontal and then vertical—to understand the final result.

Q.40 You can set preferences in a mobile app by making a series of selections. You want to be notified of promotions and transactions, but do not want to receive newsletters. You want to allow access to your location and mic, but do not want to allow access to your contacts. What is the correct sequence of actions?

(A) Check, skip, check, skip, check, check

(B) Skip, Skip, check, skip, check, check

(C) Check, skip, check, skip, check

(D) Skip, skip, check, check, check, check

Correct Answer: (D)

Solution:

- You want to receive notifications for **Promotions** and **Transactions**, so these should be **checked**.

- You do not want to receive a **Newsletter**, so that should be **skipped**.

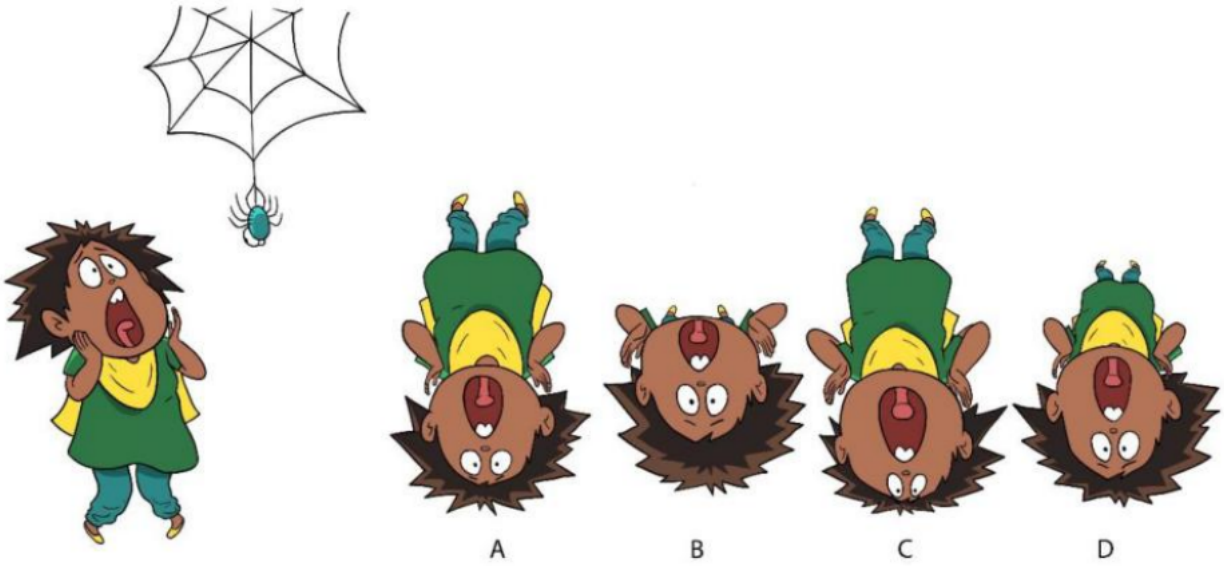
- You want to allow access to your **Location** and **Mic**, so these should be **checked**.

- You do not want to allow access to your **Contacts**, so that should be **skipped**. Therefore, the correct sequence is **(D)**: Skip, skip, check, check, check, check.

Quick Tip

When setting preferences, always read each item carefully to make sure you're selecting the right options based on your needs and restrictions.

Q.41 A story depicts Sabina encountering a spider. The continuing scene has to represent the *spider's point of view* (POV) of Sabina. What is the most appropriate option?



Correct Answer: (D)

Solution:

1) Fix the observer's pose and frame. The spider hangs *inverted* from the web above Sabina. A POV shot means "what the spider's retinas would see." Because the spider is upside down, its body-fixed vertical axis points opposite to the world's vertical.

2) What a POV does (and does not) do. A POV does not mirror the scene; it presents the scene from the observer's orientation. If the observer is inverted by $180°$, the entire world (including Sabina) appears *rotated by* $180°$ in that frame. Left–right do *not* swap unless a mirror is involved.

3) Apply the rotation. Let world coordinates be (X, Y) with $+Y$ up. The spider's camera

coordinates are related by a 180° rotation:

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix}.$$

Therefore every point of Sabina maps to one rotated by 180°: head appears at the "bottom," feet at the "top," and all features turn upside down while keeping left/right unchanged.

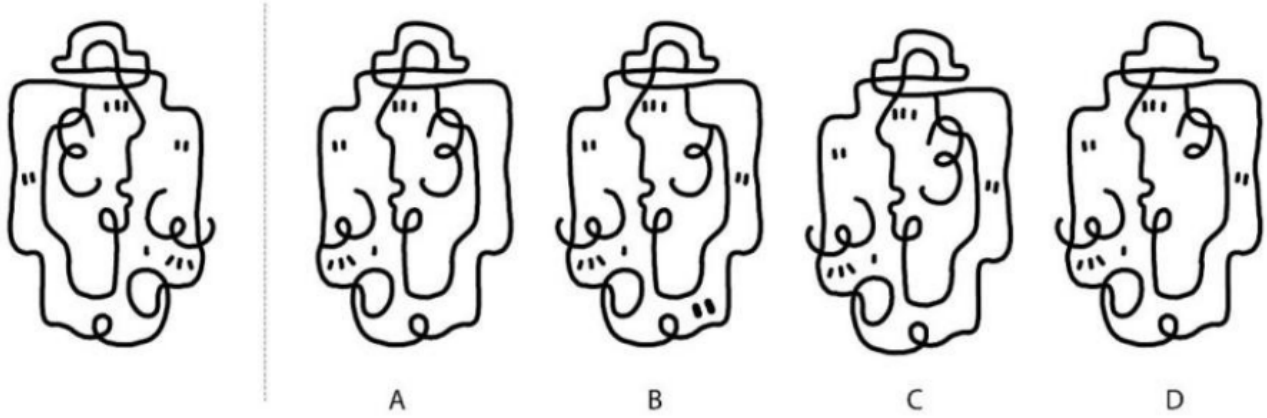
4) Eliminate wrong options.

- (A) and (B): Sabina is still upright (or only slightly tilted). That would be a ground observer's view, not an upside-down spider's.
- (C): A 90° rotation does not match the spider's inverted pose.
- (D): Sabina is rotated by 180° (upside down) with no left–right flip — exactly the spider's POV.

Quick Tip

POV = rotate the world into the observer's body frame. Mirror = flip left/right about a line. Do not confuse rotation (POV) with reflection (mirror).

Q.42 Which option is the correct *mirror image* of the figure given on the left (vertical mirror line)?



Correct Answer: (C)

Solution:

1) What a vertical mirror does. Let the mirror be the Y–axis. Reflection is the map $(x, y) \mapsto (-x, y)$: left/right swap, top/bottom remain unchanged, and there is no rotation. Every asymmetric cue must appear on the opposite side at the same height.

2) Identify non-symmetric cues in the source figure. (Exact labels may vary, but the picture shows them clearly.)

- A brim/hat detail leaning to one side,
- A side curl/bulge on one flank,
- A bottom curl opening toward one side,
- A small group of dots/notches on only one side.

In the mirror image, each must appear on the *opposite* side at the same vertical levels.

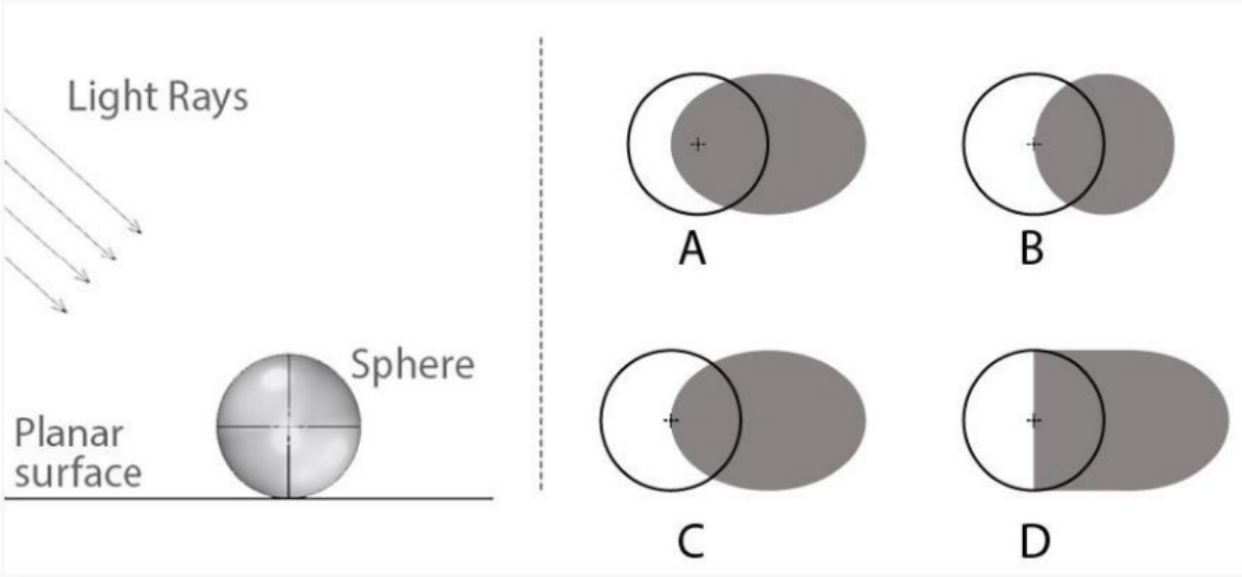
3) Check each option.

