

CAREERS 360 **PREPARATION** **Series**

UCEED 2026

**Full Study
Material**



CONTENTS

| | |
|--|----------|
| About This eBook | 4 |
| UCEED Exam Pattern | 5 |
| List of Topics for UCEED Exam | 6 |
| Chapter-wise Breakdown | |
| Visualization and Spatial Ability | 7 |
| Mental Visualization: 2D to 3D | 39 |
| Paper Folding & Unfolding | 52 |
| Spatial Orientation/Volumes and Direction | 70 |
| Volumes Transformation/Counting Surfaces | 79 |
| Spinning and Rotation of Volumes | 92 |
| Scaling Up and Down | 106 |
| Gestalt's Theory: Figure and Ground | 115 |
| Pattern Recognition | 127 |
| Observation and Design Sensitivity | 151 |
| Basic Design Principles | 192 |
| Rule of Thirds/Layout Principles | 203 |
| Geometric Shapes and Fundamentals of Geometry | 221 |
| Organic Shapes (Nature Inspired) | 233 |
| Evolution of Objects/Materials & Manufacturing | 242 |
| Understanding Gears, Pulleys, and Motion | 251 |
| Design Thinking for Problem Solving | 274 |
| Situation-Based Questions | 296 |
| Sketching Skills | 304 |
| Orthographic Projection - 90 Degree | 313 |

| | |
|---|-----|
| Isometric Projection - 30/45 Degree | 313 |
| Informative Drawings (Section View/Exploded View) | 326 |
| Geometric Shapes + Volumes | 340 |
| Human Anatomy/Figure Drawing | 352 |
| Freehand Sketching | 360 |
| Perspective Sketches | 367 |
| Doodling/Gesture/Life/Blind Contour Drawings | 378 |
| Analytical and Logical Reasoning | 387 |
| Cubes & Dices | 404 |

Other Useful Resources 417

UCEED Previous Year's Question Papers with Solutions PDF

UCEED Official Sample Question - Solution Creation

About This eBook

Dear Students,

We are excited to share that we have created an eBook for students preparing for the UCEED exam. This eBook is a comprehensive guide for UCEED aspirants, covering all essential areas to help you ace the exam. It includes detailed information on the exam pattern, marking schemes, and the types of questions asked in both Part A and Part B.

The eBook is organized into key sections:

- **Visualization and Spatial Ability:** Techniques such as 2D to 3D visualization, paper folding, spatial orientation, and transformation of volumes.
- **Observation and Design Sensitivity:** Understanding basic design principles, geometric shapes, and the evolution of objects and materials.
- **Sketching Skills:** Orthographic projection, isometric projection, and freehand sketching of geometric and non-geometric volumes.
- **Analytical and Logical Reasoning:** Data sufficiency, cubes & dices, and solving complex visual problems.
- **Design Thinking for Problem Solving:** Human-centric design methods, situation-based questions, and creative solutions.
- **Practical Knowledge:** Understanding mechanisms like gears, pulleys, and basic geometry for 2D and 3D shapes.

This guide aims to provide you with the skills and insights needed to excel in the UCEED exam, equipping you with both the theoretical knowledge and practical skills necessary for success.

UCEED Exam Pattern

The UCEED exam pattern tends to change annually. Last year, there was an increase in design-related questions, and this year, we anticipate that design will carry even greater weightage.

| UCEED | Part A(NAT) | Part A(MSQ) | Part A(MCQ) | Part B (Skteching) |
|-------|-------------|-------------|-------------|--------------------|
| 2023 | 18 | 18 | 32 | 1 |
| 2022 | 18 | 18 | 32 | 1 |
| 2021 | 18 | 18 | 32 | 1 |
| 2020 | 18 | 18 | 32 | 1 |
| 2019 | 20 | 20 | 45 | 0 |
| 2024 | 14 | 15 | 28 | 2 |

List of Topics of UCEED 2026

| CHAPTER | CONCEPTS |
|--|--|
| Visualization and Spatial Ability | <ul style="list-style-type: none"> • Mental Visualisation : 2D to 3D Visualisation based on views • Paper Folding & Unfolding • Spatial orientation/Volumes and Direction : Perceiving the 3D volumes from 2D shapes/view Understanding of Solid Volumes (prisms, pyramids, cubes, cylinders, spheres) • Volumes Transformation/ Counting the Surfaces : (Metamorphosis) • Spinning and Rotation of Volumes : 3D volumes at 90-180 Degree • Scaling Up and Down : To understand the uses • Gestalt's Theory : Hidden information, Figure and Ground Theory • Pattern Recognition : Transformation, Arrangements, Alignments & Orientation |
| Observation and Design Sensitivity | <ul style="list-style-type: none"> • Understanding of Basic Design Principles : Balance, Contrast, Emphasis, Hierarchy, Movement, Proportion, Repetition, Rhythm/Pattern etc. • Rule of Thirds / Layout and Principles of Design • Understanding of Composition • Geometric Shapes and Fundamentals of Geometry • Understanding of Organic Shapes (Nature Inspired) • Evolution of Objects/Materials and Manufacturing Processes • Understanding of Gears and Pulleys and Basics of Motions • Fundamental Principles of Motion/Mechanism (e.g Hub-spoke Model) |
| Design Thinking for Problem Solving | <ul style="list-style-type: none"> • Human/User Centric Design Methods • Situation Based questions (Visual Communication of a solution for a given situation) |
| Sketching Skills (Primarily Analytical Drawing Based) | <ul style="list-style-type: none"> • Projection-Based (Orthographic Projection -90 Degree) (Isometric Projection-30/45 Degree) • Informative Drawings (Section View- Cut view for internal information) • (Exploded Views : showing Individual internal Parts) (Assembly Drawings/ Packaging) • Geometric Shapes + Volumes : Cover understanding of 2D shapes & 3D volumes • Human Anatomy/Figure Drawing : Understanding of Human Anatomy • Freehand Sketching for Products/Volumes : For Geometric or Non-Geometric Volumes • Perspective Sketches : Based on Understanding of 1/2/3 point perspectives • Doodling/Gesture/Life/Blind Contour Drawings : More Freehand |
| Analytical and Logical Reasoning | <ul style="list-style-type: none"> • CUBES & DICES |
| | <ul style="list-style-type: none"> • Data Sufficiency/ Blood Relations/ Decision making |

Chapter 1: Visualization and Spatial Ability

Since a lot of pictorial and diagrammatic questions are based on understanding different shapes, and volumes, their transformation and/ or manipulation of 2d shapes and 3d objects, how they can be interpreted when seen in cross sections, when rotated or how their views will appear, surface counting, and recognising different patterns (explained in detail ahead), it becomes crucial to develop a good visualization and spatial ability. Now that we understand what types of questions are asked in exams, we can better understand why visualization and spatial ability play an important role in designing competitive exams like UCEED 2026. To understand Visualization and Spatial Ability and its importance for the preparation for design competitive exams, let us first start with understanding each of these terms separately to get a better hang of it.

Visualization

To give our ideas and narratives a form, we need visualization in design thinking. Visualization is thinking, listening, interpreting the idea in our minds and then putting it out on paper altogether. It can also be defined as any technique for creating images, designs, concepts or animations to communicate a message. Visualization is important for any aspiring designer as through visualization only they can get a better understanding of 2-D and 3-D shapes and forms, their pictorial and diagrammatic questions, which is very crucial to understand.

Spatial Ability

Spatial ability can also be termed as spatial intelligence is the ability of designers that allows them to visualize a 2-D shape and understand how it will appear in a 3-D state, their transformation and/ or manipulation of 2d shapes and 3d objects. It also helps designers to interpret how it can scale up or scale down, how it will look in cross-sections, or how it can rotate in their minds without the presence of any physical state or any tangible pieces in front of them.

How to develop Visual and Spatial ability

To develop good visual and spatial ability, students need to practice as many questions as they can daily so that they can become more efficient and accurate. Another way to do this, students

can incorporate visualization into their daily activities. For example, suppose you see a cup and visualize a cylinder, then try to mentally make a drawing of its top, side and front views. Now try to rotate it and see how its face changes when drawn in a 2-D shape. Try to visualize how its different cross-sections will appear and make a mental map out of it. Like this, you can take as many different 2-D and 3-D shapes and forms and try developing and practice visualization and spatial ability. This practice also helps students to develop speed and accuracy in solving questions related to these topics as time management is one of the most crucial aspects for UCEED 2026 preparation and other design competitions.

UCEED 2026 Visualization and Spatial Ability Syllabus

According to the UCEED syllabus 2026, a brief introduction for each topic is provided below.

1. Mental Visualization : 2D to 3D Visualization based on views

Under this topic, questions are asked for students to mentally visualize and make mental drawings for 2-D shapes into 3-D forms for pictorial and diagrammatic questions. The simplest way to understand is by understanding the 3-D forms of our basic shapes, namely; Square whose 3-D form becomes a Cube, Rectangle whose 3-D form will become a Cuboid or a Cylinder, Circle will become a Sphere, Triangle will become a Pyramid. 2-D Shapes that do not come under basic or regular shapes can be a little tricky to visualize into their 3-D forms but with practice, it becomes easy to visualize them.

2. Paper Folding & Unfolding

Paper folding and unfolding/cutting is a process where a sheet of paper is taken and folded in a given direction (usually shown marked with an arrow), and then a mark or cutting could be made. The questions that arrive in the UCEED exams are asked to as to visualize how this paper will appear when unfolded and then chose from the given options. These questions again need a good understanding of visualization and spatial ability because students need to see the figures in 2-D given in exams, then analyze that in their minds, imagine how it will look when the paper is unfolded, and then select the correct option. These questions might sound tricky and difficult initially and might also take some time to solve but with time and practice, students can master them.

3. Spatial orientation/Volumes and Direction

When 2-D shapes are given height and they start to occupy space, they are called solid figures. These shapes have faces, edges, and vertices. These figures are called 3-D shapes. A basic shape is 3 or more line segments joined together. When equal line segments are joined at equal angles, they are called regular shapes. In a circle, the curve is created by joining points rather than joining line segments. When line segments of different lengths are joined at unequal angles, then they are referred to as irregular shapes. Curvy shapes that are not a circle (irregular) are created by free hand and are free-flowing. When these shapes are given height, they become a form. Further, forms can be regular or irregular similar to shapes. When different regular/irregular 3-D forms are given and rotated in a given direction, and questions are asked to determine the outcome of the rotation from given options, the ability for visualization for spatial orientation/volumes and directions in which they are moved is analyzed, transformation and/ or manipulation of 2d shapes and 3d objects and their spatial relationships. To mentally rotate a volume and determine direction and outcome can be mastered through solving some questions daily and practice.

4. Volumes Transformation/ Counting the Surfaces : (Metamorphosis)

Metamorphosis is the art process where a designer transforms one shape or form into something different. It is based on conceptual ability where designers are supposed to create something out of a small concept given. Questions in UCEED exams are generally asked as a shape or small concept (lines, curves, etc) are given and students need to use those and create something meaningful out of it. Better a student can create, the better their visualization ability is analyzed. Volume transformation questions are asked when a given volume is transformed or supposed to transform according to the directions given and students have to determine the outcome from the options given. Questions are also asked where a 3-D figure is given (more complex than usual), and students are asked to count the surfaces (the outermost or upper layer) and select from the options given. It can become tricky as we tend to forget to count the surfaces that are hidden to us in the figure.

5. Spinning and Rotation of Volumes : 3D volumes at 90-180 Degree

In this concept, 3-D volumes are given and directions are given to mentally rotate them (usually at 90 or 180 degrees). Students are supposed to then mentally visualize the outcome and select from the options given. 180 degrees rotation can also be termed as a mirror image of the volume

given. By these questions, examiners try to analyze how good a student has visualization and spatial reasoning.

6. Scaling Up and Down

Under this concept, 3-D volumes and figures are given and students are asked to visualize how it will appear when either scaled up or down, and then determine how it can have usability after the transformation. This exercise helps in understanding and developing better visual and logical reasoning and therefore, becomes a crucial practice for designers.

7. Gestalt's Theory: Hidden Information, Figure and Ground Theory

According to Gestalt's theory, how an object is perceived by someone may not be whole in meaning and can have hidden parts when looked closely. According to the theory, a person perceives any object that is either in the foreground or in the background. According to his ground theory, it is human ability that makes them segregate figures in the foreground from their background and see. Therefore figure becomes their main focus mentally and visually. According to the theory, everything that is not the main figure becomes the ground.

Questions generally are asked from the theory of the concept or when poster-making skills are needed.

8. Pattern Recognition: Transformation, Arrangements, Alignments & Orientation

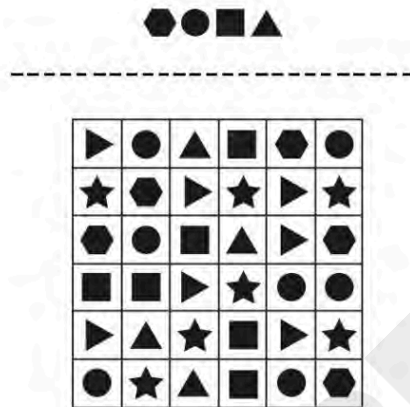
Pattern recognition is the process where a series of patterns are given and students are then asked to select the next appropriate pattern from the given options. To do so, students should focus on common elements occurring in the previous patterns, identify common differences, and then compare them with the probable next pattern. Pattern recognition can be based upon the transformation of a figure in a series, arrangement in a series of different patterns, different alignment present in a series, and orientation series. Pattern recognition is important to analyze student's visual, logical and non-verbal reasoning in designing competitive exams.

9. Coding-Decoding

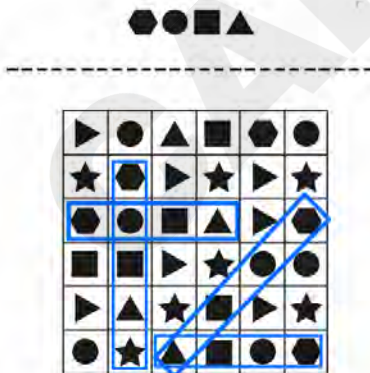
In coding-decoding exercises, codes are given to several series (could be alphabets, numbers or if complex questions are asked basic figures), then according to these codes a question is asked where students have to apply these codes and come up with the solution. For coding and decoding questions, creating an answer key to code is usually not too tricky but one has to be smart about it. These questions are asked to understand logical reasoning ability for students and how better they visualize the solutions.

Visualization and Spatial Ability UCEED Previous Years Questions and Answers

Ques: How many times does the shape sequence (shown on the top) appear in the grid below? The sequence may appear top-to-bottom, bottom-to-top, left-to-right, right-to-left or at an angle.

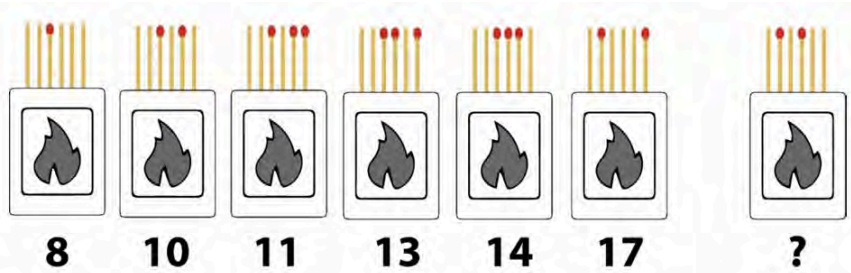


Solution:



We can see in the image given below that we have 4 sequences. Hence, the answer is 4.

Ques:

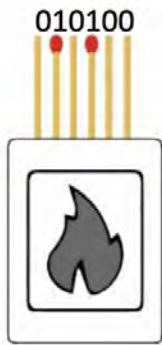


Solution: We can see we have no. of lines in each pattern, i.e., 6. But there are two tires of match sticks, i.e., one with a head and one without a head.

Let's use a binary number and consider



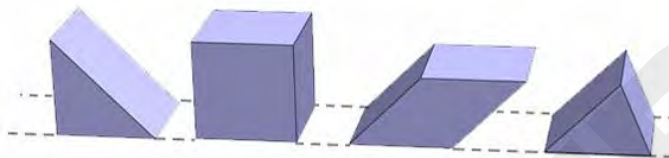
| 001000 | 001010 | 001011 | 001101 | 001110 | 010001 |
|--|---|---|---|---|--|
| | | | | | |
| 8 | 10 | 11 | 13 | 14 | 17 |
| $001000 = 1 * 2^3$ $+ 0 * 2^2 + 0 * 2^1$ $+ 0 * 2^0 = 8$ | $001010 = 1 * 2^3$ $+ 0 * 2^2 + 1 * 2^1$ $+ 0 * 2^0 = 10$ | $001011 = 1 * 2^3$ $+ 0 * 2^2 + 1 * 2^1$ $+ 1 * 2^0 = 11$ | $001101 = 1 * 2^3$ $+ 1 * 2^2 + 0 * 2^1$ $+ 1 * 2^0 = 13$ | $001110 = 1 * 2^3$ $+ 1 * 2^2 + 1 * 2^1$ $+ 1 * 2^0 = 14$ | $010001 = 1 * 2^4$ $+ 1 * 2^0 = 17$ |



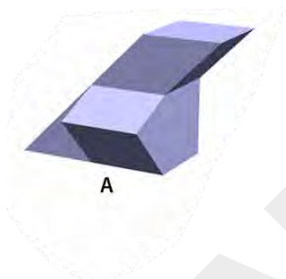
$$010100 = 1 * 2^4 + 1 * 2^2 = 20$$

Hence, the answer is 2.

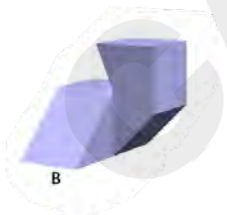
Ques: Shown in the top row are 4 pieces of building blocks. Which of the option(s) is/are made using all four pieces?



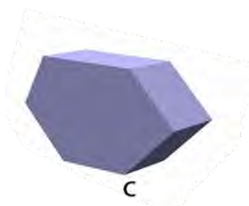
Option A:

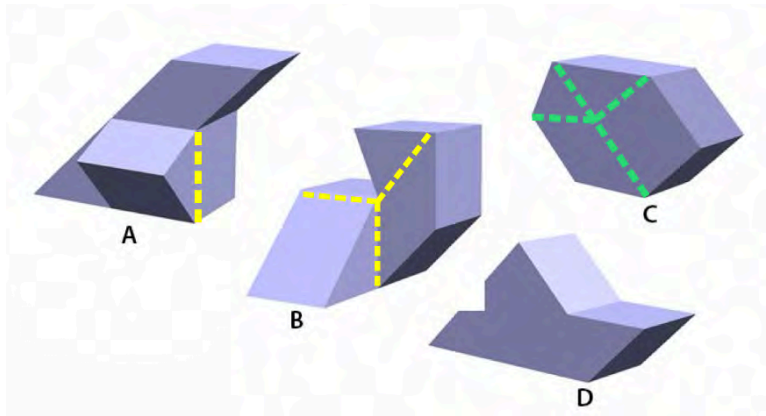


Option B:



Option C:



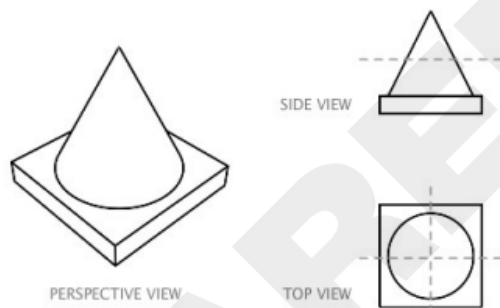
Option D:**Solution:**

If we join four pieces of building blocks, we can

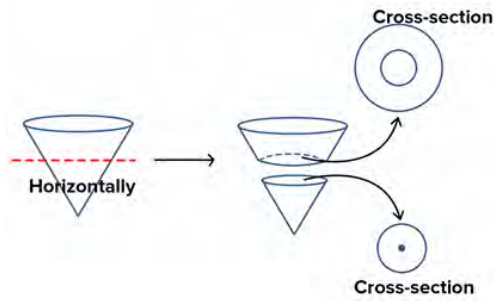
We can see that all pieces can be seen in option A.

Hence, the answer is A.

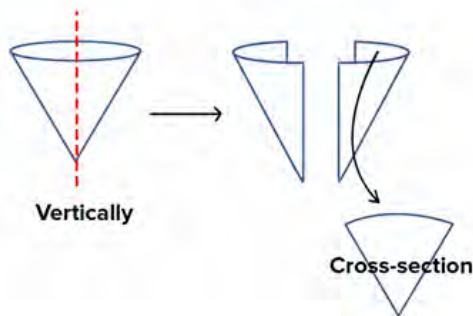
Ques: A perspective view of a solid object is shown on the left. The object is cut simultaneously along THREE perpendicular planes, as shown on the right. How many surfaces will the resulting pieces have in total (i.e. sum of the surfaces of all pieces)?

**Solution:**

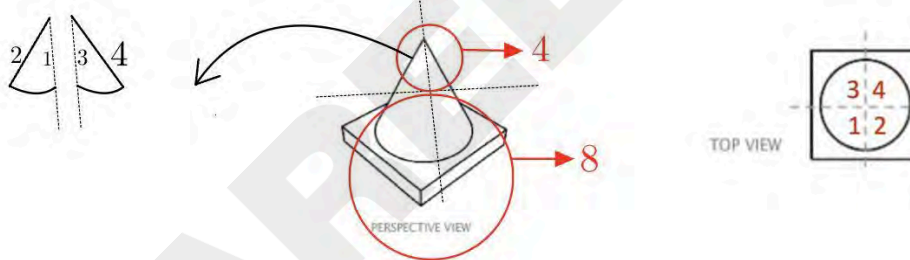
When the cone cuts along the Horizontal axis we get another cone as shown below.



When the cone is cut along the vertical axis. We get (as shown below)



Now ATQ,

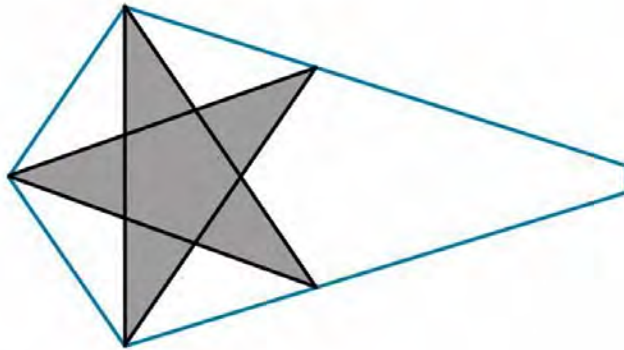


4 surfaces on top (as shown above) and 8 at the bottom. So, like this, we have 4 more parts.

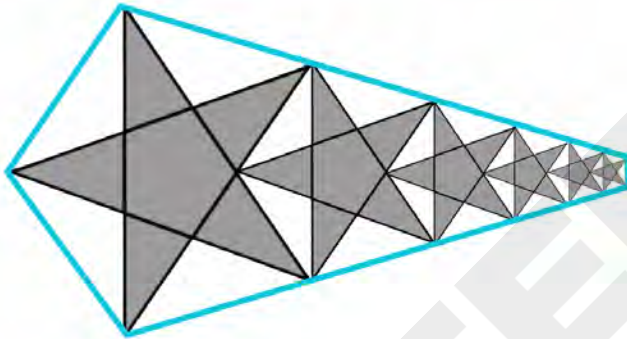
$$\therefore 4 \times 4 + 8 \times 4 = 16 + 32 = 48$$

So, the total surfaces are 48 surfaces.

Ques: What is the maximum number of stars that can be packed inside the blue color boundary, including the one that is shown in the image below? The stars can be scaled, but should not overlap. At least 4 points of every star should touch the blue color boundary.

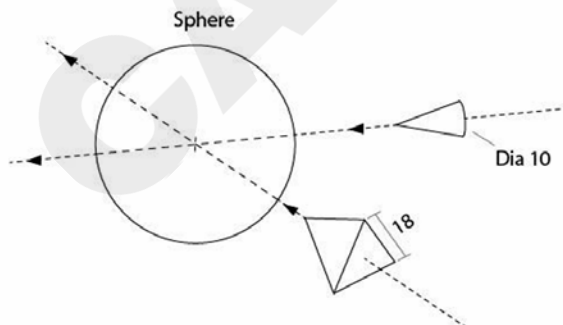


Solution: According to the question, we have to pack a maximum no. of stars inside the blue color boundary. As shown below.

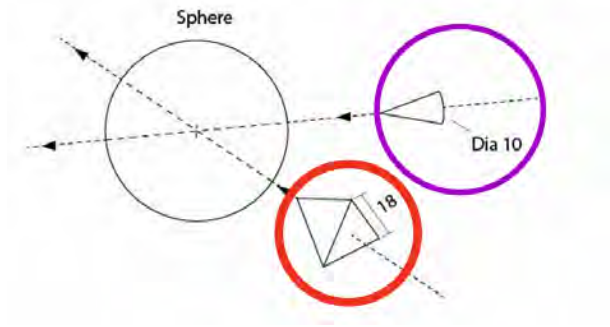


We can have 6 maximum no. of stars.

Ques: A tetrahedron of side 18 units and a cone having a base diameter of 10 units are cutting through a sphere as shown. Count the total number of surfaces in the resultant sphere.



Solution:

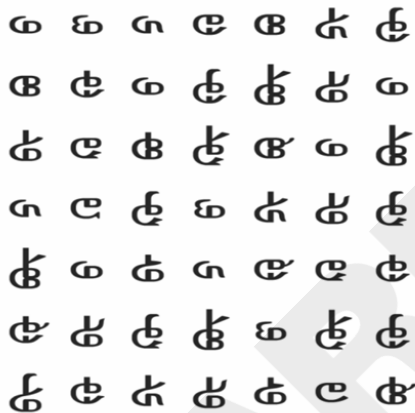


The tetrahedron will make a triangular hole and because of this triangular hole the number of surfaces will be 3 and the outer one will be 4.

Now, the cone will make a circular hole, i.e, 2 surfaces and because it has a diameter less than the side of a tetrahedron (i.e, 18) so it will pass through it (from inside)

So a total of 6 no. of surfaces should be there.

Ques: How many distinct types of characters appear in the figure given below?



Solution:

| | | | | | | | |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| G | E | B | N | K | D | | 7 |
| X | X | X | X | K | N | X | 2 |
| N | E | B | K | E | X | X | 5 |
| N | E | K | E | X | X | X | 4 |
| X | X | N | X | E | X | X | 2 |
| E | X | X | X | X | X | X | |
| N | X | X | X | N | X | X | |

| | | | | | | | |
|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---|
| ୬ | ୭ | ୮ | ୯ | ୧୦ | ୧୧ | ୧୨ | 7 |
| ୬ | ୭ | ୮ | ୯ | ୧୦ | ୧୧ | ୧୨ | 2 |
| ୬ | ୯ | ୧୦ | ୧୧ | ୧୨ | ୧୩ | ୧୪ | 5 |
| ୮ | ୯ | ୧୦ | ୧୧ | ୧୨ | ୧୩ | ୧୪ | 4 |
| ୬ | ୭ | ୮ | ୯ | ୧୦ | ୧୧ | ୧୨ | 2 |
| ୯ | ୧୦ | ୧୧ | ୧୨ | ୧୩ | ୧୪ | ୧୫ | 1 |
| ୬ | ୭ | ୮ | ୯ | ୧୦ | ୧୧ | ୧୨ | 2 |

So there are 23 distinct types of characters.

Ques: A printer wishes to print four colors, Crimson, Pink, Brown, and Indigo, using CMYK [Cyan, Magenta, Yellow, and Key (black)] inks. The printer uses the CMYK combinations shown below (in % of each ink) to produce the colors on the right. Which combination(s) will result in the correct colour (s)?


Option A:

| | | |
|---------|---|---|
| C = 05% | } |  |
| M = 90% | | |
| Y = 70% | | |
| K = 05% | | |

Crimson

A

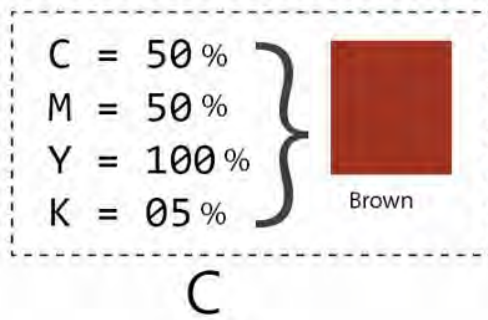
Option B:

| | | |
|---------|---|---|
| C = 05% | } |  |
| M = 15% | | |
| Y = 70% | | |
| K = 00% | | |

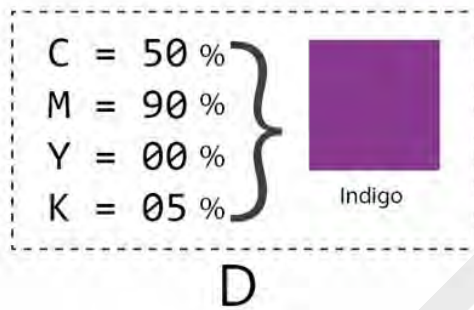
Pink

B

Option C:



Option D:



Solution: To get the exact combination, we have to check each option one by one

Option A:



Hence, option A is correct.

Option B:



Hence, option B is incorrect.

Option C:



Hence, option C is incorrect.

Option D:



Hence, option D is correct.

Ques: Which of the pieces could be used four times individually to form a square? The pieces can be rotated and flipped but should not be overlapped.

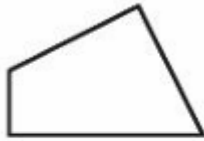


Option A:



A

Option B:



B

Option c:



C

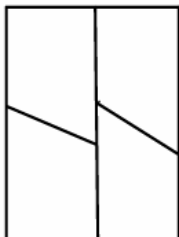
Option D:



D

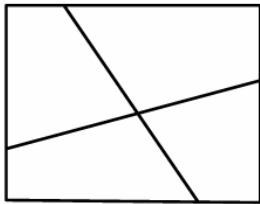
Solution:

Option A:



By combining the rotated and flipped form of the given figure, we can form a square as shown above.

Option B:

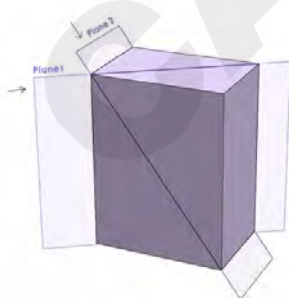


By combining the rotated and flipped form of the given figure, we can form a square as shown above.

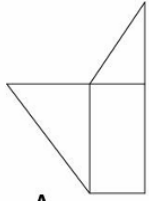
Option C: Not possible to make a square by combining the pieces.

Option D: Because of the curve in the piece, we can not form a square by combining the pieces.

Ques: The rectilinear hollow box shown on the left is cut along plane 1 and plane 2. Which of the option(s) shows (s) the correct unfolded pieces?

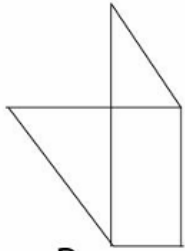


Option A:



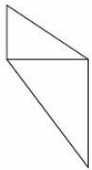
A

Option B



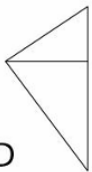
B

Option C:



C

Option D:



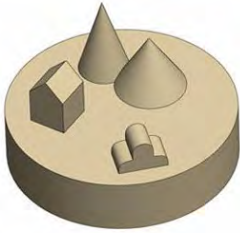
D

Solution:



We can see the 2 right angles at the corner in all the pieces. Now go through each option. We can see options B and D are correct.

Ques: Which of the molds shown on the right can be used to make the cake shown on the left?

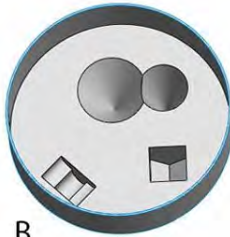


Option A:



A

Option B:



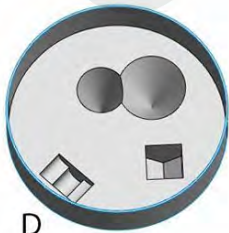
B

Option C:



C

Option D:



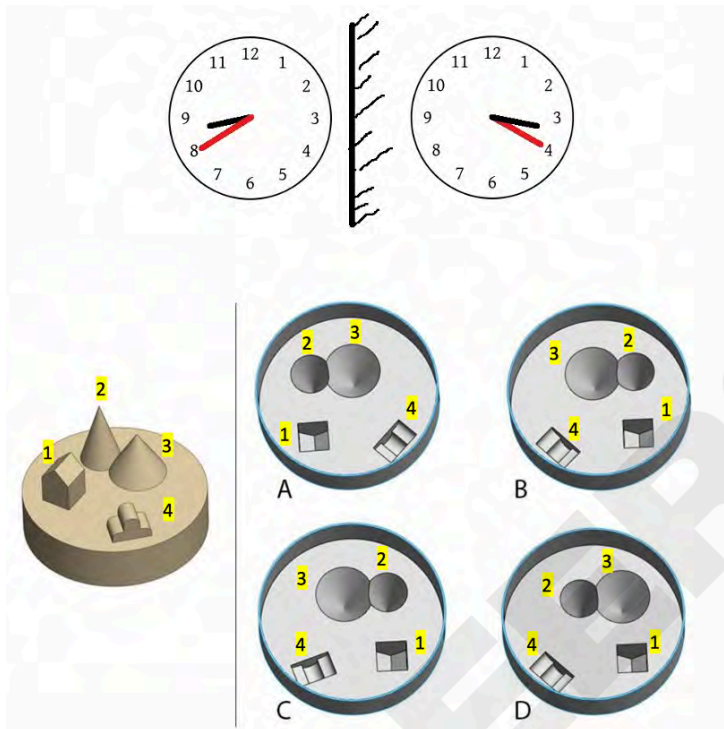
D

Solution: This question is related to mirror image. So let's understand the mirror image.

In the mirror image,

- The right side of the object becomes the left side.
- The left side of the object becomes the right side.
- The top and bottom sides of the object remain unchanged.

Example:

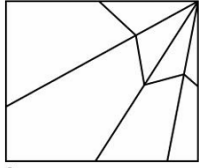


So we can see that the mirror image of the object given is B
Hence, the correct answer is B.

Ques: Which of the options shown on the right, when folded at the lines, will resemble the paper shown on the left?

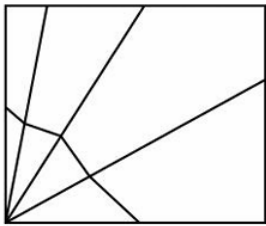


Option A:



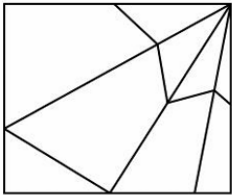
A

Option B:



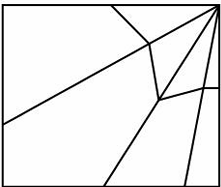
B

Option C:



C

Option D:



D

Solution:

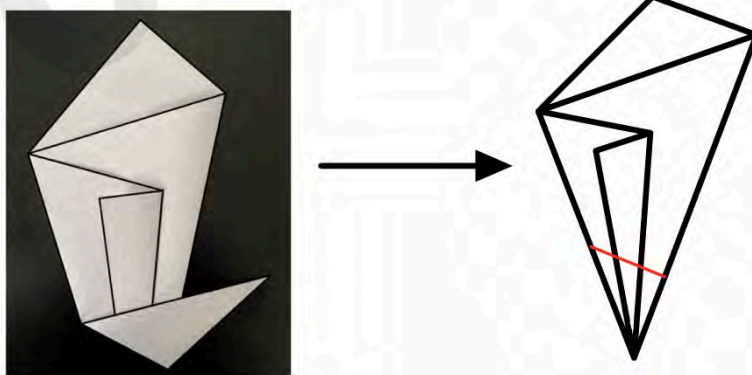
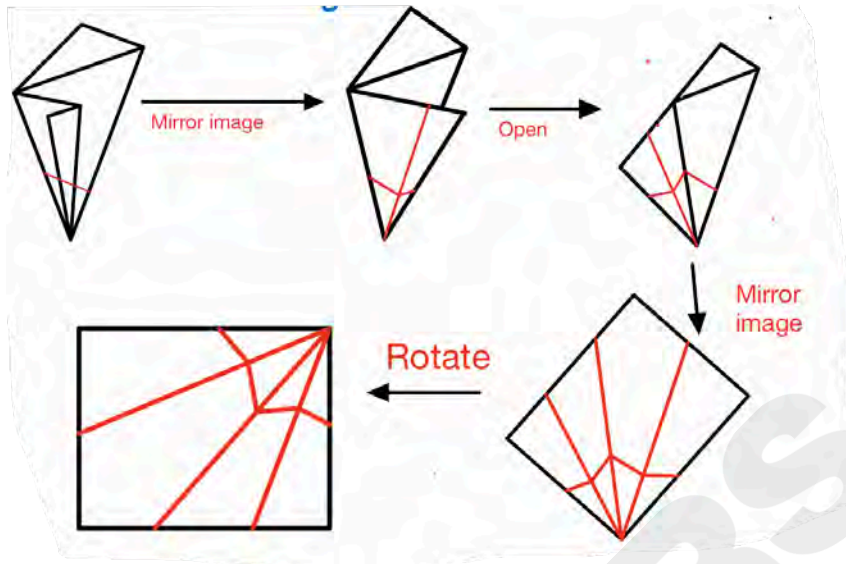


Figure 1

Figure 2

When we open the figure 2 we will get the mirror image.

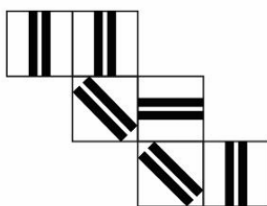


So if we match it with options, we can clearly say that A is the correct answer.

Ques: Shown on the left are all the 6 faces of a cube. Which option can be folded into this cube?

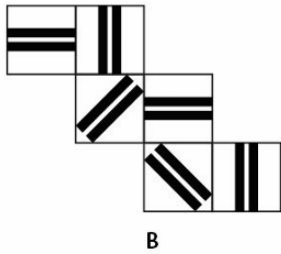


Option A:

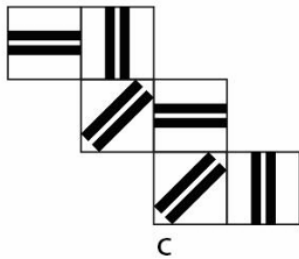


A

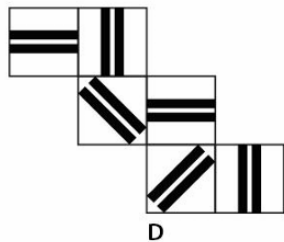
Option B:



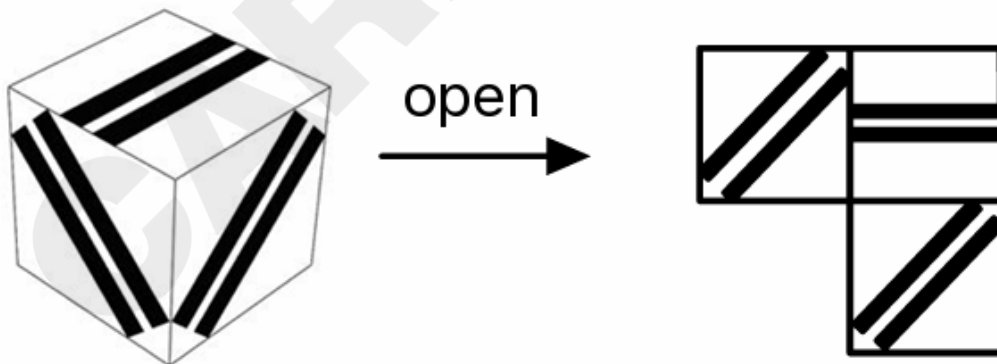
Option C:



Option D:

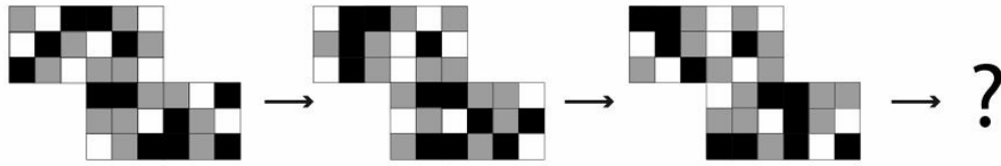


Solution:

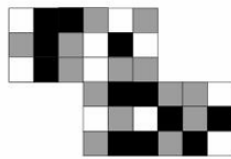
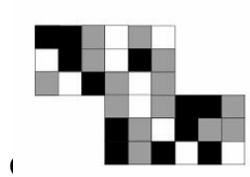


Now if we try to find a particular combination (figure 2) we can find it in option C
Hence, option C is correct.

Qus:

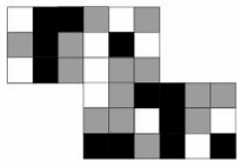


Option A:



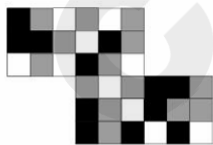
B

Option C:



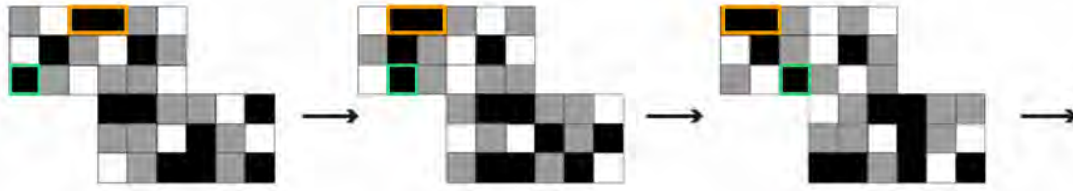
C

Option D:

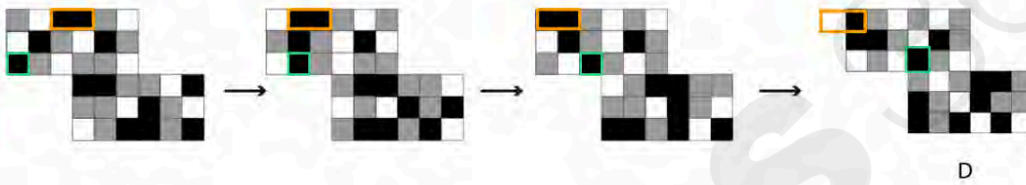


D

Solution:



If we observe the above image we can see that the shaded area (orange) is moving on the left side in Row 1 but in the 2nd row, No movement has been observed in Row 3rd, the shaded area (green) is moving on to the right side. Now by option, we can see that option D is correct (shown below)



Ques: The white part in the shoe sole shown left represents the embossed / raised area. Find out the right footprint of the shoe from the given options.



Option A:



A

Option B:



B

Option C:



C

Option D:



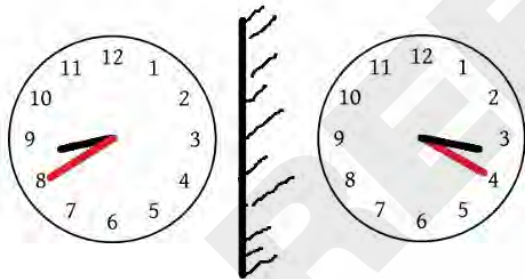
D

Solution:

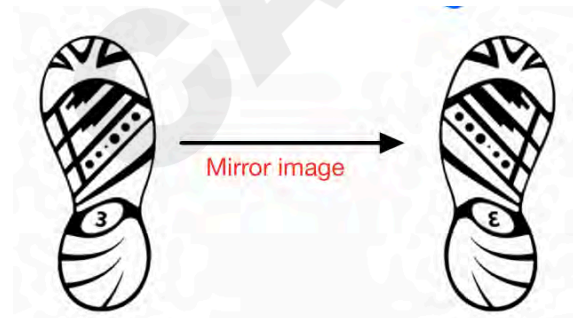
We need to find out the mirror image of the footprint.

In the mirror image,

- The right side of the object becomes the left side.
- The left side of the object becomes the right side.
- The top and bottom sides of the object remain unchanged.

Example:

So the mirror image of the footprint is



Now check the options one by one.

Option A:



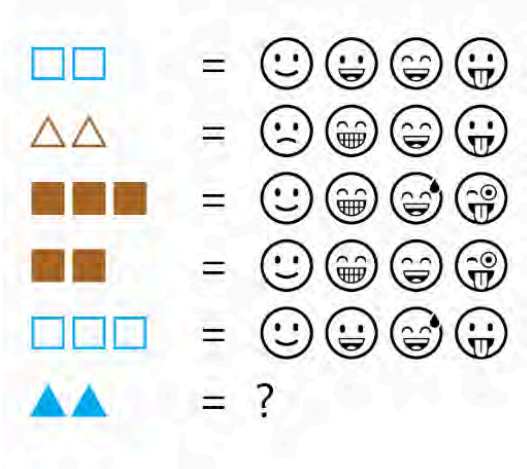
Both images don't resemble. Hence, option A is incorrect.

Option B:



Both images resemble each other. Hence, option B is correct.

Ques:



Option A:



Option B:



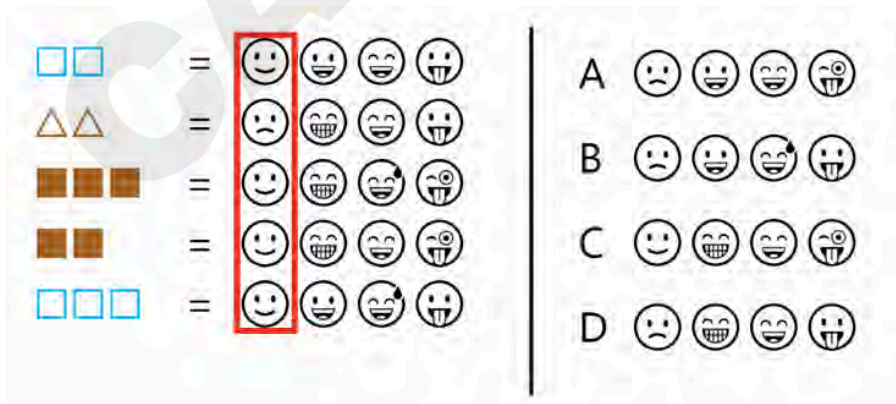
Option C:



Option D:

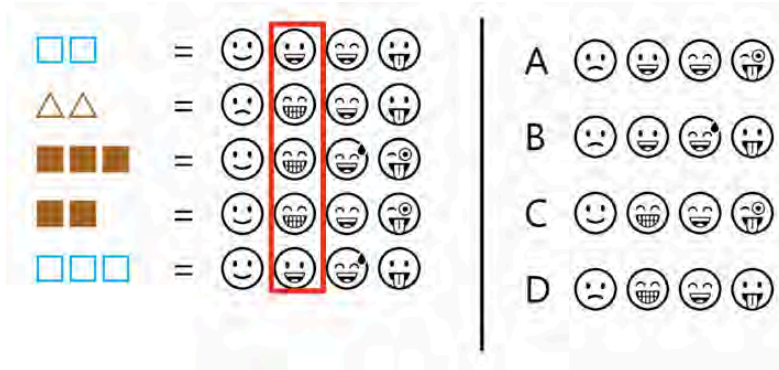


Solution:

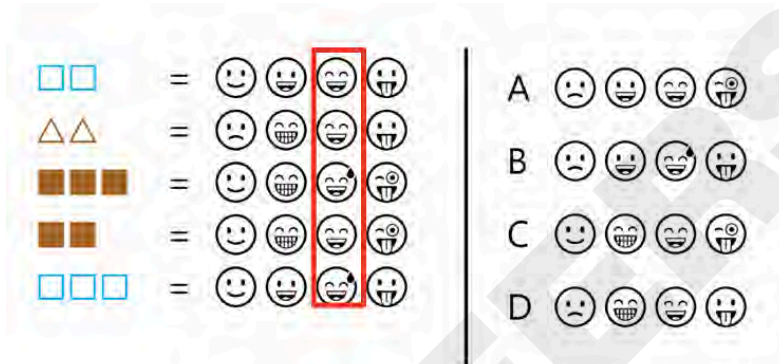


- A
- B
- C
- D

If we observe it, we can see an emoji and observe the triangle shape's emoji is sad. Therefore, option C is eliminated.



If we look for row 2 we can see that brown color emojis are different from blue colour. Therefore, option D is eliminated.



If we look for row 3 then the third and fifth column has smiles with tears and the common between the third and fifth columns that we observe both have quantity i.e., No of squares same. Hence, option B is eliminated. Therefore, option A is correct.

Ques: If the image on the left is flipped horizontally (about Y-axis), and then rotated 180 degrees, what will be the resulting image?



Option A:



Option B:



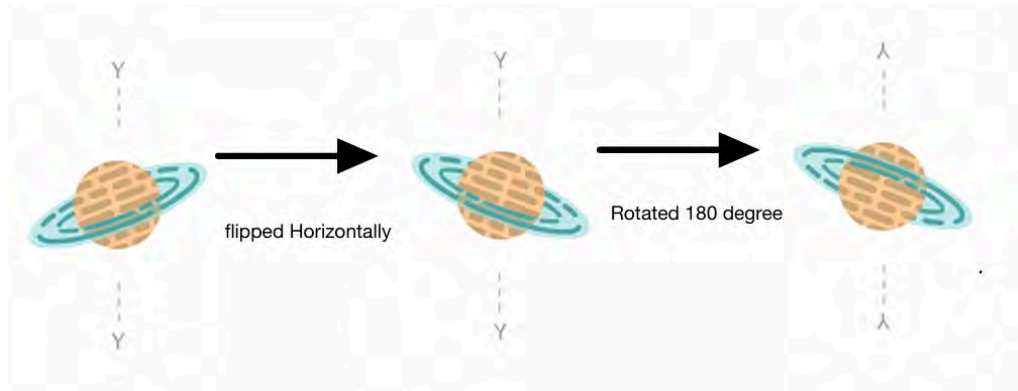
Option C:



Option D:



Solution:



The given image is flipped horizontally about the y-axis (as shown above) and then rotated 180 degrees.

Hence, option C is correct.

Ques: Which collection when arranged correctly will result in the silhouette of the pen shown below?



Option A:



A

Option B:



B

Option C:



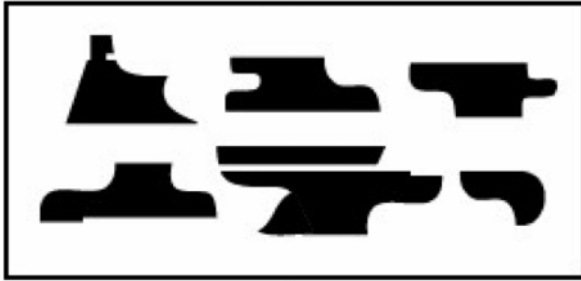
C

Option D:



D

Solution:



A

When the parts are rearranged, we get an image as shown below.



This does not resemble the original pen figure. Hence, option A is wrong.



B



This figure of pen resembles the original pen figure.
Therefore, option B is correct.

Mental Visualization:

2D to 3D Visualization based on views

The topic named Mental Visualisation holds great significance under UCEED 2026. Under this topic, questions are asked for students to mentally visualize and make mental drawings for 2-D shapes into 3-D forms for pictorial and diagrammatic questions according to the directions and instructions given to them. The simplest way to understand is by understanding the 3-D forms of our basic 2-D shapes, namely; a Square is a 2-D shape whose 3-D form becomes a Cube, a Rectangle whose 3-D form will become a Cuboid or a Cylinder, a Circle will become a Sphere, Triangle will become a Pyramid. 2-D Shapes that do not come under basic or regular shapes can be a little tricky to visualize into their 3-D forms but with practice, it becomes easy to visualize them. A basic shape is 3 or more line segments joined together. When equal line segments are joined at equal angles, they are called regular shapes. In a circle, the curve is created by joining points rather than joining line segments. When line segments of different lengths are joined at unequal angles, then they are referred to as irregular shapes. Curvy shapes that are not a circle (irregular) are created by free hand and are free-flowing. When these shapes are given height, they become a form. Further, forms can be regular or irregular similar to shapes.

What is Mental Visualization in Design Thinking?

Mental Visualization is the process of creating or imagining mental maps and mental images of a given figure or scenario. In mental visualization, a person purposefully makes a mental image or sets of images according to the requirements or instructions given. The easiest example to understand mental visualization is to think of images and scenarios we imagine during daydreaming, or reading a book or when someone is telling a story. In Design thinking, mental visualization is a skill where designers can imagine and visualize the shapes, figures, forms and other information given through a set of instructions and create a visual composition out of it for others to understand. In design, the process is not limited to mentally constructing the information but also to put it out physically (by sketching, drawing, photography, digital compositions etc) for others to understand as well.

2D to 3D Visualization-based Questions in the UCEED exam

Any shape on the plane is called a plane figure. Popular examples of plane figures are squares, rectangles, triangles and circles. Plane figures have sides, corners and angles except in the case of a circle which does not have any straight line. These plane figures are called 2-D shapes. When these 2-D shapes are given height and they start to occupy space, they are called solid figures or 3-D forms. These shapes have faces, edges, and vertices. 3-D shapes originate from plane figures when they are given height.

According to UCEED syllabus 2026 and previous years paper analysis, for visualization of 2-D shapes into 3-D figures we need to understand basic views for 3-D figures. Three basic views are compulsory when we need to convert from 2-D to 3-D, namely;

1. **Top view:** Top view of a 3-D object is the view when it is seen from the above or the top perspective. Top view is generally used to show the basic shape and features of an object from the above most top surface perspective.

For example; if you see a cube from the top view, you will see a square 2-D shape.

2. **Side View:** Side view of a 3-D object is the view of the surface of the face of that object when looked from one side. Side view can be left side view or right side view depending on the instructions. It is used to define the height of the object.

For example; Side view of a 3-D cone will appear as a 2-D shape triangle. Height of the triangle will be the height of the cone.

3. **Front View:** Front view of a 3-D object is the view of the surface of the face of that object when looked from the front surface. It is also used to define the height of the object.

For Example; Front view of a 3-D cylinder will appear as a 2-D shape of a rectangle.

Now, with the knowledge of basic views for a 3-D object, we can understand that when these three 2-D views are present, we can figure out the basic shape of the base, height and front and features for the 3-D object. Hence, using 2-D shapes, it is easy to visualize the 3-D figure.

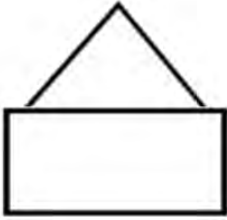
Let us understand with the help of an example;

2-D views

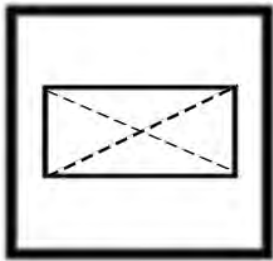
Front View:



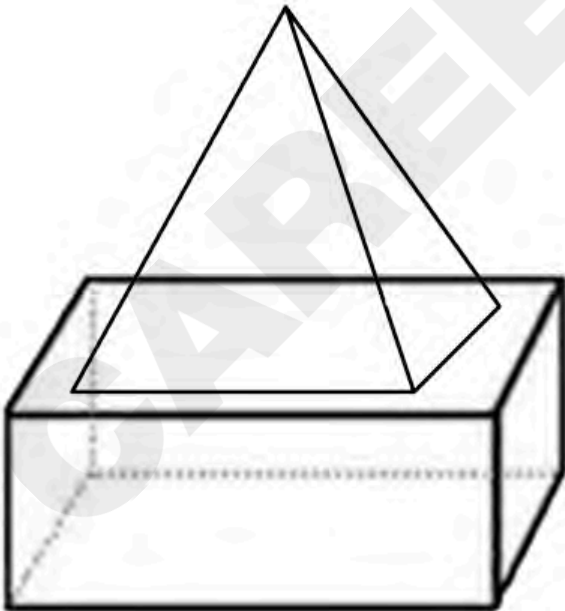
Side View:



Top View:



3-D object:



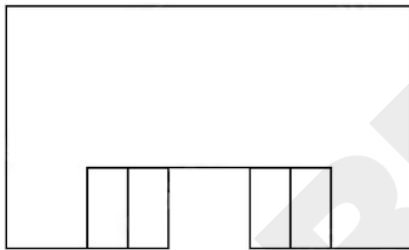
Tips and Tricks to better visualize 3-D objects from their 2-D views for the preparation of UCEED 2026

General points to remember when solving these types of questions while preparing for UCEED 2026.

- Look and understand the question and the instructions given carefully.
- Take time to look at the views carefully and understand the shapes completely.
- Understand the basic shapes of the 3-D figure by looking at the views carefully, the top view will help in understanding the base shape. Side view and front view will further help in understanding the shape as it reveals how the figure will appear from each side.
- Height can be observed by looking at the side and front views, the height of the 2-D shape in the views will be the height of the 3-D figure.
- Lastly put all the information and shape together and then look if the final 3-D figure corresponds to the 2-D shapes.
- While preparing for UCEED 2026, time required to understand, visualize and then create 3-D figures on paper will only be reduced through continuous practice.

Another example;

Top View:



Here, we can see a 2-D shape with a rectangular top view of 2 sets of steps in the middle from one edge. Since there is no line on the front edge, therefore, we can assume that there is an empty space in the center between 2 sets of steps. Let us further see side and front views.

Front View:



Here, we can see that the heights of the steps can be seen. Therefore, the figure appears like a platform with 2 steps on each side from the center. Lines can be seen at top and bottom edge as these are the lines that are seen for the edges behind the steps.

Side View:



Here we can see, as steps are not visible at the right and left sides, therefore only a rectangle can be seen defining the height and base of the 3-D figure from the side.

From the given information in the views, 3-D figure will be;

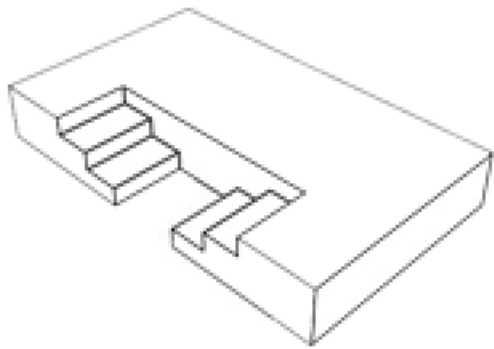
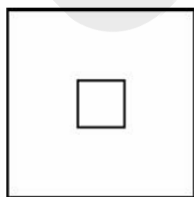


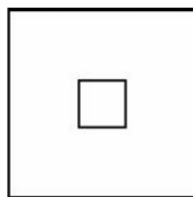
Figure here is seen as a cuboid as interpreted from the top view, with a rectangular base which has 2 steps cut-out at 1 edge. Therefore, it can be seen from top side, bottom side and front side. A rectangle is seen when we view the above figure from the side view (as steps cut-out are only at the 1 edge (front side), therefore, it is not visible on sides).

Mental Visualization UCEED Previous Years Questions and Answers

Ques: Which of the object(s) given in the options can produce the top and front view as shown in the figure? The arrow shows the direction of the front view.

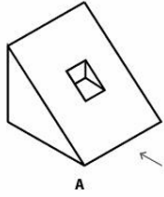


Top View

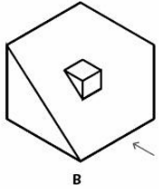


Front View

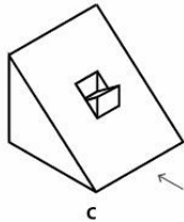
Option A:



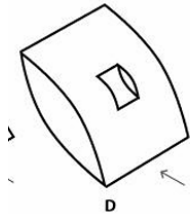
Option B:



Option C:



Option D:



Solution:

Option A: The front view and top view are correct.

Option B: The front view and top view are correct.

Option C: The front view and top view are correct.

Option D: As the image has a curved surface but when it is viewed from the top and front it appears a square.

Hence, all options are correct.

The trick here is to notice that in the question object(s) is mentioned instead of just object so more than 1 option could be correct.

Ques: An artwork on a paper creates an illusion of a ladder resting on a wall when the paper is folded and viewed from a specific angle as shown in the image. Which of the options correctly depicts this artwork on the paper when unfolded?



Option A:



A

Option B:

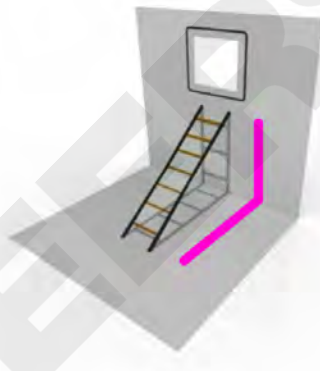


B

Option C:



C

Option D:**D****Solution:****Fig 1****Fig 2**

Looking at the middle, the ladder looks straight from the angle (figure 1) but in reality it is bent (figure 2) and the bend seen in the shadow will actually be straight in order for the illusion to occur. So now check each option.

Option A and D are eliminated because in both the option shadow and ladder both are bent.

Now option B is also eliminated as bars of ladder are close to each other so it can't be distorted. Hence, option C is correct.

Ques: A plane is landing smoothly on the airport runway. Select the correct picture.

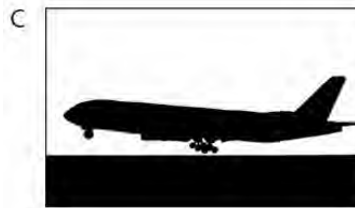
Option A:



Option B:



Option C:



Option D:



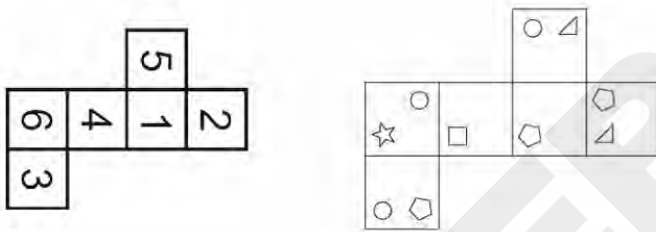
Solution:

Landing is the last part of a flight, where a flying aircraft or spacecraft (or animals) returns to the ground. When the flying object returns to water, the process is called alighting, although it is commonly called "landing" and "touchdown" as well.

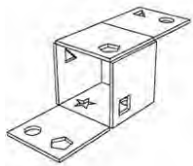


Hence, we can see option C is correct.

Ques: The image below shows the developed surface of a cube. Which of the options will NOT open up as the shown image?

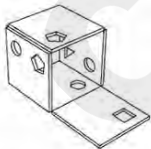


Option A:



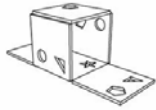
A

Option B:



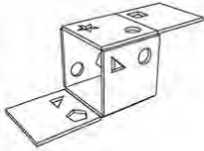
B

Option C:



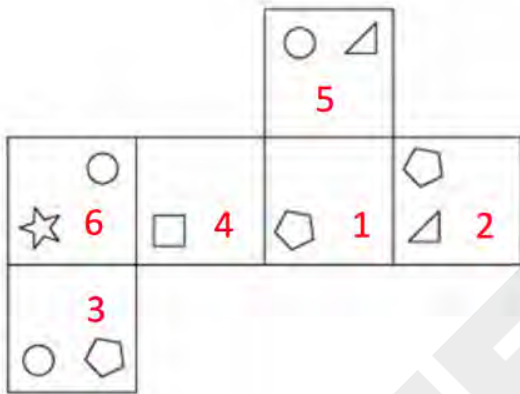
C

Option D:



D

Solution:

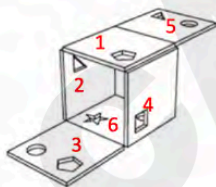


Name the cubes (as shown above)

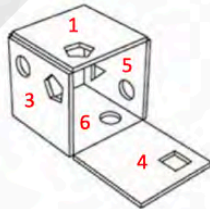
5 is adjacent to 3

6 is adjacent to 1

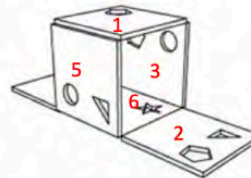
4 is adjacent to 2



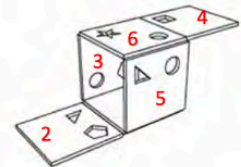
A



B



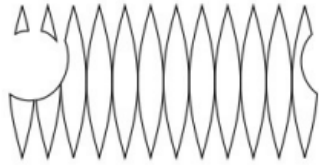
C



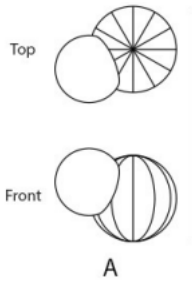
D

Option B is not possible, as the cube with No. 5 has an incorrect orientation of triangle. Hence, option B is the answer.

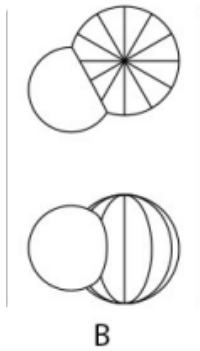
Ques: Given on the left is the unwrapped surface of a hollow sphere that was intersected by a smaller solid sphere. Which of the options would result in this unwrapped surface?



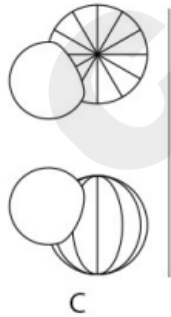
Option A:



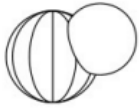
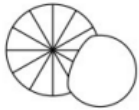
Option B:



Option C:



Option D:



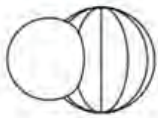
D

Solution:

A hollow sphere is a sphere that has been thinned out, has space and a cavity inside, and is not solid.

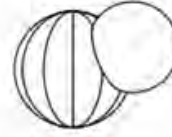
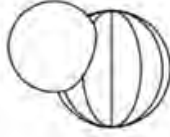
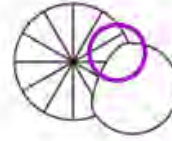
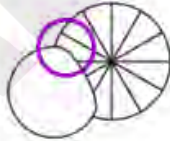
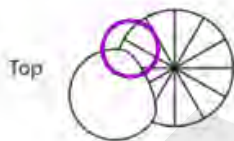
Now use the elimination method.

Option B:



B

A straight line (as highlighted) makes this option wrong because the top view is straight, but the front view does not.



A

C

D

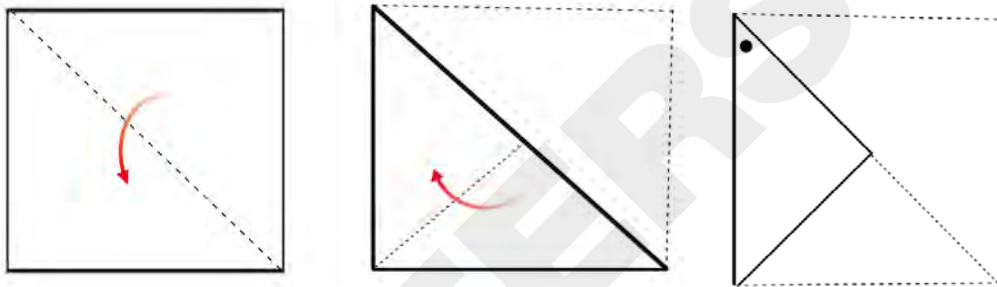
The position in option C (as highlighted) is wrong, as the distance is greater in C. Therefore, A and D are the correct answers.

Paper Folding & Unfolding

Paper folding and paper cutting is one of the most important and trickiest concepts that are asked in the reasoning test. To understand this, let us start with understanding the concept- Paper folding questions are usually asked where paper is shown in figures in ascending order of their folds with mostly an arrow marked on how and in which direction the paper is being folded. Lastly a mark is made on the paper in the last folded stage. Students must answer how the paper will appear if it is unfolded completely from the options given. Paper folding and paper cutting examines the capability to follow the instructions and carry the shape and size of the figures and are the high-order thinking questions.

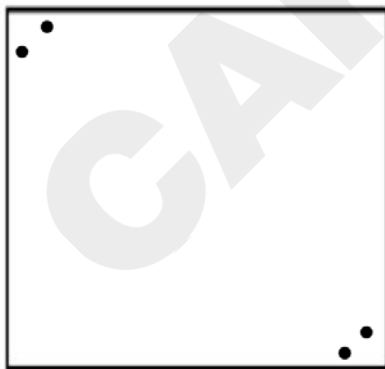
Let us try to understand this with the help of an example.

Question:

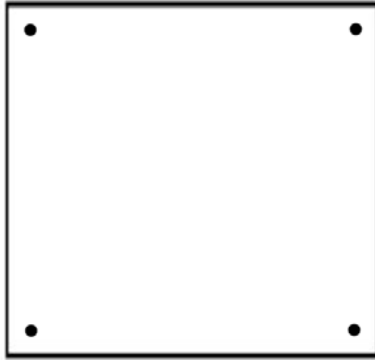


Options:

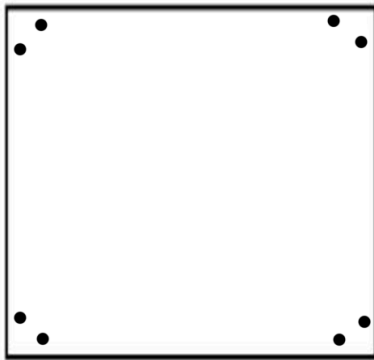
Option A



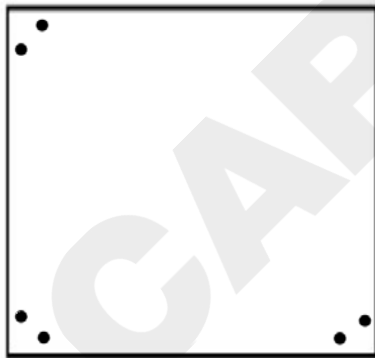
Option B



Option C

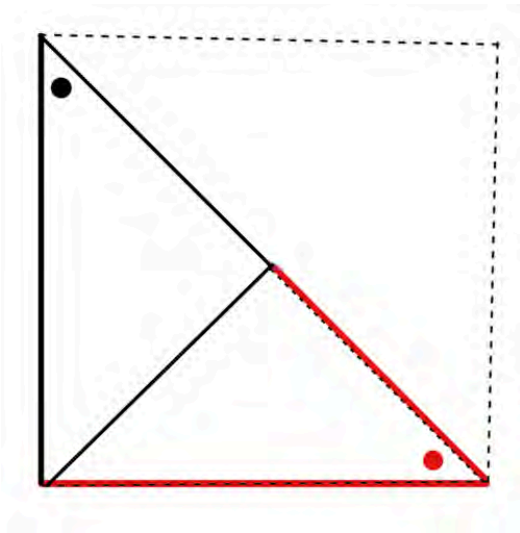


Option D



Now let us start with the last fold initially and draw the same lines shown in that to the options with the dot as seen in the question. Now try the method of elimination to understand what our probable answers could be. By doing that, we can clearly see that the last two options which have two dots which are one more than what shown in the last figure, and hence they cannot be our answers and therefore are eliminated from the choices which leaves us with two probable

answers that are option 1 and option 2. Now let us understand the next step for us, to do that we first need to make the mirror image of the last figure along the line of its last fold (shown below).



The figure in red is the mirror image of the last stage. By doing so we can see that the figure given in option 2 can be eliminated as the dot shown in option 2 is in the middle which cannot be possible as the line of folding is cutting that, and the original dot is at the side of the folding line.

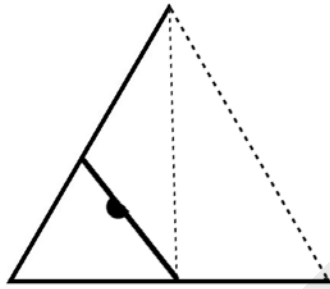
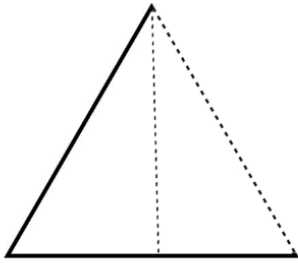
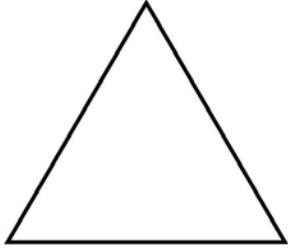
Now we can understand on how to solve these problems by summing up the 3 simple steps that we just learned above:

1. Look for the last figure to be present in the options and eliminate those which do not hold that.
2. Make the mirror image of the last figure along the last folding line.
3. Look for the marks to be present in the exact position from the options given.

The key crucial point to understand here is that these questions can take a lot of time in the examination if not tackled smartly and therefore, these tricks help in solving questions at a faster pace and accurately. Try to start with easier questions first and then gradually increase complexity, allowing you to gradually enhance your proficiency in solving Paper folding and cutting problems. Try to set a timer while solving these problems that will help you to manage your time while solving these logical questions. Through regular practice with these Paper folding and cutting questions, you can easily build confidence in your ability to tackle this topic and improve your overall performance in the reasoning section.

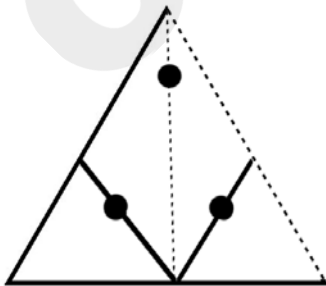
We would try to understand the concept better with another example:

Question:

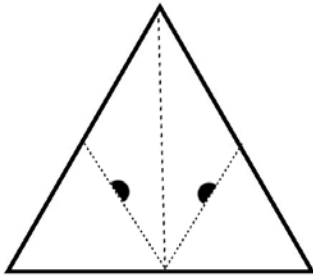


Options:

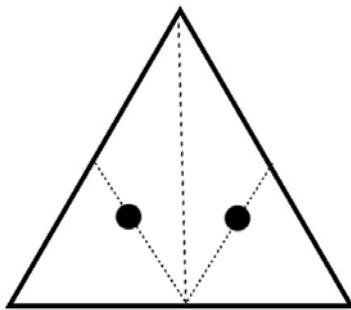
1.



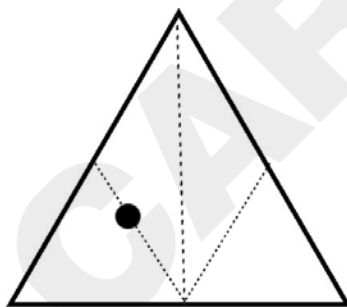
2.



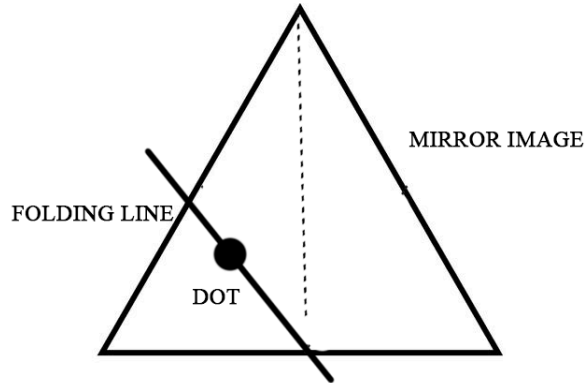
3.



4.



Let's look at the last figure of the question, we can see that the figure is not present in option B and option D. By doing so we can easily eliminate these two options and that leaves us with the remaining option A and option C. Now following the second step we will make the mirror image of the figure along the last folding line, which will look like this,



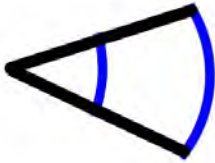
Now by doing so we can see; option A cannot be our possible answer as it has an extra dot which is not present in the mirror image and hence it leaves us with option C. Therefore, it is evident that option C is our answer.

Paper folding and paper cutting questions can be asked by using various forms, shape and sizes of the figure, hence it becomes crucial that one should sit with the question first and analyze the shape and size of the figure and then carefully examine the marks shown in the figure, folds, direction of the fold and the folding line. Initially these problems can come across as a little typical but with time and practice it becomes easier and more efficient to solve these questions.

Let us try to solve a little complex problem now,

Question

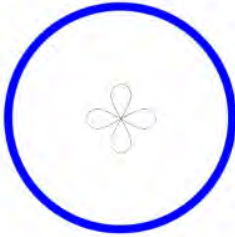
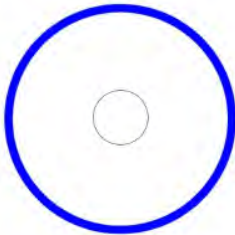
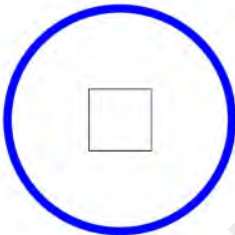




Options:

A



B**C****D**

Now as explained in the steps above, we should start by looking at the last figure of the question:

As we can see in the last figure, it shows a sector of the circle with a curved line at the center. By looking at the options given below to us, we can clearly understand that option A and option B can be easily eliminated as they have straight lines at the central image inside the initial circle. Now that leaves us with option B and option C.

Now let us look at option B, if we were to make a sector of the image, it would look something like the figure shown below,



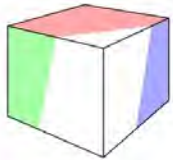
Now it is clearly evident that the sector for option B cannot be the same as given in the last figure of the question and hence by the elimination method we can easily conclude that our answer is Option C.

Here we were able to get the answer with just the first step, and therefore we do not need to follow the rest of the steps and make mirror images to solve the solution further. This method is henceforth effective in time management in the exam and gives accurate results.

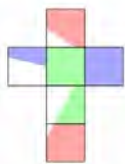
This topic is frequently asked in the reasoning section of the exams and regular practice will enhance your proficiency in solving these questions and help in increasing your speed, leading to improved performance in the reasoning section in the examination.

Previous Years Question asked from Paper Folding & Unfolding

Ques: Which option(s) can be folded to form the cube shown?

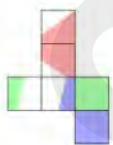


Option A:



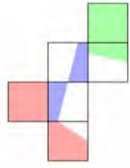
A

Option B:



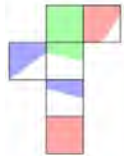
B

Option C:



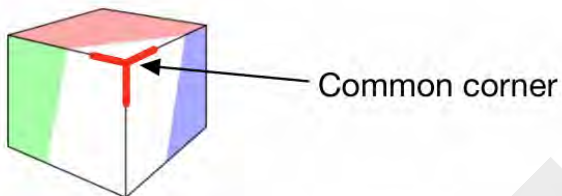
C

Option D:



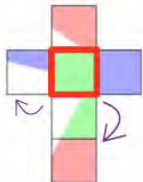
D

Solution:



We know colour shares a common corner (as shown above)

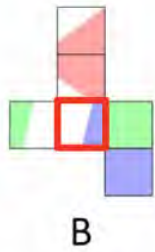
Option A:



A

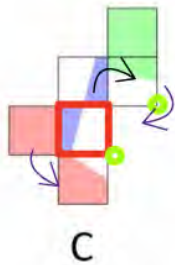
Keep this main green square (Red highlighted) as the top flip the green square down flip this blue square down and also flip this red square down, and we see that the three colours join at a corner, but they don't share a common corner as they do in the large cube. Hence, option A is incorrect.

Option B:



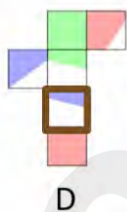
If we consider blue (Red highlighted) to be on top, green flips down and so does the red, then green and red connect like they are connected in the main image. Then blue and green are also connected, and they all share a common corner just like in the main image.

Option C:



Keep the blue square at the top and fold the blue and green square here downwards, then we further fold the green one towards the top blue square to connect them. So blue and green are then connected to the white and of their squares and red will fold down to share a common corner with the blue and the green like the main image. Hence, option C is correct.

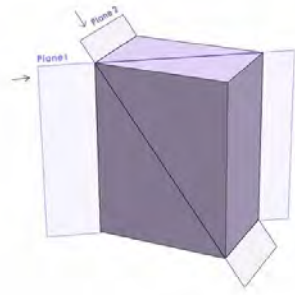
Option D:



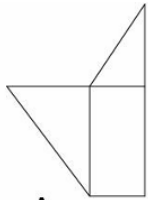
The blue is connected to the white half of the green squares, which can not be seen in the main image. Hence, option D is incorrect.

So, options B and C are correct.

Ques: The rectilinear hollow box shown on the left is cut along plane 1 and plane 2. Which of the option(s) shows (s) the correct unfolded pieces?

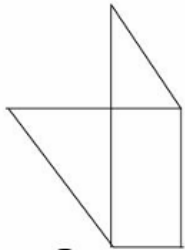


Option A:



A

Option B



B

Option C:



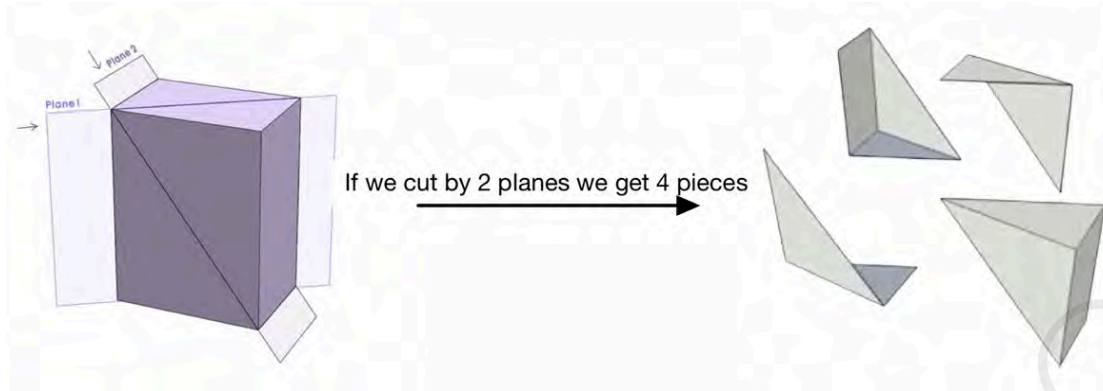
C

Option D:



D

Solution:

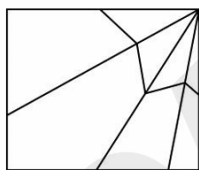


We can see the 2 right angles at the corner in all the pieces. Now go through each option. We can see options B and D are correct.

Ques: Which of the options shown on the right, when folded at the lines, will resemble the paper shown on the left?

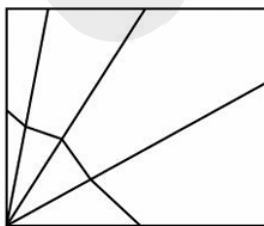


Option A:



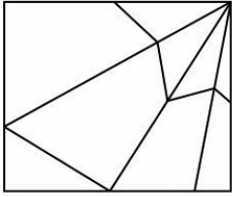
A

Option B:

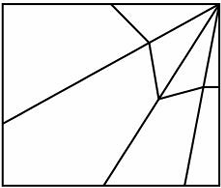


B

Option C:



C

Option D:

D

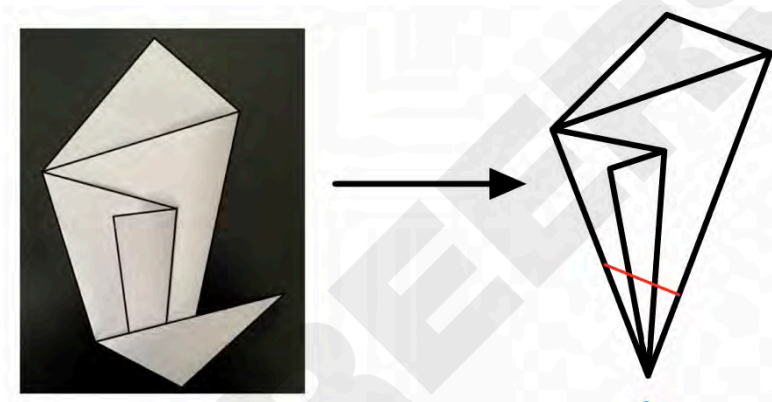
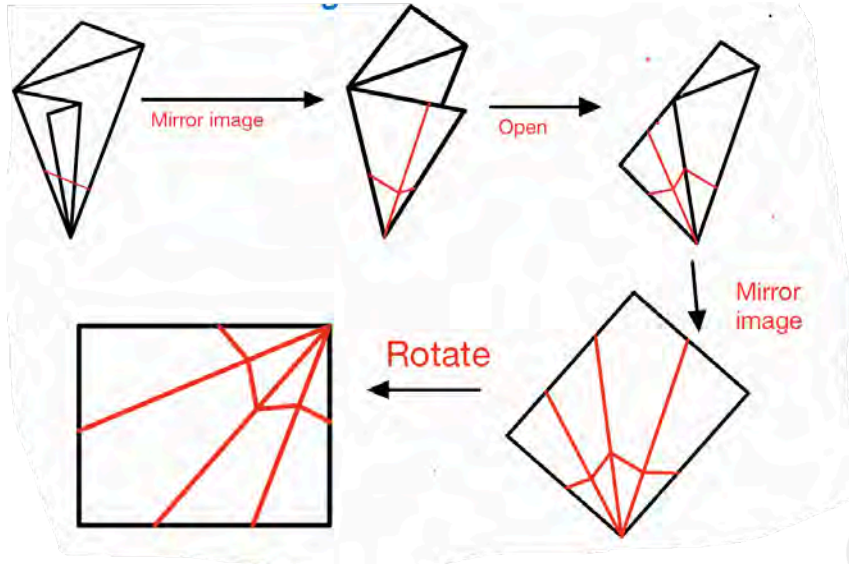
Solution:

Figure 1

Figure 2

When we open the figure 2 we will get the mirror image.

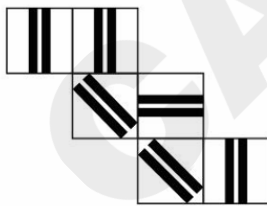


So if we match it with options, we can clearly say that A is the correct answer.

Ques: Shown on the left are all the 6 faces of a cube. Which option can be folded into this cube?

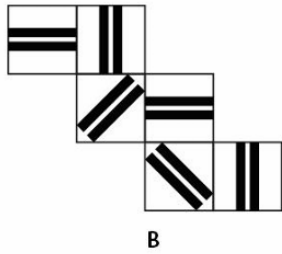


Option A:

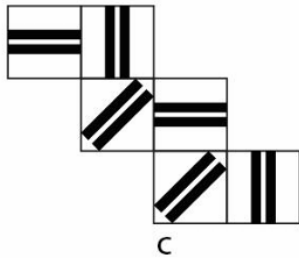


A

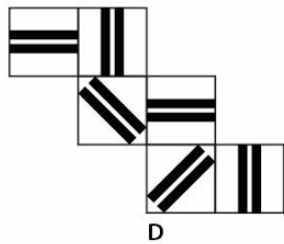
Option B:



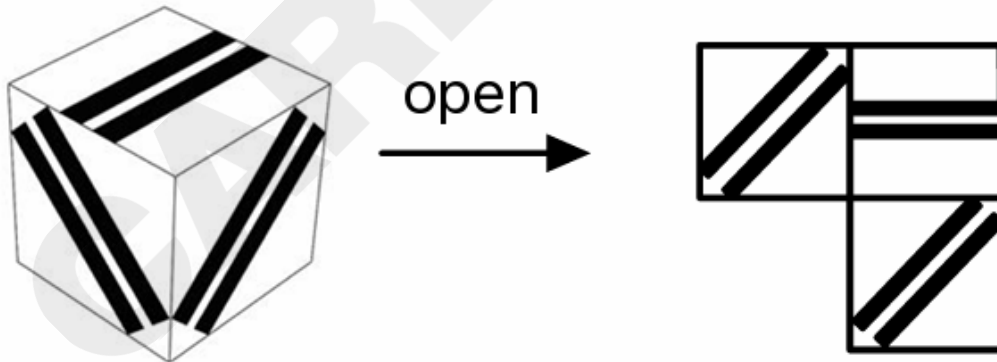
Option C:



Option D:

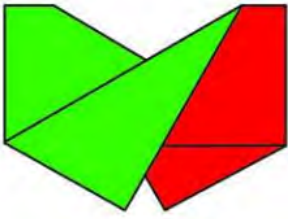


Solution:

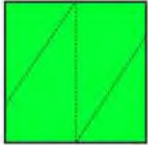


Now if we try to find a particular combination (figure 2) we can find it in option C
Hence, option C is correct.

Ques: Given below is a folded sheet of paper with green color on one side and red color on the other side. Dotted lines represent the fold lines. Which option shows the correct fold lines when this sheet is unfolded?

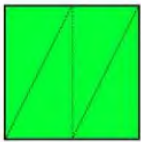


Option A:



A

Option B:



B

Option C:



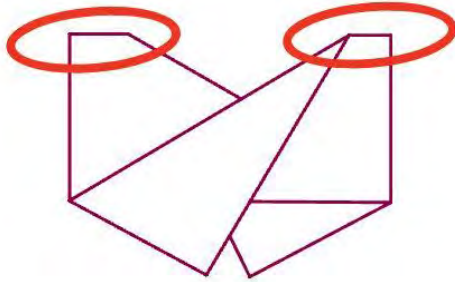
C

Option D:

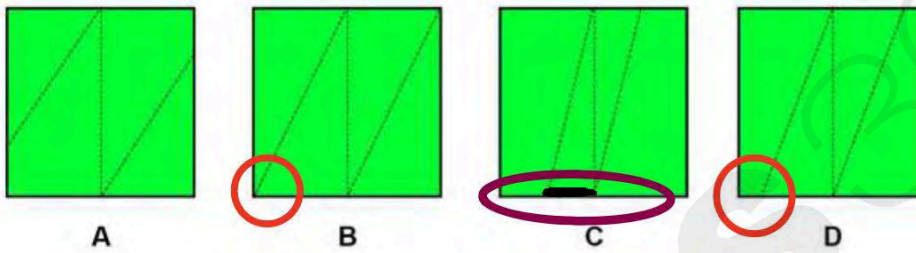


D

Solution:



This part is not so small. So option D and B is eliminated. Now part C is also eliminated because of small middle part division (as shown below)



Hence, option A is correct.