- (A) Some features change sides but others stay — not a pure mirror.
- (B) No left/right swap at all — not a mirror.
- (C) All markers swap sides without rotation — correct vertical mirror image.
- (D) Side swap plus rotation/distortion — mirrors do not rotate.

Quick Tip

For vertical mirrors: swap left/right while keeping heights fixed. Track a few distinctive markers; if any fails the left–right swap (without rotation), the option is wrong.

Q.43 A solid sphere is on a horizontal plane. Parallel rays of light come from the upper–left, as shown. Which option shows the correct shadow on the plane?



Correct Answer: (A)

Very detailed solution:

1) What is the exact shape of a sphere's ground shadow under parallel light?

Let the plane be $z = 0$, the sphere have radius R with centre $C = (0, 0, R)$ (touching the plane at the origin), and the unit light direction be

$$\hat{\mathbf{d}} = (\cos\theta,\, 0,\, -\sin\theta), \qquad 0 < \theta < \tfrac{\pi}{2},$$

i.e. light comes from the left and above. A point $P = (x, y, 0)$ on the plane is in shadow iff the line $P + t\hat{\mathbf{d}}$ hits the sphere

$$\|(P + t\hat{\mathbf{d}}) - C\| = R \text{ for some } t > 0.$$

The boundary of the shadow is where the line is tangent to the sphere, i.e.

$$\|(C - P) \times \hat{\mathbf{d}}\| = R.$$

With $C - P = (-x, -y, R)$ and the $\hat{\mathbf{d}}$ above, this yields after simplification

$$\frac{(x - R\cot\theta)^2}{(R/\sin\theta)^2} + \frac{y^2}{R^2} = 1.$$

Hence the umbra on the plane is an *ellipse*, centred at $(R\cot\theta, 0)$, with semi-axes $a = R/\sin\theta$ (along the light direction) and $b = R$ (across it). Geometrically: - The near edge of the shadow lies just to the *left* of the contact point; - The shadow stretches *farther to the right* (away from the light), producing an elongated footprint.

2) Compare with the options.

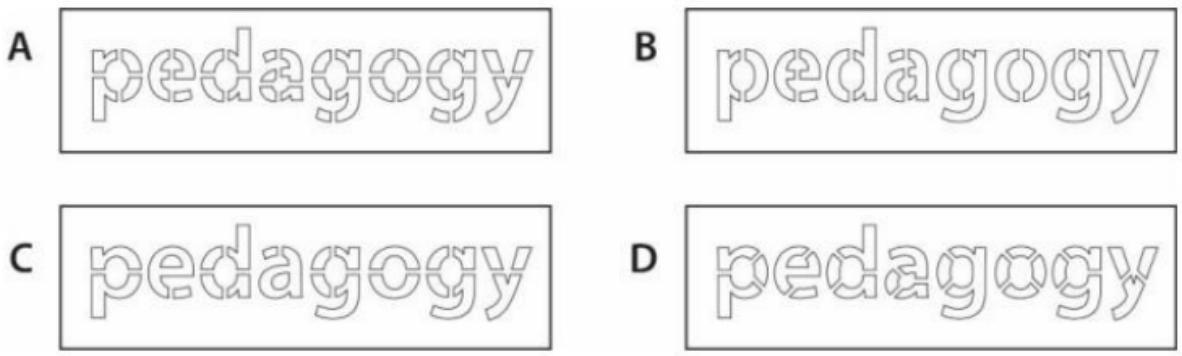
Only option **A** shows: - an *elliptical* ground shadow, - elongated in the correct (rightward) direction, - with the near edge tangent to the sphere at the floor and the far edge extending well to the right.

Options **B**, **C**, **D** either place the elongation on the wrong side, make the near/far boundaries inconsistent with the ray direction, or depict an incorrect shape.

Quick Tip

For parallel illumination, a sphere's ground shadow is the parallel projection of a circle, hence an **ellipse** whose long axis lies along the ray direction; it extends away from the source.

Q.44 Four students designed stencils for the word *pedagogy*. Which design will *not* work as a stencil?



Correct Answer: (C)

Very detailed solution:

A stencil is a single sheet that, when areas are cut out, must remain in one piece. Letters with **closed counters** (enclosed holes) would fall out unless connected to the background by small **bridges/tabs**. In the word `pedagogy`, the letters with enclosed areas are: **p, e, a, d, o, g**. **Check each option carefully.**

- **A** — The internal regions of p, e, a, d, o, g are broken with small tabs to the surrounding

rectangle. All counters stay attached. **Works.**

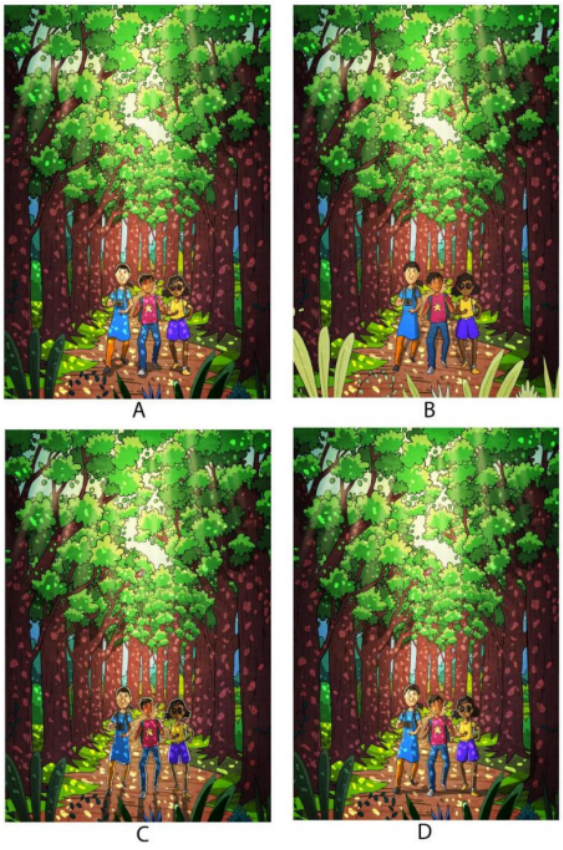
- **B** — Outline style with intentional breaks on the counters provides bridges (the islands are not fully detached). **Works.**
- **C** — Each of p, e, a, d, o, g has a *fully closed* counter with no bridge to the sheet. When cut, these islands fall away; the printed letters lose their interior shapes (e.g. o becomes a solid blob). **Does not work.**
- **D** — Like A/B, counters are interrupted by small gaps acting as bridges. **Works.**

Conclusion. The only unusable stencil is **C**.

Quick Tip

Stencil rule: **Every enclosed counter needs at least one bridge**. If a hole is fully closed, that island will fall out when cut.

Q.45 A group of friends are on a trek. The sunlight is directly above them. No other light source is present. Identify the most appropriate lighting for this scene.



Correct Answer: (A)

Solution:

With the **sun directly overhead** and no other source, the physically correct cues are:

– **Cast shadows** fall *straight down* from objects, appearing as *short, nearly circular* patches right beneath feet and plants.

– **Highlights** occur on the *top* surfaces (crowns of leaves, heads/shoulders), while vertical tree trunks have minimal left–right bias.

– The forest floor shows **dappled pools of light** approximately centered below canopy gaps.

Option **A** shows all these cues. Options **B**, **C** and **D** show directional/angled lighting (front, side, back) with long slanted shadows, which contradict an overhead sun.

Quick Tip

For "overhead light," look for *short, centered* shadows and top-lit highlights; any sideways bias in shadows implies a low, directional sun.

Q.46 Identify the odd one.

Correct Answer: (D)

Solution:

In **A**, **B**, and **C** the motif shares two structural properties:

1) a **single continuous outer boundary/loop**, and

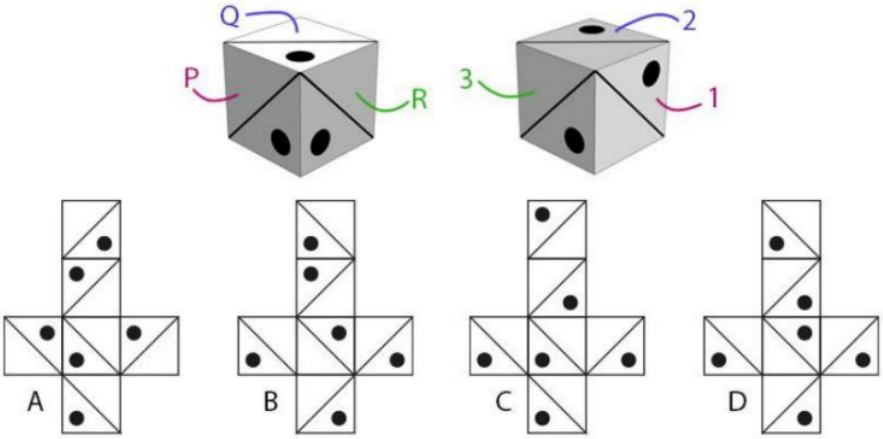
2) a **central pendant element** hanging down the vertical axis from the top into a small circle at the bottom.

Option **D** lacks this structure: its top splits into *two separate lobes* (no single enclosing outer loop) and the small circle is *supported laterally* by two arms rather than by a central vertical pendant. Hence **D** is the odd one out.

Quick Tip

When spotting an odd figure, list a couple of *shared structural rules* among most options (symmetry axis, continuous contour, common "spine") and choose the one that violates them.

Q.47 Shown below are the 2 views of a cube. If face P is opposite to 1, Q is opposite to 2 and R is opposite to 3, which option can be folded to make the cube?



Correct Answer: C

Solution:

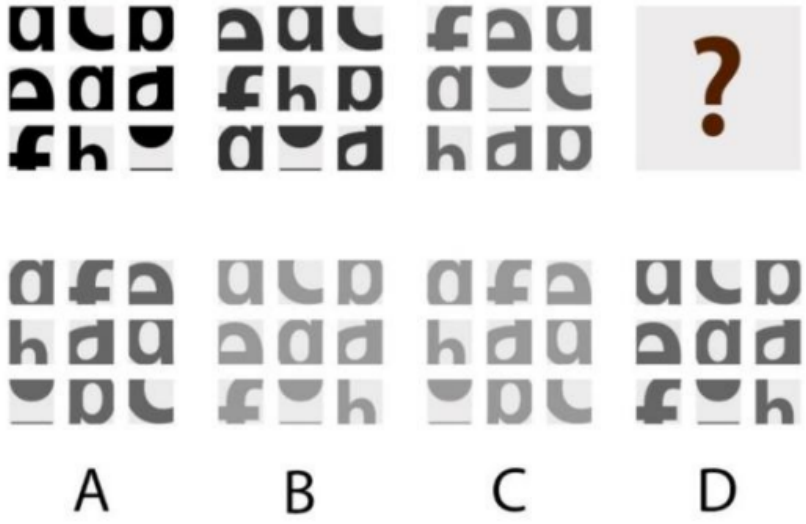
In cube folding problems, it's crucial to examine how the faces are positioned relative to each other. Based on the given views, we can determine the orientation of faces.

1. In the given views, face P is opposite to face 1, face Q is opposite to face 2, and face R is opposite to face 3.
2. Now, we need to check which of the options fits this condition when folded.
3. Option A places face P adjacent to face 1, which violates the opposite face condition.
4. Option B places face R adjacent to face 3, which also violates the condition.
5. Option C places face P opposite to face 1, face Q opposite to face 2, and face R opposite to face 3, which correctly follows the given conditions. Therefore, option C is correct.

Quick Tip

When solving cube folding problems, focus on the relationships between opposite faces and how they fold in three-dimensional space. Visualizing the cube's unfolding can help.

Q.48 Which option completes the given pattern?



Correct Answer: C

Solution:

This problem requires pattern recognition, specifically identifying how elements in the sequence change over time. Let's break it down step-by-step:

1. The images in the pattern show characters that rotate or flip in a consistent way. Each block in the sequence is a transformation of the previous one.

2. In the given set, observe that the first image starts with the letter 'a' and moves through a series of rotations and reflections.

3. The color and orientation of the letters also change in a predictable way. Each character in the row either rotates or flips 90 degrees to form the next character.

4. Option A does not align with the pattern as it introduces an incorrect rotation and change in character shape.

5. Option B introduces inconsistencies in color and position that do not match the observed

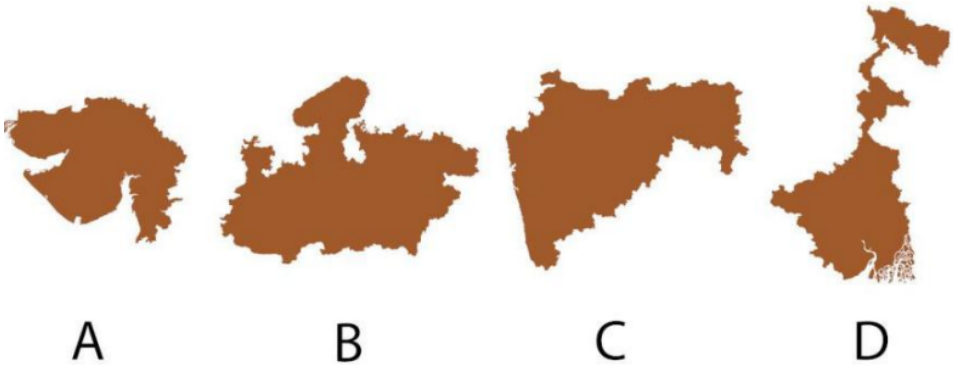
changes in the sequence.

6. Option C aligns perfectly with the required transformations based on the previous steps, and thus completes the sequence correctly.

Quick Tip

When solving pattern recognition problems, focus on the transformations, such as rotations, flips, and color shifts, that occur between steps. Identifying a consistent rule will help you predict the next image in the sequence.

Q.49 The options show maps of some states of India. In only one option the map has been *scaled* (uniformly stretched or shrunk). Which option is it?



Correct Answer: D

Solution:

A uniform scale changes only the *overall aspect ratio* (height/width) while preserving all inner angles and local shapes.

Compare each silhouette with its familiar proportions: - **A** (Gujarat), **B** (Rajasthan) and **C** (Maharashtra) keep their usual width–height proportions—no stretching is visible.

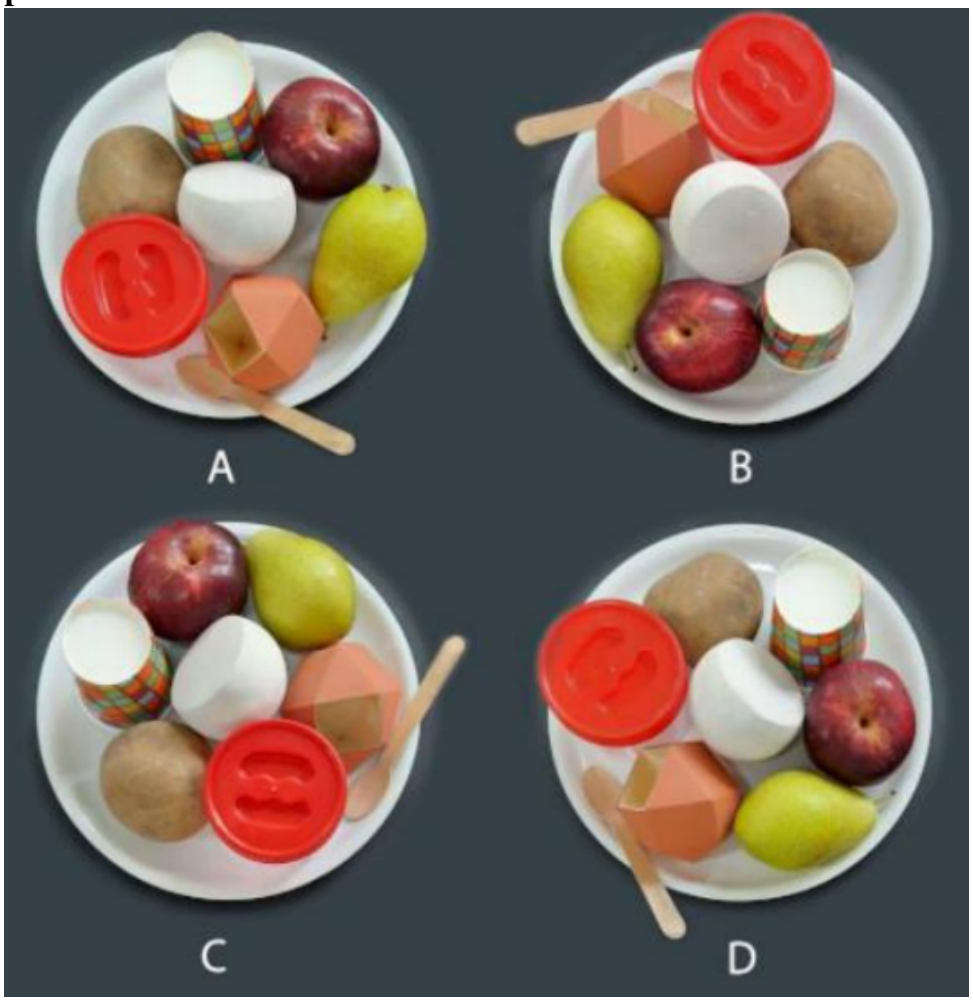
- **D** (West Bengal) appears **vertically stretched**: the narrow waist in the north and the delta in the south look taller and slimmer than the normal outline. This distortion is exactly what a uniform scale along one axis produces.