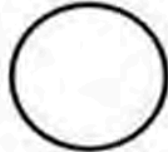
Spatial orientation/Volumes and Direction

Spatial orientation/Volumes and Direction : Perceiving the 3D volumes from 2D shapes/view
Understanding of Solid Volumes (prisms, pyramids, cubes, cylinders, spheres)

Basic shapes and forms

All the shapes exist in a flat plane in plane geometry. You can understand a plane as a flat sheet with no thickness and which can go in both directions infinitely. Any shape on the plane is called a plane figure. Popular examples of plane figures are square, rectangle, triangle and circle. Plane figures have sides, corners and angles except in case of a circle which does not have any straight line. These plane figures are called 2-D shapes. When these 2-D shapes are given height and they start to occupy space, they are called solid figures. These shapes have faces, edges, and vertices. These figures are called 3-D shapes. 3-D shapes originate from plane figures when they are given height, similarly shown below are basic 2-D shapes that generate their 3-D forms; namely: Circle- Sphere, Rectangle- Cuboid, Square- Cube, Triangle- Pyramid.

**2-D
SHAPES**



CIRCLE



RECTANGLE



SQUARE

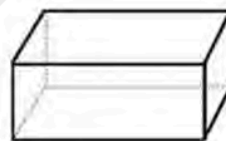


TRIANGLE

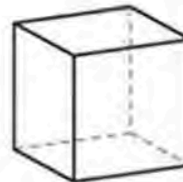
**3-D
FORMS**



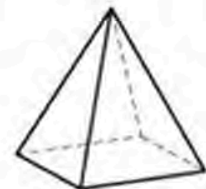
SPHERE



CUBOID



CUBE



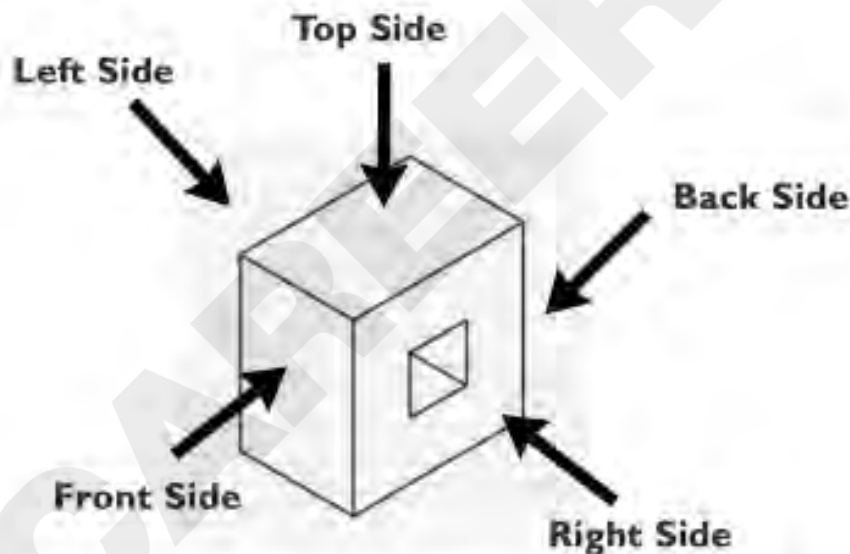
PYRAMID

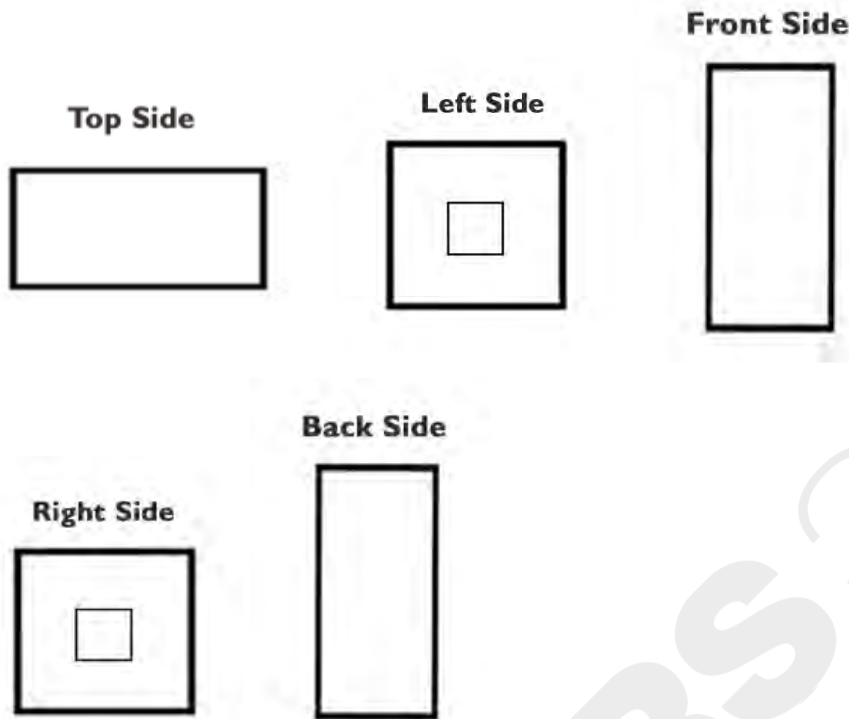
A basic shape is 3 or more line segments joined together. When equal line segments are joined at equal angles, they are called regular shapes. In a circle, the curve is created by joining points rather than joining line segments. When line segments of different lengths are joined at unequal angles, then they are referred to as irregular shapes. Curvy shapes that are not a circle (irregular) are created by free hand and are free flowing. When these shapes are given height, they become a form. Further, forms can be regular or irregular similar to shapes.

Representation of shapes through Isometric Drawing Techniques

Isometric drawing is a technique that is used by artists and designers to represent a 3-D form to a 2-D plane.

The definition of an isometric drawing is a drawing of a 3-D form on a 2-D plane along a vertical line with at least two identified points. All the horizontal lines of the image are created from this vertical line at the angle of 30 degrees. These angles are a crucial part in creating the three-dimensional, isometric view.





These views are 2-D faces determined when we see a 3-D form from its different faces. Here we can see, as a cuboid has 6 faces, it can be viewed in 6 directions namely; **top side** (view when the figure is seen directly from above), **bottom side** (view when the figure is seen directly from below), **front side** (view when the figure is seen directly from front face), **back side** (view when the figure is seen directly from back face), **left side** (view when the figure is seen directly from left face) and **right side** (view when the figure is seen directly from right face) . Questions in the exams are generally asked to determine any or all views of a given figure.

For example, in the figure given above, a cuboid is given with a square cut out through its center. As the figure given is a cuboid, its top and bottom view can be seen as rectangles. Similarly, as the cut-out is through the center and cannot be seen on other faces, its front and back views will also appear as rectangles as shown in the figure above. Now, when the figure is seen from the right face, we can easily see the square cut out, and therefore, the right view will appear to us as a larger square with a small square in the middle. Similarly for the left face, which is similar to the right face, the left view will also similar to right view appear as a large square with a smaller square in the middle.

Let us understand more from another example,

3-D Figure;

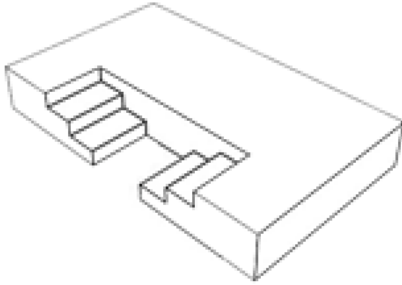
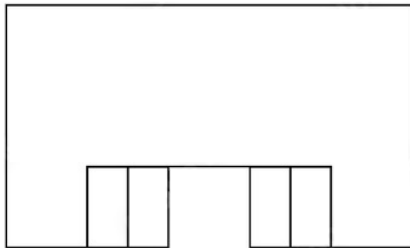


Figure given here is seen as a cuboid with a rectangular base which has 2 steps cut-out at 1 edge. Therefore, it can be seen from top side, bottom side and front side. A rectangle is seen when we view the above figure from left side, right side and back side (as steps cut-out are only at the 1 edge (front side), therefore, it is not visible on back view).

Top View:



Here, we can see a rectangle with a rectangular top view of 2 sets of steps in the middle from one edge. The empty space in the center between 2 sets of steps is shown with no line on the front edge as.

Front View:



Here, we can see that the heights of the steps can be seen. Lines can be seen at top and bottom edge as these are the lines that are seen for the edges behind the steps.

Right and Left Side View:

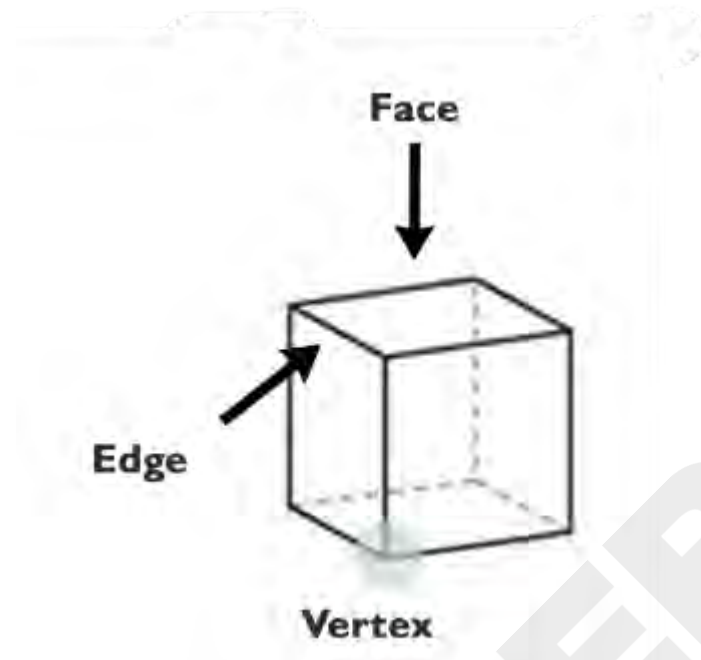


Here we can see, as steps are not visible at the right and left sides, therefore only a rectangle can be seen defining the height and base of the 3-D figure from the side.

Understanding of Solid Volumes

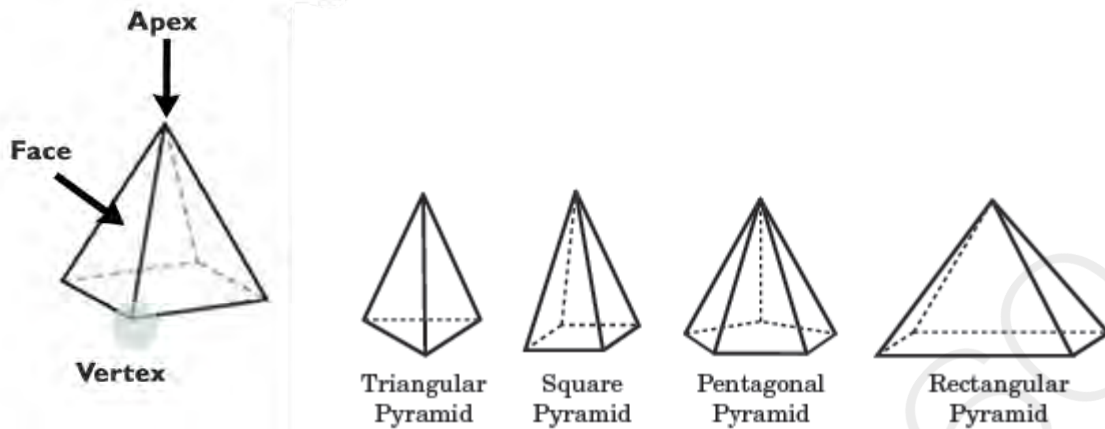
Cube:

A cube is a 3-D form of the 2-D shape square. All faces and sides of a cube are equal. The edges are equal. There are 6 faces, 12 edges, and 8 vertices in a cube.



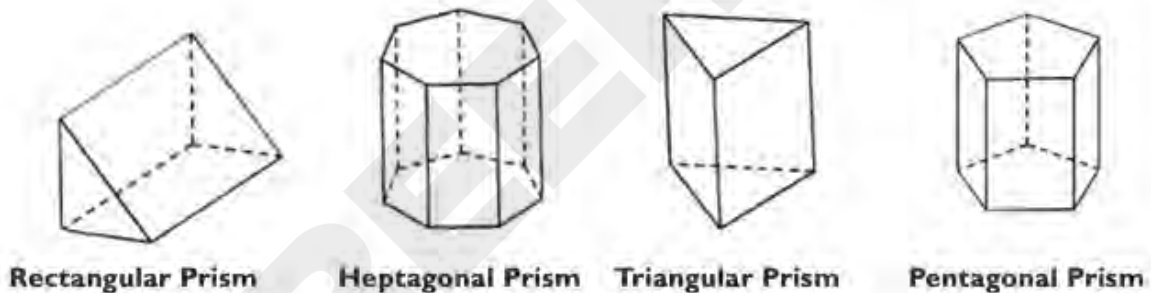
Pyramids:

A pyramid is a 3-D form with a polygonal (a plane figure with at least three straight sides and angles) base and triangular sides that meet at a single point called the apex. The base of a pyramid can be any polygon, such as a triangle, square, pentagon (5 sides) or hexagon (6 sides). Number of sides (or faces) that coincide with the vertices of the triangle depends on the number of sides of the base.



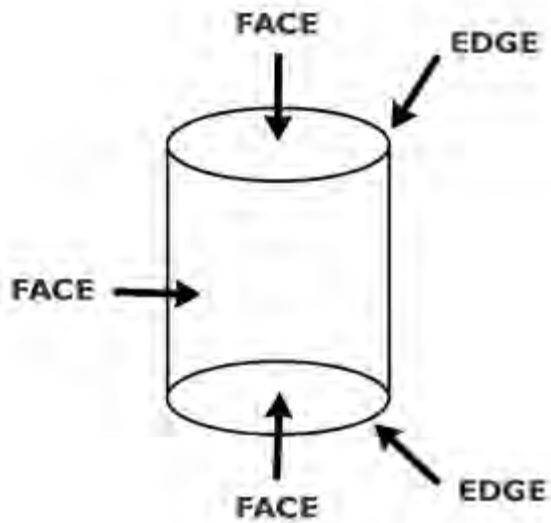
Prisms:

Prism is a 3-D form in which the two ends are identical. It is the combination of the flat n-sided polygonal faces, identical bases. The cross-section of a prism remains the same along its entire length, and prisms are named according to their cross-sectional shapes. Name of the prism is defined by the number of sides of its base.



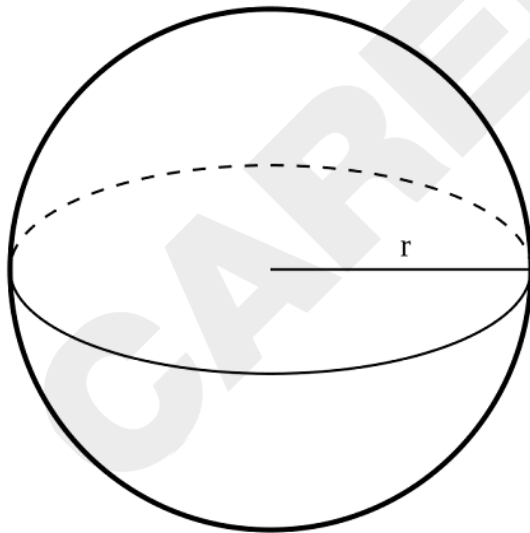
Cylinders:

Easiest way to understand a cylinder is imagining a stack of circles placed over one another. A cylinder has three surfaces, it has no vertex and 2 curved edges are present.



Spheres:

A sphere analogue to a circle is a form made of a set of points that are all at the same distance r (radius) from a given point in three-dimensional space. Simplest example to understand a sphere is a ball. A sphere does not have any edges or vertices and has one curved surface area.



Questions that are usually asked in UCEED exam

1. Ques: How many edges does a sphere have?

1. 1
2. 3
3. 5
4. None of the above

Ans: 4

Explanation: A sphere does not have any edges or vertices and has one curved surface area.

2. Ques: Complete the following sentence-

A _____ is a 3-D form with a polygonal base and triangular sides that meet at a single point called the apex.

1. Prism
2. Cone
3. Pyramid
4. None of the above

Ans: 3

Explanation: A pyramid is a 3-D form with a polygonal (a plane figure with at least three straight sides and angles) base and triangular sides that meet at a single point called the apex.

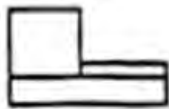
3. Ques: For the figure given below; which of the following options is the top view.



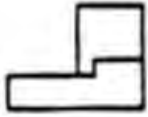
1.



2.



3.



4. None of the above

Ans: 1

Explanation: For the given figure, we need to determine the top view, which is the view when the figure is seen from above, therefore no heights are seen in the top view. The only option with no height given from the options given is option 1, therefore the correct answer for top view will be option 1.

4. Ques: What is an isometric drawing?

Ans: The definition of an isometric drawing is a drawing of a 3-D form on a 2-D plane along a vertical line with at least two identified points. All the horizontal lines of the image are created from this vertical line at the angle of 30 degrees.

5. Ques: Which form has three surfaces, no vertex and 2 curved edges.

1. Cone
2. Cube
3. Pyramid
4. Cylinder

Ans: 4

Explanation: Easiest way to understand a cylinder is imagining a stack of circles placed over one another. A cylinder has three surfaces, it has no vertex and 2 curved edges are present.

Surface Counting

Level 01: Basic

Surface counting is a visualisation-based exercise. Surface counting questions are repeatedly asked in various entrance examinations, such as NID, UCEED/CEED/ NIFT, etc.

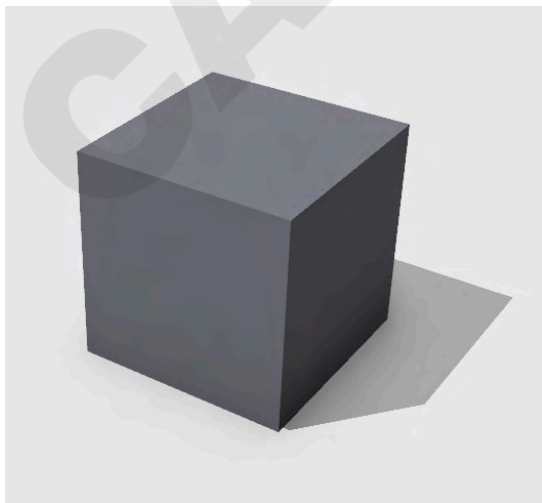
To build a strong visual and analytical perspective, design aspirants must master surface continuity. Every year, this ability is assessed in the DAT tests given by different organisations. The main goal is to evaluate the candidate's capacity for visualising and interpreting design aspects, essential for developing a strong visual memory and determining the proper interventions for a particular design solution. Read the complete article to know more about surface counting and surface counting questions.

INTRODUCTION

Surface counting involves counting the number of visible and invisible surfaces for a given three-dimensional arrangement. A three-dimensional arrangement could be a single entity or a combination of more than one three-dimensional volume with continuity or discontinuity in the surfaces, which we would go through next :

A. Discontinuous Surfaces : Cube and Cuboid

To understand the fundamentals of Surface Counting for 3D volumes, we will begin with the primary volumes like cubes and cuboids.



Cube (all sides are equal)

Cuboid (all sides are of different size)

Both cube and cuboid have 06 surfaces, considering the volumes length, width and height.

Top: 01

Bottom: 01

Sides: 04

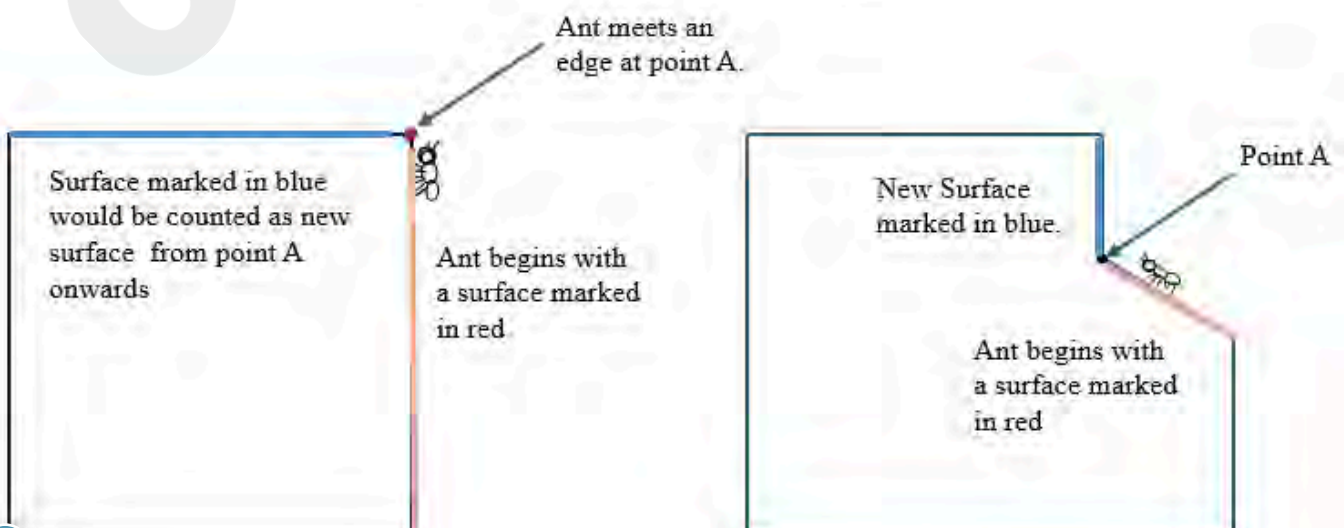
Continuous Surface : Sphere

A sphere, even with an equal/smaller or greater volume than a cube, has one continuous surface.



Activity : How to Count the Surfaces ?

Trick: Suppose an ant starts travelling across a surface, at point A, it meets an edge while travelling the surface. From Here(point A), the surface would be counted as the second surface.



Concept 01: The Ant Rule

Imagine an ant travelling along the edges of a wall.



For the above figure, Count the Number of surfaces for the given volume, as inferred from the two given views using the “Ant Rule”.

Solution: 06 Surfaces

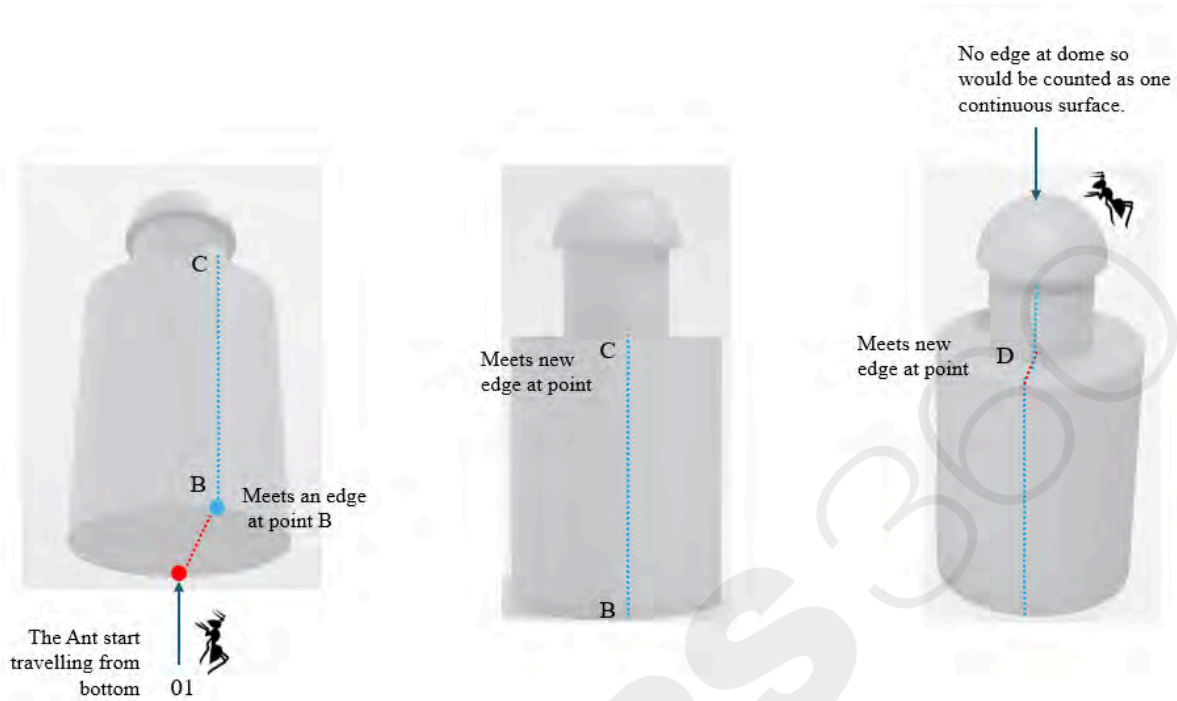
Method: Ant travelling across the edges

Description: As per the **Ant Rule**, at every encounter of an edge, the following surface count would be a new surface.

To Start counting, we need to understand the logic for solving such questions.

Logic 01: Continuity or discontinuity of a surface, marked by edge. In a question, the figure may contain two or more geometric volumes combined, as simple as a combination of cubes to a complex combination of multiple volumes, as shown in the above figure, which combines cylinders and hemispheres. In such cases, the edge serves as a partition between two surfaces.

Understanding the Concept of Continuity and Discontinuity :

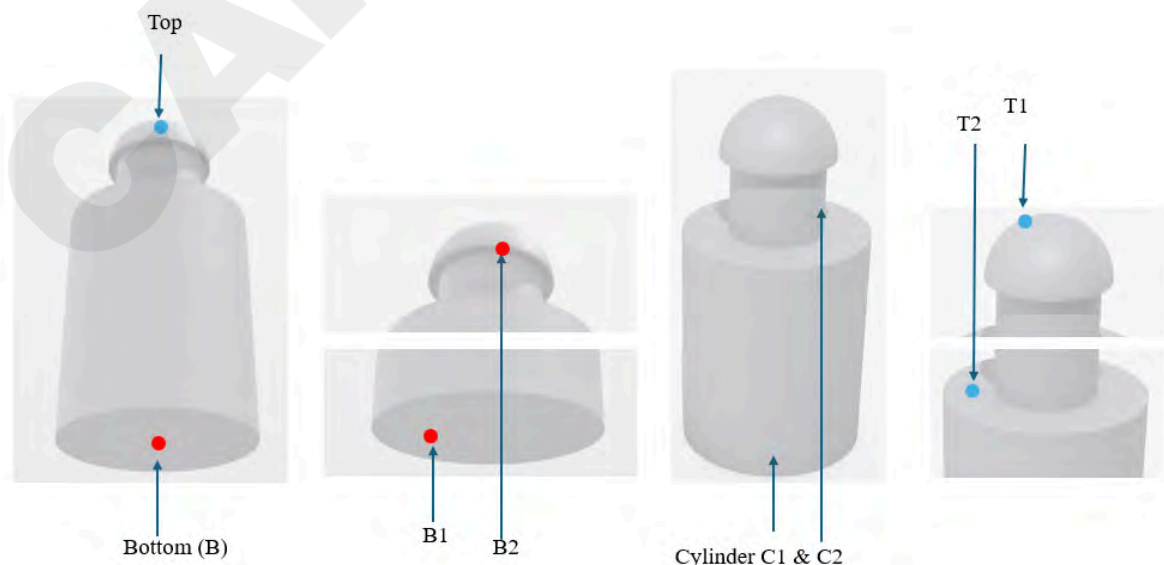


Logic 02: Direction

It is a good practice always to count all the surfaces visible from a given direction (like the top) out of 06 possible directions.

For example, all the surfaces visible from the top should be counted at a time in the figure, i.e., T1 & T2.

How To: Select a Direction to begin counting the surfaces.



Step-by-Step Approach to Solution

Step 01: Choose any one direction, only the Top or Only the bottom, to begin.

In the given figure, we start with the bottom approach.

Step 02: Count all the visible surfaces from the bottom, as shown in Figure 02

Step 03: Count all the Right-side surfaces. In this case of cylindrical surfaces, only C1 & C2

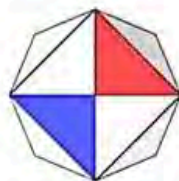
Step 04: Count all the visible surfaces from the top, in this case, T1 & T2

TOTAL SURFACES

$$B1+B2+C1+C2+T1+T2 = 6 \text{ surfaces}$$

Practise Questions for Surface Counting:

Q1 Four views of a convex solid are shown. How many surfaces does the solid have? :



Top view



Front view

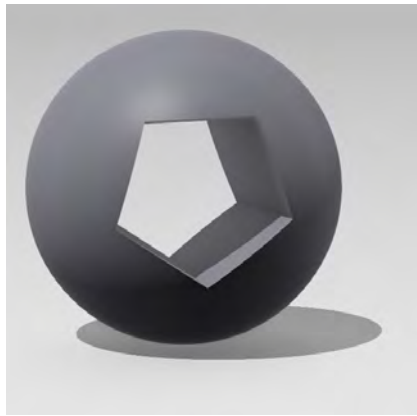


Side view



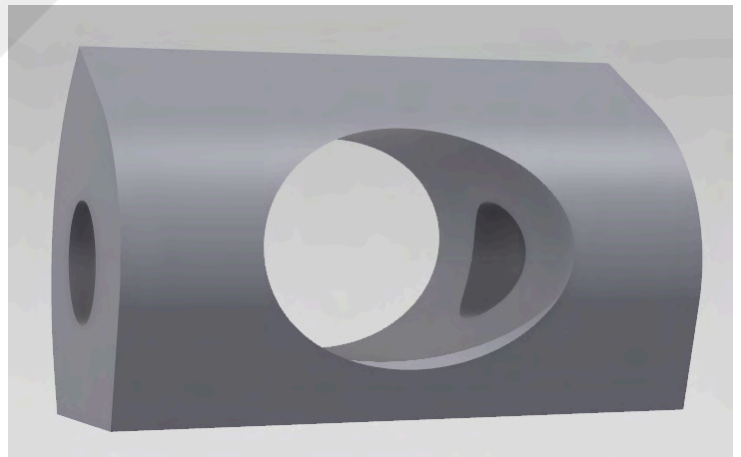
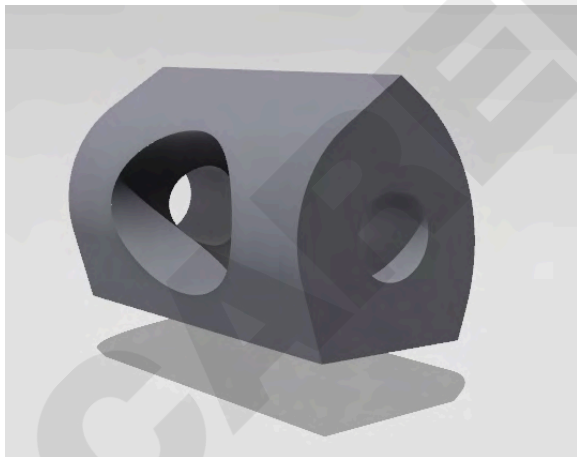
Bottom view

Q 2 : A pentagonal shape is cut out from the sphere for the given figure. Count the number of surfaces in the newly formed 3D volume.



Q 3 : From the Front, Right side and Perspective views for the given volume, Count the number of faces in the figure.

Hint: Count all the faces from one side in one go, e.g. counting all the visible surfaces from the right side view.



Level 02: Advanced

Understanding the surface through the Analytical Reasoning Approach.

In this article, we share the approach for counting the number of shapes in the given parent volume that consists of multiple sub-shapes/volumes, e.g. A stack of cubes is given, and some cubes are missing.

The focus is also on introducing the concept of platonic solids and their understanding from DAT examinations and Surface counting advanced level questions.

A. Introduction to Regular Polyhedron (Platonic Solids)

Platonic solids are a unique class of highly symmetric three-dimensional objects with equal faces, edges, and angles. The **Greek philosopher Plato gave these solids their namesake** and connected them to the elements of classical philosophy.

These volumes/solids are considered Platonic for the following properties.

1. Equilateral Faces: The dimensions and forms of every face are the same.
2. Equal Angles: Every internal angle is equal.
3. Vertices: An equal number of faces are joined by each vertex.
4. Every solid possesses a great degree of symmetry.

There are 05 types of fundamental Platonic Solids.

Tetrahedron: 04 faces in a triangle











Hexahedron or cube: 06 square faces

Octahedron: 08 equal faces

Dodecahedron: 12 faces in a pentagon

Icosahedron: 20 triangular faces



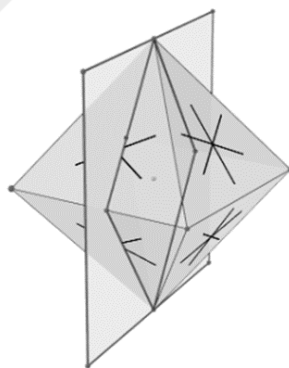
| | Tetrahedron | Cube | Octahedron | Dodecahedron | Icosahedron |
|----------------------|---|---|---|---|---|
| Platonic Solid |  |  |  |  |  |
| Spherical Polyhedron |  |  |  |  |  |
| F : Faces | 4 | 6 | 8 | 12 | 20 |
| p : Edges/face | 3 | 4 | 3 | 5 | 3 |
| q : Edges/vertex | 3 | 3 | 4 | 3 | 5 |

B. Introduction to Symmetry and Asymmetry in the Compositions for Surface Counting.

Symmetrical Shapes

Symmetry refers to the shape's ability to be split into mirror-image segments or to remain unchanged when rotated around an axis. Because of their homogeneous and predictable characteristics, symmetric volumes are simpler to visualise and analyse.

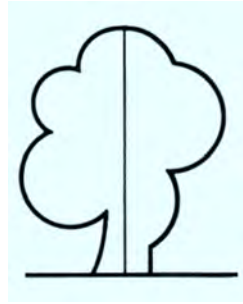
For example, as mentioned earlier, the tetrahedron, cube, octahedron, dodecahedron, and icosahedron are platonic solids. These shapes have equal faces, edges, and angles and are highly symmetrical.



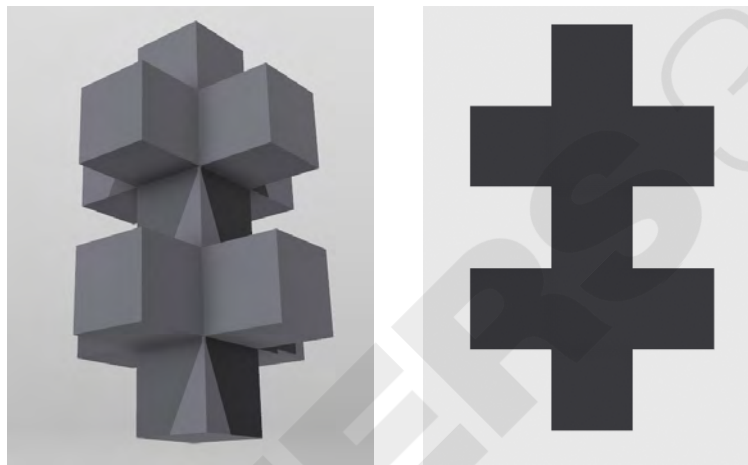
Asymmetric Shapes

Asymmetrical shapes are three-dimensional shapes that lack translational symmetry points, axes of rotation, and planes of reflection. Because of their irregular and unpredictable characteristics, asymmetric shapes are more challenging to understand and depict.

For example, organic volumes/shapes like rocks and trees are unlike most naturally occurring structures.

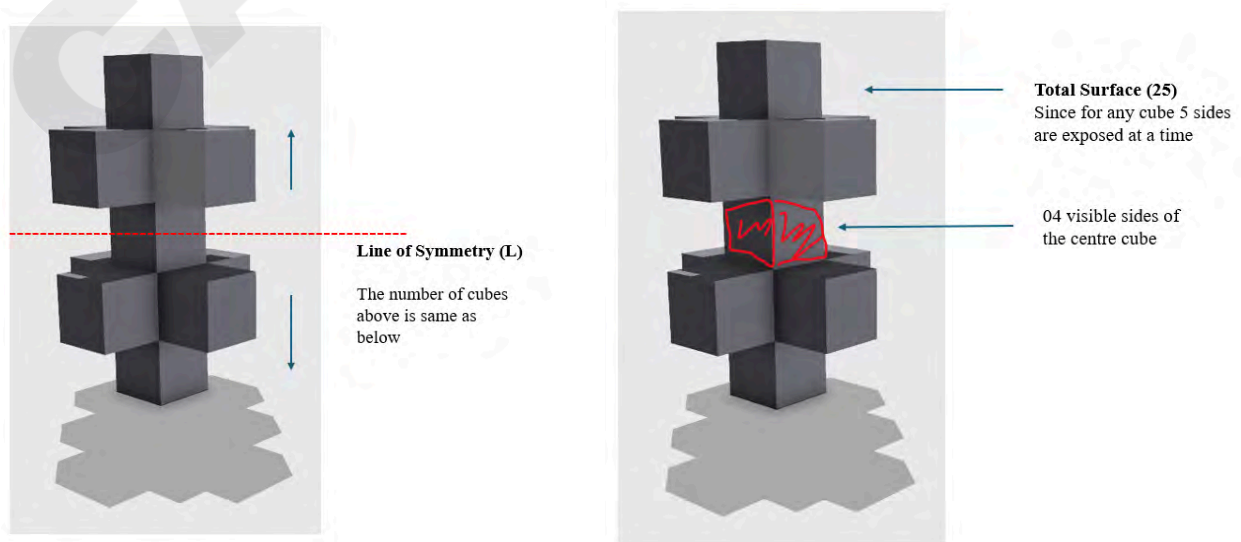


C. Visualising the Symmetry/Asymmetry in Surface Counting



Two views(Perspective and Right Side view) of the same object are given. Count the Number of Surfaces for the given shape.

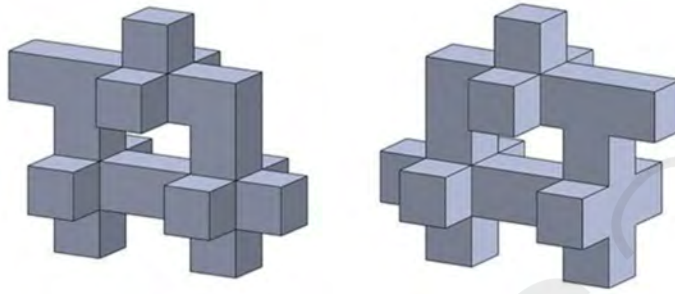
Solution: By marking a line from the middle, the shape provided can be divided from the centre, and thus it is symmetrical. This reduces the effort for counting the surfaces one by one instead of counting the surface from the centre and multiplying by two to count the total possible surfaces in such given volumes quickly.



$$\begin{aligned}
 \text{Total Exposed Surfaces} &= 25 \times 2 \text{ (for both top and bottom)} + 4 \text{ sides for centre cube} \\
 &= 50 + 4 \\
 &= 54 \text{ sides}
 \end{aligned}$$

Surface counting advanced level with answers:

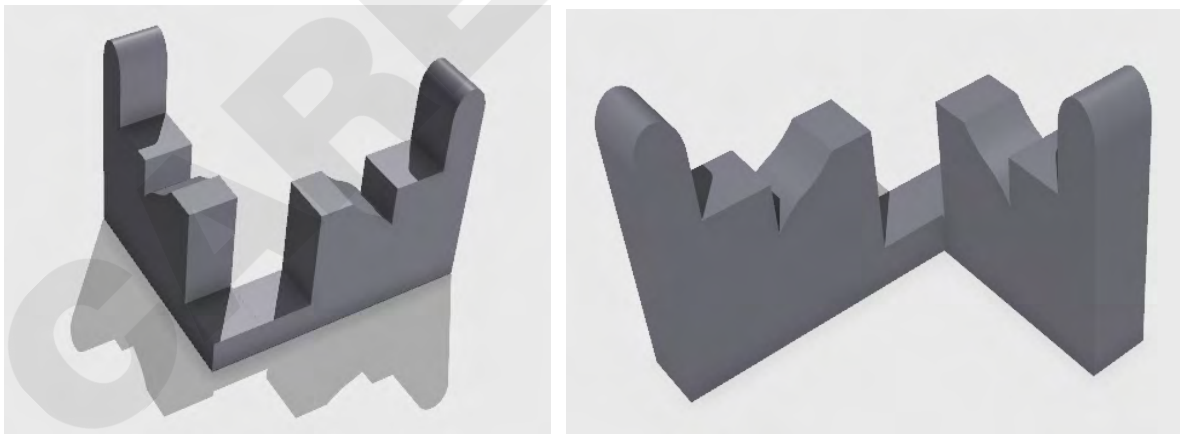
Practise Question 01: Below are two views of the same object. Count the number of surfaces in the given shape.



Hint: Primarily check if a symmetry/asymmetry in shape is possible across any axis.

Count all faces in one direction at a time, like counting all the faces visible from the top.

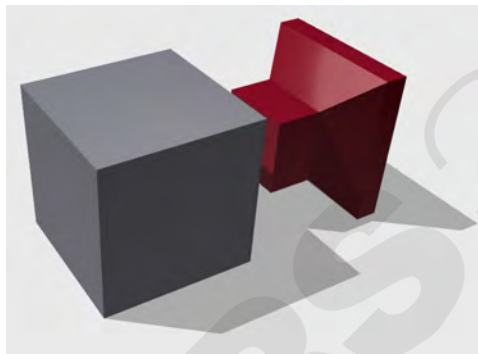
Practise Question 02: Two perspectives of the same solid, as shown below. Count the number of surfaces in the object, and consider the hidden faces flat.



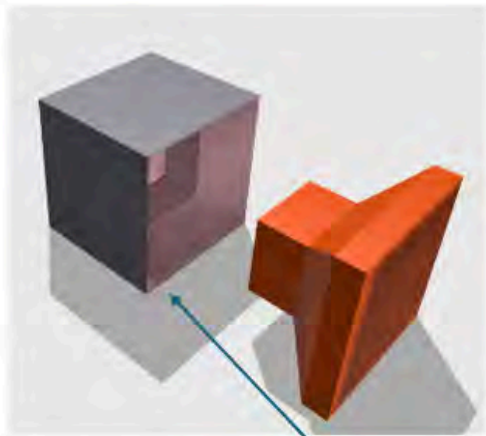
D. The surface formed by the Intersection of solids

In specific questions, a solid is given, and a part is cut out of the solid, thus exposing the new cut-out surfaces of the solid. **The candidate must count the new surfaces exposed/formed by this subtraction operation. The addition operation is also done to make new surfaces in some instances.**

Let us understand with the help of an example.

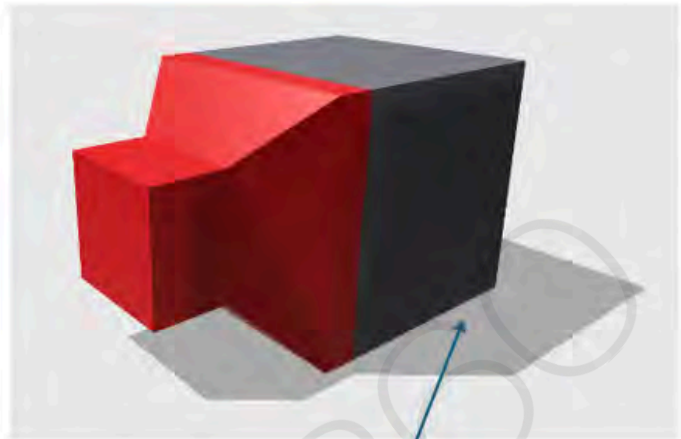


Parent figure



Subtraction Operation (14 surfaces)

By subtraction operation of in the cube there is a cavity formed exposing 9 new surfaces, and 5 original surfaces of the cubes making total 14 surfaces.



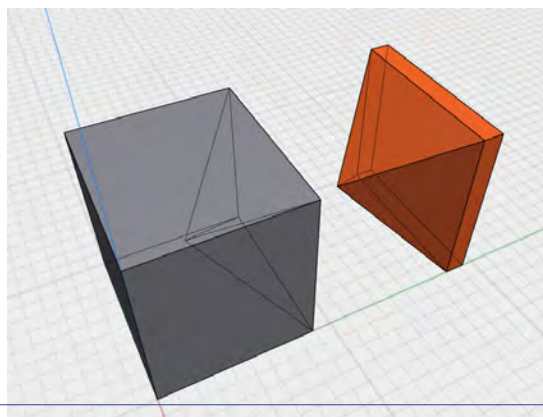
Addition Operation (18 surfaces)

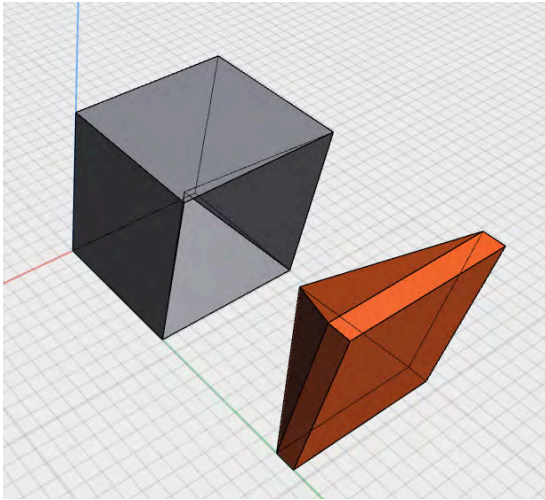
By Addition operation of in the cube the bodies have combined to make in all together 18 surfaces on counting.

Practise Question for Surface Intersections

Surface counting advanced level with answers:

Ques 01 : From one side of a solid cube of each side 2 units, a square pyramid of height 1 unit was removed, as shown in the image, resulting in a solid (in grey colour) with 9 surfaces. If one more pyramid of the same dimensions is removed from another side of the resultant solid, how many surfaces can the new resultant solid have?





Option A :10 Sides

Option B :11 Sides

Option C :12 Sides

Option D :13 Sides

The solution will be provided in the next article, so stay tuned.

Spinning and Rotation of Volumes

3D volumes at 90-180 Degree

Significance of the topic for UCEED Preparation

Since a lot of pictorial and diagrammatic questions are based on understanding different shapes, and volumes, their transformation and/ or manipulation of 2d shapes and 3d objects, how they can be interpreted when rotated or how their views will appear, it becomes crucial to develop a good visualization and spatial ability. Visualization and spatial ability play an important role in designing competitive exams like UCEED 2026. Questions are asked for students to mentally visualize and make mental drawings for 3-D forms/ Volumes and transformation of their position in a space according to the directions and instructions given. Therefore, it becomes important to understand the topic and practice questions for preparation of UCEED 2026.

In this concept for spinning and rotating, 3-D volumes are given and directions are given to mentally rotate them (usually at 90 or 180 degrees). Students are supposed to then mentally visualize the outcome and select from the options given. 180 degrees rotation can also be termed as a mirror image of the volume given. By these questions, examiners try to analyze how good a student has visualization and spatial reasoning.

What is spinning and rotation of volumes

Let us first understand that what do we mean by a 3D volume;

A 3D volume is an object that has all 3 dimensions namely length, width and height and occupies space. They are typically made by their 2-D shape or plane figure (regular or irregular) when given height to them.

Rotation is typically the motion of these 3D volumes when they are subjected to move along a circular path with a fixed axis. Spinning is the continuous motion of the object when rotated along its axis. To understand rotational motion, let us see some of the basic daily life examples;

- Earth's rotation around the axis.



- Rotational motion of a clock's hand around its fixed center.



- Movement of a window with its one edge fixed and moving in a circular path through that fixed axis.



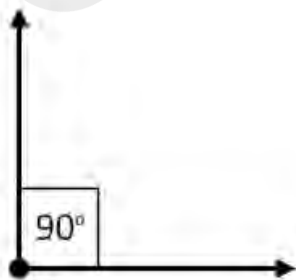
- Movement of a wrench for nut/screw along one axis.



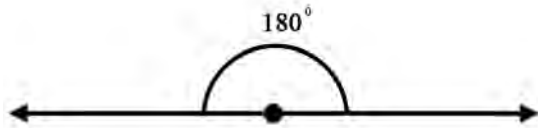
These are some of the examples that can help students to visualize the path of the object when subjected to spinning or rotation.

90 and 180 Degrees rotation

90 Degrees angle : A 90 degrees angle or right angle is quarter of a circle, which is made by 2 perpendicular straight lines meeting at one point. To understand more easily, see for any square or rectangular corner, which is 90 degrees in angle.



180 Degrees angle : A 180 degrees angle or straight angle is half of a circle, which is made a straight line. Since 180 degrees angle always makes a straight line, therefore the name straight angle is derived. To understand more easily, see for any straight surface like a pencil or a see-saw.



3D Volume spinning and rotation based Questions in the UCEED Exam

Questions in the UCEED exam are asked generally by giving a 3D shape or object in the question figure and then students have to visualize and mentally create the transformed position of that 3D figure at 90 degrees or 180 degrees angle and then create the final transformed object or choose from the options given below. To prepare for these kind of questions student have to keep certain points in mind,

- Read the question carefully and understand what angle and what direction to move the object is given in the question.
- Make a mental figure of the object on how it will appear when rotated in the given direction and angle.
- Usually, a very small detail is changed in the options to choose from, so it is very important for students to keep a keen eye for details.
- With everyday practice, these questions become easy and fast to solve, therefore try to visualize and create as many objects as you see around to get more and more efficient daily.

Bonus Tip: These questions, with practice develop skill for fast and accurate results, therefore can easily help in saving time in the UCEED 2026 for more complex questions.

Let us understand the concept better with examples;

Figure:



Now the key point to understand here is that the figure in the image is diagonal, therefore to rotate with accuracy we need to first make a straight line for its surface and then understand rotation as shown;



Now for clockwise 90 degrees rotation, rotate the surface at 90 degrees;



For anti-clockwise 90 degrees rotation, rotate the surface at 90 degrees in the opposite direction;



Similarly for rotation at 180 degrees, will be as shown below;



NOTE: For rotation at 180 degrees, clockwise and anti-clockwise rotation will appear the same.

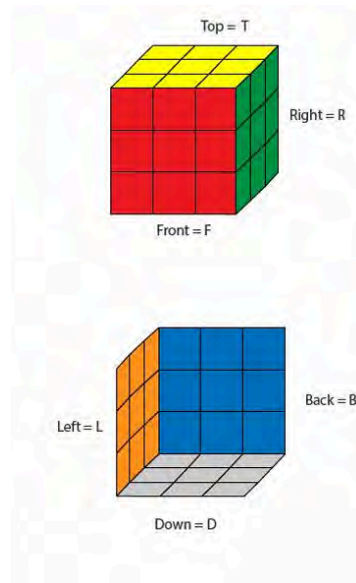
Tips to understand question patterns for UCEED 2026

Questions generally arrive to rotate a single object/objects or combinations of rotation for complex problems for the UCEED Exam. Sometimes language in the questions are twisted for students to understand and therefore, it is important for aspiring students to carefully read and understand what exactly the question demands. For example, a mirror image will mean rotation at 180 degrees, straight angle means 90 degrees rotation etc.

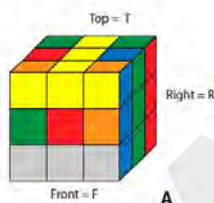
Spinning and Rotation of Volumes UCEED Previous Years Questions and Answers

Ques: The faces of a solved Rubik's Cube are shown in the figure. A 90-degree clockwise turn of a face T is denoted as 'T+' and a 90-degree anticlockwise rotation is denoted as 'T-'. What is the result of the operation T+, D+, R-, L-?

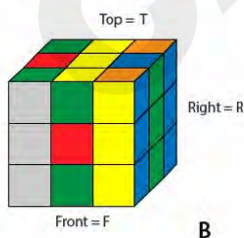
All operations are done by looking directly at the face.



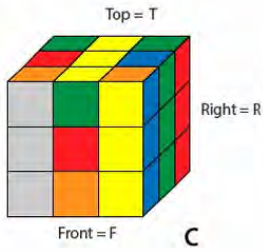
Option A:



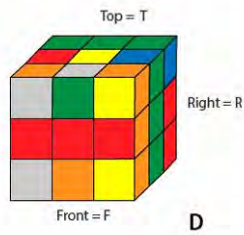
Option B:



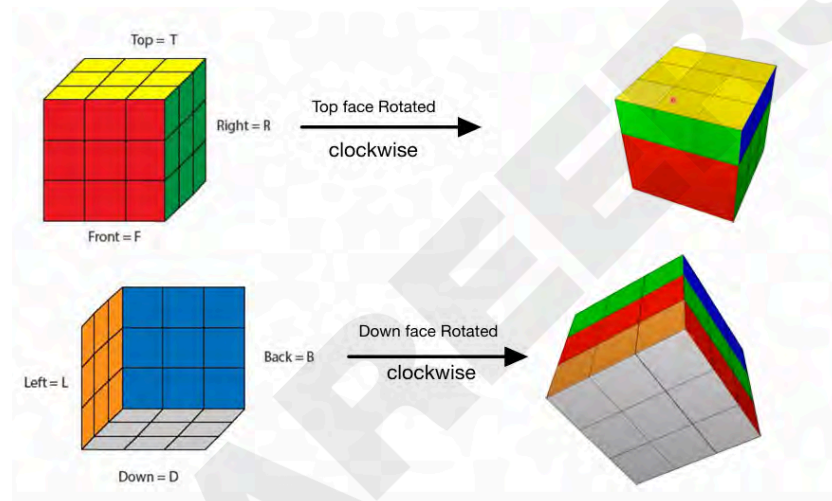
Option C:



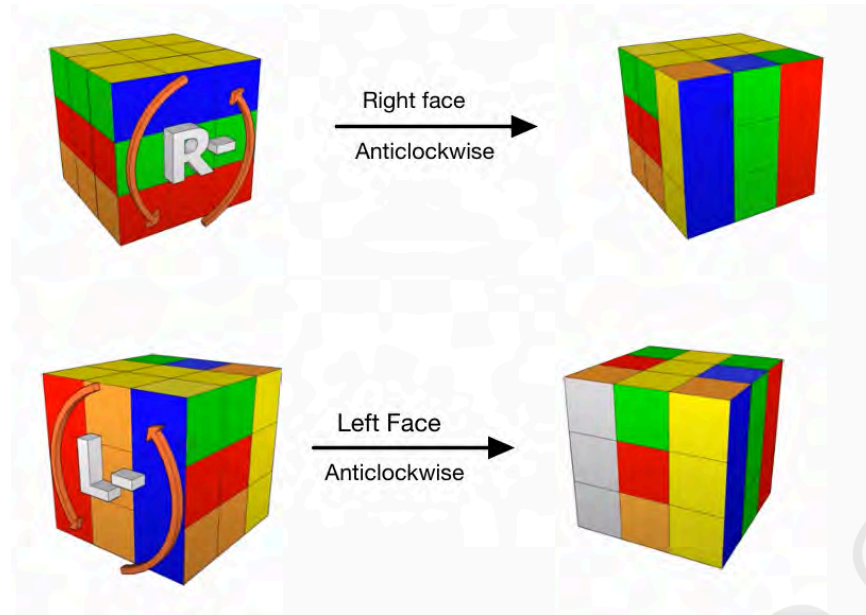
Option D:



Solution:



According to the next instruction R- i.e., Right face anti-clockwise.



We can see that C is the correct answer.

Ques: The white part in the shoe sole shown left represents the embossed / raised area. Find out the right footprint of the shoe from the given options.



Option A:



A

Option B:



B

Option C:



C

Option D:



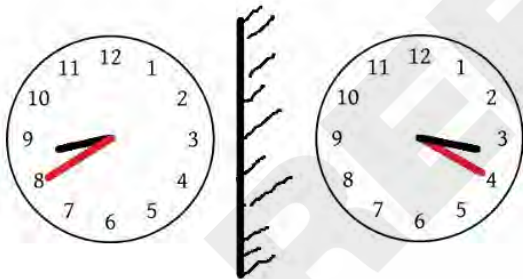
D

Solution:

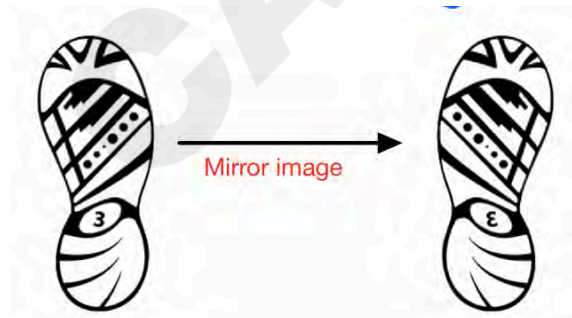
We need to find out the mirror image of the footprint.

In the mirror image,

- The right side of the object becomes the left side.
- The left side of the object becomes the right side.
- The top and bottom sides of the object remain unchanged.

Example:

So the mirror image of the footprint is



Now check the options one by one.

Option A:



Both images don't resemble each other. Hence, option A is incorrect.

Option B:



Both images resemble each other. Hence, option B is correct.

Ques: Which of the options can be created by the stamp shown on the left?



Option A:



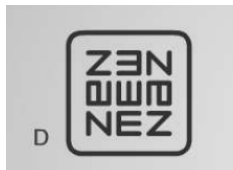
Option B:



Option C:

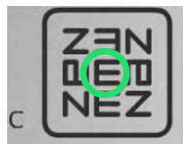


Option D:



Solution:

Option C:



If we compare both images given above, we can say this is not possible to create because of the position of center E.

Therefore, options A, B, and D are correct.

Ques: If the image on the left is flipped horizontally (about Y-axis), and then rotated 180 degrees, what will be the resulting image?



Option A:



Option B:

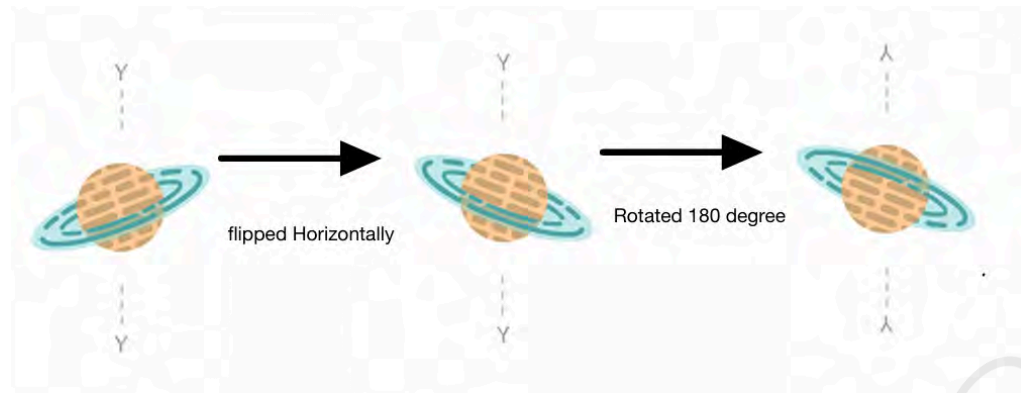


Option C:



Option D:



Solution:

The given image is flipped horizontally about the y-axis (as shown above) and then rotated 180 degrees.

Hence, option C is correct.

Scaling Up and Down:

To understand the uses

Scaling up and down is a topic that comes under the larger umbrella for Mental Visualization and Spatial Ability for UCEED Syllabus. Mental Visualization in design thinking is the process of thinking, listening, interpreting the idea in our minds and then putting it out on paper altogether. It is the process of creating mental maps and mental images of a given figure or scenario according to the instructions given. Spatial ability is the process of mentally visualizing how a 2D or 3D shape/figure or object will take up space or appear when manipulated or transformed in a 3-dimensional space. For students to prepare for UCEED 2026, they need to develop the skill for mental visualization and spatial ability as it is one of the topics with most weightage. This could be developed with constant practice and further help in developing better time management and accuracy.

What is a scale?

Scale for any object is used to define the exact measurement or comparison for that object. In geometry, scale is defined as the ratio for any object to dimension for its model to the dimensions of its actual size. You can see the easiest example as the scale we have been using since childhood in our geometry class to measure anything or to create something with the dimensions as measured with the help of a ruler with scale marked on it.

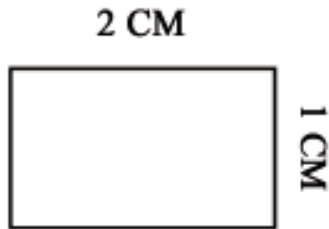
Scale is usually represented as ratios, two numbers with colon (:) between them. For example, 1:1 is the scale denoted when the dimensions of the model and dimensions of the actual object are exactly the same. 1:6 is the scale denoted when the dimensions of the object is 6 times bigger than the actual size of the object. This representation is known as scale factor.

Numbers in the scale, when used for dimensions are usually taken in both positive and negative directions. Positive numbers meaning going in the positive direction or scaling an object in larger than its original size. Similarly Negative numbers mean going in the negative direction or scaling an object smaller than its original size.

Now having the basic knowledge of scale and scale factors, let us understand what concepts for mental visualization we need to prepare under this topic for UCEED 2026.

Scaling Up: The process of scaling up any object is enlarging the object into a given dimension or size while maintaining all the other features like shape, form, color etc. exactly the same.

For example, if a rectangle of dimensions 2 cm X 1cm is given as shown below;

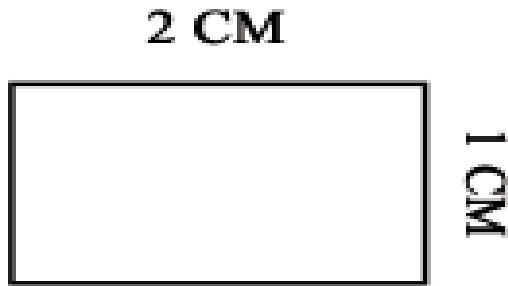


Now instructions are given to scale up the rectangle by a scale of **1:3**, 3 being the scale factor here. Here, to scale up an object we multiply the object to its scale factor, therefore dimensions of 2 cm X 1cm will be multiplied by 3 and become 6 cm X 3 cm as shown below;

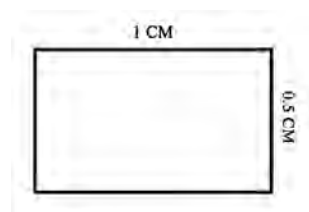


Scaling Down: The process of scaling down any object is reducing the object into a given dimension or size while maintaining all the other features like shape, form, color etc. exactly the same.

For example, if a rectangle of dimensions 2 cm X 1 cm is given as shown below;



Now instructions are given to scale down the rectangle by a scale of **1:2**, 2 being the scale factor here. Here, to scale up an object we divide the object to its scale factor, therefore dimensions of 2 cm X 1 cm will be divided by 2 and become 1 cm X 0.5 cm as shown below;



Note: For 3D objects, when we scale up or scale down an object, the height or depth will also be multiplied or divided by scale factor as per the instructions given.

Scaling Up and Down based Questions in the UCEED Exam

For UCEED 2026 preparation, we now understand the detailed concept on what scaling up and scaling down mean and how it is done. Let us now understand what kind of scaling questions are generally asked in the examination,

- Questions are asked to mentally visualize and create a scaled up or scaled down model of an object.
- Memory question: Sometimes to make the question more complex, the original object is not given and asked to imagine any object based on a daily basis and then draw a scaled version of the object.
- Questions are also asked to take an object, visualize its scaled up or scaled down model and then, using your imagination, come up with the uses the new scaled object can deliver. These types of questions are asked to analyze logical and creative skills of the students.

Tips for students on the topic for Preparation for UCEED 2026

- First thing students need to keep in mind is to develop a habit of sitting with the question and taking time to understand what exactly is asked in the question.
- Practice on graphs first to get a better sense of size and scale. Start with basic shapes and figures first, try to make as many scaled up and scaled down models as possible to get a better understanding.
- After graphs, students should be able to draw on plane sheets with accuracy and ease that can be achieved by practice and time. This is important as in the exam, students are not given graphs and have to draw on plane sheets only.
- Once, method of scaling up and scaling down is understood and skill is developed, aspiring students should be able to mentally visualize the objects without them being physically present or through a drawing for them.
- Last step is to visually practice and imagine different objects and their scaled up and scaled down versions and create uses other than the conventional uses for them.
- Students can develop these skills and get accuracy and efficiency with regular practice and this in turn will help them to manage time for these questions in the UCEED Exam.

For example,

Imagine a suitcase, and now scale it down to a scale of 1:5;

Original suitcase should be of size;



Now a scaled down version for suitcase, which is dividing its dimensions of **75 cm X 45 cm X 20 cm** to scale factor of 5. This will give the result as a suitcase with dimensions of **15 cm X 9 cm X 4 cm**;



Now the next step is to imagine uses for this new scaled suitcase which will appear as a box of size **15 cm X 9 cm X 4 cm**.

Let's imagine the possible uses this suitcase can offer now,

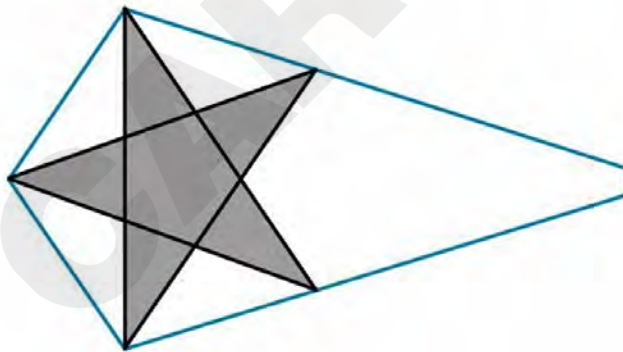
- Pencil Box
- Jewelry box
- Organizer
- Eyeglasses case
- Planter
- First Aid box

Similarly you can imagine more uses and applications for the object according to the new size and scale.

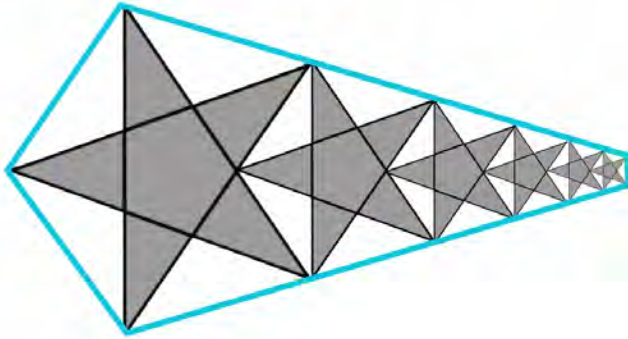
Note: Always remember the original shape and material of the object to provide more logical and better uses for your answers.

Scaling Up and Down UCEED Previous Years Questions and Answers

Ques: What is the maximum number of stars that can be packed inside the blue color boundary, including the one that is shown in the image below? The stars can be scaled, but should not overlap. At least 4 points of every star should touch the blue color boundary.

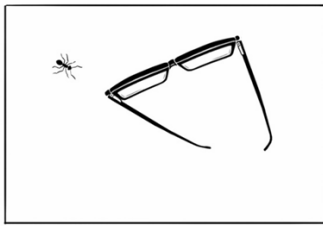


Solution: According to the question, we have to pack a maximum no. of stars inside the blue color boundary. As shown below.



We can have 6 maximum no. of stars.

Ques: An illustration of a walking ant and a pair of glasses lying on the table surface is shown. Which is the correct illustration from the ant's current point of view?



Option A:



Option B:



Option C:

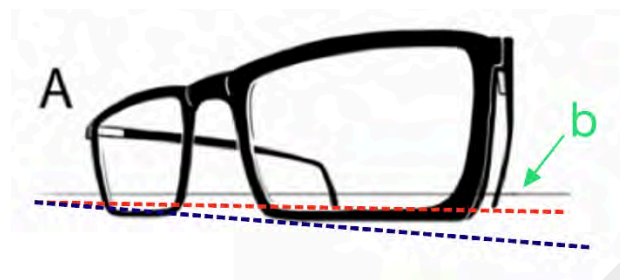
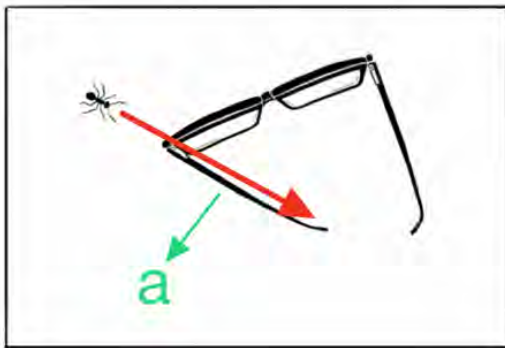


Option D:



Solution:

If we observe the direction of the ant's travel, it is almost parallel and in line with the left frame 'a' as shown in the image below. So, the frame will appear the least to its view.



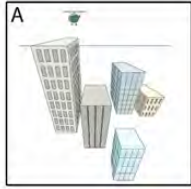
Hence, option A is correct.

As shown in the second image, the position of point b should be higher along the vanishing line (red dotted) to that of the vanishing line in the blue dash. This is because, in view, the nearest object to the eye appears closer to the bottom of the image (and bigger) while the farthest object to the eye appears smaller. And also away from the bottom of the image.

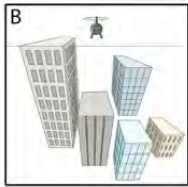
Ques: A giant creature is walking towards a group of buildings in the city. Which is the correct perspective from the creature's point of view?



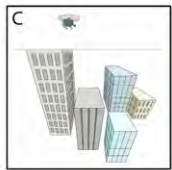
Option A:



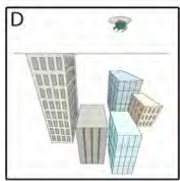
Option B:



Option C:



Option D:



Solution:

The dragon's eye level is the same as the tallest building height, and the helicopter is flying above its eye level and to the left of it.

Hence, option C is correct.

Gestalt's Theory:

Hidden information, Figure and Ground Theory

According to Gestalt's theory, how an object is perceived by someone may not be whole in meaning and can have hidden parts when looked closely. According to the theory, a person perceives any object that is either in the foreground or in the background.

Therefore, for preparation of UCEED 2026, students need to understand and develop how to interpret and decode the patterns using this theory when asked in the UCEED Exam.

Questions are also generally asked in UCEED 2026 from the theory and its concepts or when poster-making skills are needed.

To give our ideas and narratives a form, we need visualization in design thinking. Visualization is thinking, listening, interpreting the idea in our minds and then putting it out on paper altogether. It can also be defined as any technique for creating images, designs, concepts or animations to communicate a message. Visualization is important for any aspiring designer as through visualization only they can get a better understanding of shapes and forms, colors, texture, etc.

How to develop Visualization skills

To develop good visual ability, students need to observe everything very carefully, understand its characteristics and practice as many questions as they can daily so that they can become more efficient and accurate. Another way to do this, students can incorporate visualization into their daily activities. For example, if you see a plant, understand its shapes, color, texture, material. Observe different patterns present in its form. Observe how it is placed, what is in the background, how by changing a few elements around the plant can change the narrative, how to change the position to create more focus etc. Incorporating these small practices develop better observation into the students ability to focus on small details and characteristics for objects. This further also helps in remembering details when these objects are not physically present for them.

Observation skill is the most crucial ability for any aspiring designer. This practice also helps students to develop speed and accuracy in solving questions related to these topics as time management is one of the most crucial aspects for UCEED 2026 preparation and other design competitions.

What is Gestalt's theory?

According to Gestalt's theory or principles, it is a set of psychological laws or principles that explains how humans perceive visual information and how the human brain has the ability to group similar elements in a visual composition together and simplify complex images. It states how the human brain can see patterns, when visually represented. It is important for any designer to understand and apply these principles as this helps in creating better visual compositions which are easy to understand and more appealing to its users.

According to Gestalt's theory, it emphasizes that “the whole of anything is always better than its parts”.

Gestalt's Principles:

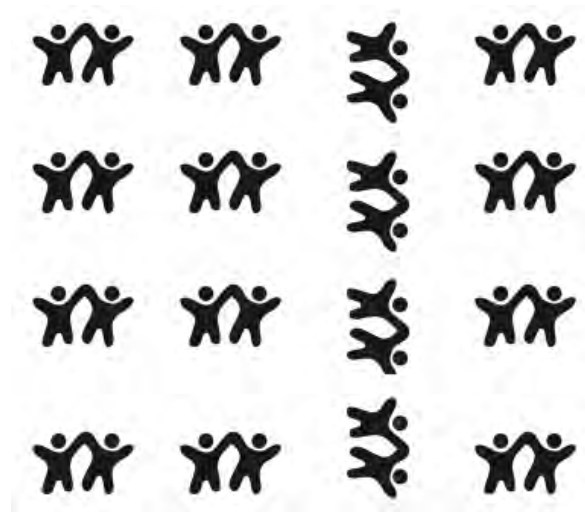
1. Figure-Ground

According to his ground theory, it is human ability that makes them segregate figures in the foreground from their background and see. Therefore figure becomes their main focus mentally and visually. According to the theory, everything that is not the main figure becomes the ground.



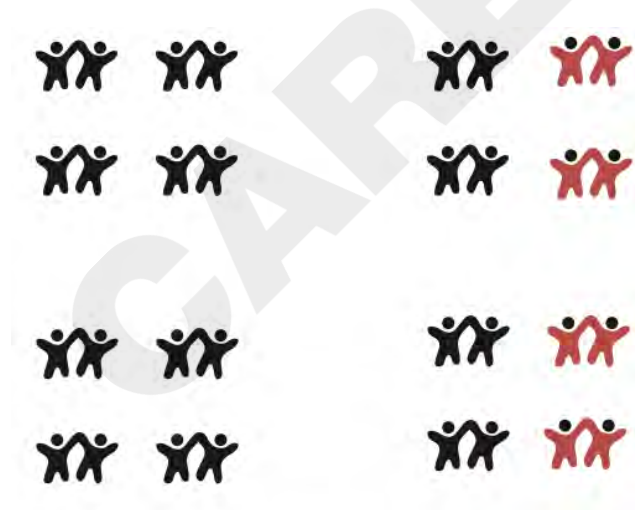
2. Similarity

The similarity principle states that when the human brain sees similar elements, it groups them together and assumes them to have similar functions. This can be done by using similar color, shapes, texture etc



3. Proximity

Proximity is the principle that states that elements when placed together seem more related to one another than the ones that are placed apart to each other. Proximity when used properly is more powerful than similarity of color, shape etc.

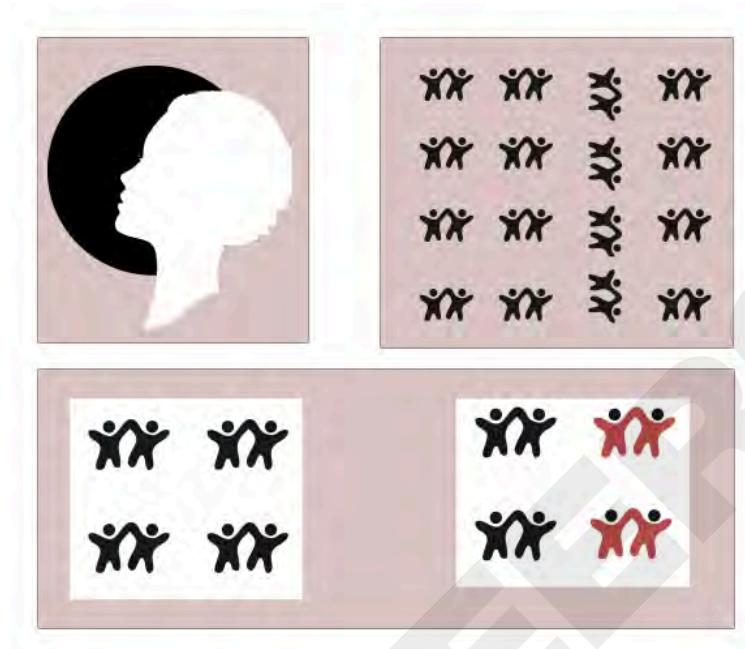


4. Common Region

Principle of common region is highly similar to the principle of proximity and states that elements when grouped together inside a closed border appear to the human brain as grouped together irrespective of color, shape or character.

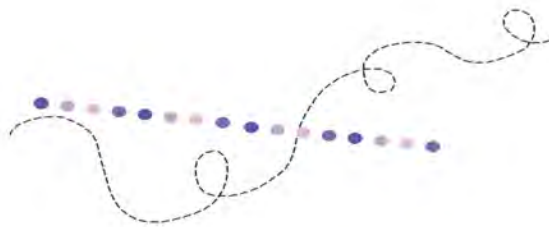
Even if things are similar in terms of closeness, shape, color, etc., designers can still create the illusion of separation between groups of objects by adding borders or visual obstacles.

We can take an example of a pinterest page to understand this.



5. Continuity

This principle states that how a line or curve represents a sense of continuation and therefore when elements in a composition are shown in a line or curve appears more related to each other. This is true even when the same color is grouped and more eludes them as the human eye automatically follows a line or curve and therefore groups elements together.



6. Closure

The principle of closure states that when a human brain sees an image with missing parts, it automatically fills in the missing parts to complete the image. Therefore, when seeing a visual composition, humans tend to recognise visual patterns.

We can see examples of this principle in the logos of a variety of companies including IBM, NBC, Zendesk, and Funding Circle where closure principle is used.



7. Focal Point

This principle is used to create a point of focus. It states that when in a composition, any element which is standing out visually by the use of color, shape or size will capture the attention of the viewer as soon as it is seen.



Gestalt's Theory UCEED Previous Years Questions and Answers

Ques: Which option will replace the question mark?



Option A:



A

Option B:



B

Option C:



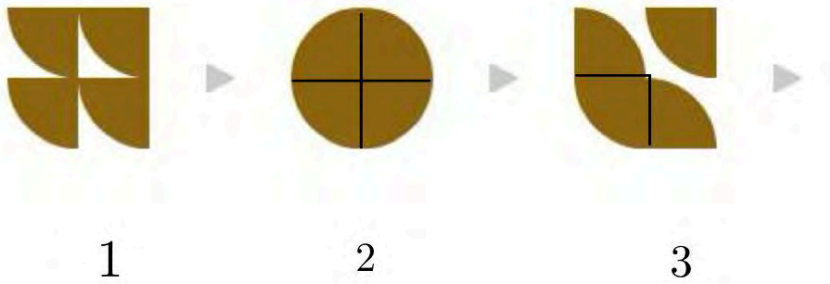
C

Option D:

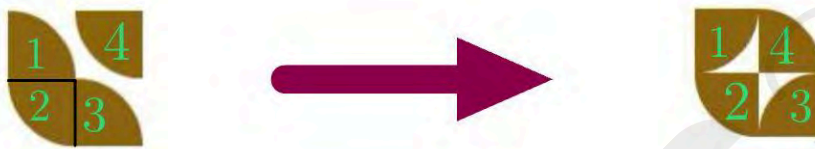


D

Solution:

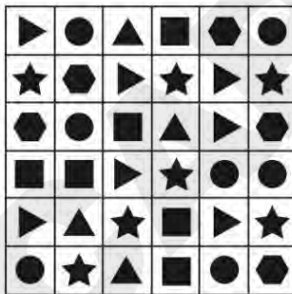


If we observe the 2nd figure, i.e., The circle is made up by combining all part of 1st figure. Now when we combine all parts of figure 3rd we will get (as shown below)

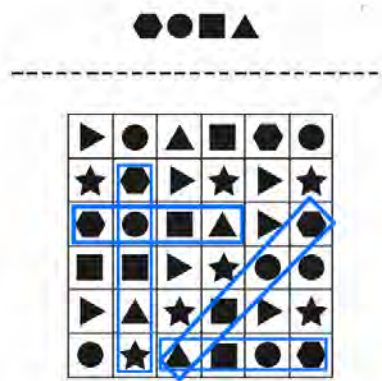


Hence, option B is correct.

Ques: How many times does the shape sequence (shown on the top) appear in the grid below? The sequence may appear top-to-bottom, bottom-to-top, left-to-right, right-to-left or at an angle.

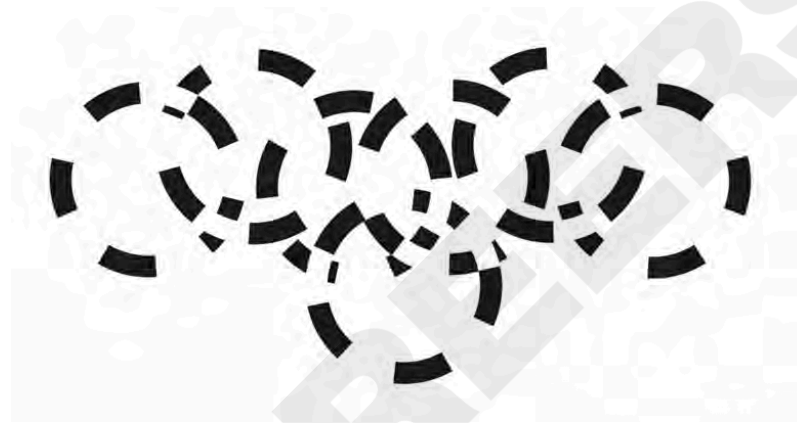


Solution:



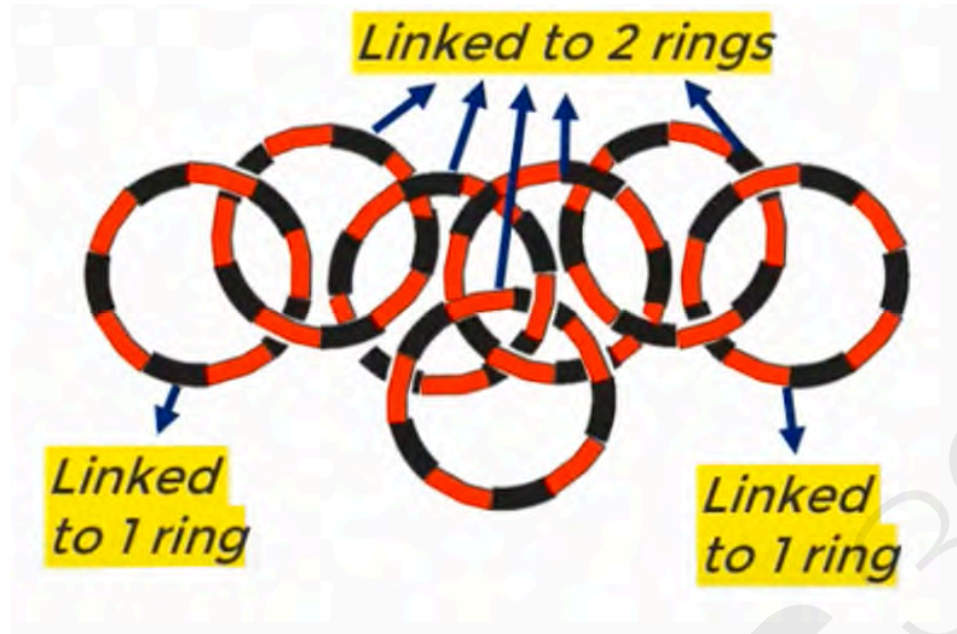
We can see in the image given below that we have 4 sequences.
Hence, the answer is 4.

Ques: Shown below is an image of solid rings of black and white patterns. A ring going inside another is called a link. Which of the statement(s) is/are TRUE?



- A. All rings are linked to form one continuous chain.
- B. One ring does not have any link.
- C. One ring has three links.
- D. Two rings have only one link.

Solution:



Hence, we can see that statements A and D are correct.

Ques:

| | | | | | |
|--|---|---|--|--|--|
| | = | | | | |
| | = | | | | |
| | = | | | | |
| | = | | | | |
| | = | | | | |
| | = | ? | | | |

Option A:

- A

Option B:

- B

Option C:



Option D:



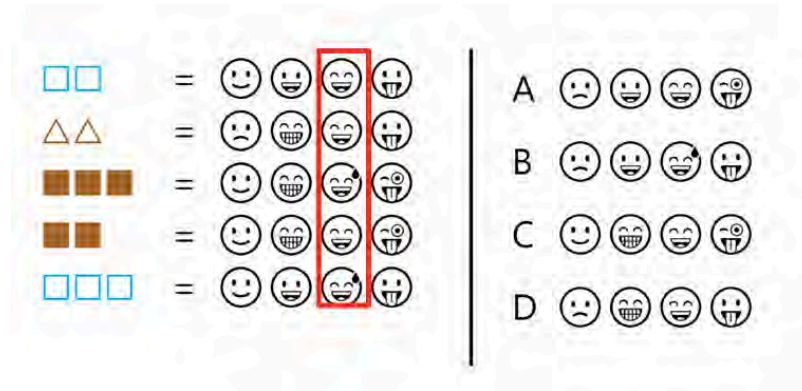
Solution:

| | | | | | |
|---------|---|---------|--|---|---------|
| ☐☐ | = | 😊 😄 😁 😏 | | A | 😞 😄 😁 😏 |
| △△ | = | 😞 😄 😁 😏 | | B | 😞 😊 😁 😏 |
| ■ ■ ■ ■ | = | 😊 😄 😁 😏 | | C | 😊 😄 😁 😏 |
| ■ ■ | = | 😊 😄 😁 😏 | | D | 😞 😄 😁 😏 |
| ☐☐☐ | = | 😊 😄 😁 😏 | | | |

If we observe it, we can see an emoji and observe that the triangle shape's emoji is sad. Therefore, option C is eliminated.

| | | | | | |
|---------|---|---------|--|---|---------|
| ☐☐ | = | 😊 😄 😁 😏 | | A | 😞 😊 😁 😏 |
| △△ | = | 😞 😄 😁 😏 | | B | 😞 😊 😁 😏 |
| ■ ■ ■ ■ | = | 😊 😄 😁 😏 | | C | 😊 😄 😁 😏 |
| ■ ■ | = | 😊 😄 😁 😏 | | D | 😞 😄 😁 😏 |
| ☐☐☐ | = | 😊 😄 😁 😏 | | | |

If we look for row 2 we can see that brown emojis are different from blue colour. Therefore, option D is eliminated.



If we look for row 3 then the third and fifth column has smiles with tears and the common between the third and fifth columns that we observe both have quantity i.e., No of squares same. Hence, option B is eliminated. Therefore, option A is correct.

Ques:

SUGAR = ?

Option A:



Option B:



Option C:



Option D:

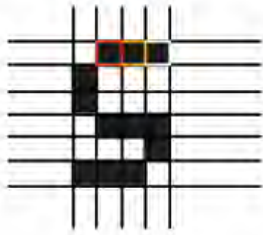


Solution:



The word is obtained from a grid as shown above. So we can see 3 squares on the upper side of S which are not in options A, B, and D.

Hence, option C is correct.



CAREERS360

Pattern Recognition

Transformation, Arrangements, Alignments & Orientation

Significance in UCEED

Since a lot of pictorial and diagrammatic questions are based on understanding different shapes, and volumes, their transformation and/ or manipulation of 2d shapes and 3d objects, it becomes crucial to have better observation skills and develop a good visualization and spatial ability.

A lot of questions that are asked in design competitive examinations like UCEED are based on observation and logical skills of the students that involve the student's ability to recognize different patterns and decode design series. These patterns involve different elements, shapes, figures or forms of different color, size or texture. These patterns can be based upon different elements in the series through transformations, arrangements, alignments or orientation (explained in the detail below).

Now that we understand what types of questions are asked in exams, we can better understand why visualization and observation skills play an important role when preparing for different design competitive exams like preparation for UCEED 2026.

Understanding Pattern Recognition

Pattern Recognition is a method of data analyzation, where from a data set a pattern is recognised based on categorization through similarity or regularity of the elements.

Pattern recognition is the process where a series of patterns are given and students are then asked to select the next appropriate pattern from the given options. To do so, students should focus on common elements occurring in the previous patterns, identify common differences, and then compare them with the probable next pattern. Pattern recognition can be based upon the transformation of a figure in a series, arrangement in a series of different patterns, different alignment present in a series, and orientation series. Pattern recognition is important to analyze student's visual, logical and non-verbal reasoning in designing competitive exams.

To understand the pattern recognition method, it is important to first understand the steps that are needed to define and observe a pattern throughout a data set. Once these steps are mastered, pattern recognition will become easier to solve and understand for students aspiring for UCEED 2026. These steps are as follows;

Steps for pattern recognition for students to follow:

1. Identification of the similar or common elements in the data set. These are generally recurring elements in the set.
2. Identification of common differences that is usually uniform throughout the data set. Interpretation of these differences are important to recognise a pattern in the set.
3. From the given data set, it is also important to identify individual elements and understand their characteristics.
4. Once a pattern is identified, the next step is to define the pattern and check if that is working throughout the data set.
5. Once a pattern is identified and checked, the last step is to predict the next element that will appear in the pattern.

Once these steps are understood by students, it is important to understand what types of pattern recognition based questions are asked in the UCEED Exam.

Transformation

Transformation is the process of change or alteration in appearance or characteristic of an element by changing its dimensions or color but keeping the identity of the element as same. Under transformation type of pattern recognition, an element or elements in the data set for pattern undergoes transformation in one part of the element or complete element.

Pattern recognition (Transformation) UCEED Previous Years Questions and Answers

Ques: A ball with a thin elastic rod moves from left to right as shown below. Which option represents the movement of the rod?