Hence only option **D** is a scaled version.

Quick Tip

To spot a scaled outline, compare **key ratios**—e.g., height/width or the relative sizes of distinctive lobes. If every local corner looks right but the whole looks too tall or too wide, it's been scaled.

Q.50 Gita photographed a plate of objects, then took two more photos by *turning the plate* without disturbing the arrangement. Later, Shefali arranged the *same objects* on a similar plate under similar lighting and took a photo. Which option shows *Shefali's* photo?



Correct Answer: A

Solution:

When Gita rotates the plate, all items rotate rigidly; the photo therefore must be a **pure**

rotation of the original—no left/right reversal.

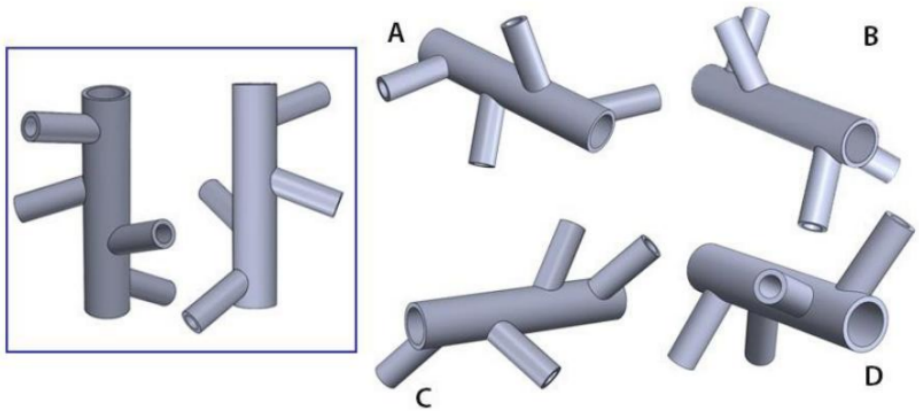
Inspect the options using features such as the direction of the wooden stick and the order (clockwise) of {cup, red lid, apple, pear, potato, prism}.

- **B**, **C**, and **D** are rotations of the first view (the clockwise ordering is preserved).
- **A** shows a **mirror reversal** (the clockwise order becomes counter-clockwise); such a reflection cannot result from merely turning the plate, but it can occur when a second person re-places the same objects on another plate.

Therefore **A** must be Shefali's photo.

> **Quick Tip**
>
> A rotation preserves the clockwise order of objects; a mirror swap reverses it. Use that invariant to separate "turned" photos from re-created ones.

Q.51 Two views of the same object are shown in the box. Which option depicts the same object?



Correct Answer: A

Solution:

In this problem, we are presented with two different views of a 3D object, and we need to identify which option accurately represents that object when viewed from a different angle.

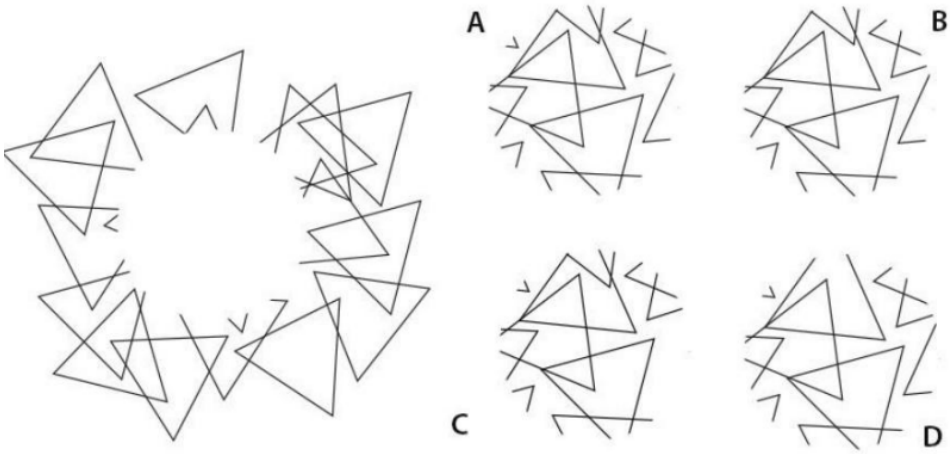
- The given object has a central cylindrical portion with smaller cylindrical sections attached at different angles.

- **Option A** shows the same structure with the same arrangement of the cylindrical pieces in the correct orientation, so it matches the given object.
- **Options B, C, and D** do not match the object's structure, as the arrangement of cylindrical sections differs from the provided views. Therefore, the correct answer is **A**.

Quick Tip

When dealing with 3D objects, try to visualize how the different parts are oriented relative to each other, and match them from different angles.

Q.52 The image shown below is made up of triangles only, from which the central portion is missing. Identify the missing portion.



Correct Answer: A

Solution:

We are provided with a geometric figure formed entirely of triangles, where the central portion is missing. Our task is to identify which of the given options completes the missing portion.

- We can observe that the triangles in the image are arranged symmetrically in a circular pattern. By analyzing the pattern, we can infer that the missing portion should fit in the center of the arrangement and complete the symmetry.
- **Option A** correctly fills in the missing portion, continuing the symmetry of the surrounding triangles.

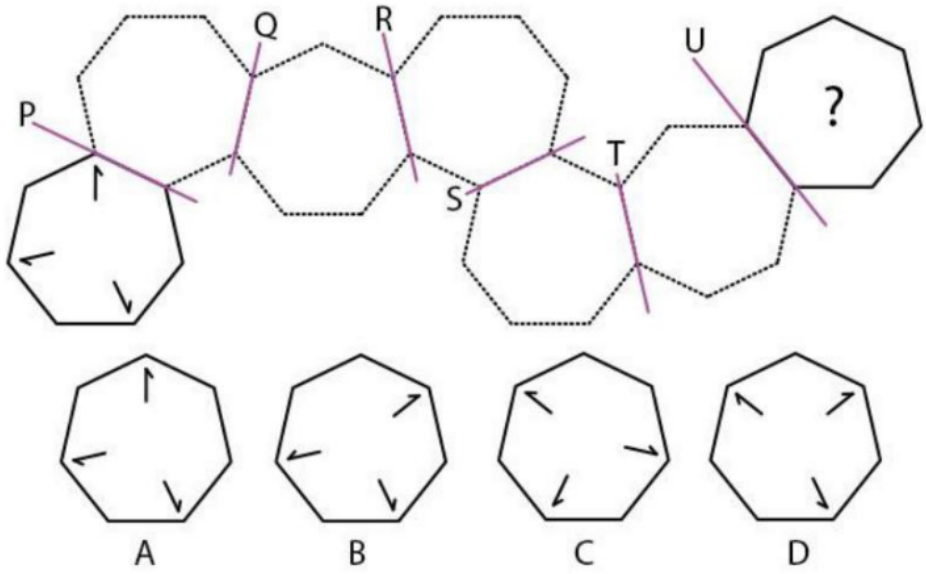
- **Options B, C, and D** do not fit the pattern as they either lack the correct orientation or number of triangles.

Thus, the correct answer is **A**.

Quick Tip

When solving geometric puzzles, focus on identifying the pattern and symmetry in the arrangement of shapes to deduce the missing portion.

Q.53 The figure shown below is mirrored along the axes P, Q, R, S, T and U. What would be the resultant figure?



Correct Answer: (B)

Solution:

Step 1: Understanding the Mirroring Process:

To solve this, we need to mirror the figure along the given axes (P, Q, R, S, T, U). This means we will reverse the parts of the figure across each of these axes and check the resulting positions of the shapes.

Step 2: Visualizing the Mirroring on Each Axis:

- The first axis (P) mirrors the shape in the first part of the figure. - The second axis (Q) mirrors the next portion, and so on until all axes are accounted for. We must ensure that the

mirrored parts align correctly with the given options.