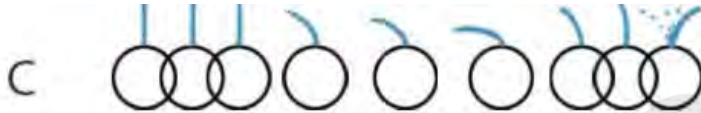
Option A:



Option B:



Option C:



Option D:

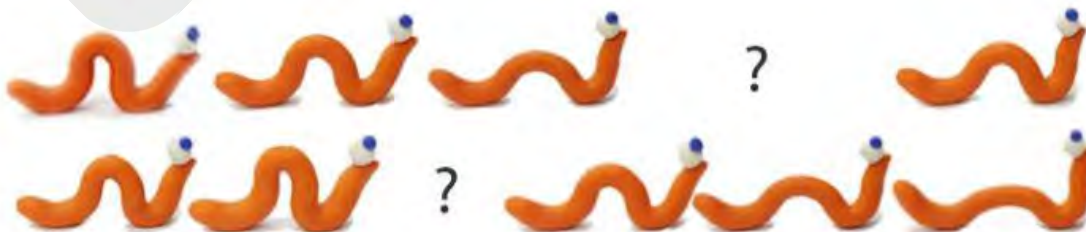


Solution:

A ball with a thin elastic rod moves from left to right, then the movement of this elastic rod will be toward left (Not straight or right). Therefore, option B and C are eliminated.

When we start the movement in no circumstances the elastic rod will be straight. So, option D is eliminated. Because if we see the mid-ball, the elastic rod is straight. Hence, option A is correct.

Ques: Shown below is the crawling sequence of a worm in eleven frames. Which option represents the missing frames?



Option A:



Option B:



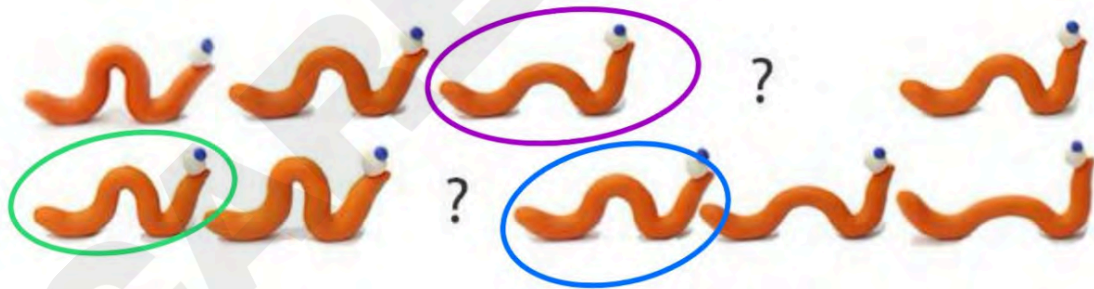
Option C:



Option D:



Solution:



Purple color highlighted worm is the same as given in option C.

So, option C is eliminated.

The blue color highlighted worm is the same as given in option A.

So, option A is eliminated.

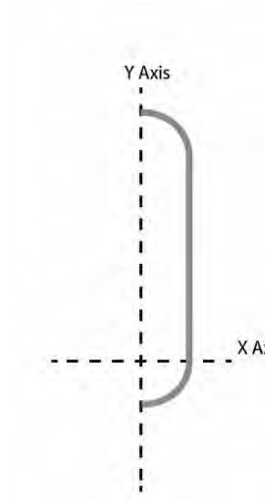
The green color highlighted worm is the same as given in option D.

Option D is eliminated.

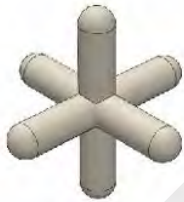
Ques: The following operations are done on the curve shown in the figure.

1. The curve revolves 360 degrees around the Y axis.
2. The resulting form is then cloned twice around the X-axis at 120 degrees to each other.
3. The resulting form is then cloned once about the Y axis at 90 degrees.

What is the resulting 3D form?

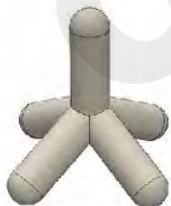


Option A:

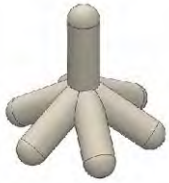


A

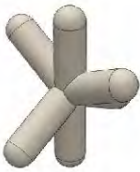
Option B:



B

Option C:

C

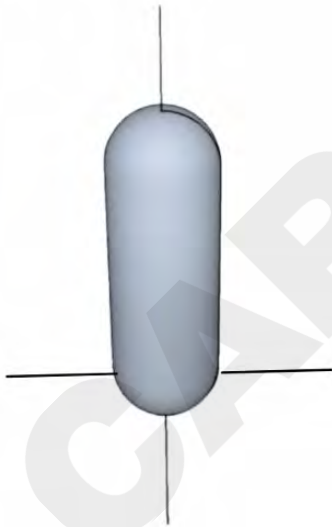
Option D:

D

Solution:

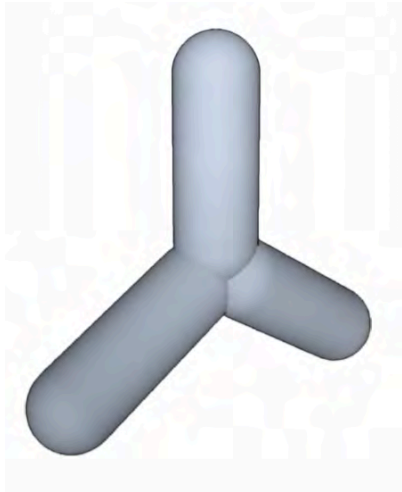
Statement 1:

The curve is revolved 360 degrees around the y-axis



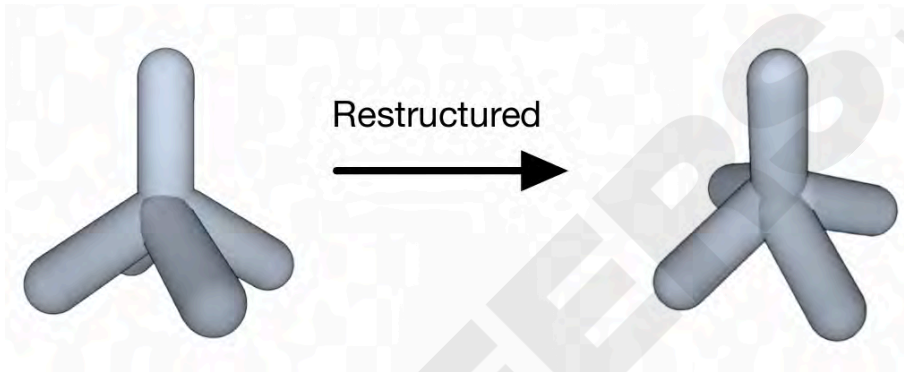
Statement 2:

The resulting form is then cloned twice around the x-axis at 120 degrees to each other.



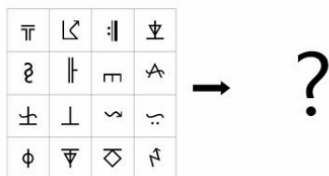
Statement 3:

The resulting form is then cloned once about the y-axis at 90 degrees.



Hence, option B is correct.

Ques:



Option A:

| | | | |
|---|---|---|---|
| ↘ | ◇ | ⊥ | φ |
| ˘ | ˘ | ⊥ | ± |
| ↘ | ⊥ | | § |
| ⊥ | | ∩ | ⊥ |

A

Option B:

| | | | |
|---|---|---|---|
| ↘ | ◇ | ⊥ | φ |
| ˘ | ˘ | ⊥ | ⊥ |
| ↘ | ⊥ | | ∩ |
| ⊥ | | ∩ | ⊥ |

B

Option C:

| | | | |
|---|---|---|---|
| ↘ | ◇ | ⊥ | φ |
| ˘ | ˘ | ⊥ | ± |
| ↘ | ⊥ | | § |
| ⊥ | | ∩ | ⊥ |

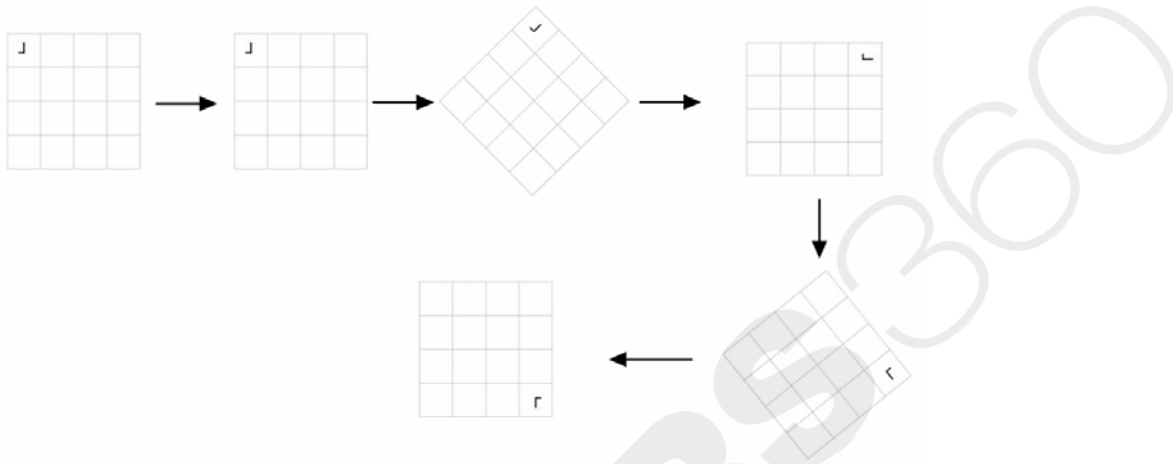
C

Option D:

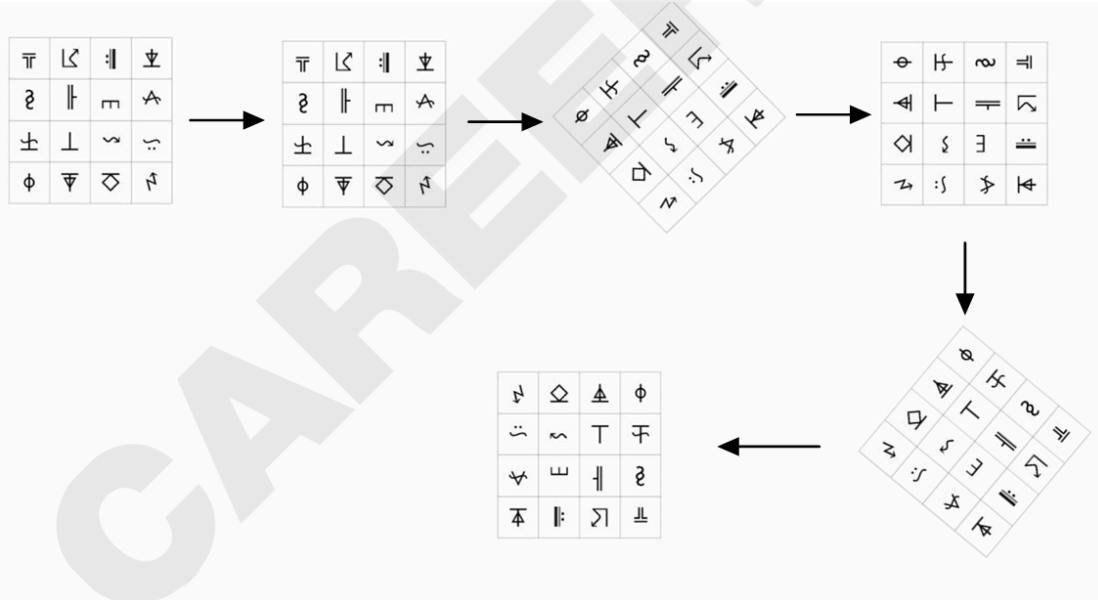
| | | | |
|---|---|---|---|
| ↘ | ◇ | ⊥ | φ |
| ˘ | ˘ | ⊥ | ⊥ |
| ↘ | ⊥ | | ∩ |
| ⊥ | | ∩ | ⊥ |

D

Solution:



So this is a sequence, now do this process in the given image.



Hence, option B is correct.

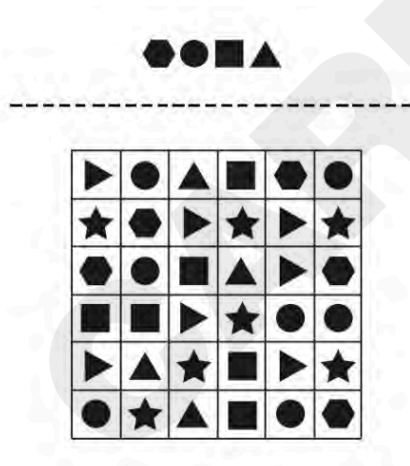
Arrangements

Arrangement of an element or set of elements in a design composition or data set is a visually organized way of representing elements according to a common link between them which could be based on dimensions, color, texture or characteristics.

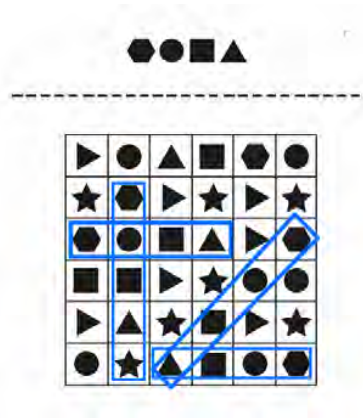
Under arrangement type of pattern recognition, an element or elements in the data set for pattern are arranged in a way that their missing part when put together completes the puzzle or composition.

Pattern recognition (Arrangement) UCEED Previous Years Questions and Answers

Ques: How many times does the shape sequence (shown on the top) appear in the grid below? The sequence may appear top-to-bottom, bottom-to-top, left-to-right, right-to-left or at an angle.

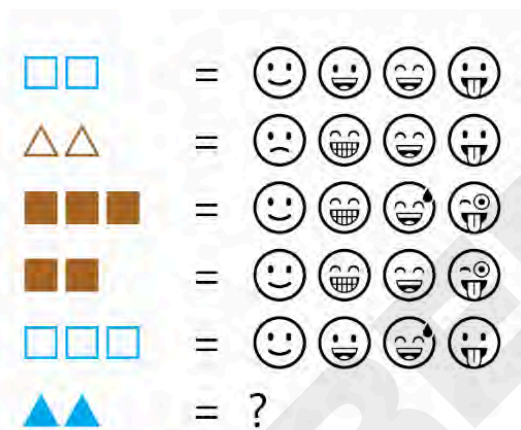


Solution:



We can see in the image given below that we have 4 sequences. Hence, the answer is 4.

Ques:



Option A:



Option B:



Option C:



Option D:



Solution:

| | | | |
|---------|----------|--|------------|
| ☐☐ = | ☺️ 😄 😊 😈 | | A ☹️ 😄 😊 😈 |
| △△ = | ☹️ 😄 😊 😈 | | B ☹️ 😄 😊 😈 |
| ■ ■ ■ = | ☺️ 😄 😊 😈 | | C ☺️ 😄 😊 😈 |
| ■ ■ = | ☺️ 😄 😊 😈 | | D ☹️ 😄 😊 😈 |
| ☐☐☐ = | ☺️ 😄 😊 😈 | | |

If we observe it, we can see an emoji and observe that the triangle shape's emoji is sad. Therefore, option C is eliminated.

| | | | |
|---------|----------|--|------------|
| ☐☐ = | ☺️ 😄 😊 😈 | | A ☹️ 😄 😊 😈 |
| △△ = | ☹️ 😄 😊 😈 | | B ☹️ 😄 😊 😈 |
| ■ ■ ■ = | ☺️ 😄 😊 😈 | | C ☺️ 😄 😊 😈 |
| ■ ■ = | ☺️ 😄 😊 😈 | | D ☹️ 😄 😊 😈 |
| ☐☐☐ = | ☺️ 😄 😊 😈 | | |

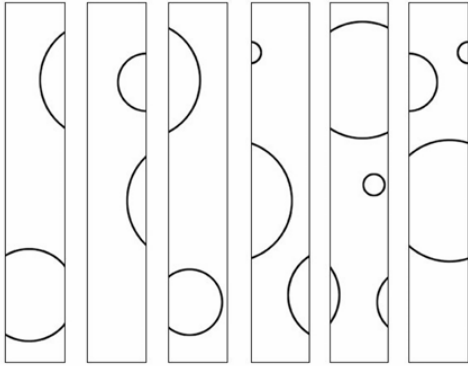
If we look for row 2 we can see that brown emojis are different from blue color. Therefore, option D is eliminated.

| | | | |
|---------|----------|--|------------|
| ☐☐ = | ☺️ 😄 😊 😈 | | A ☹️ 😄 😊 😈 |
| △△ = | ☹️ 😄 😊 😈 | | B ☹️ 😄 😊 😈 |
| ■ ■ ■ = | ☺️ 😄 😊 😈 | | C ☺️ 😄 😊 😈 |
| ■ ■ = | ☺️ 😄 😊 😈 | | D ☹️ 😄 😊 😈 |
| ☐☐☐ = | ☺️ 😄 😊 😈 | | |

If we look for row 3 then the third and fifth column has smiles with tears and the common between the third and fifth columns that we observe both have quantity i.e., No of squares same. Hence, option B is eliminated.

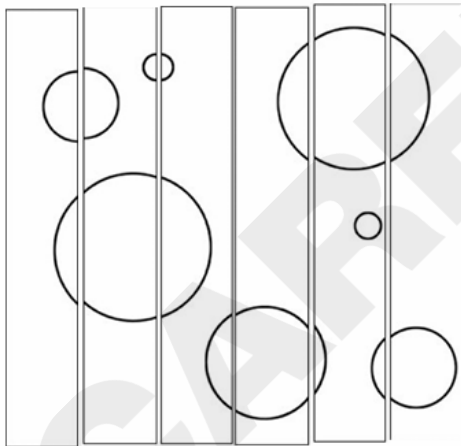
Therefore, option A is correct.

Ques: What is the maximum number of complete circles that will be seen, if the strips given below are rearranged without rotating?



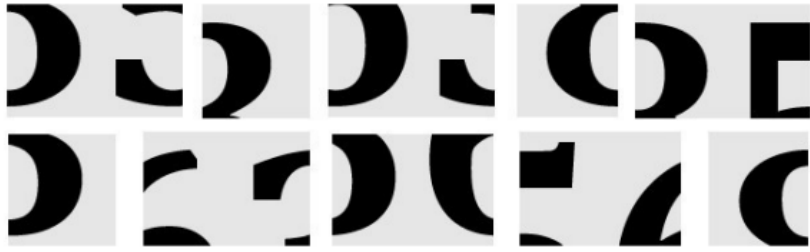
Solution:

If we rearrange, then we get the figure (shown below)



Hence, we get 7 circles.

Ques: Given below are ten pieces of a puzzle. When arranged correctly, they form a four-digit number. What is the number formed after the correct arrangement?

**Solution:**

If we rearrange the puzzle they will form a four-digit number, we get 8563 as shown below.

**Alignments**

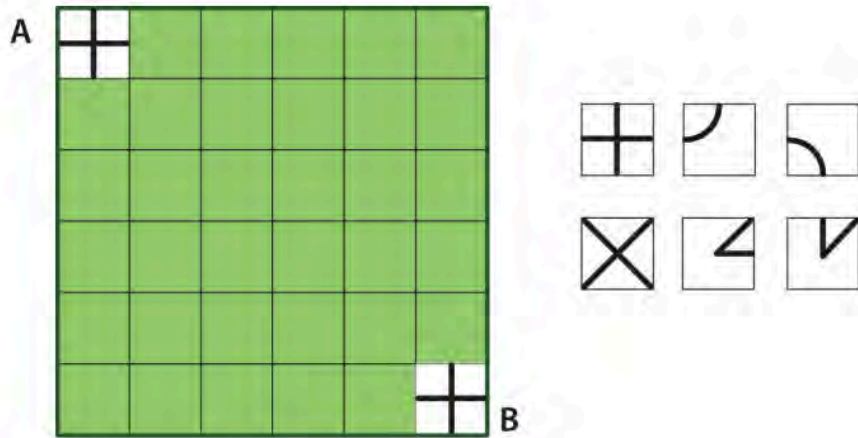
Alignment of an element or set of elements in a design composition or data set is a visually organized way of arranging elements in a correct position relative to each other (usually a line).

Under alignment type of pattern recognition, an element or elements in the data set for pattern are arranged in a typical manner which is relative to each other in form of size, shape and dimensions or characteristic.

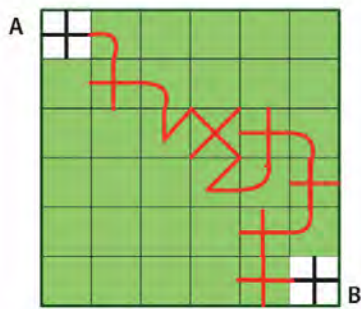
Pattern recognition (Alignments) UCEED Previous Years Questions and Answers

Ques: What are the minimum number of tile pieces (shown on the right) that are required to create a path from tile A to tile B, such that ALL the following conditions are met:

- All tiles are to be used at least once.
- Tiles cannot overlap.
- The path of a tile must be connected to another path of a tile.
- The same type of tile cannot be used one-after-the other in a sequence.
- Rotation of the tiles is not allowed.
- Exclude tile A and tile B from the count.



Solution:



So, with all terms and conditions, 13 tiles are required to create a path from tile A to tile B. Hence, the answer is 13.

Ques: Tile X was used to create a pattern that is seamless (without gaps) when arranged as shown in Y. Which tile(s) from the options will create a seamless pattern?



Option A:



Option B:



Option C:

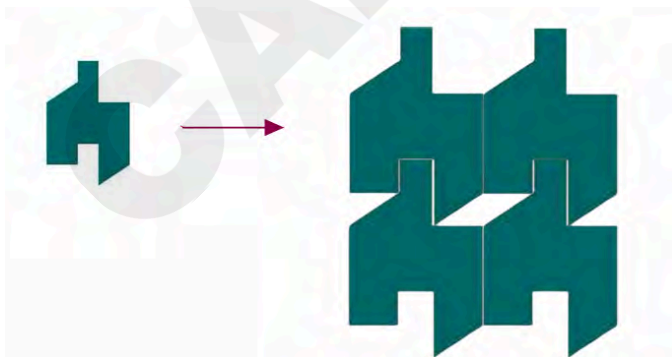


Option D:



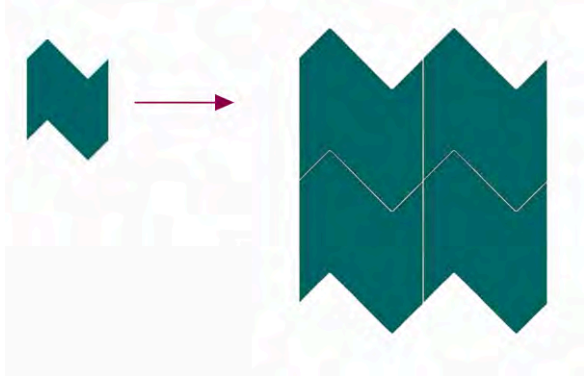
Solution:

Option A:



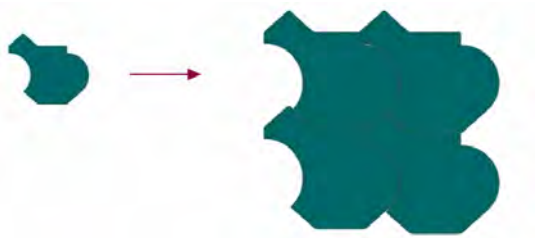
So we can see that option A does not make a seamless pattern.

Option B:



Option B makes a seamless pattern.

Option C:



Option C makes the seamless pattern

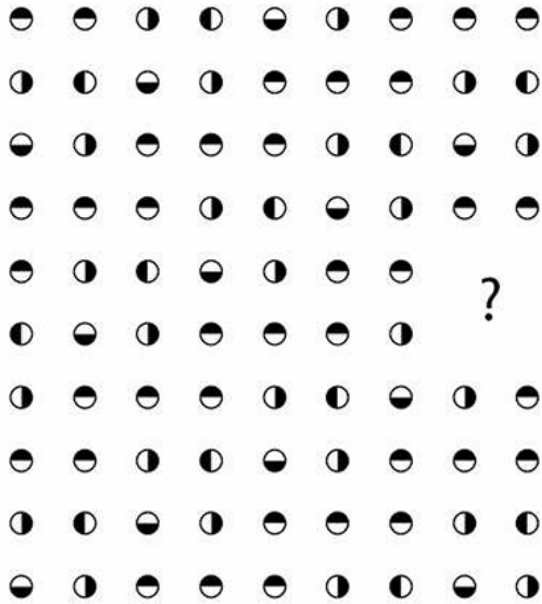
Option D:



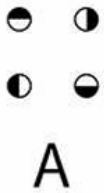
Option D is wrong

Hence, options A and C make seamless patterns.

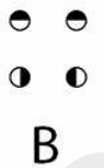
Ques: Which option will replace the question mark?



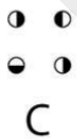
Option A:



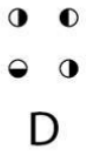
Option B:



Option C:

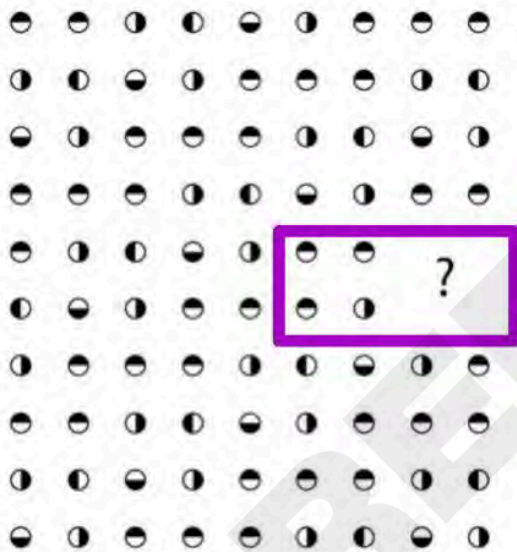


Option D:



Solution:

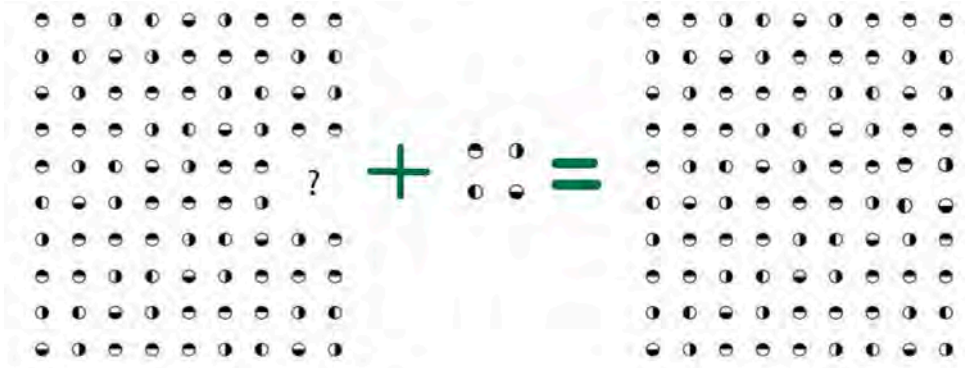
Now observe the pattern carefully we can see the sequence as shown below.



Now we observe the pattern in highlighted part, then the sequence will be

1112
1234

Therefore, option A is correct.



Orientation

Orientation of an element or set of elements in a design composition or data set is a visually placing them with respect to the direction of surface (could be horizontal or vertical).

Under orientation type of pattern recognition, an element or elements in the data set for pattern are arranged in a typical manner which is relative to the direction and create a visually balanced composition that appears to be conceived by the viewer as an organized visual composition. In questions related to orientation patterns, students need to sometimes also figure out the correct orientation to solve the pattern.

Pattern recognition (Orientation) UCEED Previous Years Questions and Answers

Ques: Which option will replace the question mark?



Option A:



A

Option B:



B

Option C:



C

Option D:

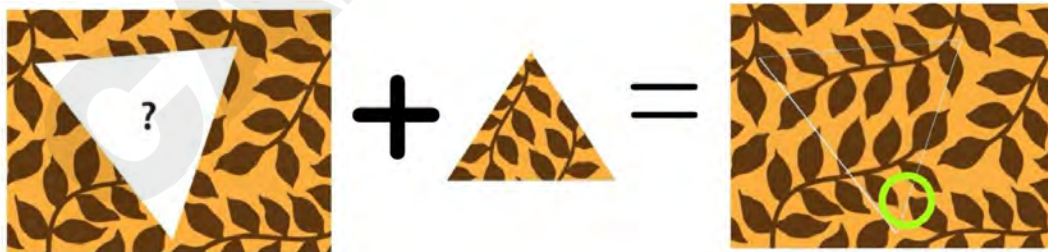


D

Solution:

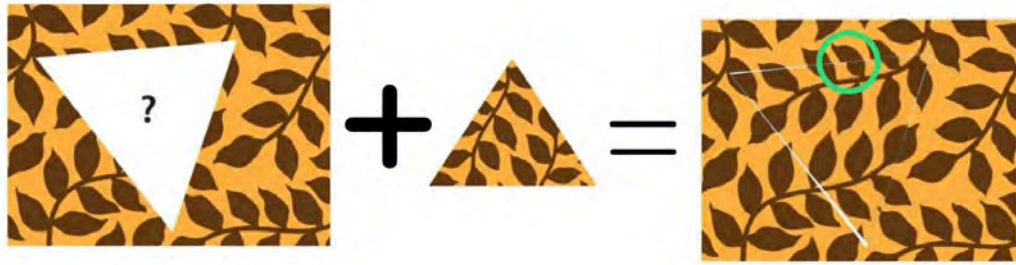
In such a question check each option one by one.

Option A:



In this, the lighted part shows that the leaf's tip is incomplete.
Hence, option A is wrong.

Option B:



This lighted part shows that the leaf is not maintaining a proper curve.
Hence, option B is wrong.

Option C:



Hence, the question mark will be replaced by option C.

Ques: Which combination shows a lunar eclipse?

Option A:



Option B:



Option C:



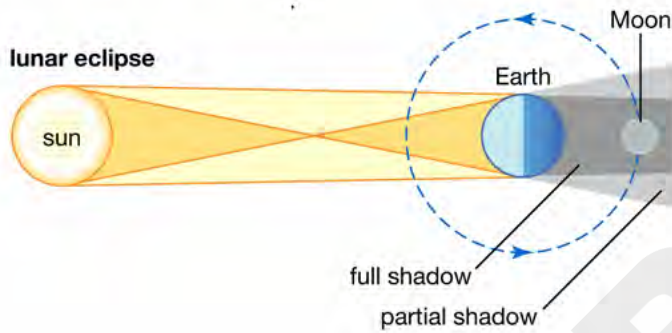
Option D:

D



Solution:

A Lunar eclipse occurs when the Sun casts Earth's shadow onto the Moon. For this to happen, the Earth must be physically between the Sun and Moon, with all three bodies lying on the same plane of orbit. A lunar eclipse can only occur during a Full Moon and when the Moon passes through all or a portion of Earth's shadow



Hence, option B is correct.

Ques:



Option A:



A

Option B:



B

Option C:



C

Option D:



D

Solution:

If we observe, the second image is a mirror image of the 1st and twists in a circle. We get image 2



Now focus on image 3



B

Hence, option B is correct.

Chapter 2: Observation and Design Sensitivity

Observation in design thinking is an important component of the UCEED examination as a lot of the questions asked in the exam are based on the student's ability for them and it is only when they have a better understanding of observation and design sensitivity that they will be able to solve those questions in the exam.

Question-related to Understanding of Basic Design Principles: Balance, Contrast, Emphasis, Hierarchy, Movement, Proportion, Repetition, Rhythm, Pattern etc, Rule of Thirds / Layout and Principles of Design, Geometric Shapes and Fundamentals of Geometry, and Understanding of Organic Shapes (Nature Inspired), Evolution of Objects/Materials and Manufacturing Processes, Understanding of Gears and Pulleys and Basics of Motions, and Fundamental Principles of Motion/Mechanism (e.g Hub-spoke Model) are usually asked in UCEED exam to examine these skills.

Meaning of the terms: Observation and design thinking

Observation in design thinking is an immersion into the design for gathering insights and information. Observation is understanding the design in-depth and understanding the needs of your users and then coming up with practical, logical and critical solutions. It is through observation skills that a designer develops a good eye which is crucial for a good designer. Design is all about the details, the more a design has good details, the more it will have depth. Therefore, it is a very crucial skill that every designer or design aspirant has to develop within themselves. Design sensitivity is the sensitivity ability a designer should have that helps to analyze any change in the design and then respond accordingly to that change. Design sensitivity also helps a designer cast their ideologies and thoughts aside and gain a better understanding of what their users need. Observation and Design Sensitivity together helps a designer to get a better and more detailed understanding of the needs of the users for whom they are designing and become more mindful and sensitive in creating their design.

How to develop the skills

To develop better observation and design sensitivity skills, students need to incorporate and practice questions related to the topics mentioned above. Students need to understand the principles of design and have a keen eye for details in everything they see around them. Decoding their surroundings into design details is a helpful key for them to understand and develop better observation skills. Students also need to read and understand more about their user's needs to create better solutions for them. By adapting a lifestyle rich with the above

practices, with time it becomes easy for students to gather these abilities and will also help come up with more accurate and efficient solutions to the questions asked in UCEED exams. With practice, it will also help them to better prepare for the UCEED 2026 exam, as time is an important foundation.

List of Topics under UCEED Observation and Design Thinking

According to the UCEED syllabus 2026, a list of topics is tabulated for which a brief introduction is provided below.

| |
|--|
| Understanding of Basic Design Principles |
| Rule of Thirds / Layout and Principles of Design |
| Understanding of Composition |
| Geometric Shapes and Fundamentals of Geometry |
| Understanding of Organic Shapes (Nature Inspired) |
| Evolution of Objects/Materials and Manufacturing Processes |
| Understanding of Gears and Pulleys and Basics of Motions |
| Fundamental Principles of Motion/Mechanism (e.g Hub-spoke Model) |

1. Understanding of the basic design principles: Balance, Contrast, Emphasis, Hierarchy, Movement, Proportion, Repetition, Rhythm, Pattern etc

The principles of design are the rules you must follow to create an effective and attractive design composition. The fundamental principles of design are Balance, Contrast, Emphasis, Hierarchy, Movement, Proportion, Repetition, Rhythm, and Pattern. One may still think that the design is all about creativity and freedom, but we first must understand that without the understanding of basic principles, it may take a lot of trial and error to create something that both looks good and creates an optimal user experience. If we tend to ignore these principles and go wild in creating our designs, we often find that the designs come out to be puzzling, crowded, unfinished or visually unpleasant. Every piece of design has a structure and language of its own that makes it visually balanced and pleasing. By understanding the design principles, it becomes easy to unfold the surfaces below each design layer.

2. Rule of Thirds / Layout and Principles of Design

Rule of thirds/layout is one of the design principles rules set by the experts which is used by dividing a design composition, photograph or art piece into a grid of 3X3 in equals both horizontally and vertically. Design field is innovative and allows freedom for creativity but it is full of its own rules for designers to follow in order to allow them to make better compositions for their users. The rule of thirds/ layout and principle of design are used to create more visually appealing and eye-catching design compositions. Questions from this topic are asked in the UCEED exam to examine the student's ability to observe how good a composition can be created or analyzed by them.

3. Understanding of Compositions

A design composition is a design space where all different elements (color, text, image, and shape) come together and combine to create one whole. There are 5 main rules for composition in any design namely: Rule of Odds, Balance, Rule of Thirds, Emphasis & Scale, and The Grid System. It is important for designers to have a good understanding of compositions to create better visual balance and appealing design compositions according to their users needs. Aspiring designers and students preparing UCEED are needed to practice and gather this ability as questions are asked in UCEED exams to test their ability on how good compositions they can create.

4. Geometric Shapes and Fundamentals of Geometry

All the shapes exist in a flat plane in plane geometry. You can understand a plane as a flat sheet with no thickness and which can go in both directions infinitely. Any shape on the plane is called a plane figure. Popular examples of geometric shapes are square, rectangle, triangle and circle. Geometric shapes have sides, corners and angles except in the case of a circle which does not have any straight line. These plane figures are called 2-D shapes. A basic geometric shape is 3 or more line segments joined together. When equal line segments are joined at equal angles, they are called regular shapes. In a circle, the curve is created by joining points rather than joining line segments. When line segments of different lengths are joined at unequal angles, then they are referred to as irregular shapes. Curvy shapes that are not a circle (irregular) are created by free hand and are free flowing.

5. Understanding of Organic Shapes (Nature Inspired)

Organic shapes are the shapes that are inspired by nature. These shapes include curves, bend, rounds or spiral shapes. All these shapes are found in the natural environment around us. When we look at the organic shapes, our minds tend to travel to the outer environment and hence we can understand that they are inspired by the natural world. We use organic shapes in design, because of the balance, calmness and soothes it provides when we look at them and we tend to connect with the calmness of natural surroundings.

6. Evolution of Objects/Materials and Manufacturing Processes

Humans have been evolving since the stone age and with them their tools, objects and materials have been evolving as well. With change in eras and the coming up of new technologies, it is important for any designer to understand and have in-depth knowledge of the new and upcoming objects/ materials as well as know the history of evolution for these tools and objects. It is from this knowledge that they can better understand and create new tools and technologies for their end users. Similarly manufacturing processes have also evolved with changing times and new technologies, and are still evolving. Be it any manufacturing industry, it is crucial for any designer to have a good knowledge of it so as they can better understand and therefore design accordingly.

7. Understanding of Gears and Pulleys and Basics of Motions

This is one of the important topics from which questions are asked in the UCEED exam. Questions that are generally asked are to calculate the displacement, distance, velocity, acceleration, speed, or change in frame of reference to an observer, with change in time. Motion, in physics, is most simply defined as the change in position or orientation of an object with the change in time. A pulley is a wheel that is attached with a flexible rope or a cable that is used to raise heavy objects for tall heights. A gear is a toothed wheel present singular or in combination used to increase the force of speed, (usually seen in heavy machines, example; bike).

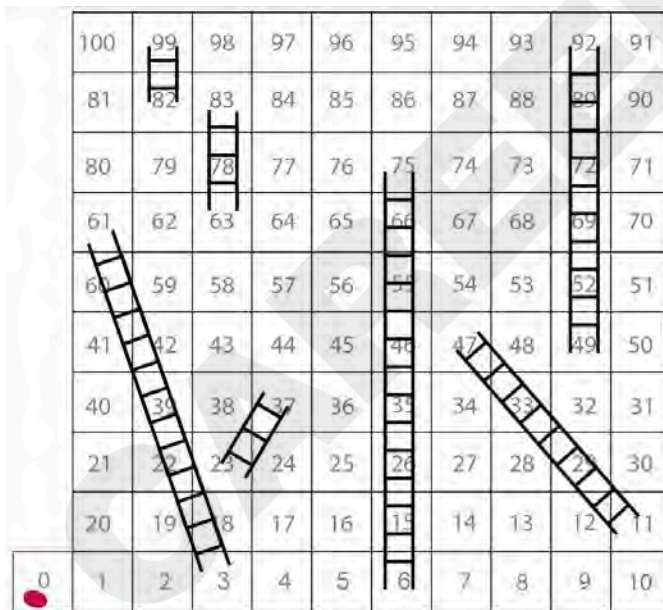
8. Fundamental Principles of Motion/Mechanism (e.g Hub-spoke Model)

Fundamentals of Mechanisms of motion states that the mechanism is taking one type of motion as input and getting a different type of a motion as output. Simplest example to understand this is by looking at our childhood bicycles and remembering how we used to rush when our chains got

down from the gears. Here, we can see that rotational motion provided by the chain and gear of the bicycle works as an input with linear motion as we ride our bicycle and cover the linear distances as the output. Similarly we can use the same example of our bicycle and understand the Hug-Spoke Model which is a distribution network that resembles the spikes and gears of the bicycle with hub in the middle and allows each of the spokes to meet at a central location and to move in one direction of delivery.

Previous Years Question asked from Observation and Design Sensitivity UCEED Topic

Ques: A dice throw can result in the numbers 2,3,5 or 6. Every 4th throw will result in 3. What is the minimum number of times the dice have to be thrown for the pawn to move from zero to reach exactly 100?



Solution:

Step 1: As dice can throw the numbers 2,3,5 or 6 as 1 is not there, from 99 will not reach 100. So that means this ladder (as shown below is of no use)

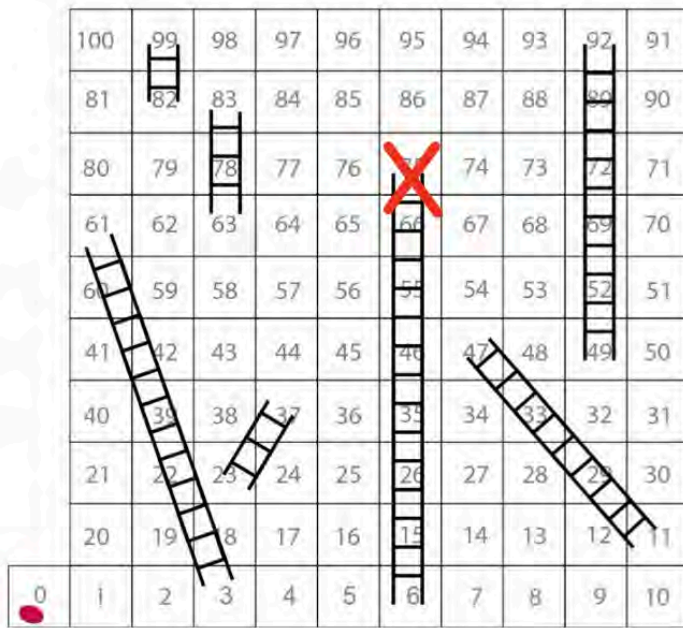
| | | | | | | | | | | |
|-----|---------------|---------------|---------------|----|---------------|----|---------------|---------------|----|----|
| 100 | 99 | 98 | 97 | 96 | 95 | 94 | 93 | 92 | 91 | |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | |
| 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 | 72 | 71 | |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | |
| 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | |
| 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | |
| 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Step 2:

| | | | | | | | | | | |
|-----|---------------|---------------|---------------|----|---------------|----|---------------|---------------|----|----|
| 100 | 99 | 98 | 97 | 96 | 95 | 94 | 93 | 92 | 91 | |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | |
| 80 | 79 | 78 | 77 | 76 | 75 | 74 | 73 | 72 | 71 | |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | |
| 60 | 59 | 58 | 57 | 56 | 55 | 54 | 53 | 52 | 51 | |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | |
| 40 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 31 | |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | |
| 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

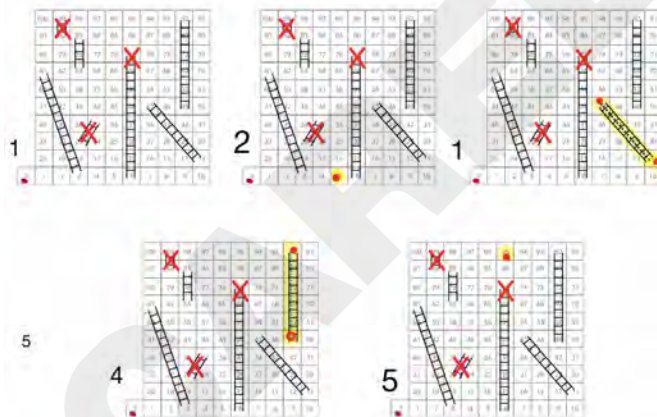
Coming to 23 we have to move whole, as there is no shortcut, so again it will be too many times dice have to be thrown so again it will not be of any use.

Step 3:



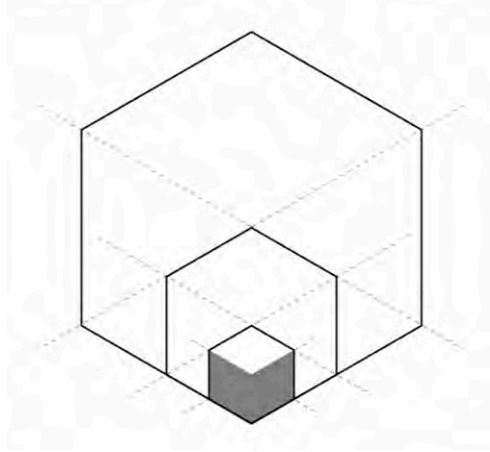
So this again is of no use, because from 77 to reach 100 is too many times the dice has to be thrown.

These three will not be of much use so we can get the answer in one way, so here I am showing one way [given below]



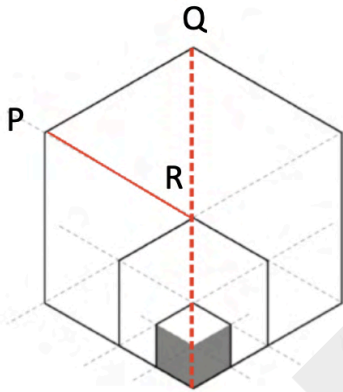
In the next step with 5 on the dice, it will read 100 so we know that a minimum of 5 times the dice has to be thrown for the pawn to move from 0 to 100.

Ques: In the figure given below, the area of the largest regular hexagon is 720 units. What is the area of the shaded portion?



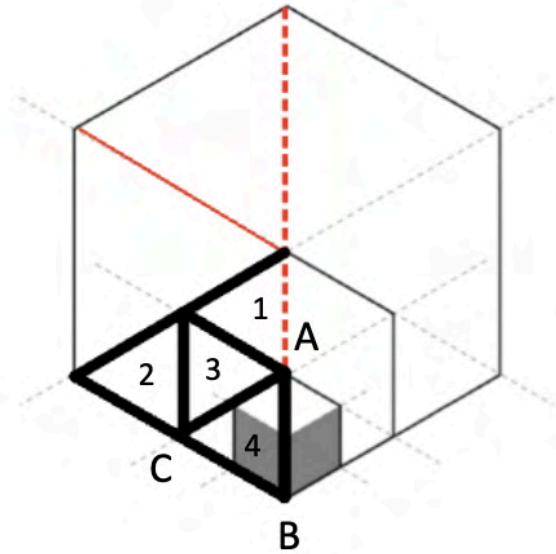
Solution: The area of the largest regular hexagon is 720 *units*.

We just need to find a relation between the shaded portion and the largest regular polygon.



So this triangle PQR is $\frac{1}{6}th$ part of the largest hexagon.

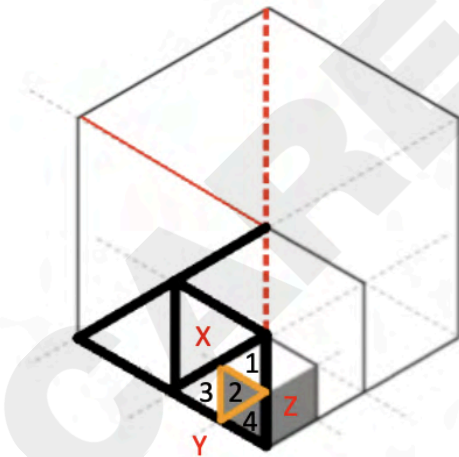
$$\therefore \text{Area of } \Delta PQR = \frac{1}{6} \times 720 = 120 \text{ units}$$



Then we again divide the triangle into smaller units, we can say that there are 4 such triangles.

$$\therefore \text{Area of } \triangle ABC = \frac{1}{4} \text{Area of } \triangle PQR$$

$$\begin{aligned} \text{Area of } \triangle ABC &= \frac{1}{4} \times 120 \\ &= 30 \text{ unit} \end{aligned}$$



Then we again divide the triangle ABC into smaller units, we can say that there are 4 such triangles.

$$\therefore \text{Area of } \triangle XYZ = \frac{1}{4} \text{Area of } \triangle ABC$$

$$\begin{aligned} \text{Area of } \triangle XYZ &= \frac{1}{4} \times 30 \\ &= 7.5 \text{ unit} \end{aligned}$$

So in the shaded area, we have 4 such triangles
 So shaded area = $4 \times 7.5 = 30 \text{ units}$.

Ques: Tim cycled from his house to his friend John's house and then on to his (Tim's) school without stopping. The average speed for his entire journey was 26 km/hr. The distance from John's house to Tim's school is 0.3 times the distance from Tim's house to John's house. Tim's speed from John's house to Tim's school was twice that of Tim's speed from Tim's house to John's house. What was Tim's average speed from John's house to Tim's school in km/hr?

Solution:



Time taken from Tim to John's house:

$$\text{Time} = \frac{\text{Distance}}{\text{speed}} = \frac{x}{y} \text{ hr}$$

Time taken from John to Tim's school:

$$\text{Time} = \frac{\text{Distance}}{\text{speed}} = \frac{3x}{2y} \text{ hr}$$

$$\begin{aligned} \text{Distance between Tim's house and school} &= x + 0.3x \\ &= 1.3x \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Total time} &: \frac{x}{y} + \frac{3x}{2y} = \frac{x}{y} \left[1 + \frac{0.3}{2} \right] \\ &= \frac{x}{y} [1 + 0.15] \end{aligned}$$

$$= 1.15 \frac{x}{y} \text{ km}$$

The average speed between Tim's house and school = 26 km/hr

$$\frac{1.3x}{1.15 \frac{x}{y}} = 26$$

$$1.3y = 26 \times 1.15$$

$$y = \frac{26}{1.3} \times 1.15 = 23 \text{ km/hr}$$

Tim's average speed from John's house to Tim's school $2y = 2 \times 23$
 $= 46 \text{ km/hr}$

Ques: Count the number of cats in the given image.



Solution:

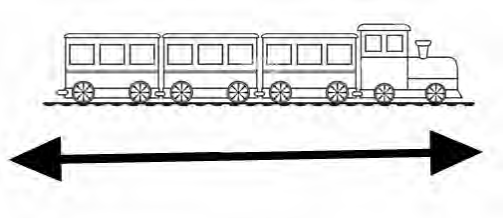
To make it easy, count the cat's head or tale.



Total No of cats = 11

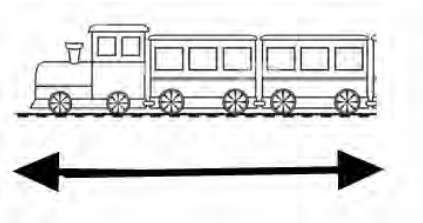
Ques: Two trains of unequal length have speeds of 60 and 50 km/hr. When they travel in opposite directions in straight-line tracks, they take 9 seconds to completely cross each other. When they travel in the same direction, a person on the faster train sees the slower train for 18 seconds. For how much time (in seconds) would a person in the slower train see the faster train when the trains travel in the same direction?

Solution:



Length = x m

Speed = 60 km/hr



Length = y m

Speed = 50 km/hr

Formula area: $Speed = \frac{distance/length}{Time}$

Relative speed in opposite direction: $60 + 50 = 110$ km/hr

$$\Rightarrow 110 \times \frac{5}{18} \text{ m/s}$$

Time = 9 sec.

Distance = $x + y = speed \times time$

$$= 110 \times \frac{5}{18} \times 9 = 275 \text{ m}$$

- When they travel in the same direction, a person on the faster train sees the slower train for 18 seconds.

Relative speed in the same direction: $60 - 50 = 10$ km/hr = $10 \times \frac{5}{18}$ m/sec.

The time taken by the slower train to cross is 18 seconds.

Length of slower train = y m = $Relative\ speed \times time = \frac{50}{18} \times 18 = 50$ m

The total length of both trains = 27 m

Length of faster train = $275 - 50 = 225$ m

- For the person on the slower train

Relative speed in the same direction: $60 - 50 = 10$ km/hr = $10 \times \frac{5}{18}$ m/sec

Length of faster train = 225 m

Time taken by faster train to cross = $\frac{225}{\frac{50}{18}} \text{ sec} = 225 \times \frac{18}{50} = 81 \text{ sec.}$

Ques: Shown on the left is a sheet of stickers. Identify the option(s) in which monkeys of the same species are sitting together.



Option A:



Option B:



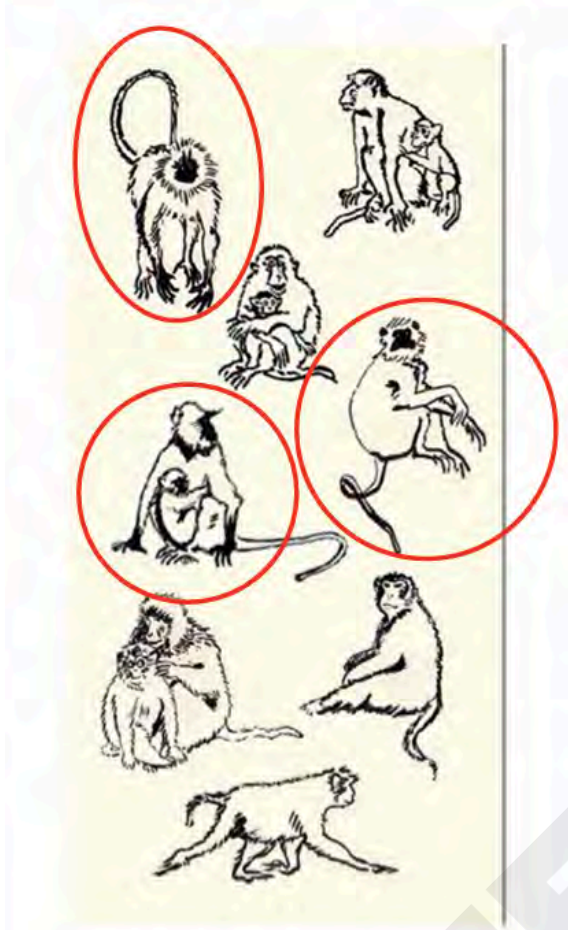
Option C:



Option D:



Solution:



We can see above that these 3 monkeys have dark faces. So, we can identify them through their tails and now check each option one by one.

Option A:



We can see the same tails which means this is correct.

Option B :



We can see they do not have the same types of tails.

Option C:



We can see the same tails which means this is correct.

Option D:

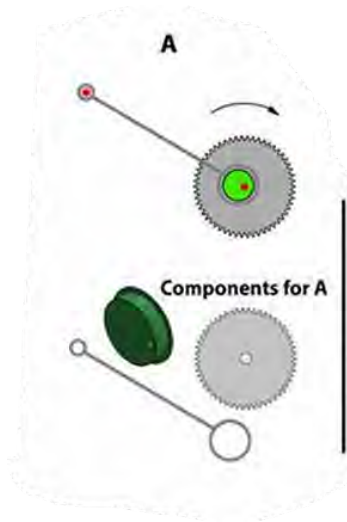


We can see they do not have the same types of tails.

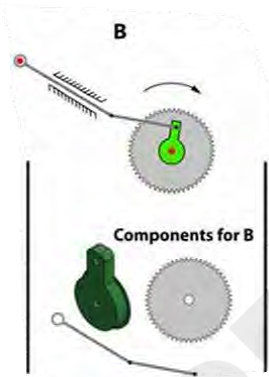
Ques: Different views of the cross-section of a fish toy are shown here. The points P and Q are connected in such a way that the fishtail waves. The grey colour gear and the green colour part are joined together. The rod is free to move depending on how it is connected to the green part. Which of the option(s) will work to wave the tail?



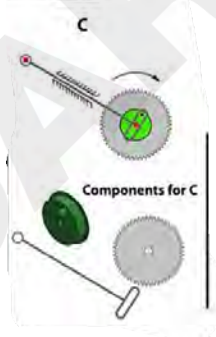
Option A:



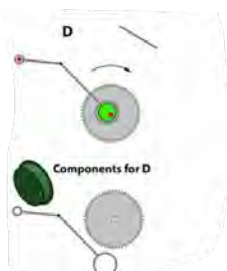
Option B:



Option C:



Option



Solution:

The gray color gear and green color parts are joined together. The rod is free to move depending upon how it is connected to the green part, then A, B, and C will work to wave the tail as in option D connection is not making it move.


Hence, options A, B, and C are correct.

Ques: The options show four ways of attempting to write the word “universe” in a mix of lower-case and upper-case letters. Which of the option(s) is/are correctly read as “universe”?

Option A:

A 

Option B:

B 

Option c:

C 

Option D:



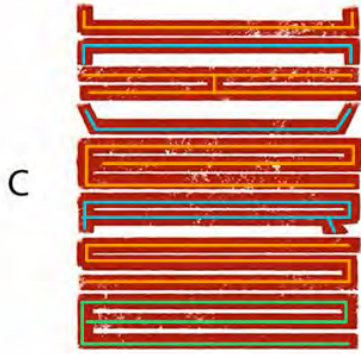
Solution:



Hence, this is incorrect.



Hence, this option is correct.



Hence, this option is correct.



Hence, this option is correct.

Ques: Which of the option(s) is/are from the same font family (i.e. weight and/or width variations) as the words given below?

मुद्राक्षर अभिकल्प

Option A :

फेड

A

Option B:

वात
B

Option C:

धागा
C

Option D:

अकल
D

Solution:

मुद्राक्षर अभिकल्प

We can see in red that it is a slant and in the green highlighted part we have a gap. Now observe each option one by one.

Option A:



A

This has a slant. Hence, the option is correct.

Option B:



B

This has a gap. Hence, this is also correct.

Option C:



C

This is straight. Hence, this is wrong.

Option D:



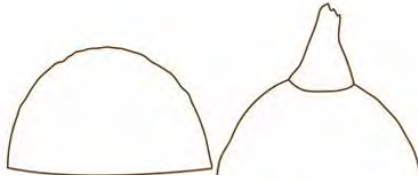
D

This has a gap. Hence, this is also correct.

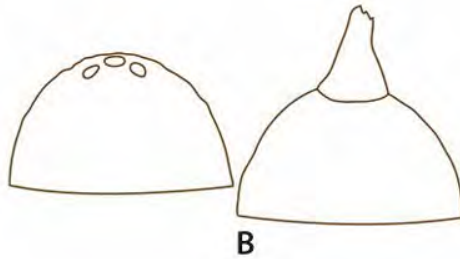
Therefore, the A, B, and D options are correct.

Ques: Shown below is a coconut broken into two pieces. Identify the correct representation(s) of the coconut.

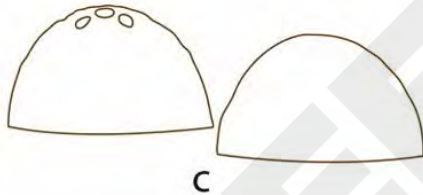
Option A :



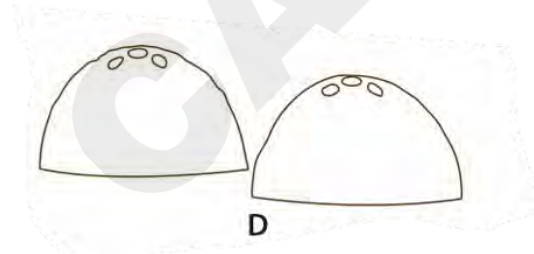
Option B:



Option C:



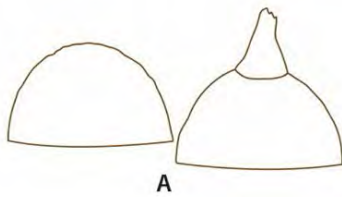
Option D:



Solution:

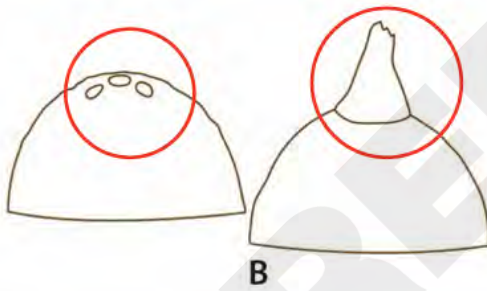


Option A :



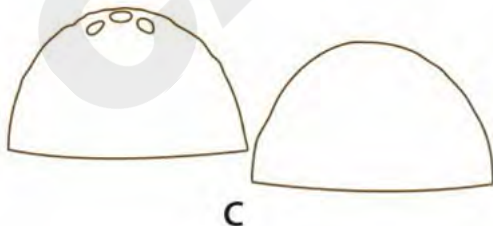
This option is correct

Option B:



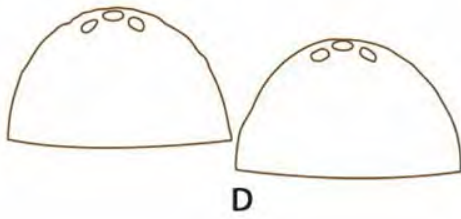
These both are on the same side of a coconut. Hence, this is incorrect.

Option C:



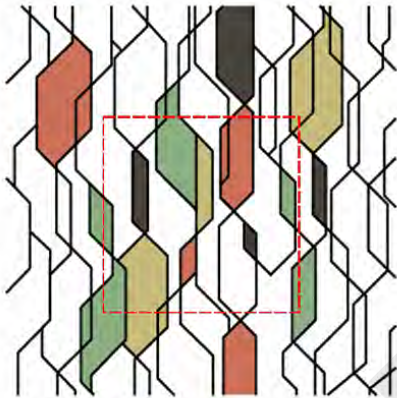
This option is correct.

Option D:



The 3 eyes are only one side of a coconut. Hence, this is incorrect.

Ques: Find the exact pattern highlighted in the red square.



Option A:



A

Option B:



B

Option C:

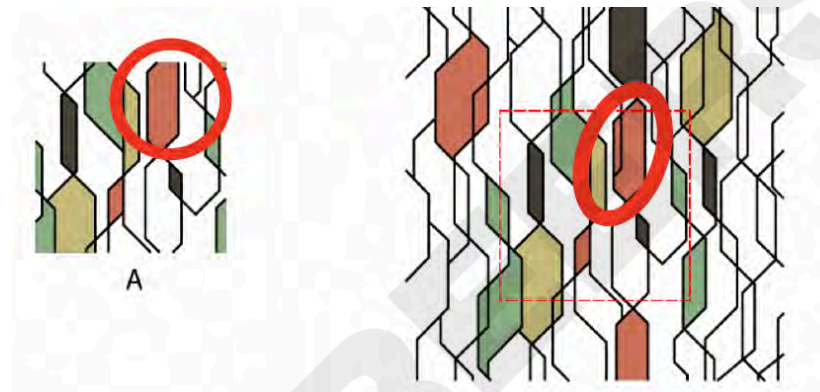


Option D:



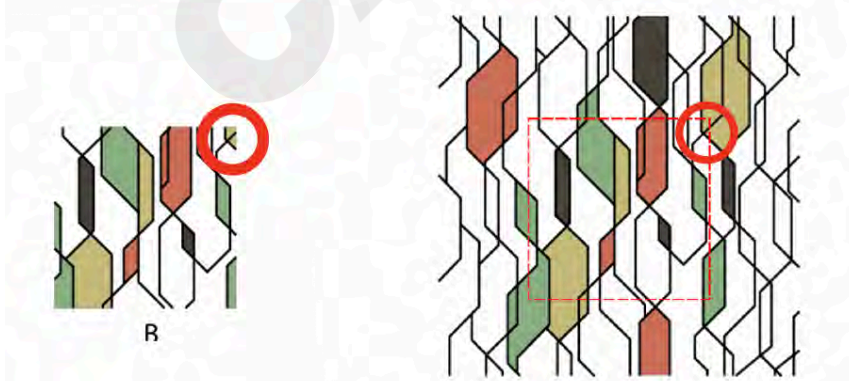
Solution:

Option A:



We can observe that the black line in the red part is not present in option A. Hence this is incorrect.

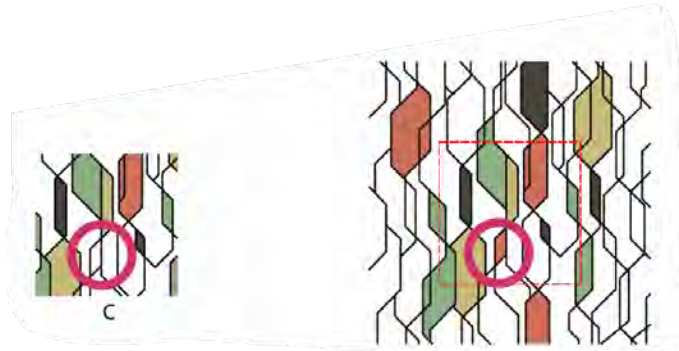
Option B:



The highlighted part doesn't resemble it.
So this option is not correct.

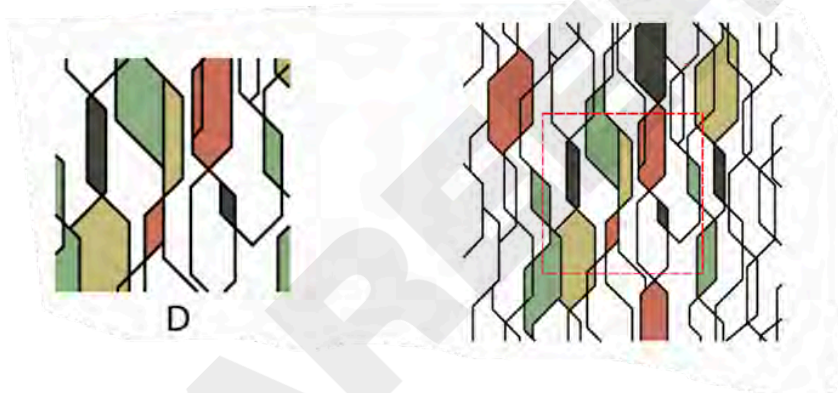
Note: It has a very minute difference, so students need to observe it minutely.

Option C:



We can see we have color in the original figure, this is not present in option C. Therefore, this option is incorrect.

Option D:



Option D is the correct answer.

Ques: Shown below is a transparent roller stamp. Identify the print made from the roller.



Option A:



A

Option B:



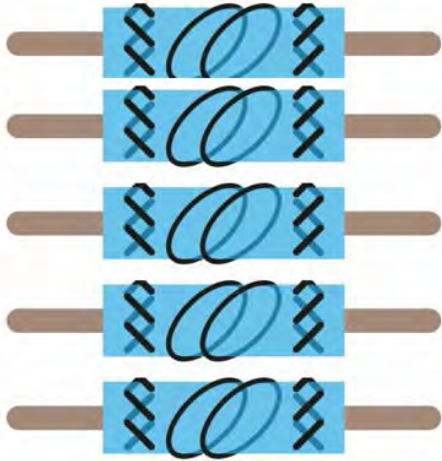
Option C:



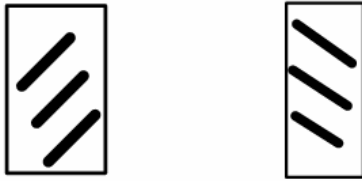
Option D:



Solution:



The transparent part will be stamped on the paper, so the side pattern will be like shown in the image given below.



So we can observe this pattern in option D. Hence, option D is correct.

Ques: Find the odd one.

Option A:



A

Option B:



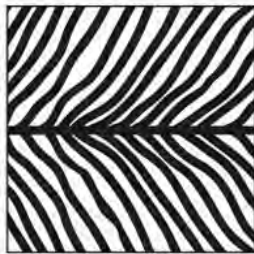
B

Option C:



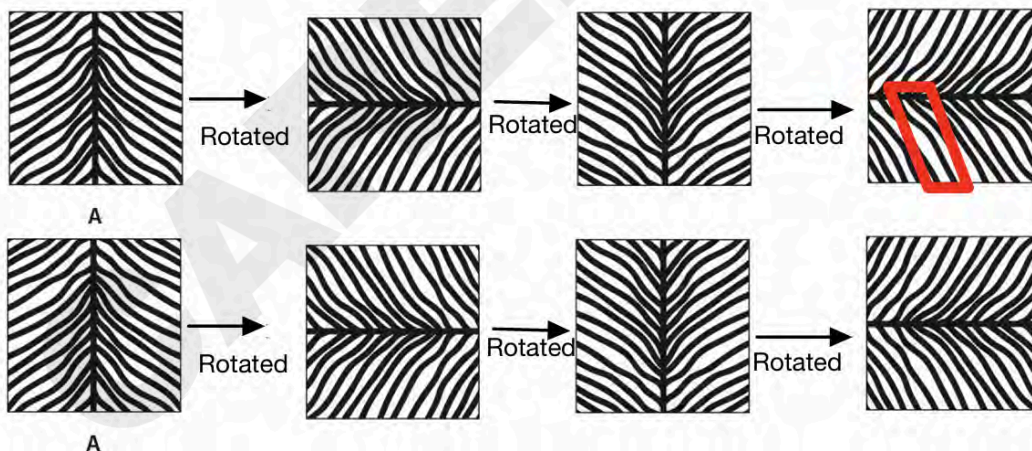
C

Option D:



D

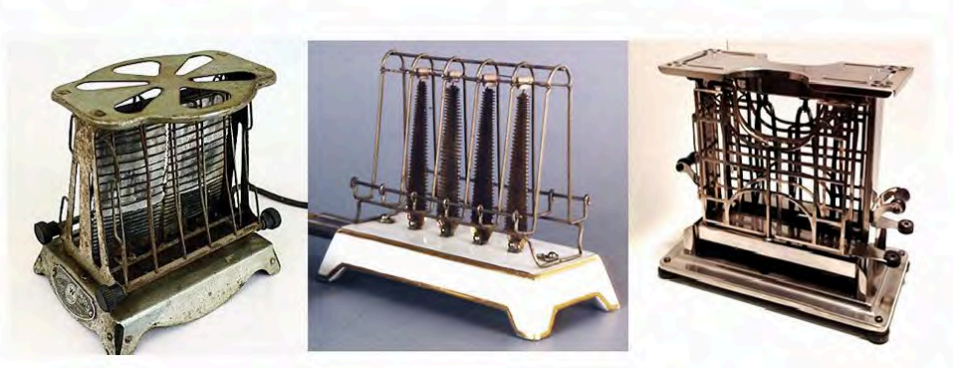
Solution:



When we rotate option A clockwise we get option B, when option B is rotated clockwise we get option C and when option C is rotated clockwise we get an image that has a difference when compared to option D i.e., The zigzag pattern as shown above.

Hence, option D is the odd one out.

Ques: What is the function of these objects?



- A. Measuring earthquakes
- B. Weaving cotton
- C. Toasting bread
- D. Burning wood

Solution:



Antique 1920s Westinghouse turnover toaster.

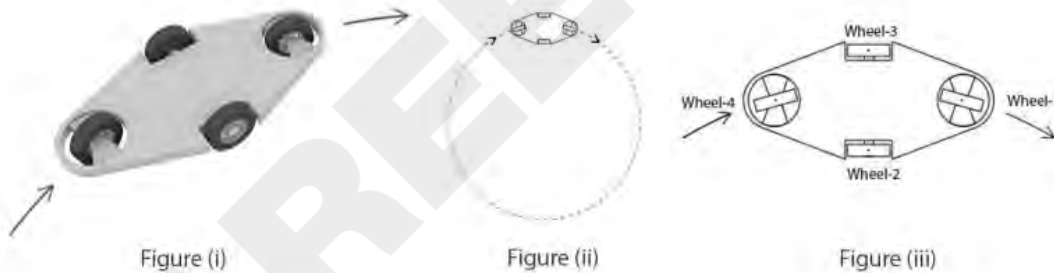


D-12 Toaster, invented in 1909 by Frank Shailor by General Electric.

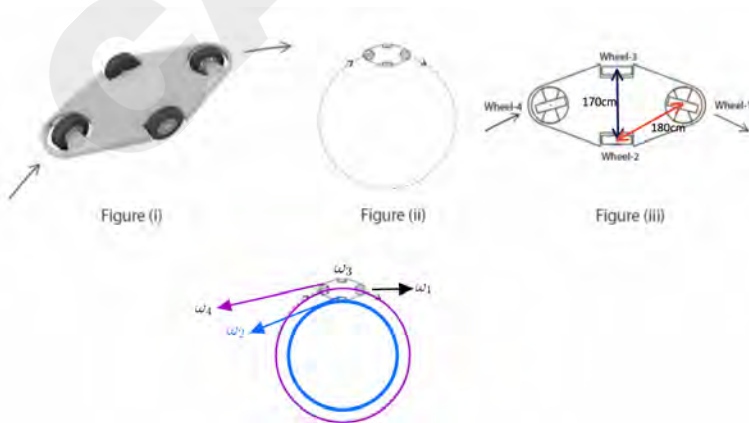


Universal Toaster with swinging cages.
Hence, option C i.e., toasting bread is correct.

Ques: A vehicle with a wheel arrangement is shown in Figure (i). This vehicle is traveling along a circular path as shown in Figure (ii). The wheels do not change their orientation while moving along the circular path. Figure (iii) shows the location of the centers of the wheels. The distance between the centers of Wheel-3 and Wheel-2 is 170 cm, and the distance between the centers of Wheel-1 and Wheel-2 is 180 cm. The radius of the circular path followed by Wheel-2 is 525 cm. What is the radius of the path followed by Wheel-1 in cm?

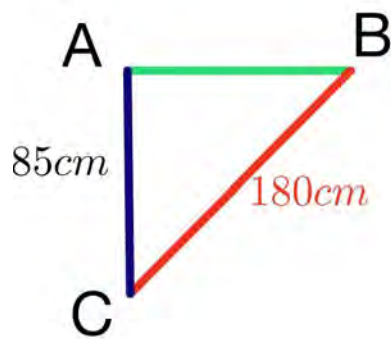
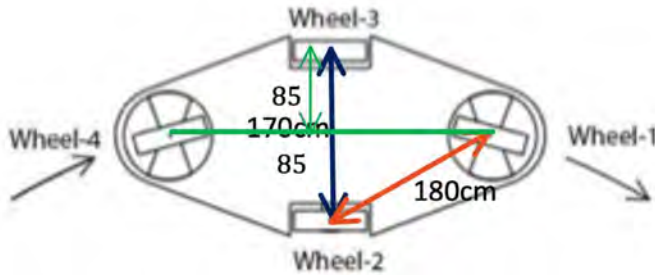


Solution:



So the blue color path is traced by wheel 2 i, e. 525 cm.

Now, we have to find the path created by the wheel 4 (purple color path)



So to get AB, only Pythagoras theorem,

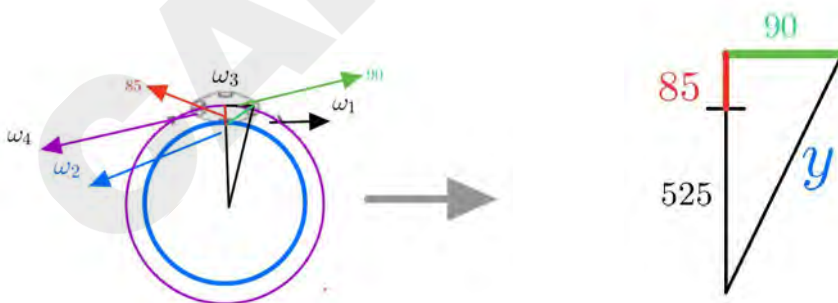
$$BC^2 = AB^2 + AC^2$$

$$180^2 = AB^2 + 85^2$$

$$AB^2 = 180^2 - 85^2$$

$$AB^2 = 8100$$

$$AB = 90 \text{ cm}$$



$$\Rightarrow y^2 = (85 + 525)^2 + 90^2$$

$$= (610)^2 + 8100$$

$$= 372100 + 8100$$

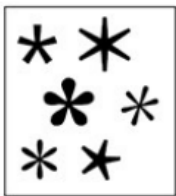
$$y^2 = 380200$$

$y \approx 617$

Ques: Which option(s) contain(s) stars that are NOT found in the image below?

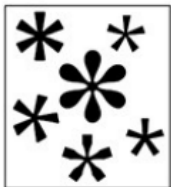


Option A:



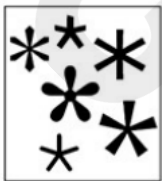
A

Option B:



B

Option C:



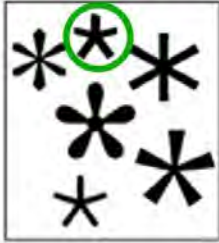
C

Option D:



D

Solution:



C



A

These types (as highlighted in the above image) of stars can not be found in the given image. Hence, options A and C are the answers.

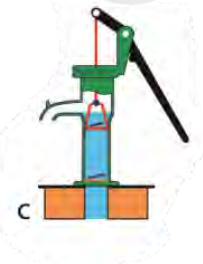
Ques: Shown below are the vertical cross-sections of handpumps. Which of the following options depict(s) the correct working principle?

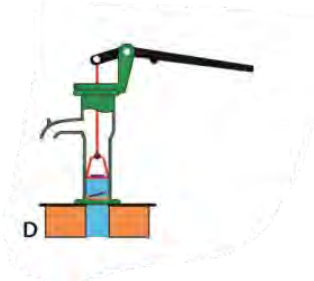
Option A:

Option B:



Option C:



Option D:**Solution:**

Pulling the pump lever upwards causes the piston to move downwards and the foot valve to close; the piston non-return valve is open as the piston moves downwards. The result of this movement is that water from the underside of - the piston non-return valve is moved to the topside of the piston non-return valve.

In options C and D, we can see that the piston is not underwater so they will not follow the correct working principle, So options C and D are wrong.

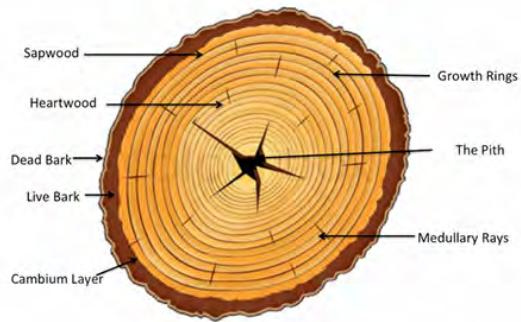
Therefore, options A and B are correct.

Ques: Shown below is a cross-section of two different trees of the same species and age but found in different locations. Based on the image, which of the statement(s) is/are TRUE.



- A. Growth of the tree X is more consistent than tree Y
- B. Growth of the tree X is healthier than tree Y
- C. Climatic conditions could be the reason for the uneven ring structures in tree Y
- D. Growth of the tree Y is healthier than tree X

Solution:



Growth rings: As trees age, they grow in height and width. You can tell the age of a tree by counting these rings. The annual growth of a tree can be measured by the distance between the growth rings. As the growth rate slows down in the winter months, the new layer of wood cells is smaller and packed more closely.

Now if you look at the options then we can say options A B and C are correct but D is wrong because D says growth of tree X is healthier than tree Y which contradicts option A.

Therefore, options A, B, and C are correct.

Ques: Tile X was used to create a pattern that is seamless (without gaps) when arranged as shown in Y. Which tile(s) from the options will create a seamless pattern?



Option A:



Option B:



Option C:

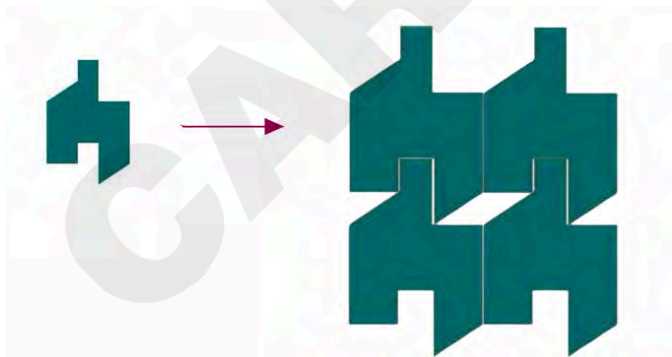


Option D:



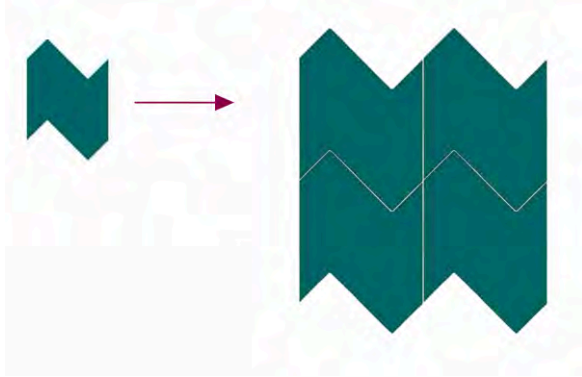
Solution:

Option A:



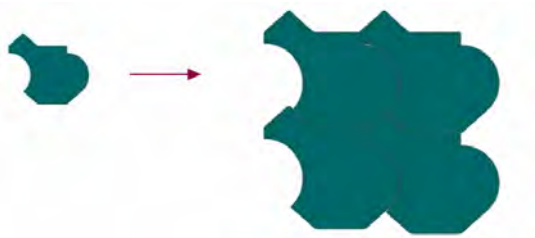
So we can see that option A does not make a seamless pattern.

Option B:



Option B makes a seamless pattern.

Option C:



Option C makes the seamless pattern

Option D:



Option D is wrong

Hence, options A and C make seamless patterns.

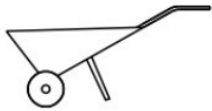
Ques: Construction materials are to be moved using the trolleys in the options. Assume friction is negligible. Which trolley requires the least amount of effort?

Option A:



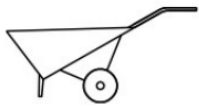
A

Option B:



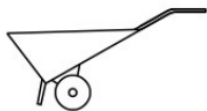
B

Option C:



C

Option D:

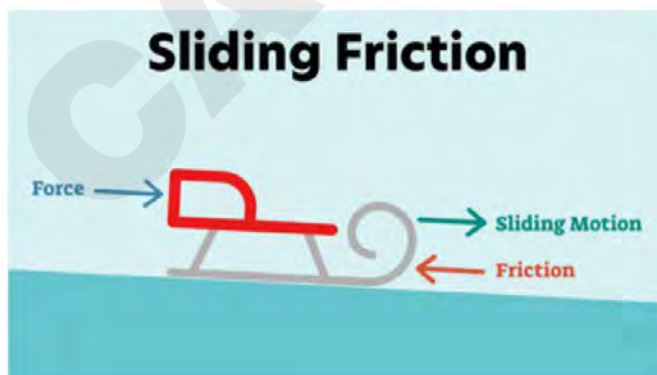


D

Solution:

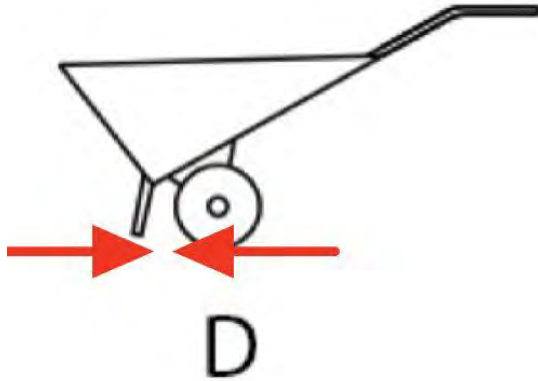
Friction is defined as the resistance offered by the surfaces that are in contact when they move past each other. Friction provides traction that is needed to walk without slipping.

For e.g.



Now according to the question friction is negligible so when friction is negligible, it is typically a situation in which two opposing forces are not acting strongly against each other, resulting in minimal resistance.

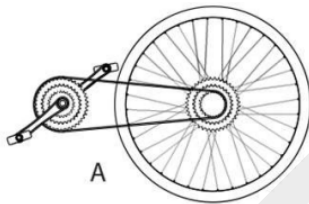
Now we can see in option D only two opposing forces acting against each other are weak (as shown below).



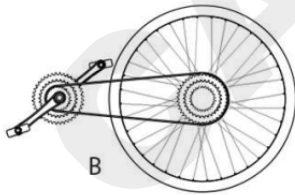
Hence, option D is correct.

Ques: A cyclist was peddling a geared cycle on an upward inclined road and decided to stop on the incline. Which option can be used to stop the bicycle on the incline only using force on foot pedals?

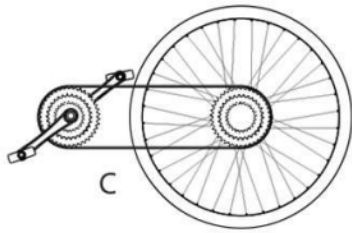
Option A:



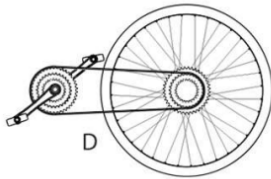
Option B:



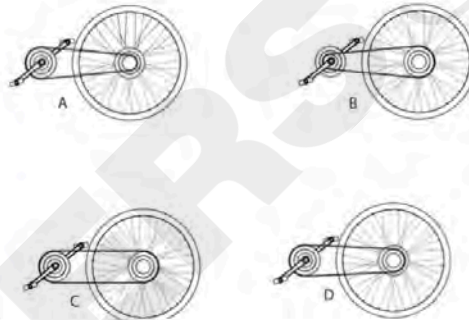
Option C:



Option D:



Solution:



A typical bicycle has anything from three to thirty different gears—wheels with teeth, linked by the chain, which make the machine faster (going along the straight) or easier to pedal (going uphill). Bigger wheels also help you go faster on the straight, but they're a big drawback when it comes to hills. That's one of the reasons why mountain bikes and BMX bikes have smaller wheels than racing bicycles. It's not just the gears on a bicycle that help to magnify your pedaling power when you go uphill: the pedals are fastened to the main gear wheel by a pair of cranks: two short levers that also magnify the force you can exert with your legs. When you press the brake levers, a pair of rubber shoes (sometimes called blocks) clamps onto the metal inner rim of the front and back wheels. As the brake shoes rub tightly against the wheels, they turn your kinetic energy (the energy you have because you're going along) into heat—which has the effect of slowing you down.

Now if we see the position of gears we can easily eliminate option A, C and D
Hence, option B is correct.

Understanding of Basic Design Principles

What makes a design a good piece of design? - By the understanding and application of the design principles. The principles of design are the rules you must follow to create an effective and attractive design composition. The fundamental principles of design are Balance, Contrast, Emphasis, Hierarchy, Movement, Proportion, Repetition, Rhythm, and Pattern. One may still think that the design is all about creativity and freedom, but we first must understand that without the understanding of basic principles, it may take a lot of trial and error to create something that both looks good and creates an optimal user experience. If we tend to ignore these principles and go wild in creating our designs, we often find that the designs come out to be puzzling, crowded, unfinished or visually unpleasant. Every piece of design has a structure and language of its own that makes it visually balanced and pleasing. By understanding the design principles, it becomes easy to unfold the surfaces below each design layer.

9 Basic Principles of Design

We shall understand the design principles in detail now;

1. Balance

We should never forget that **every element we place on the page has its own weight depending on its size, color, shape, or texture.** For a design to have good balance, it should feel stable and need to have a certain scale.

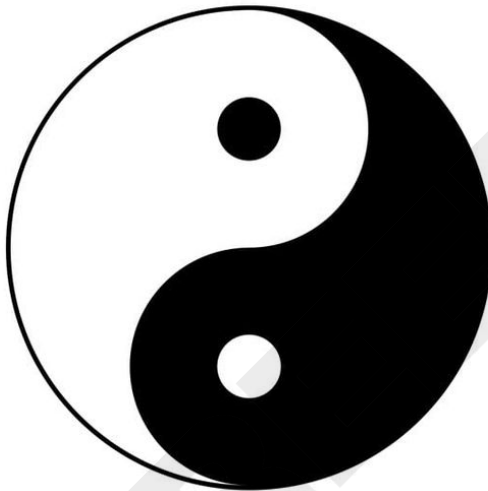


Just like we do not put all the chairs in one corner of the hall and spread it in the area in order to not make it look crowded, we should not put all the elements in our composition in one side of the design or else it would appear as if the eyes of viewer is sliding only to one part of the design. Lack of balance would make your design feel heavy on one side and empty on the opposite.

Two types of balance are

- **Symmetrical Balance**

Symmetrical design creates balance through equally weighted elements aligned on either side of an imaginary center line. **Symmetrical design is easier to balance but may come across as boring.**



- **Asymmetrical Balance**

Asymmetrical design uses different elements based on their size, shape, or color on either side that are not equal in weight but still have a sense of equilibrium. **Asymmetrical balance is bold, interesting and has visual movement.**



2. Contrast

In order to make a design that stays with the consumer, we must make the use of contrast by applying contrast in elements using color, texture, size, and shapes.

Contrast is what makes a design pop!



Contrast in design is about creating a focal point to certain elements that can draw the viewer's eyes and highlight the message given. Lack of contrast can make a design look dull, and viewers can overlook the important message. **Contrast is important especially when designing to convey a visual message to the consumer!**

For example, in the picture given above we can understand how the central image of fire in a bonfire is drawing the viewer's attention by the help of applying contrast to the image.

3. Emphasis

Emphasis is the design principle that allows designers to highlight a particular desired part of the whole by using shape, size, color, and texture. **Emphasis allows us to create something that can stand out from the rest of the design.** Let us take an example, suppose you are making a poster for a brand for marketing. Make a mental outline first, let your brain organize the information in the order of most important to least and then lay out your design in a way that communicates that order. By doing so we can create a design with emphasis on the desired information.



Let us take the example of the image shown above, with the use of color, light and texture in the image, an emphasis is created to the central structure of the building and then viewer's attention goes to the window through which the photograph has been taken.

4. Hierarchy

Hierarchy is a design principle that deals with when someone needs to define how their information on the design should be processed by their consumers. To understand this, the easiest example is to understand that the title of a page is usually given the most importance, and

therefore should be immediately recognizable as the most crucial element on a page. Headings and subheadings should be formatted in a way that shows their importance in relation to each other as well as in relation to the title and body of the entire page and therefore, creating a hierarchy in the design.

Final proposed solution

Drop basket

Problem statement:
Water leaks caused by accidentally leaving taps open in household.

Solution: A manual drop basket with a water leak detection and alarm system. This basket would be installed underneath traditional faucets to capture drips and alert users of potential leaks.