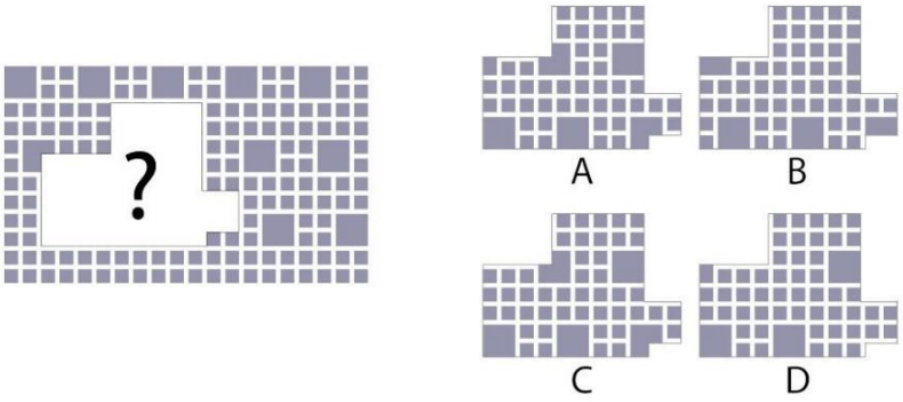
Step 3: Comparing the Resulting Shape with Options:

After mirroring, we get the final shape that matches option B. The shape created by the mirrors aligns perfectly with the geometry in option B.

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

> When solving mirroring problems, always carefully consider the axis of symmetry and how the components align when reflected. This will help in visualizing and matching the final shape.

Q.54 Shown below is a puzzle. What will fill the missing part?



Correct Answer: (A)

Solution:

Step 1: Analyzing the Puzzle:

We are given a puzzle with some missing parts that we need to fill. To solve it, we should analyze the pattern or sequence in the puzzle and identify the piece that fits.

Step 2: Observing the Pattern:

The key to solving this puzzle lies in recognizing the repetitive pattern of shapes and how they fit into the grid. By analyzing the already filled sections, we can determine which piece completes the puzzle.

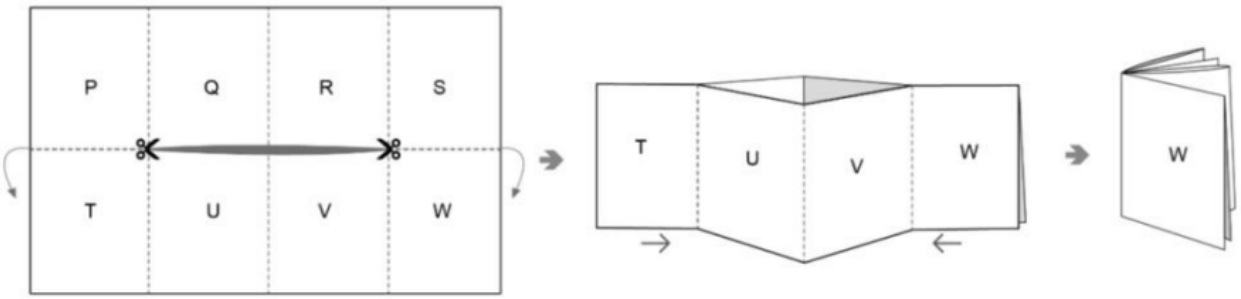
Step 3: Matching the Correct Piece:

After comparing the options, option A fits perfectly into the empty space in the puzzle. Its shape matches the pattern established by the other pieces.

Thus, the correct answer is **A**.

> In puzzles like these, look for repetitive patterns in the shapes. Identify how each piece connects and fits into the grid. Sometimes, visualizing the placement step-by-step helps in selecting the right piece.

Q.55 An A4 size paper is cut as shown below and folded across the dotted lines such that it has eight faces named from 'P' to 'W'. It is further folded to make a small booklet for the purpose of a zine design. From the given options, select the correct sequence of pages.



(A) P, Q, R, S, T, U, V, W

(B) W, S, R, V, U, Q, P, T

(C) W, S, R, Q, P, T, U, V

(D) W, V, U, T, S, R, Q, P

Correct Answer: (C)

Solution:

Understanding the structure of the folding process:

The given pattern is created from an A4 sheet folded in such a way that each face is named from P to W. These are the faces of a booklet when the paper is folded along specific dotted lines. When we fold a paper with multiple pages, we need to understand how these pages

appear after folding and how the individual faces (P, Q, R, S, T, U, V, W) are arranged in sequence.

Step 1: Visualizing the fold:

When the paper is folded, you need to consider the way it overlaps to ensure the pages end up in the right order. Each half of the fold will form part of a page spread that contains two pages per sheet. The order of the pages changes because they get folded, and the opposite sides will be together.

In this case, after folding, the first page will be facing the last one (in this case, P faces W), the second will face the second last (Q faces V), and so on.

Step 2: Visualizing the pages:

To visualize the correct sequence, we consider the following relationships between the pages:

- P faces W
- Q faces V
- R faces U
- S faces T

From this, we get the correct sequence of pages when folded:

W, S, R, Q, P, T, U, V

So the correct sequence of pages is **W, S, R, Q, P, T, U, V**.

Step 3: Comparing with options:

We now compare this sequence with the given options:

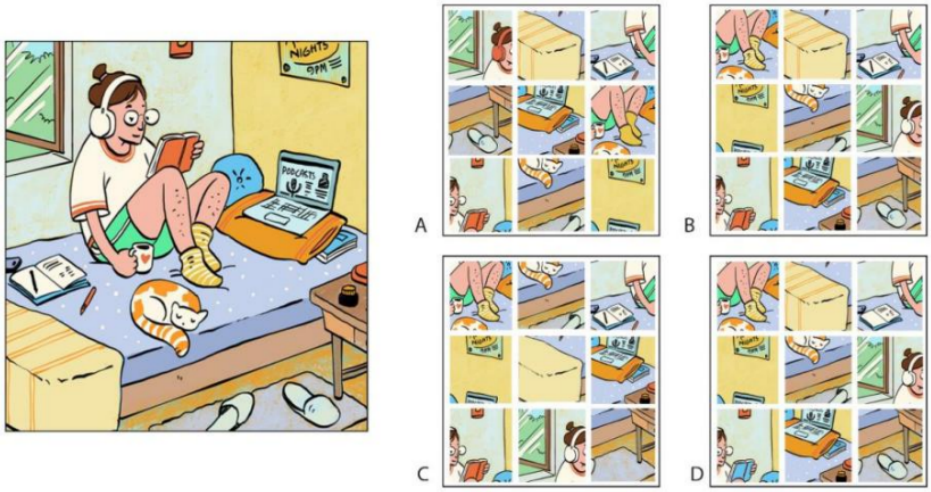
- Option A: P, Q, R, S, T, U, V, W — Incorrect, this is the sequence before folding.
- Option B: W, S, R, V, U, Q, P, T — Incorrect, doesn't match the fold pattern.
- Option C: W, S, R, Q, P, T, U, V — Correct, this matches the sequence obtained.
- Option D: W, V, U, T, S, R, Q, P — Incorrect, the sequence is out of order.

Thus, the correct option is **C**.

Quick Tip

When working with folding puzzles, always pay attention to the relative positions of the pages after folding. Consider how each fold will overlap the pages. This will help in identifying the correct sequence of pages.

Q.56 The left image below shows Nandu's study room. The image is sliced in 9 equal parts. From the given options, find the correct set of images.



(A) Image set A

(B) Image set B

(C) Image set C

(D) Image set D

Correct Answer: (C)

Solution:

Understanding the slicing process:

The given image of Nandu's study room is sliced into 9 equal parts. Each slice of the image contains a portion of the scene, which can be rearranged to form the complete picture. Our task is to find the correct arrangement of slices that would result in a coherent image that resembles the original scene.

Step 1: Analyzing the original image:

In the original image, we have several distinct elements such as a desk, a chair, a laptop, a poster on the wall, a cat, and Nandu sitting with a book. We need to observe how these elements are positioned in the original image and how they are distributed among the slices.

Step 2: Evaluating each option:

We will now look at each of the options and see which one fits the original image layout. The goal is to find a set of slices that, when arranged, will maintain the consistency of the original scene.

- Option A: This set does not align the elements in a logical sequence and does not maintain the visual flow of the image.
- Option B: This set also distorts the arrangement of elements and doesn't make the scene complete.
- Option C: This set maintains the correct positions of the various elements of the room and reconstructs the image logically. It places Nandu, the cat, the laptop, and other details in the correct sequence, making it the correct choice.
- Option D: This set, while close, doesn't maintain the correct spatial relationship between the elements.

Thus, the correct answer is **C**.