In the example above, which is also popularly used when writing articles, we can see how designers can create a hierarchy using different text sizes from most important to least important and by simply changing the color of the text. This principle allows designers to play with their consumer's attention in their composition!

5. Movement

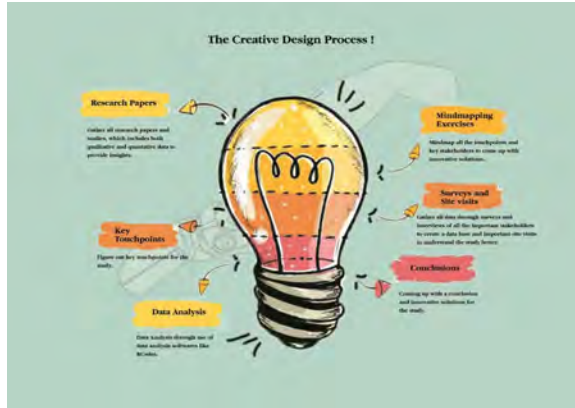
Movement is a design principle that gives designers the control to make their consumer's eye to follow a certain desired path through their design. Primary elements will lead to secondary elements and so on. **Movement in a composition creates a dynamism that keeps the viewer engaged.** Movement can be created through different shapes, lines (curved and diagonal lines create a path or better movement than straight lines) and color. A literal way of showing movement is by using an image that includes motion, like a dancer or hair in the wind.

For example, in the image below, movement is shown through distinct colors and their pattern of movement when mixed, giving a visual sense of brush moving through them and mixing them together. This creates a visual movement in the mind of the viewers.



6. Proportion

Proportion is one of the easier design principle which deals with the visual size and weight of the elements and their relation with each other in the whole composition. Proportion signals what is important in a design and what is not. Larger elements are more important, smaller elements less. For example, let us take the poster below to understand proportion better, here visuals are balanced through image and background. More important titles are given are larger text sizes and so on.



7. Repetition

Repetition is used where a designer needs to create a sense of unity that brings together different elements in a composition. **Repetition is also used where the designer needs to reinforce an idea.** Repetition can be done in numerous ways by repeating the same colors, typefaces, shapes, or other elements of a design. Repetition can also be used in brand strategies by repeating a logo, tagline, or an element from the brand.

Repetition when done by using same element again and again can make the page feel like endless as shown in the example below,



8. Rhythm

Rhythm is a more complex design principle than the rest. **It is used to create an organized tempo in the composition through use of pattern and repetition in the design.** Spaces between the elements in an organized way can create a design visual rhythm similar to the way the space between notes in a musical composition creates a rhythm. Rhythm is usually not very obvious to the eyes of the consumer as other principles.



9. Pattern

The easiest way to understand patterns can be the repetition of multiple design elements working together in a design composition. **Repetition focuses on a single element being repeated, while pattern refers to multiple elements repeated throughout a design.** Most common examples of pattern include wallpapers and backgrounds. Designers generally use pattern as design principle to enhance the consumer's experience and to enhance the overall design.



Questions that might come in Exams on Basic Design Principles:

1. Question: What are the Principles of Design?

1. Colors and shapes come together to make a pattern.
2. Creating a similar visual on both sides of the design composition
3. Rules for designers to help create a better design composition.
4. None of the above.

Answer: 3

Explanation: Option 3 is correct as the principles of design are the rules you must follow to create an effective and attractive design composition. They provide guidelines that help designers arrange the various elements and components of a design to create a visually pleasing and cohesive composition.

2. Question: Which design principle deals with the visual size and weight of the elements and their relation with each other in the whole composition?

1. Pattern
2. Balance
3. Rhythm
4. Proportion

Answer: 4

Explanation: Option 4 is correct as proportion is the size of elements in relation to one another. Proportion signals what's important in a design and what isn't. Larger elements are more important, smaller elements less.

3. Question: If you want to make an element pop, which design principle will you use?

1. Repetition
2. Balance
3. Contrast
4. Movement

Answer: 3

Explanation: Option 3 is correct as we use Contrast when we need to create a focal point to certain elements that can draw the viewer's eyes and highlight the message given, hence making it pop!

4. Question: Complete the sentence below:

Curved or diagonal lines are used to create a path or better sense of visual _____ than straight lines.

1. Pattern

2. Movement
3. Repetition
4. Proportion

Answer: 2

Explanation: Option 2 is correct as **Movement** can be created through different shapes, lines (curved and diagonal lines create a path or better movement than straight lines) and color.

5. Question: What according to you is given in the image below;

1. Pattern
2. Balance
3. Proportion
4. None of the above



Answer: 2

6. Question: Which according to you is a bad example of balance.

1.



2.



3.



4.

**Answer: 4**

Rule of Thirds / Layout and Principles of Design

Design field is innovative and allows freedom for creativity but it is full of its own rules for designers to follow in order to allow them to make better compositions for their users. The rule of thirds/ layout and principle of design is one such rule that is used to create more visually appealing and eye-catching design compositions and helps designers to create better visually accurate designs. Rule of thirds/layout is one of the design principles rules set by the experts after a lot of permutation and combination and through a lot of research and development which is used by dividing a design composition, photograph or art piece into a grid of 3X3 in equals both horizontally and vertically.

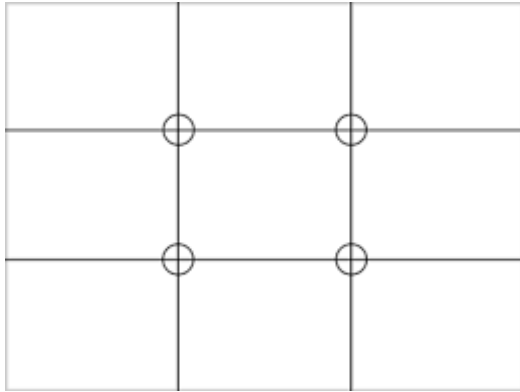
Questions from this topic are asked in the UCEED Exam to examine the student's ability to observe how good a composition can be created or analyzed by them. Observation in design thinking is an important component of the UCEED examination as a lot of the questions asked in the exam are based on the student's ability for them and it is only when they have a better understanding of observation and design sensitivity that they will be able to solve those questions in the exam.

For preparation of UCEED 2026, students need to develop observation and design sensitivity within them. Observation in design thinking is an immersion into the design for gathering insights and information. Observation is understanding the design in-depth and understanding the needs of your users and then coming up with practical, logical and critical solutions. Design is all about the details, the more a design has good details, the more it will have depth. It is through observation skills that a designer develops a good eye which is crucial for a good designer. Design sensitivity is the sensitivity ability a designer should have that helps to analyze any change in the design and then respond accordingly to that change. Design sensitivity also helps a designer cast their ideologies and thoughts aside and gain a better understanding of what their users need.

Rule of Thirds

In the field of design, there are few rules and guidelines present to guide designers in the midst of their freedom of creativity. Rule of thirds is one such guideline for layout of any design composition, artwork or photography. Rule of thirds is used by the designers to create a visually balanced and aligned design composition that is more visually pleasing and appealing to the users. According to the Rule of thirds, any design composition or image can be broken into a grid of 3 X 3, that is 9 equal boxes we get by dividing rows and columns in equal dimensions

over the composition. Best and most common example for this is the grid we see on the camera for photography.



When it comes to design, there are no rigid rules or templates any designer needs to follow and there is no right or wrong, design is a creative process and designer's intuition is the best way for any creation. Therefore, rule of thirds is more like a guiding principle for designers which can be used by designers to create more balanced compositions. Rule of thirds is most commonly used for alignment of different images, elements, text or figures in a design composition.

When designers need to play with viewer's attention, designers place elements that they want their user's eye to catch fast closer to the 4 dots created by the intersection of lines as shown in above image. By doing so, the user's attention automatically flows between these dots effortlessly and creates more visual balance for them.

For example let us see the image below;



We can see in the image above that our attention automatically is driven to the boat on the right and then to the boat placed on the left. This is done because, boat on the right is placed more close to the dot of intersections than that is seen by the boat on the left. Tree on the right is the element in the photograph that is catching the attention at the end as it is placed far from the focus points.

From this example, we can understand how rule of thirds also helps in creating a natural asymmetry by the help of the grid that creates more naturally dynamic designs with a sense of flow that is not common with symmetric compositions that creates more stillness and rigidity which sometimes appears to be more dull.

Let us see another example of placement through rule of third for better understanding;



Here the main element of the composition is placed away from the main focus by creating negative and positive spaces and therefore viewer's attention directly focuses on the mountain top. This makes sure that important details are not missed in a design composition. This is generally used by photographers, product designers and in the area of marketing.

How to develop the skill and prepare for UCEED 2026

To develop better observation and design sensitivity skills, students need to incorporate and practice observation exercises on a daily basis. Students need to understand the principles of design and have a keen eye for details in everything they see around them. Decoding their surroundings into design details is a helpful key for them to understand and develop better observation skills. Students also need to read and understand more about their user's needs to create better solutions for them. By adapting a lifestyle rich with the above practices, with time it becomes easy for students to gather these abilities and will also help come up with more accurate and efficient solutions to the questions asked in UCEED exams. With practice, it will also help them to better prepare for the UCEED 2026 exam, as time is an important foundation. To understand the rule of thirds, try to make compositions according to the grid. With a lot of trials and permutation and combinations, students will get a deeper understanding of the principle. Students can also try and place grid of 3X3 over already existing compositions and observe how elements are placed in the grid and how properly that solves the purpose of the element in the composition.

Rule of Thirds / Layout and Principles of Design UCEED Previous Years Questions and Answers

Ques: Image shows part of a poster made by the CDC in the context of COVID-19. Which of the statements is/are true?



- A. It effectively communicates physical distancing.
- B. It is gender-neutral. It promotes mask usage.
- C. It is faith-neutral and age inclusive.
- D. It effectively communicates all COVID-19-related safety measures.

Solution:

Option A: Yes, it does effectively communicate physical distancing.



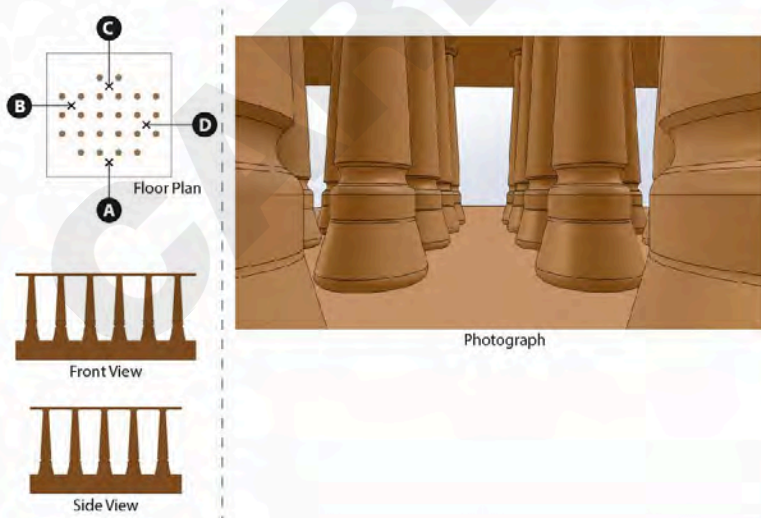
Option B: Yes, it does promote mask usage (as shown in the poster), and since both men and women are shown in the poster. So it is gender-neutral.

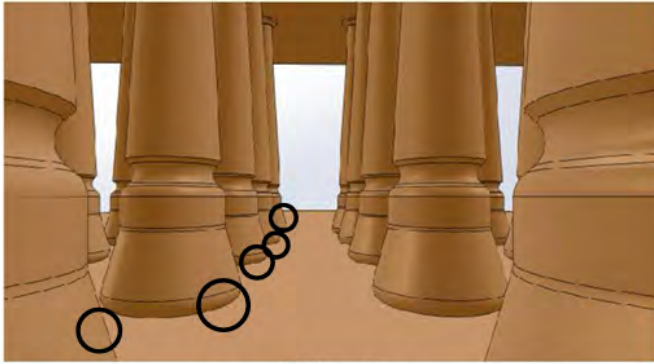
Option C: No, nothing in this poster promotes neutrality and age inclusiveness.

Option D: No it only communicates 2 guidelines, i.e., Social distancing and wearing a mask.

Hence, options A and B are correct.

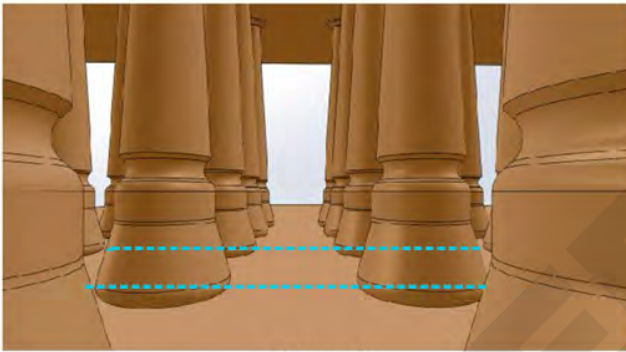
Ques: A tourist is shooting photographs of an ancient building from four locations A, B, C, and D marked by x. The tourist is using only one camera without changing its magnification. Identify the location(s) in the floor plan which will result in the given photograph.

**Solution:**

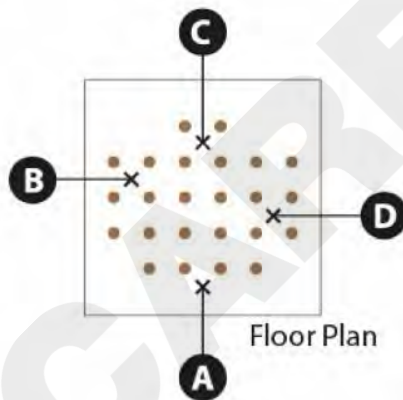


Photograph

We can see from the photograph that we have 5 columns.



Photograph



Floor Plan

On the left and right from the third row make columns are seen so if we see from position A, 5 columns can be seen and from the third row, left and right columns are there so that means A is correct.

If seen from position B, straight ahead we can see 5 columns but from the third, we have columns on the left side on the fourth row, there are no columns but in the picture, we can see columns. Therefore, this is incorrect.

If seen from position C, we can see only 4 columns, but there are 5 columns, so C will not be correct.

If seen from position D, there are 5 columns ahead which can be seen. Therefore, D is also correct.

Therefore, the correct answers are A and D.

Sketching Question where Rule of thirds can be used by students for better composition.

Q.1 Sketching

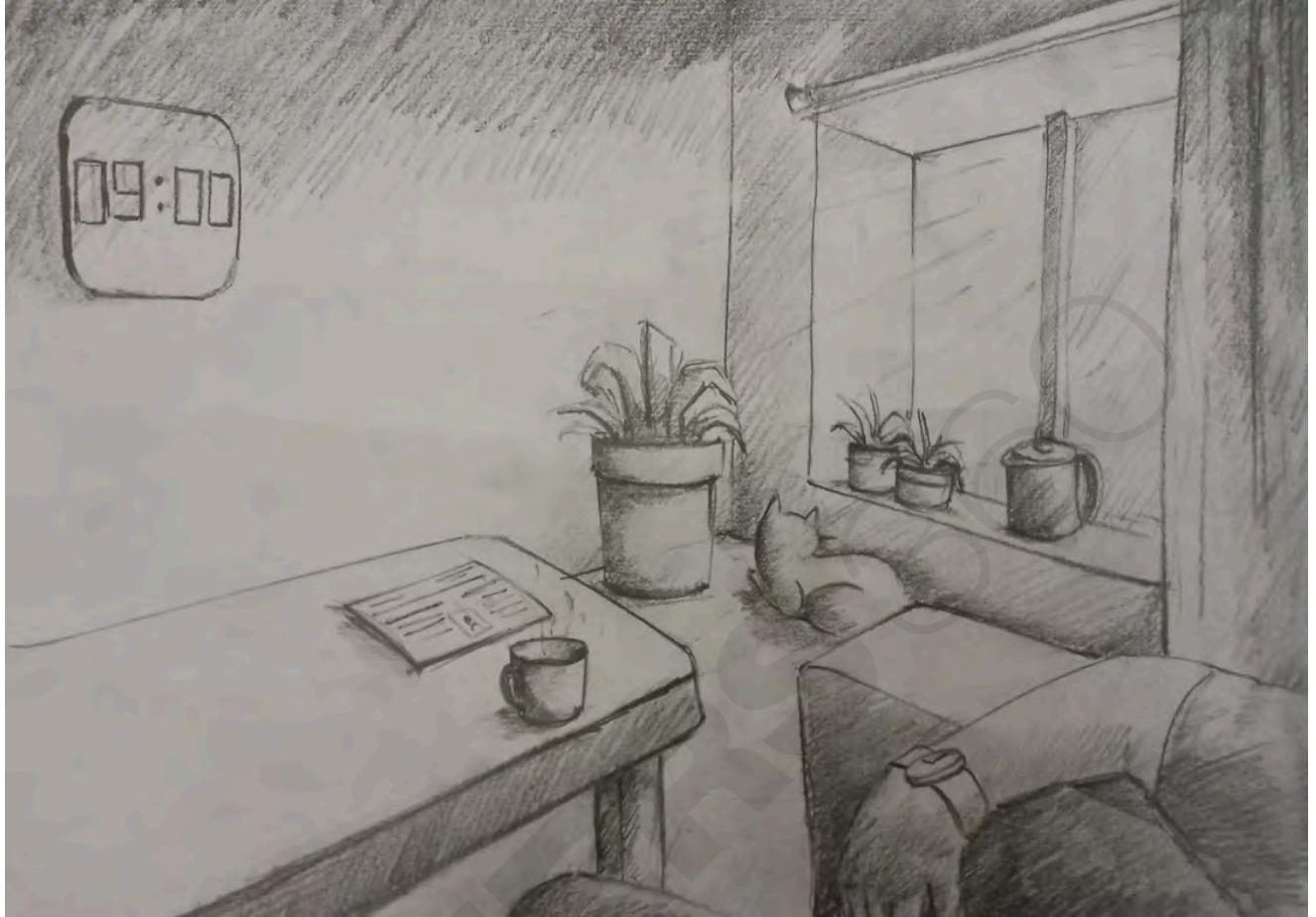
(30 minutes – 60 marks)

[Note:

- 1) This question must be answered in the answer booklet provided by the invigilator
- 2) It is not mandatory for the candidates to mark the Part-B question as 'answered' at the bottom of the screen on the computer]

You are sitting in a well ventilated drawing room. It is 9 in the morning and sun light is streaming through the window on the East casting shadows on the floor. A cat is resting on one of the sunlit patches. A newspaper is placed beside a cup of hot tea on a small side table. There are three freshly watered potted plants in the room; one on the floor and two on the window sill with the watering jug next to it.

From the above description, sketch the scene from your point of view.



CAREERS

Understanding of Composition

A design composition is a design space where all different elements (color, text, image, and shape) come together and combine to create one whole. There are 5 main rules for composition in any design namely: Rule of Odds, Balance, Rule of Thirds, Focus/Emphasis & Scale, and Pattern. It is important for designers to have a good understanding of compositions to create better visual balance and appealing design compositions according to their users needs. Aspiring designers and students preparing for UCEED 2026 are needed to practice and gather this ability as questions are asked in the UCEED Exam to test their ability on how good compositions they can create and understand. For understanding compositions from a designer's perspective and to create better visually appealing compositions, aspiring designers need to develop a better skill for observation and design sensitivity which can only be accomplished through daily practice and time.

Observation in design thinking is an immersion into the design for gathering insights and information. It is only through observation skills that a designer develops a good eye which is crucial for any design composition. Design is all about the details, the more a design has good details, the more it will have depth and the composition will be appealing to their users. Design sensitivity is the sensitivity ability a designer should have that helps to analyze any change in the design and then respond accordingly to that change. Design sensitivity also helps a designer cast their ideologies and thoughts aside and gain a better understanding of what their users need. Therefore, both these skills become important and crucial for design composition.

Significance of Understanding of Compositions for UCEED 2026

Since the pattern for the UCEED Exam has changed from just analyzing students on logical, quantitative and non-verbal reasoning to more design related skills including sketching skills, design knowledge and design pattern or composition related reasoning from 2019 onwards, it becomes crucial for students doing preparation for UCEED 2026 to understand and have better practice for design related topics in order to answer with more accuracy and efficiency.

Understanding of Compositions is one of the basic design topics that is important for students aspiring to be a designer. Through the knowledge of design composition they can understand and create better visually appealing compositions for their end users and can be more sensitive towards their users needs.

What is a design composition?

In most simple words, a design composition can be defined as all parts or elements coming together and making a whole. Elements that could make a composition include text, images, colors, graphics and shapes. When these elements are aligned and arranged properly, it makes the composition a good design composition that is visually appealing and solves the needed purpose effectively.

For a designer, in order to convey their idea to its end user, they need to create a better interconnected and organized composition where all the elements are balanced and in harmony to each other. In order to create and convey their design through good design composition effectively, there are some basic rules or guidelines designers can live by:

Focus

Focus is the design principle that allows designers to highlight a particular desired part of the whole by using shape, size, color, and texture. **Focus allows us to create something that can stand out from the rest of the design.**

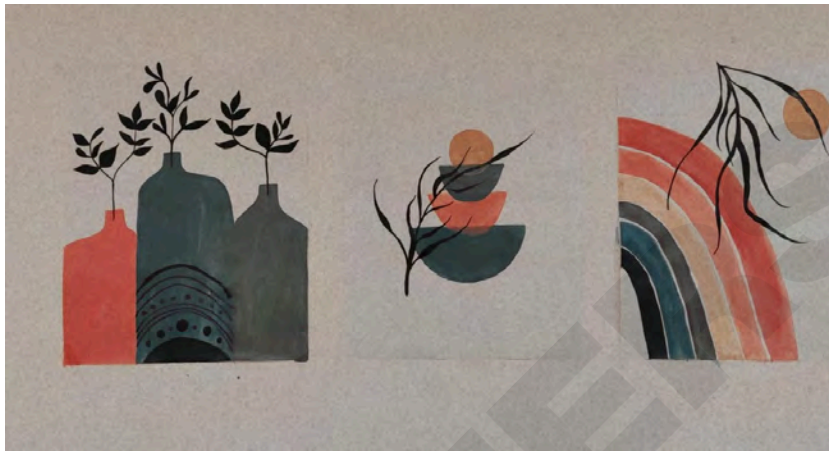
Let us take an example, suppose you are making a poster for a brand for marketing. Make a mental outline first, let your brain organize the information in the order of most important to least and then lay out your design in a way that communicates that order. By doing so we can create a design mental map on the desired information. Now create a focal point for the idea according to the information you think is most important and should get more attention by the viewer.



Let us take an example of the image above, here highlighted pink rectangle, and frame at two edges with color contrast of text all is done to create a focal point and focus in general to the composition.

Rule of Odds

Rule of odds in design composition is a simple rule/guideline that states that in a composition an odd number of elements will be more visually pleasing than that of the even number of elements. This rule is more generally used by photographers in the composition of the pictures.



For example, take this image. Here elements in number 3 creates more visual balance and harmony than even composition.

Balance

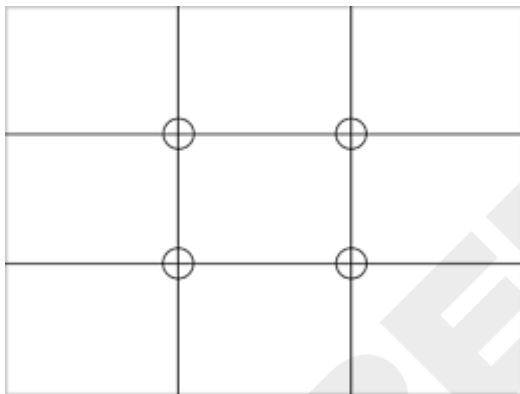
We should never forget that every element we place on the page has its own weight depending on its size, color, shape, or texture. For a design to have good balance, it should feel stable and need to have a certain scale.



Just like we do not put all the chairs in one corner of the hall and spread it in the area in order to not make it look crowded, we should not put all the elements in our composition in one side of the design or else it would appear as if the eyes of viewer is sliding only to one part of the design. Lack of balance would make your design feel heavy on one side and empty on the opposite.

Rule of Thirds

Rule of thirds is a guideline for layout of any design composition, artwork or photography. Rule of thirds is used by the designers to create a visually balanced and aligned design composition that is more visually pleasing and appealing to the users. According to the Rule of thirds, any design composition or image can be broken into a grid of 3 X 3, that is 9 equal boxes we get by dividing rows and columns in equal dimensions over the composition. Best and most common example for this is the grid we see on the camera for photography.



Rule of thirds is more like a guiding principle for designers which can be used by designers to create more balanced compositions. Rule of thirds is most commonly used for alignment of different images, elements, text or figures in a design composition.

When designers need to play with viewer's attention, designers place elements that they want their user's eye to catch fast closer to the 4 dots created by the intersection of lines as shown in above image. By doing so, the user's attention automatically flows between these dots effortlessly and creates more visual balance for them.

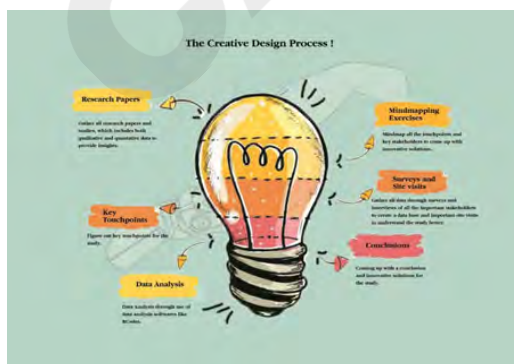
For example let us see the image below;



We can see in the image above that our attention automatically is driven to the boat on the right and then to the boat placed on the left. This is done because, boat on the right is placed more close to the dot of intersections than that is seen by the boat on the left. Tree on the right is the element in the photograph that is catching the attention at the end as it is placed far from the focus points.

Scale

Scale for any object is used to define the exact measurement or comparison for that object. In geometry, scale is defined as the ratio for any object to dimension for its model to the dimensions of its actual size. Proportion signals what is important in a design and what is not. Larger elements are more important, smaller elements less.



For example, let us take the poster below to understand proportion better, here visuals are balanced through image and background. More important titles are given are larger text sizes and so on.

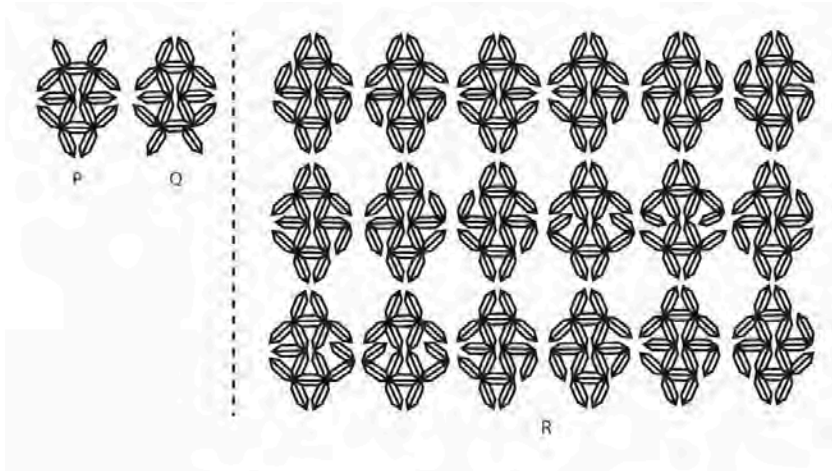
Pattern

The easiest way to understand patterns can be the repetition of multiple design elements working together in a design composition. Repetition focuses on a single element being repeated, while pattern refers to multiple elements repeated throughout a design. Most common examples of pattern include wallpapers and backgrounds. Designers generally use pattern as design principle to enhance the consumer's experience and to enhance the overall design.

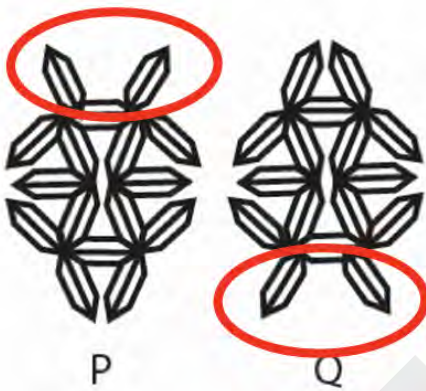


Previous Years Question asked from Understanding of Composition UCEED Topic

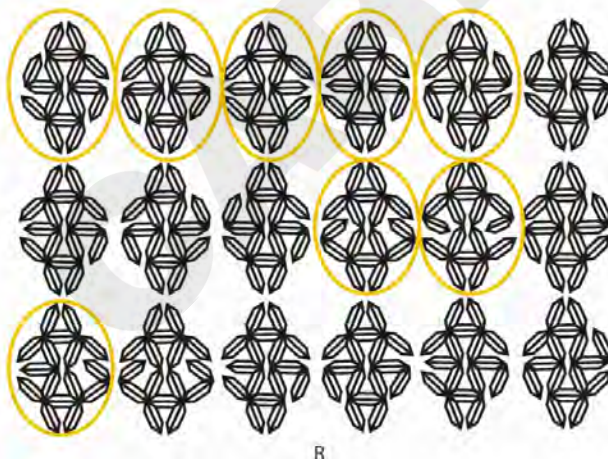
Ques: How many distinct motifs appear in the figure on the right? Flips and rotations are to be counted separately, for example, the motifs P and Q are distinct.



Solution:



P and Q have openings on one end, so now we have to find unique motifs in the image given (as shown below)



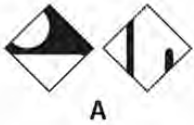
R have 8 unique motifs as they have no opening on any end.

Hence, the answer is 8.

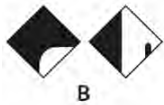
Ques: Each of the options shows a pair of two different pieces. Which of the options CAN NOT be cut out of the given figure?



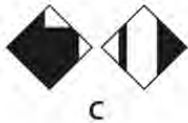
Option A:



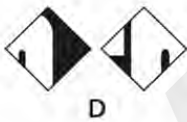
Option B:



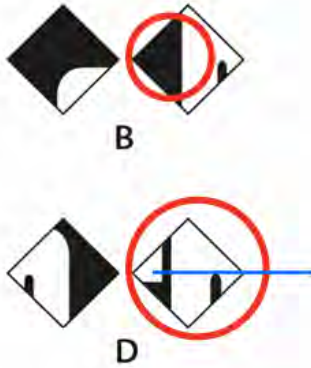
Option C:



Option D:



Solution:



As shown in the image above in option B the white hand is missing (highlighted by red circle) For option D the blue horizontal line, the level of the inseam (two leg joints), and the hand are not as shown in the question.

Hence, B and D are correct answers.

Sketching question:

Read and visualize the following:

- A rat is spotted inside a school canteen.
- A school boy is afraid and standing on a stool/chair.
- A brave school girl is chasing the rat out of the canteen.
- A tiffin box is falling on the floor.
- Two school bags and two water bottles are kept on a table.
- A few plates are broken and lying on the floor.
- The canteen owner is watching this in shock, standing on top of the counter table.

Sketch this scene from the canteen owner's point of view.

Solution:



CAREERS

Geometric Shapes and Fundamentals of Geometry

Geometry:

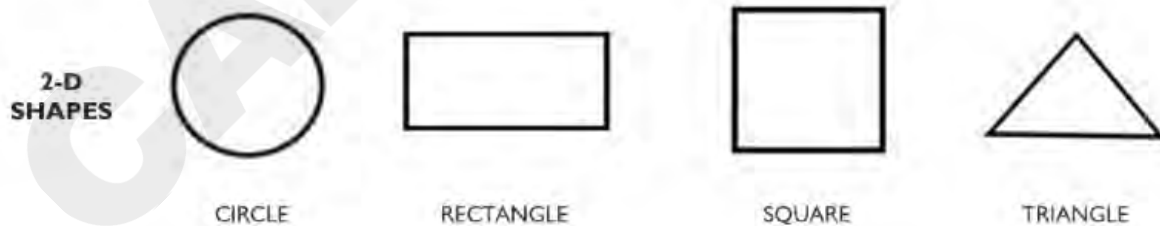
As taken from ancient Greek (geōmetría), (ge) means land or earth, (metron) which means a measure of something. Geometry is a branch of mathematics that deals with the measurement properties such as distance, shape, size and angle.

Geometric Shapes:

Any figure with a closed boundary and which is made by any line segment, curves or points of definite amount.

2-D Geometric Shapes:

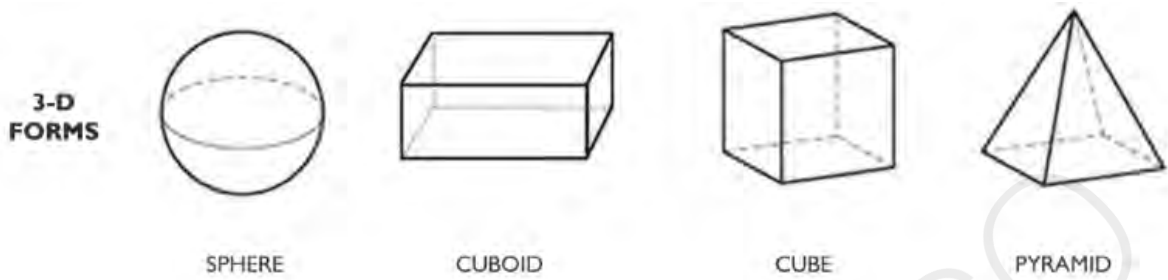
All the shapes exist in a flat plane in plane geometry. You can understand a plane as a flat sheet with no thickness and which can go in both directions infinitely. Any shape on the plane is called a plane figure. Popular examples of geometric shapes are square, rectangle, triangle and circle. Geometric shapes have sides, corners and angles except in the case of a circle which does not have any straight line. These plane figures are called 2-D shapes. A basic geometric shape is 3 or more line segments joined together. When equal line segments are joined at equal angles, they are called regular shapes. In a circle, the curve is created by joining points rather than joining line segments. When line segments of different lengths are joined at unequal angles, then they are referred to as irregular shapes. Curvy shapes that are not a circle (irregular) are created by free hand and are free flowing.



3-D Geometric Shapes:

When these 2-D shapes are given height and they start to occupy space, they are called solid figures. These shapes have faces, edges, and vertices. These figures are called 3-D shapes. 3-D shapes originate from plane figures when they are given height, similarly shown below are basic

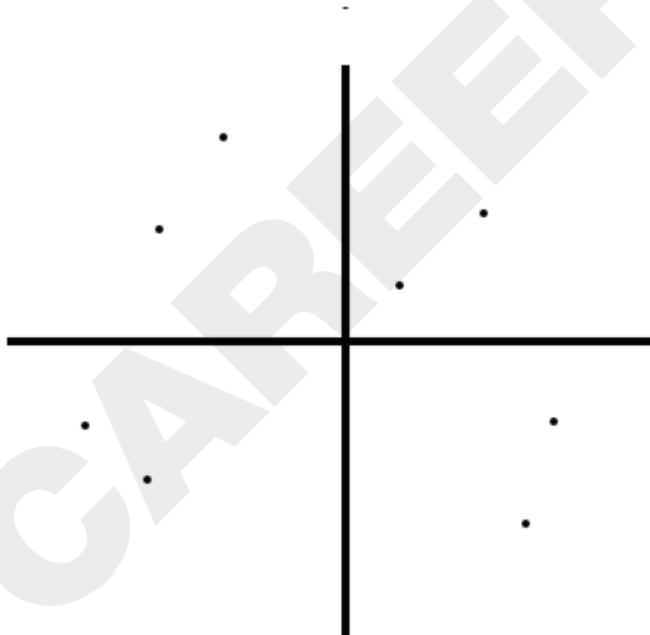
2-D shapes that generate their 3-D forms; namely: Circle- Sphere, Rectangle- Cuboid, Square- Cube, Triangle- Pyramid.



Fundamentals of Geometry :

1. Points:

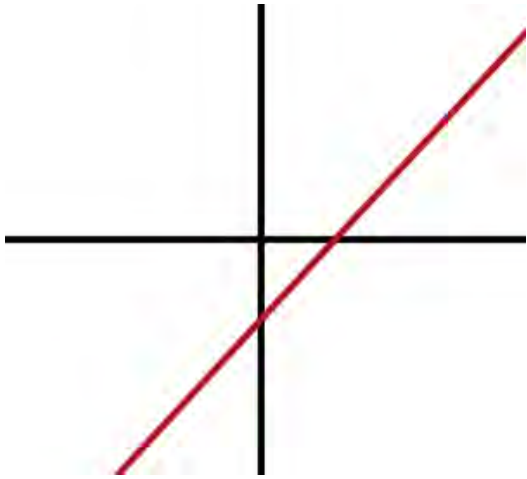
A point is an exact location in a plane which does not have any dimensions or occupy any space. To understand better, imagine a dot in a space.



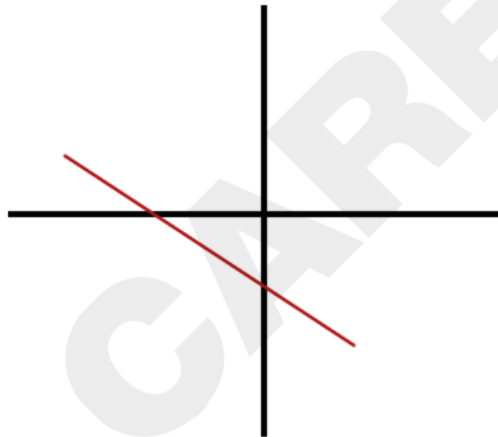
2. Lines and Line segments:

A line is a one-dimensional, straight shape that has only length and no breadth. A line goes in both directions indefinitely. Whereas, a line segment similar to line is also one-dimensional and has only length and no breadth but its length is definite.

Line:

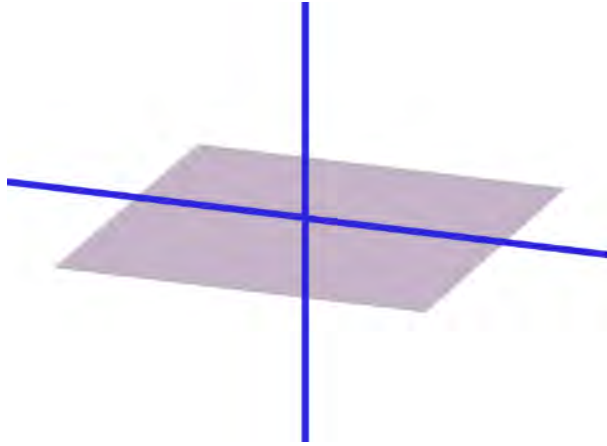


Line Segment:



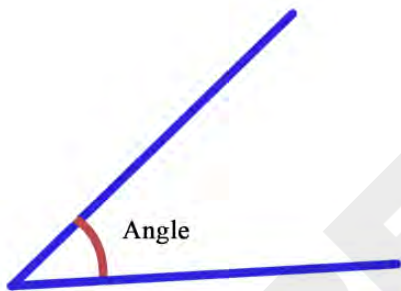
3. Plane:

You can understand a plane as a flat sheet with no thickness and which can go in both directions indefinitely. A Plane similar to a line goes in both directions indefinitely but instead of a line it is a 2-dimensional surface.



4. Angles:

You can understand an angle as the rotational distance between two line segments. The common point where the 2 line segments meet is called a vertex.



Significance of geometric shapes and fundamentals of Geometry for preparation of UCEED 2026

Knowledge and understanding of geometric shapes and fundamental concepts of geometry is important for aspiring students for the UCEED Exam as a lot of pictorial and diagrammatic questions are asked in the exam. Questions are generally based on geometric solutions for visualization of geometric figures, pattern recognition or to find mathematical solutions like area or volume depending on the instructions given in the question.

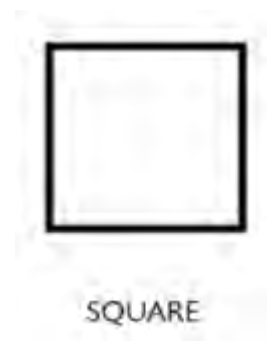
Area: Area is a measurement of a 2-dimensional region or a shape.

Volume: Volume is a measurement of a 3-dimensional region or space.

Different mathematical formulas are set and given for different 2-D and 3-D geometric shapes and figures.

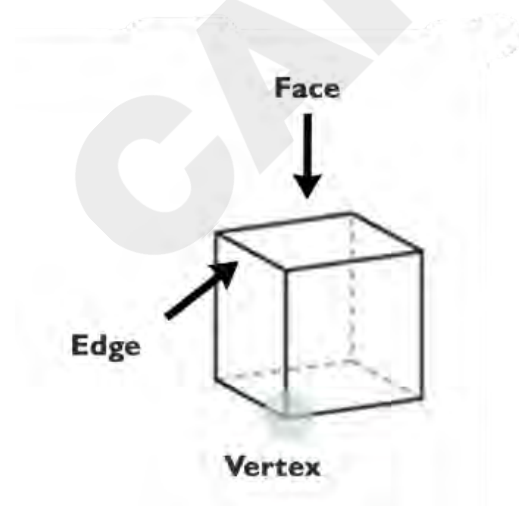
For example, let's take the most basic shape- a square;

A square is a 2-dimensional figure with a definite length and a definite breadth. It has 4 sides with opposite sides being parallel and all the sides being of the same size. All the vertices of a square are at 90 degrees angle.



Area for square is the measurement of the space enclosed by the square. Therefore; **area: length multiplied by its breadth.**

A cube is a 3-D form of the 2-D shape square when given height. All faces and sides of a cube are equal. The edges are equal. There are 6 faces, 12 edges, and 8 vertices in a cube.

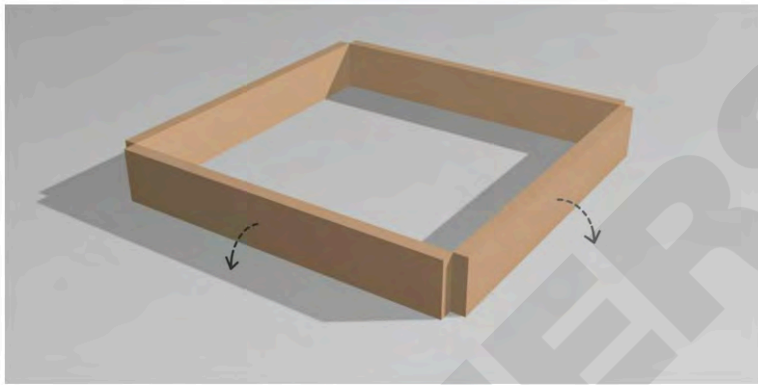


Volume for a cube is the measurement of the 3-dimensional space enclosed by the cube.

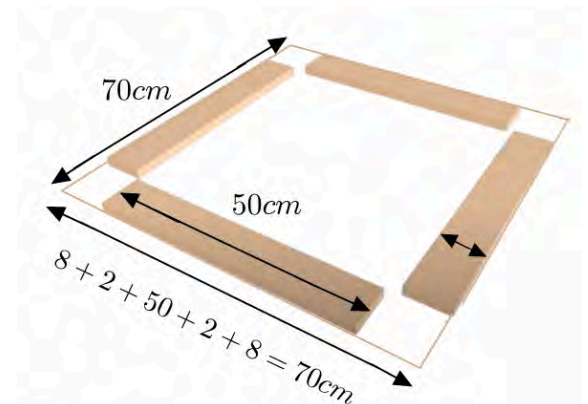
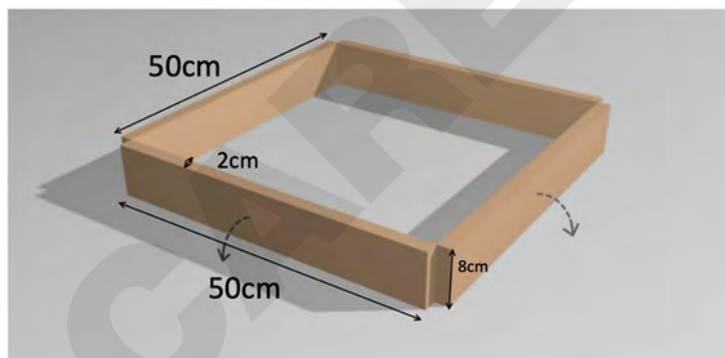
Therefore; **volume: length multiplied by its breadth and then multiplied by its height.**

Previous Years Question asked from Geometric Shapes and Fundamentals of Geometry in the UCEED Exam

Ques: Four identical pieces of wood of length 50 cm x 8 cm x 2 cm are arranged as shown in the figure. Another larger square is generated by rotating all the wooden panels along the outer edges and extending the outermost edges till they touch each other. What is the area of this larger square thus constructed?