Step 3: Reconstructing the image:

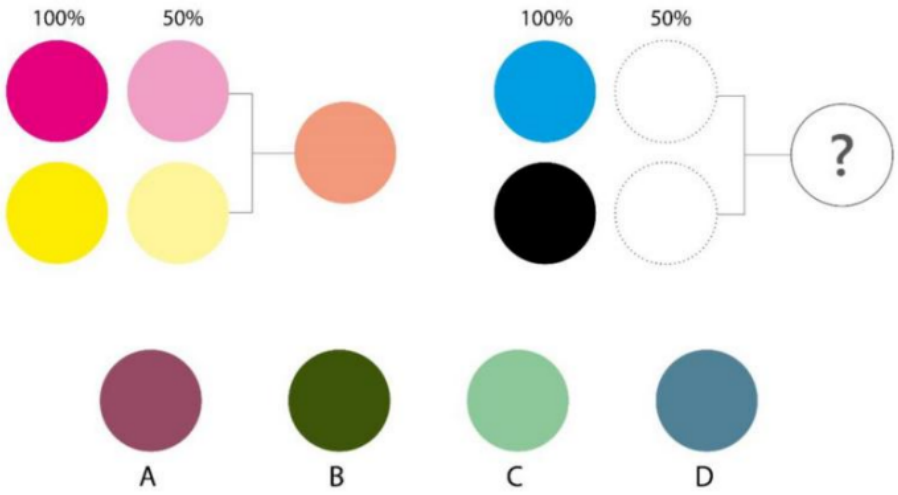
The correct set of slices, when arranged, will resemble the original image, where we see Nandu sitting in the room with the cat and the desk, and the elements are correctly placed. This matches the original scene perfectly.

Quick Tip

When working with image slicing puzzles, first identify key visual features in the original image. Then, focus on arranging the slices in a way that keeps these features intact, such as the positioning of objects and characters in the scene.

Q.57 The two color combinations shown on the left are mixed in the ratio 100%:50%. Which color combination, when mixed in the same ratio, will result in the color on the

right?



Correct Answer: D

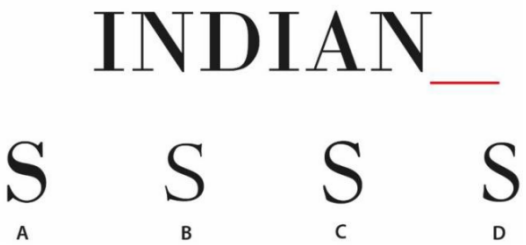
Solution:

For the left pair, the two colors (magenta and yellow) mix to form orange. The ratio 100For the right pair, blue and white are mixed. If we mix blue (100Now, we check the options: - **A, B, and C** do not represent a light blue shade. - **D** shows a shade of blue that corresponds well with the 100Hence, the correct answer is **D**.

Quick Tip

When mixing colors, the intensity of the final color is determined by the dominant color in the mixture. In this case, the right combination of blue and white gives a light blue color.

Q.58 Fill in the blank with the same font.



Correct Answer: A

Solution:

The given word is ”INDIAN,” and we are tasked with choosing the correct font for the letter ”S.” We observe that the font is bold with clean edges and straight lines. - **Option A** shows a similar font with the same boldness and straight lines, making it the correct choice. - **Options B, C, and D** do not match the font style as closely as Option A does. Therefore, the correct answer is **A**.

Quick Tip

To match fonts, focus on the characteristics like weight (bold or regular), shape (serifs or sans-serif), and line quality (straight or curved).

Q.59 A folding paper fan P is dipped in orange colour and then in red colour as shown. Which option is the closest representation of the resultant fan?

Solution:

In the given question, the fan P is first dipped in orange colour, and then in red colour. The folding fan has a gradient effect where orange is present in the inner parts and red is on the outer part due to the sequence of dipping. The final result shows a blended gradient from orange to red.

Step 1: Analyze the folding process

The folding fan consists of paper sections arranged radially, and when dipped, the innermost areas will have the first colour (orange), with the outermost parts getting the second colour (red).

Step 2: Compare each option against the visual characteristics

(A) The fan has orange in the middle and red on the edges, which is the expected effect from the dipping order — this fits the correct representation.

(B) The fan shows an incorrect colour distribution that does not match the pattern of dipping.

(C) The fan shows an abrupt transition between colours that is not consistent with the expected gradient.

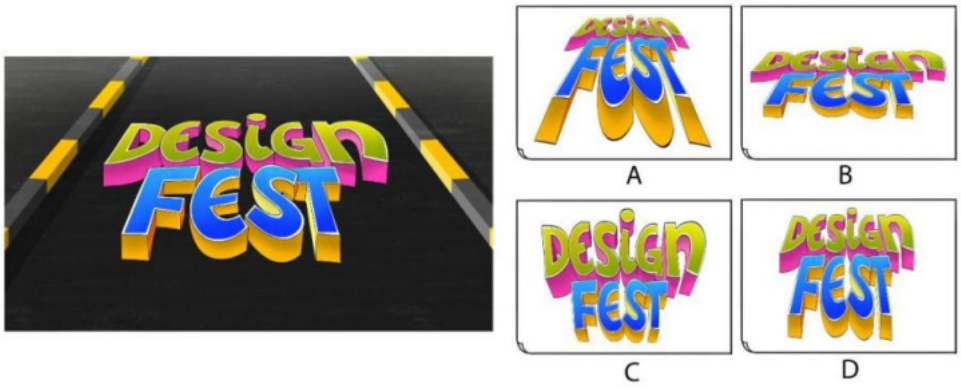
(D) The fan has a reverse colour distribution, with red in the centre and orange on the outer edges, which does not match the expected outcome.

$\boxed{A}$

Quick Tip

In gradient-based questions, carefully examine the placement and blending order of colours based on the sequence of actions described in the question. Pay attention to how the colours interact and where they are applied.

Q.60 A painting was created on the road as shown in the image. From the given options, identify which image was used to plan the painting (as seen from the top view).



Solution:

The painting shows the text ”DESIGN FEST” with three-dimensional effects, placed in the middle of a road. To plan this painting, we need to visualize it from the top view.

Step 1: Understand the perspective and orientation

In the given options, the painting should have the text visible from a bird’s eye view, which would affect how the 3D elements (like shadows and depths) are viewed. The text should appear properly aligned with the road’s lanes in the top view.

Step 2: Compare each option with the road view

(A) The text ”DESIGN FEST” appears to have the correct depth and angle when viewed from the top, matching the ground-level painting’s perspective. This option matches the expected outcome.

(B) The text shows an angle that is too extreme for a top view.

(C) The perspective here is wrong, as the 3D text is misaligned with the road lanes.

(D) The depth and positioning here do not align with the expected top view.

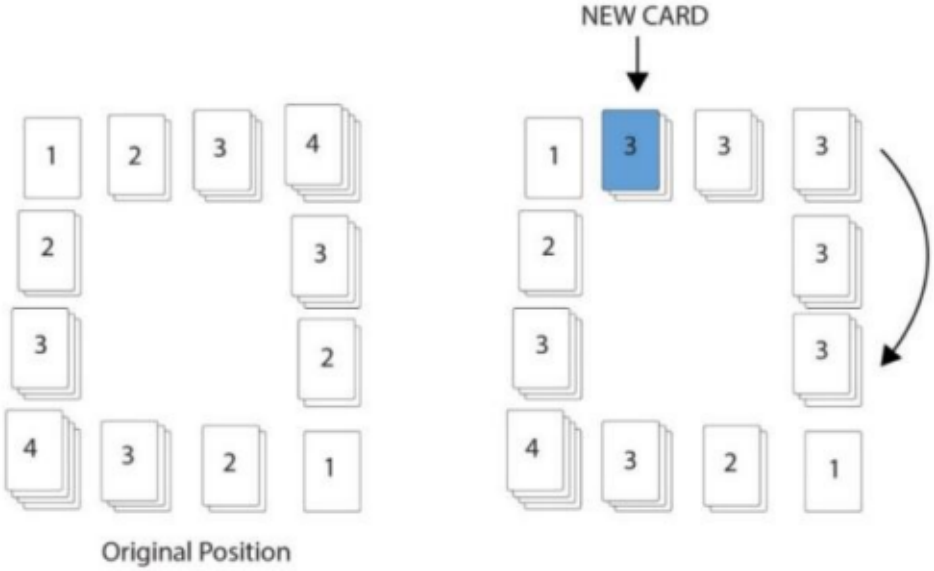
$\boxed{A}$

Quick Tip

When evaluating top-down view questions, focus on how 3D elements such as shadows and depth would appear if viewed from above. Correct alignment and proportion with the surrounding context (in this case, the road) is key.

Q.61 A game board was set with multiple decks of cards arranged in such a way that sum total of the cards on each side was equal (1+2+3+4=10). However, a new card was added on

one side (blue card) and the cards were rearranged to maintain the rule, namely, that the sum total equals 10. How many cards can be added (starting from original position as shown on the left) before the game ends and no more cards can be added? Assume that every position must have at least one card and the sum total rule of 10 must be followed.



(A) 4

(B) 6

(C) 8

(D) 10

Correct Answer: (B) 6

Solution:

Let's examine the initial card arrangement: the cards are arranged in four positions and each set of numbers on each side adds up to 10. The sum of numbers on each side is balanced by the addition of a blue card. After the blue card is placed, we need to check how many more cards can be added while maintaining the rule that each side sums to 10.

Step 1: Analyze the existing positions

Initially, we have cards 1, 2, 3, and 4, which sum to 10. Once the new card (value of 3) is added, we need to ensure that every position still sums to 10 with the new card included.

Step 2: Check each possible scenario for adding more cards

- If we add more cards, we must check that the sum rule of 10 holds for each side. - As the cards need to maintain their individual value as well, we are limited in the number of cards

that can be added.

Step 3: Conclusion

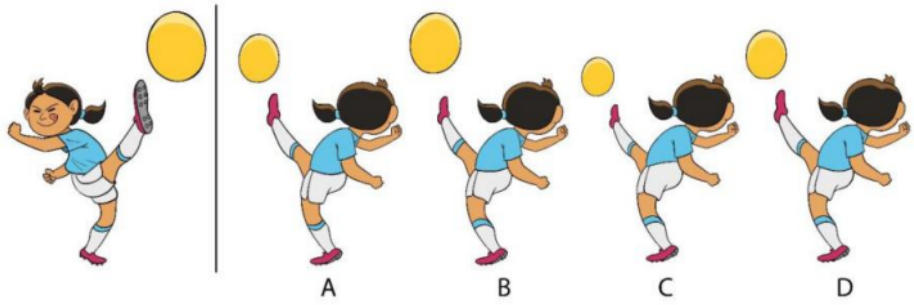
From the structure of the problem and the limits imposed by the sum rule of 10, the correct number of cards that can be added is 6.

6

Quick Tip

When dealing with number arrangement puzzles, always start by analyzing the initial setup to understand the pattern. Then, incrementally check how each new addition influences the overall sum and constraints.

Q.62 Fatima is shown kicking the football. Identify the most appropriate illustration of the scene observed from behind.



Solution:

To determine which illustration best represents the scene observed from behind, we need to imagine the position of Fatima and the ball from the rear perspective.

Step 1: Understand the movement and position of the ball

- Fatima is kicking the football, so the ball will likely be projected forward in the direction of her kick.

- The key observation is that from behind, the ball would appear to be just in front of her foot, showing the trajectory in alignment with the motion.

Step 2: Compare each option against the rear view

- Option (A) shows Fatima with the ball further behind her, not in line with the expected direction of the kick.

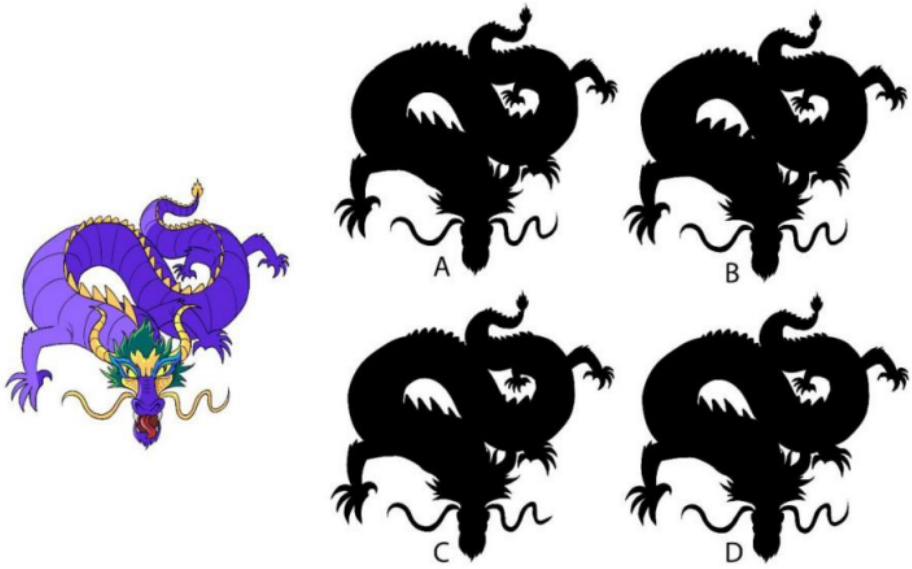
- Option (B) correctly shows the ball in front of her and aligns with the direction in which she is kicking.
- Option (C) and (D) show incorrect perspectives where the ball's position and Fatima's foot alignment do not match the rear view.

$\boxed{B}$

Quick Tip

For questions involving perspectives, always focus on the direction and position of key elements (like the ball or object in motion). Visualize how the scene would appear from the given perspective.

Q.63 Identify the correct silhouette of the coloured dragon.



Correct Answer: A

Solution:

In this problem, we are given a coloured image of a dragon and asked to identify which silhouette correctly represents the dragon from the provided options.

- The dragon's shape and features must be closely examined to match the silhouette accurately.
- **Option A** shows the correct silhouette, closely following the contours of the dragon's body, head, and tail, as seen in the original image.

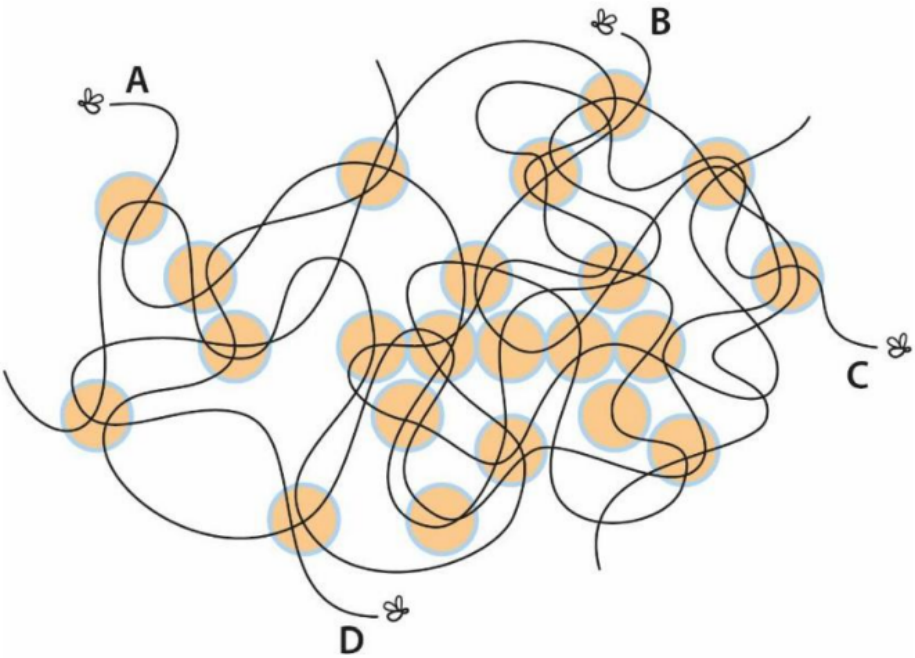
- **Options B, C, and D** do not match the shape or position of the features of the dragon as closely as option A.

Thus, the correct answer is **A**.

Quick Tip

When identifying silhouettes, focus on key features such as body shape, limbs, and distinguishing characteristics like the head or tail.

Q.64 Shown below are trajectories of 4 flies over the juice glasses. Identify the fly that crossed over the maximum number of glasses.



Correct Answer: B

Solution:

In this problem, we are given four trajectories of flies over glasses and asked to determine which fly crossed over the maximum number of glasses.

- We can observe the paths of each fly and count the number of glasses each fly intersects.
- By closely tracking the fly paths in each option, **Option B** clearly crosses the most number of glasses.

- **Options A, C, and D** do not intersect as many glasses as fly B does. Thus, the correct answer is **B**.

Quick Tip

When determining the number of intersections in a path, carefully trace each path and count all glasses that the path crosses.

Q.65 A list of 8 country names in Vietnamese (shown in red), and their English translations (shown in blue) are given below. The translation list is mixed up. Which of the following statements is TRUE?

Áo, Ba Lan, Bỉ, Đan Mạch, Hà Lan
Na Uy, Phần Lan, Thụy Điển

Finland, Austria, Denmark, Norway,
Netherlands, Belgium, Sweden, Poland

(A) an Mch is Denmark, Thy in is Sweden, Phn Lan is Poland
(B) Hà Lan is Netherlands, Áo is Austria, and Ba Lan is Poland
(C) Bi is Belgium, Hà Lan is Finland, and Na Uy is Norway
(D) Na Uy is Netherlands, Thy in is Denmark, and Phn Lan is Finland

Correct Answer: (B) **Hà Lan is Netherlands, Áo is Austria, and Ba Lan is Poland**

Solution:

We are given the following Vietnamese country names and their English counterparts:

Áo, Ba Lan, B, an Mch, Hà Lan, Na Uy, Phn Lan, Thy in

and their English translations:

Finland, Austria, Denmark, Norway, Netherlands, Belgium, Sweden, Poland

Let's evaluate each option:

Option (A): ”an Mch is Denmark, Thy in is Sweden, Phn Lan is Poland” — This does not match. The correct translation of ”Phn Lan” is Finland, not Poland.

Option (B): ”Hà Lan is Netherlands, Áo is Austria, and Ba Lan is Poland” — This is correct. ”Hà Lan” is Netherlands, ”Áo” is Austria, and ”Ba Lan” is Poland.

Option (C): ”Bi is Belgium, Hà Lan is Finland, and Na Uy is Norway” — This is incorrect. ”Hà Lan” is Netherlands, not Finland.

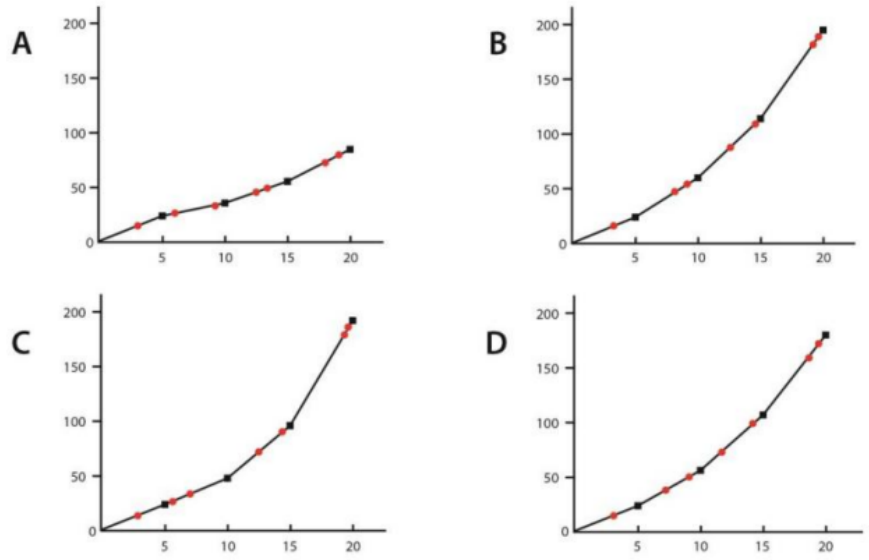
Option (D): ”Na Uy is Netherlands, Thy in is Denmark, and Phn Lan is Finland” — This is incorrect. ”Na Uy” is Norway, not Netherlands.

$\boxed{B}$

Quick Tip

For such translation and matching problems, process each pair logically by comparing known facts (geographical, linguistic). When in doubt, break the problem down into smaller components.

Q.66 India and Australia are playing the finals of World Cup T20 cricket match. India won the toss and decided to bat. At the end of 5 overs, India scored 24 runs with one wicket down. From there on, in every 5 overs, India scored 50% more runs than the previous 5 overs and lost two wickets. From the options, identify the correct graph that shows India's final score.



Solution:

Let's break down the scoring process: - **At the end of 5 overs**, India scored 24 runs, with one wicket down. - **In every subsequent 5 overs**, the runs scored increased by 50% compared to the previous 5 overs, while two wickets were lost.

Step 1: Calculate runs scored in successive intervals

- 5th over: 24 runs - 10th over: $24 \times 1.5 = 36$ runs (50% more) - 15th over: $36 \times 1.5 = 54$ runs (50% more) - 20th over: $54 \times 1.5 = 81$ runs (50% more)

Step 2: Construct the graph

The total runs will continue to increase, and we expect an upward-sloping graph, with each increase representing 50% more runs compared to the previous segment. The wickets continue to increase as well.

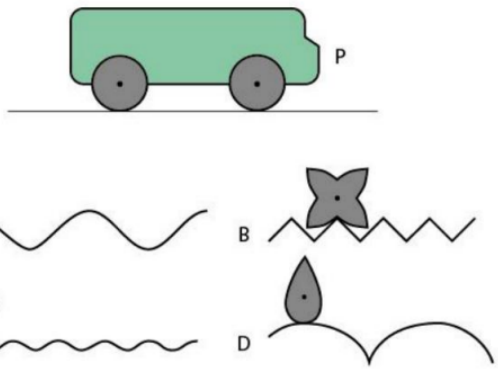
Looking at the graph options, Option B clearly shows this growth pattern, with an increasing trend at a consistent rate.

$\boxed{B}$

Quick Tip

For problems involving growth or sequences, always break the problem into smaller time intervals. Calculate each interval's growth based on the percentage increase and ensure the correct pattern is reflected in the graph.

Q.67 Figure P shows a profile of a bus with circular wheels on a flat road. The options below show profiles of 4 wheels and corresponding roads. If the 'wheel' always moves without slipping or sliding, which of the options will result in the bumpiest ride?



Correct Answer: (D) **Option D**

Solution:

When the wheel is moving without slipping or sliding, the profile of the wheel and the corresponding road must match in terms of how the wheel's movement translates to the road's shape.

To identify the bumpiest ride, consider how much the wheel will lift or fall as it rolls over the road. A very wavy or jagged profile will cause the wheel to move unevenly, resulting in a bumpier ride.

Step 1: Analyze each option

(A) The profile in option A suggests a smooth, consistent road, which would likely result in a smooth ride.

(B) The profile in option B has more sharp peaks, but they are relatively gentle and spaced out, leading to a moderate ride.

(C) Option C presents a very smooth profile, indicating a gentle ride.

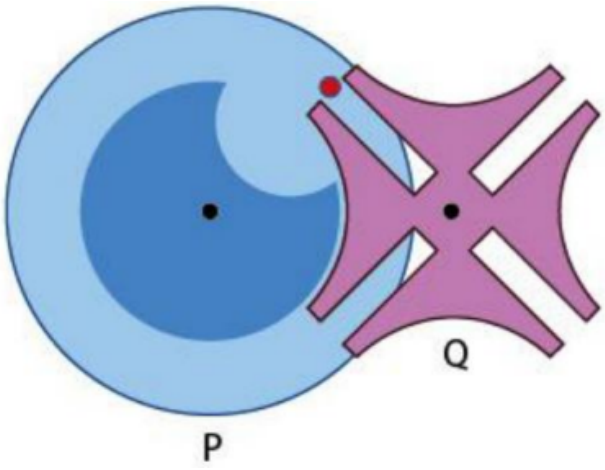
(D) The profile in option D has sharp, narrow peaks and valleys, indicating a rough and bumpy ride as the wheel would be constantly lifting and dropping. This is the bumpiest ride.

Thus, the correct answer is $\boxed{D}$.

Quick Tip

When analyzing mechanical motion, pay attention to the sharpness and frequency of peaks in the road profile. The more abrupt and frequent the peaks, the bumpier the ride.

Q.68 In the figure shown below, the drive wheel P engages with the driven wheel Q through a pin marked in red. Which of the options describes the movement of Q, when P moves in the clockwise direction?



(A) Continuously anti-clockwise

(B) Intermittently anti-clockwise

(C) To and fro

(D) Intermittently clockwise

Correct Answer: (B) **Intermittently anti-clockwise**

Solution:

In this question, we are asked to analyze the movement of wheel Q when wheel P moves in the clockwise direction. The pin connecting the two wheels will transfer the rotational motion from P to Q.

Step 1: Analyze the direction of motion

Since the pin is directly attached to both wheels, the motion of P will affect Q's motion. As P rotates in the clockwise direction, Q will rotate in the opposite direction due to the nature of the pin connection.

Step 2: Examine the options

(A) Continuously anti-clockwise — This would suggest constant, uninterrupted movement, which is not the case here because of the intermittent nature of the pin connection.

(B) Intermittently anti-clockwise — This is correct. The motion will be intermittent due to the nature of the pin and the way it transfers motion between the two wheels.

(C) To and fro — This is incorrect as the question does not describe any to-and-fro motion.

(D) Intermittently clockwise — This is incorrect because the opposite direction (clockwise) does not apply here, as P is moving clockwise.

Thus, the correct answer is $\boxed{B}$.

Quick Tip

When dealing with gears or pin connections, always keep in mind that motion is transferred based on the interaction between surfaces. For gears, the direction of rotation alternates between connected wheels.