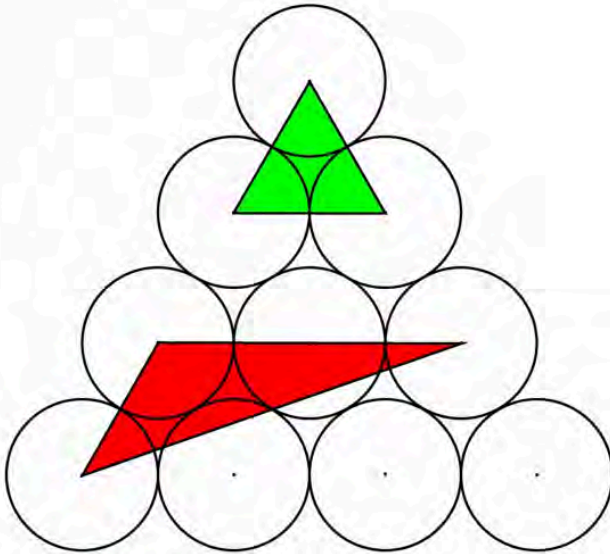
Solution:



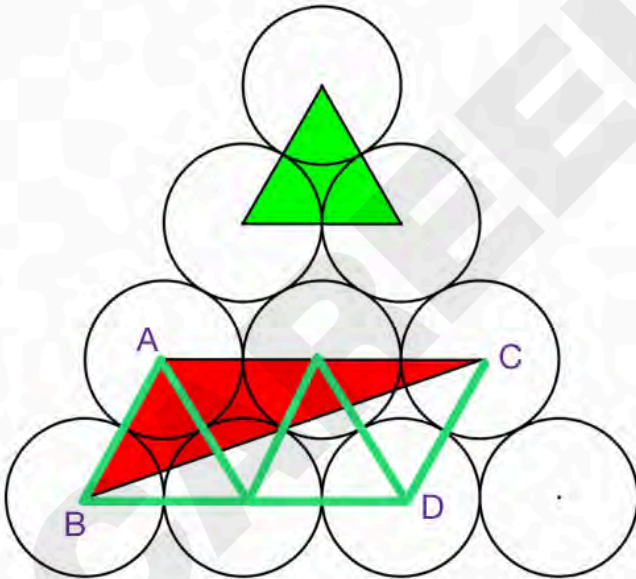
As it is a square so side = 70 cm

$$\begin{aligned} \text{Area of square} &= \text{side}^2 \\ &= 70^2 \\ &= 4900 \text{ sq cm} \end{aligned}$$

Ques: The corners of the green and red triangles coincide with the centers of the circles. All the circles have equal diameters, and adjacent circles touch each other. If the area of the green triangle is 3.14, what is the area of the red triangle?



Solution:



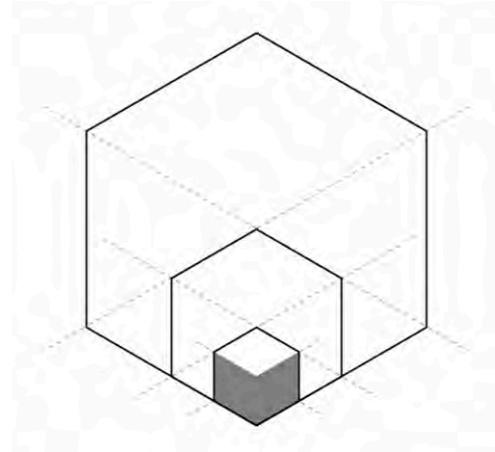
Area of green triangle = 3.14

Area of parallelogram (ABCD) = Area of 4 green triangle
 $= 4 \times 3.14$

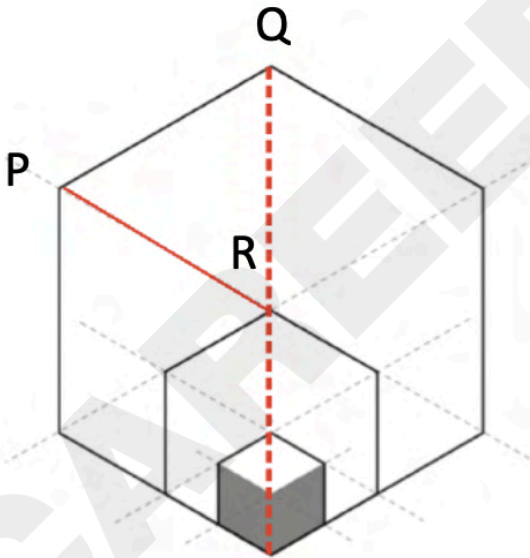
Area of red triangle $= \frac{1}{2} \times \text{Area of parallelogram}$
 $= \frac{1}{2} \times 4 \times 3.14$
 $= 2 \times 3.14$

$$= 6.28$$

Ques: In the figure given below, the area of the largest regular hexagon is 720 units. What is the area of the shaded portion?

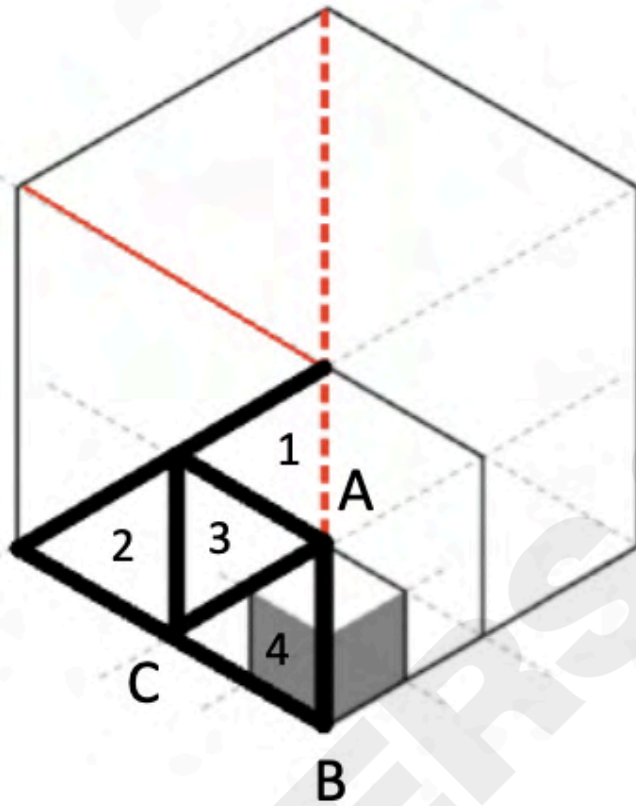


Solution: The area of the largest regular hexagon is 720 units.
We just need to find a relation between the shaded portion and the largest regular polygon.



So this triangle PQR is $\frac{1}{6}th$ part of the largest hexagon.

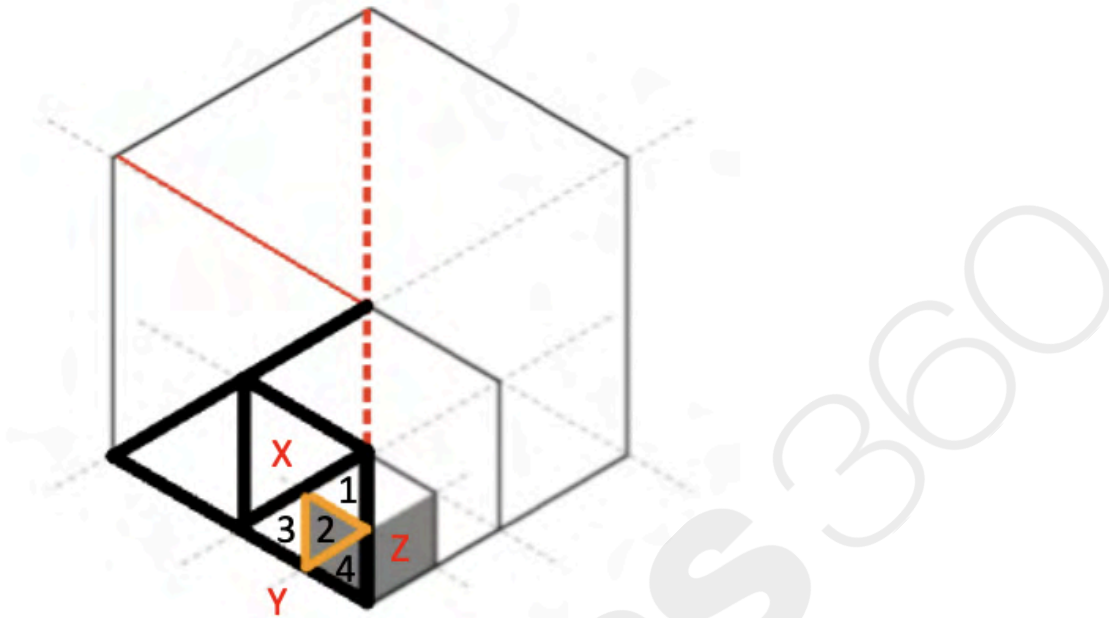
$$\therefore \text{Area of } \Delta PQR = \frac{1}{6} \times 720 = 120 \text{ units}$$



Then we again divide the triangle into smaller units, we can say that there are 4 such triangles.

$$\therefore \text{Area of } \Delta ABC = \frac{1}{4} \text{Area of } \Delta PQR$$

$$\begin{aligned} \text{Area of } \Delta ABC &= \frac{1}{4} \times 120 \\ &= 30 \text{ unit} \end{aligned}$$



Then we again divide the triangle ABC into smaller units, we can say that there are 4 such triangles.

$$\therefore \text{Area of } \Delta XYZ = \frac{1}{4} \text{Area of } \Delta ABC$$

$$\begin{aligned} \text{Area of } \Delta XYZ &= \frac{1}{4} \times 30 \\ &= 7.5 \text{ unit} \end{aligned}$$

So in the shaded area, we have 4 such triangles

$$\text{So shaded area} = 4 \times 7.5 = 30 \text{ units.}$$

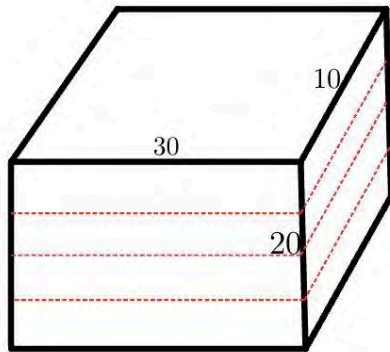
Ques: A wooden block of dimension 10cm x 20cm x 30cm is cut into equal-sized planks. The cut planks are stacked one above the other to achieve a total height of 100cm exactly. If the minimum number of planks are cut to achieve this height, then what is the volume of each plank in cm³?

Solution:

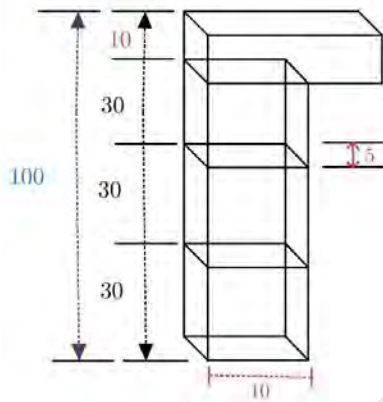
Given,

Wooden block dimension = 10cm × 20cm × 30cm

Total height = 100 cm

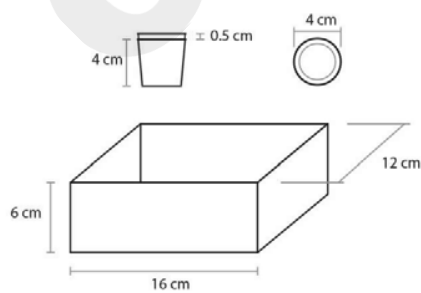


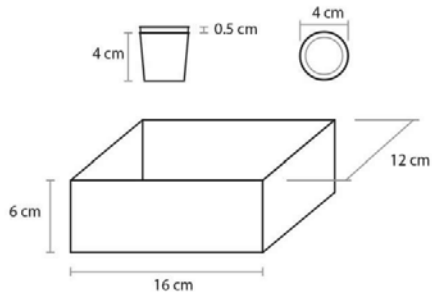
So cut it alongside having 20 cm dimension (as shown above with a red dotted line) to get a minimum no. of planks of equal size, now put them (cutouts) one on another. So we will image something like shown below.



$$\begin{aligned} \text{Now the volume of each plank} &= L \times B \times H \\ &= 10 \times 5 \times 30 \\ &= 1500 \text{ cm}^3 \end{aligned}$$

Ques: Shown below are two stacked paper cups and a box with their dimensions. If stacking is allowed, then what is the maximum number of cups that can be stored in the box without deforming the cups?



Solution:

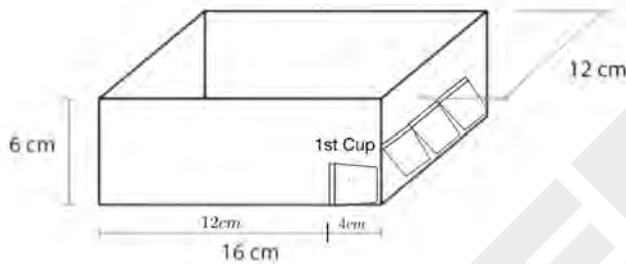
There are 3 possibilities to placing cup of 4 cm

i) along 4cm

ii) along 6cm

iii) along 16 cm

Put along 16 cm (as shown below)



We can see 1 cup has been placed now the left space=12 cm (16 cm-4cm)

Now 0.5 cm space is required for stacking

$$\frac{12}{0.5} = 24 \text{ cup}$$

Total=24+1=25 cup in 1 row

We have 3 rows

Total no of cups= $25 \times 3 = 75 \text{ cups}$

Understanding of Organic Shapes (Nature Inspired)

Shapes and forms that are natural and are not irregular and imperfect are known to be organic shapes. These shapes and forms are curvy and free flowing. As these shapes are unique, we find them to be always slightly different from each other. These shapes give more of a calm and warm feeling to its viewer. They are not uptight like the geometric shapes with definite rules and guidelines, therefore they sometimes also represent a sense of freedom. When line segments of different lengths are joined at unequal angles, then they are referred to as irregular shapes. Curvy shapes that are not a circle (irregular) are created by free hand and are free flowing. Natural or Organic shapes create a sense of fluidity or harmony within the viewer and therefore helps when certain emotions are needed to evoke by the designers.

Examples of organic shapes:



Significance of understanding of organic shapes for design competitive exams

Understanding of organic shapes is essential for any aspiring designer as different shapes and elements from nature are used by designers to evoke different feelings and emotions within the end users. Organic shapes are used for a sense of fluidity, calmness, warmth and harmony. Different colors are used with these shapes to evoke different emotions. Since different organic shapes invoke different feelings within different people and feel more connected to them, different organic shapes are used to invoke different emotions by the designers to make their users feel more connected towards the design.

Organic Shapes inspired from different elements in the nature

Organic shapes in nature are largely seen when we see leaves, clouds, honeycombs, flowers, amoebas etc. These shapes are used to inspire design for a lot of different design sectors largely including, architecture, jewelry design, textile, accessories etc.

A large part of designing anything comprises how its end users will perceive it and how well a designer can make its user feel connected to the design.

Everything present in the mother nature including different flora and fauna provide inspiration to the designers for different organic shapes for different uses. Different organic shapes provide different feelings and emotion depending on the inspiration they are from. For example; a white lily or white dove represents peace, a lion will represent pride, a pack of wolves represent loyalty or a red rose will represent love and so on.

Designers especially when designing for visual and graphic design use these organic shapes and colors to invoke desired feelings and therefore create a design with a clear message.



For the image above, we can see how when we see a lotus with soothing, calm colors we tend to connect with the emotion of calmness and peace.



For the image above, we can see how when we see trees growing upwards in direction, we tend to connect with the feeling of growth and freedom.

Difference Between organic and geometric shapes

Geometric shapes are rigid shapes made up of straight line segments or curves in case of a circle defined by specific rules present in mathematics. Whereas, in the case of organic shapes, they are free flowing curvy shapes inspired by natural elements such as different flora and fauna. In geometry, different formulas are given to calculate areas and volumes of geometrical shapes and forms, but in case of organic shapes, there is no set formula to calculate the area or volume as these shapes and forms are unique and different to each other.

Characteristics of organic shapes

- Organic shapes are usually more curvy and free flowing in nature than straight and rigid line segments.
- Organic shapes convey a sense of playfulness, calmness, ease and freedom.

- Organic shapes make us feel more connected to nature and the outer world.
- Since organic shapes are mostly curvilinear, they provide a sense of continuity or eternity, which does not have any beginning or end.
- Organic shapes are also used for well-being purposes, as our own human body is made up of organic shapes, it makes us feel more like home when organic shapes are used and hence, create a sense of well-being in general.
- Organic shapes can be largely used to show motion and continuity as for example the shape of drops feel like droplets of rain falling, shape of flowing wind feels like movement of air, etc.
- Organic shapes are largely used in our daily objects such as: vases, portraits, accessories, prints, furniture, toys, architecture etc.

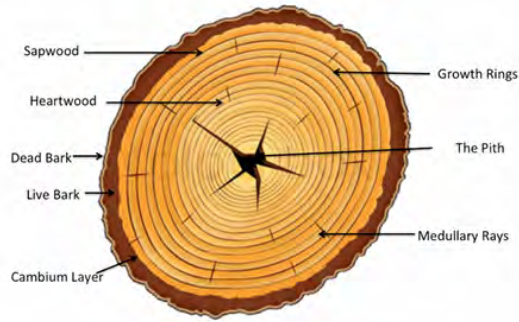
Previous Years Question asked from Understanding of Organic Shapes

Ques: Shown below is a cross-section of two different trees of the same species and age but found in different locations. Based on the image, which of the statement(s) is/are TRUE.



- A. Growth of the tree X is more consistent than tree Y
- B. Growth of the tree X is healthier than tree Y
- C. Climatic conditions could be the reason for the uneven ring structures in tree Y
- D. Growth of the tree Y is healthier than tree X

Solution:



Growth rings: As trees age, they grow in height and width. You can tell the age of a tree by counting these rings. The annual growth of a tree can be measured by the distance between the growth rings. As the growth rate slows down in the winter months, the new layer of wood cells is smaller and packed more closely.

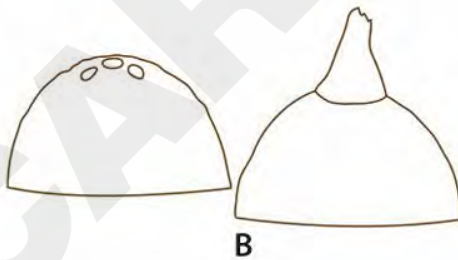
Now if you look at the options then we can say options A B and C are correct but D is wrong because D says growth of tree X is healthier than tree Y which contradicts option A. Therefore, options A, B, and C are correct.

Ques: Shown below is a coconut broken into two pieces. Identify the correct representation(s) of the coconut.

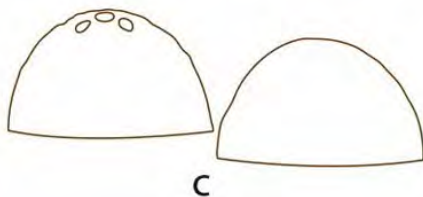
Option A :



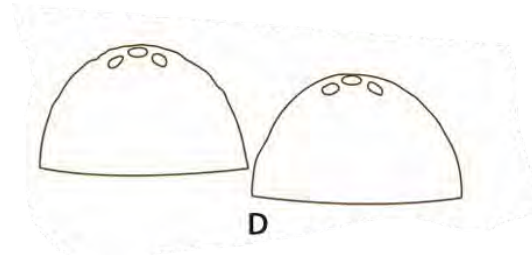
Option B:



Option C:



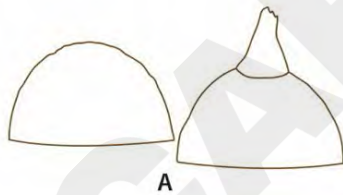
Option D:



Solution:

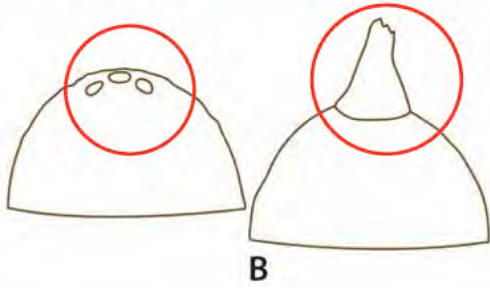


Option A :



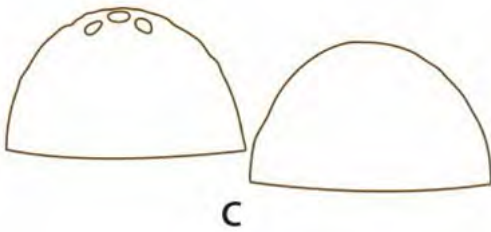
This option is correct

Option B:



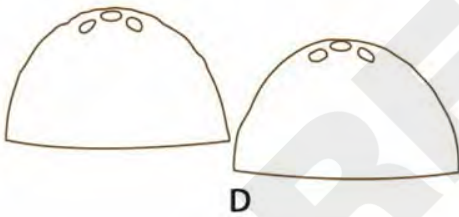
These both are on the same side of a coconut. Hence, this is incorrect.

Option C:



This option is correct.

Option D:



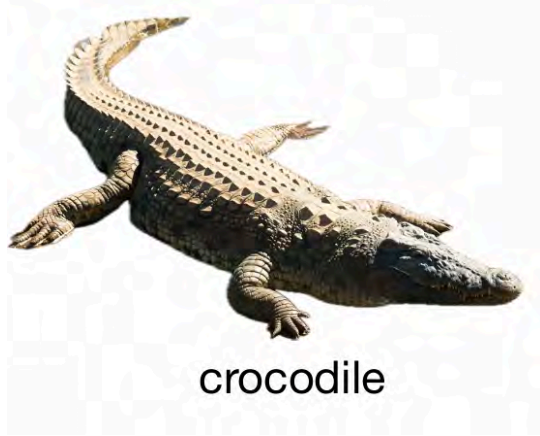
The 3 eyes are only one side of a coconut. Hence, this is incorrect.

Ques: Select the correct option which lists the animals appearing in the GIF.



- A. Lizard, Dog, Swan
- B. Goat, Cat, Crocodile
- C. Dog, Swan, Seal
- D. Dog, Goat, lizard

Solution:



If we observe the given figure, we can see that this image has nothing that resembles crocodiles and lizards. Therefore, options A, B, and D are eliminated. Hence, option C is the correct answer

Ques: If color and size differences are not to be counted as unique, how many types of leaves occur only once?



Solution:



These two leaves occur only once, Hence answer is 2.

Evolution of Objects/Materials and Manufacturing Processes

Let us start with understanding what is a material. A material is a matter from which something can be made out of. A material is a matter that exists in physical form and is tangible. Evolution is the process of development in something with the time and need. With changing times, humans have evolved and with them material they use have also evolved with the need and development through the years. Understanding of different materials is important for any aspiring designer as it will help in making conscious and accurate decisions when working on different projects that deal with different materials. With understanding of materials, students also need to have a good understanding of how different materials are made and what their raw materials are. This knowledge can be acquired through understanding manufacturing processes of different materials. These topics are important to understand and study as basic knowledge of these concepts are generally asked in design competitive exams to analyze how much students have general knowledge about them.

Evolution of Materials

Since prehistoric times, the evolution of materials has been seen. From the use of wood, stone, animal skin to ceramics, metal, glass, wool to composites, and electronic materials. Since the development of science and technology, new materials and objects have evolved. Materials are important as everything we use around and our daily needs objects are all made from different materials and therefore, it becomes important to understand different materials and how they can be used. From our furniture to utensils, clothes we wear, accessories we use to buildings we live in to the gadgets we use all are made from different materials. As a designer it becomes important when designing what different materials can be used for different uses. Evolution of materials can be broadly explained through different ages namely;

Stone Age

During the stone age, materials were used by the cavemen as they were found naturally in their surroundings. These materials include, stone, animal skin, plant based materials (leaves, petals etc.), wood, bones, shells, feathers and clay.



Bronze Age

During the bronze age, civilizations started to take place with the use of copper seen evidently. Metals like gold, silver and copper are seen in use. But since they were soft, instead of using them for tools, decorative items, utensils and jewelry were mostly made from them. Around 3000 BCE, alloys of copper have been discovered. Alloy of copper with tin is called bronze which is stronger and harder and therefore more durable. Bronze was seen in the making of tools and first swords were made.



Iron Age

With further evolution, iron based objects were seen to be made which were more durable and high in strength. Using small amounts of carbon to iron with heat helped in producing steel which had an advantage over bronze weaponry.



Roman Age

During the Roman age, architecture has flourished with materials such as limestone, volcanic ash found from Mount Vesuvius, sedimentary rock and silt, with the discovery of cement paste all of which contributed in making of their magnificent structures.



Industrial Revolution

With development in the department of science and metallurgy department, carbon based and more economic materials are produced.



Technology Age

With further development in technology, a material called silicon has seen to be used in a tiny, postage stamp-sized sliver of material called the Silicon Chip. This silicon chip is used in electronic devices such as computers for advanced and accurate performances.



Manufacturing Processes

Manufacturing is the process of turning raw materials into materials or objects with the use of machinery, tools or human labor. Materials and objects were produced by human resources and tools before the industrial revolution, which used to take great time and energy. With the introduction of the industrial revolution, the manufacturing process has evolved into mass production through machines and chemical use. Mass production of materials and goods helped create larger amounts of goods at a lower cost. Therefore, mass production has seen to be more financial and cost efficient.

There are largely 4 types of manufacturing processes:

1. Casting and Molding

Casting and molding is a popularly used manufacturing process where molten materials are more generally used to cast into a mold of desired shape and size and then cooled down to get the desired material/object. They are more generally used for materials like plastic and glass.

2. Machining

Machining is the manufacturing process for making goods through machine activities like turning, grinding, drilling, and milling. Drilling uses sharp bits to drill holes in materials. Milling uses a rotating tool that can be used in creating intricate and detailed patterns. Turning rotates the machined part against a fixed cutting tool.

3. Joining

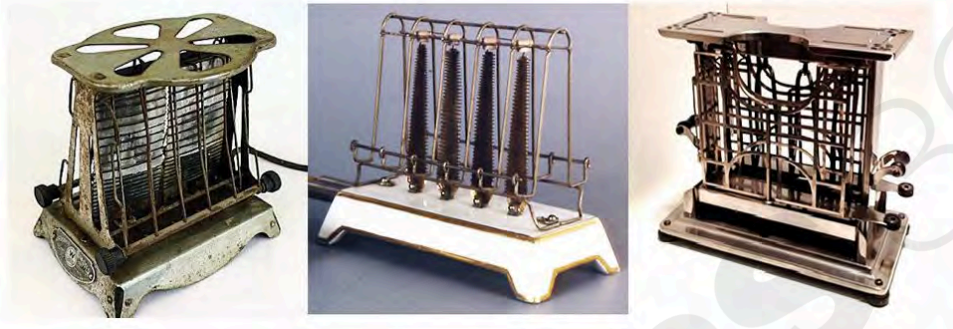
Joining is the manufacturing process of binding materials together to create the desired goods. This can be done by using adhesives or welding where metals are joined with heat.

4. Shearing and Forming

Popularly used for materials like paper, plastic, fabric and metals, shearing is the process of cutting a material into 2 pieces. These pieces can further be curved from edges as per the need. Whereas forming is the process of transforming the shape of the material without the loss of any material.

Previous Years Question asked from Evolution of Objects/Materials and Manufacturing Processes

Ques: What is the function of these objects?



- A. Measuring earthquakes
- B. Weaving cotton
- C. Toasting bread
- D. Burning wood

Solution:



Antique 1920s Westinghouse turnover toaster.



D-12 Toaster, invented in 1909 by Frank Shailor by General Electric.



Universal Toaster with swinging cages.
Hence, option C i.e., toasting bread is correct.

Ques: Which betel nut cutter will require less force to be applied to cut a betel nut? Consider the hinge points to be at the same line.

Option A:



A

Option B:



B

Option C:



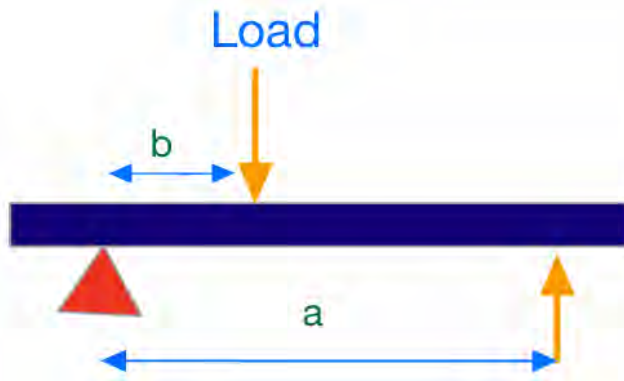
C

Option D:



D

Solution:



A Class 2 lever has the load between the effort and the fulcrum. In this type of lever, the movement of the load is in the same direction as that of the effort. Note that the length of the effort arm goes all the way to the fulcrum and is always greater than the length of the load arm in class 2

$$\text{Force} \times a = \text{Load} \times b$$

$$\text{Force} = \text{load} \times \frac{b}{a}$$

We can $\text{force} \propto b$ and $\text{force} \propto \frac{1}{a}$

i.e., The higher the force, the larger the distance b , or the higher the force, the smaller the distance a

The force will be lesser when it is applied far from the hinge and the load is near to the hinge. This case is in option C. Therefore, the correct answer is C.

Ques: Refer to the tools below and read the statements. Based on what you can see, which of the following options is/are correct?



- A. All tools have at least one common working principle
- B. All of them can be used for cutting fabric
- C. Only one has spring back element, at least one has provision to crack nuts
- D. Three of them have a provision to crack nuts

Solution:

All the tools given are used for cutting something or other, but not cutting fabric. Only the first has a spring back element and the second can crack nuts.

Hence, statements A and C are correct.

Ques: Refer to the following images of a metal artifact made using traditional manual tools, skills and processes. Identify the correct set of operations required to make it.



- A. Forging, Bending, Punching, Twisting
- B. Casting, Bending, Punching, Twisting
- C. Twisting, Drilling, Punching, Bending
- D. Bending, Casting, Forging, Punching

Solution:

Forging is a manufacturing process involving the shaping of metal using localized compressive forces. Bending is a manufacturing process that produces a V-shape, U-shape, or channel shape along a straight axis in ductile materials, most commonly sheet metal. Commonly used equipment include box and pan brakes, brake presses, and other specialized machine presses. Punching is a forming process that uses a punch press to force a tool, called a punch, through the workpiece to create a hole via shearing. Drilling is a cutting process where a drill bit is spun to cut a hole of circular cross-section in solid materials. Casting is a manufacturing process in which molten material, like metal, is poured into a mold and allowed to harden. Once solidified, the mold is.

So the figure is first forged as we can see the new image has shorter legs. So option B and C are eliminated.

In casting, metal is molded, but here this is not the case. Therefore, option D is also eliminated.

Hence, option A is correct.

Understanding of Gears and Pulleys and Basics of Motions

Motion, in physics, is most simply defined as the change in position or orientation of an object with the change in time. There are 3 basic types of motion namely linear, rotational and oscillatory. A pulley is a wheel that is attached with a flexible rope or a cable that is used to raise heavy objects for tall heights. A gear is a toothed wheel present singular or in combination used to increase the force of speed, (usually seen in heavy machines, example; bike). This is one of the important topics from which questions are asked in the competitive exam. Questions that are generally asked are to calculate the displacement, distance, velocity, acceleration, speed, or change in frame of reference to an observer, with change in time. Having the basic knowledge of motion and basic gears and pulleys system helps while designing for products and services where understanding of basic working principles become important. Therefore, it is important for any aspiring designer to learn and understand these concepts.

Basics of Motions

What is Motion?

In physics, when a body changes its orientation or its position with time, then it is said to be in motion. When a body moves along a line or a curve, then the motion is translation. When the orientation of the body changes, then it is said to be rotation. To understand motion better, we can look at objects around and see examples of motion we see in our daily lives. Moving animals, moving vehicles, humans, planets etc. are all examples of motion around us. All motions are relative motion to some frame of reference. A body is said to be moving when seen from a frame of reference which is at rest. To understand this let us see an example of a moving car and how it appears to a man standing still on the road. For that man, the car is seen to be in motion and the buildings will be seen to be at rest according to that frame of reference. Therefore, motion is relative in nature. Motion can be calculated based on velocity, distance, displacement and acceleration.

Some basic formulas:

Velocity,

$V = d/t$, V is the velocity, d is the displacement, and t is the time.

Displacement,

Displacement = Final position – initial position = change in position

Acceleration,

Acceleration (a) is the change in velocity (Δv) over the change in time (Δt)

$$a = \Delta v / \Delta t$$

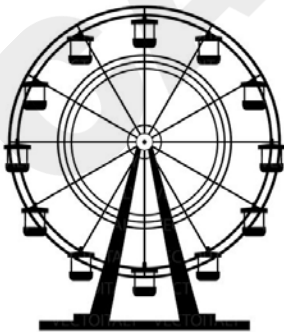
Linear Motion

Linear motion is the most basic form of motion where a body moves from point A to point B in a straight line. For example, a car moving in a straight line on a highway is seen to be in linear motion.



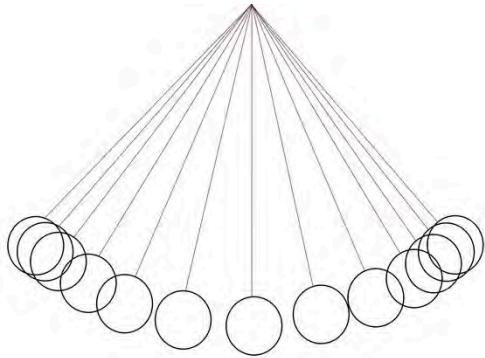
Rotational Motion

Rotational motion is a motion of a body that changes the orientation of the object and the object moves in a circular motion. For example, to understand rotational motion, let us see a ferris wheel or tires of a vehicle.



Oscillatory Motion

Oscillating motion is a motion when an object moves back and forth constantly with time. Examples of oscillating motion include pendulum, springs or waves.



Understanding of Gears

A gear is a toothed wheel present singular or in combination used to increase the force or speed, (usually seen in heavy machines, example; bike). A gear system can be simply understood by imagining a system of wheels with teeth that mesh with each other to increase the speed for rotational motion.



Gear Ratio: Gear ratio is defined as the number of times a gear has to turn for another gear to turn once.

For example, for a gear ratio of 3 : 1, the smaller driver gear must turn three times to get the larger driven gear to make one complete turn.

To calculate the gear ratio, divide the number of driven gear teeth by the number of drive gear teeth.

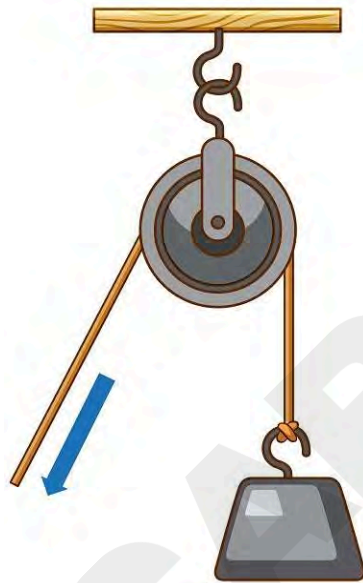
Gears are generally used for:

- To increase or decrease the speed of rotation
- To reverse the direction of rotation
- To move rotational motion to a different axis

Understanding of Pulleys

A pulley is a wheel that is attached with a flexible rope or a cable that is used to raise heavy objects for tall heights.

Pulley System: The wheel of the pulley is generally fixed to a hinge and rotates on an axle or shaft by a chain/rope/belt/cable that drives over the wheel. At the one end of the rope, the load is attached, and from the end, the rope is pulled down to lift the load. To lift large objects, a system of 2 or more pulleys are used.



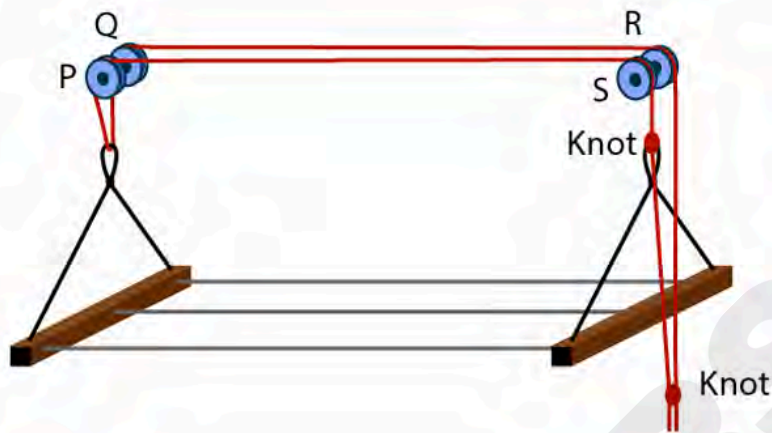
There are typically three types of pulleys, namely, fixed pulleys, movable pulleys, and compound pulleys.

- Fixed pulleys are those pulleys that are attached to a single point.
- Movable pulleys are different types of pulleys as they move with the object.
- Compound pulleys are the combination of the fixed pulleys and movable pulleys.

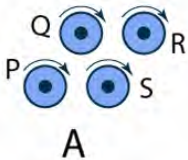
Formula for Pulley System: Work = Force x Distance (W= Fd)

Previous Years Question asked from Understanding of Gears and Pulleys and Basics of Motions

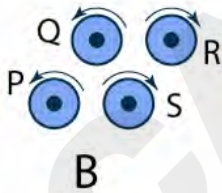
Ques: Figure shows a clothesline attached to four independent pulleys P, Q, R & S. Which of the options represents the correct rotation of pulleys that would result in lowering the clothesline?



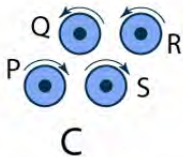
Option A:



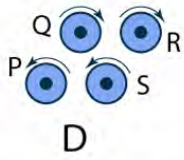
Option B:



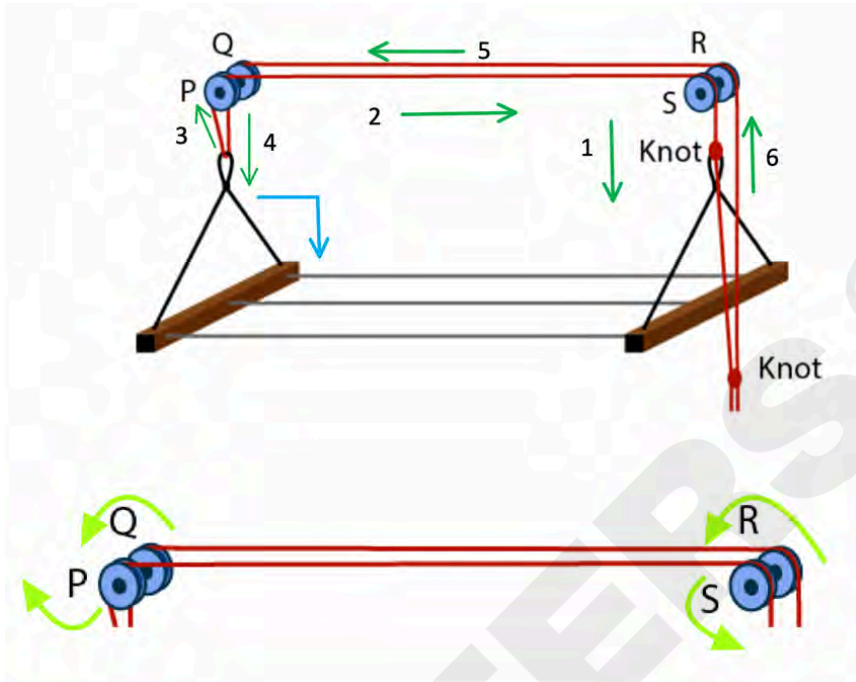
Option C:



Option D:



Solution:



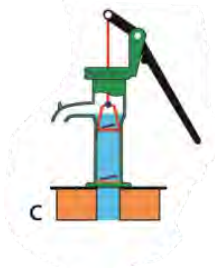
So we can observe the options and find the correct sequence and direction of rotation of the P, Q, R and S wheels as shown in option C. Hence, option C is the correct answer.

Ques: Shown below are the vertical cross-sections of handpumps. Which of the following options depict(s) the correct working principle?

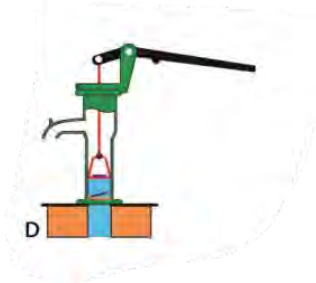
Option A:



Option B:



Option C:



Solution:

Pulling the pump lever upwards causes the piston to move downwards and the foot valve to close; the piston non-return valve is open as the piston moves downwards. The result of this movement is that water from the underside of the piston non-return valve is moved to the topside of the piston non-return valve.

In options C and D, we can see that the piston is not underwater so they will not follow the correct working principle, So options C and D are wrong.

Therefore, option A is correct.

Ques: A ball with a thin elastic rod moves from left to right as shown below. Which option represents the movement of the rod?



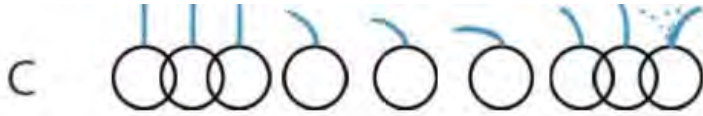
Option A:



Option B:



Option C:



Option D:



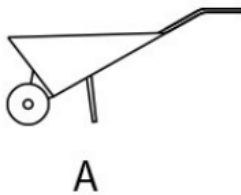
Solution:

A ball with a thin elastic rod moves from left to right, then the movement of this elastic rod will be toward left (Not straight or right). Therefore, option B and C are eliminated.

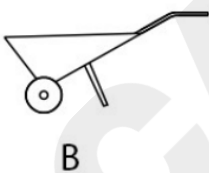
When we start the movement in no circumstances the elastic rod will be straight. So, option D is eliminated. Because if we see the mid-ball, the elastic rod is straight. Hence, option A is correct.

Ques: Construction materials are to be moved using the trolleys in the options. Assume friction is negligible. Which trolley requires the least amount of effort?

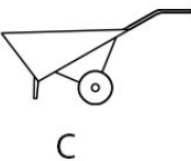
Option A:



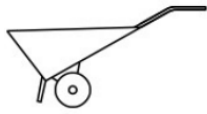
Option B:



Option C:



Option D:

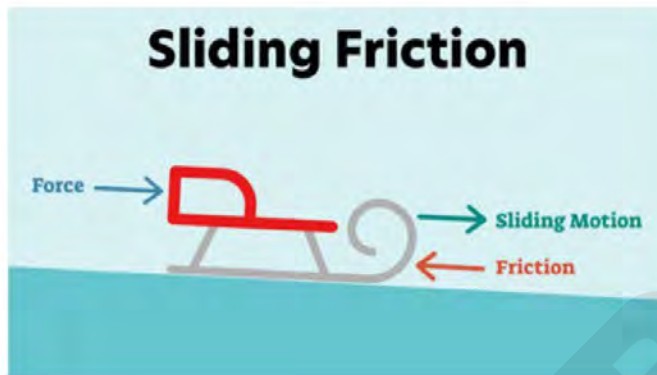


D

Solution:

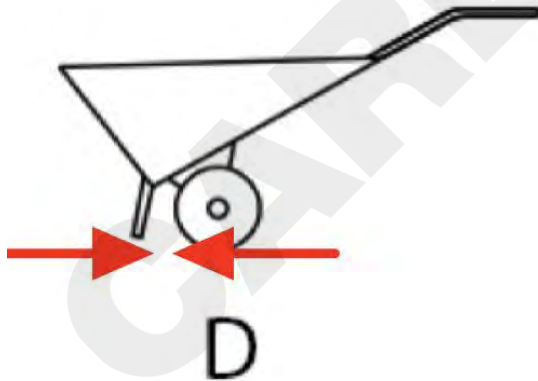
Friction is defined as the resistance offered by the surfaces that are in contact when they move past each other. Friction provides traction that is needed to walk without slipping.

For e.g.



Now according to the question friction is negligible so when friction is negligible, it is typically a situation in which two opposing forces are not acting strongly against each other, resulting in minimal resistance.

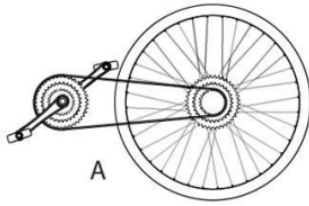
Now we can see in option D only two opposing forces acting against each other is weak (as shown below).



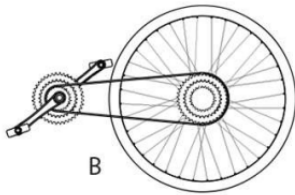
Hence, option D is correct.

Ques: A cyclist was peddling a geared cycle on an upward inclined road and decided to stop on the incline. Which option can be used to stop the bicycle on the incline only using force on foot pedals?

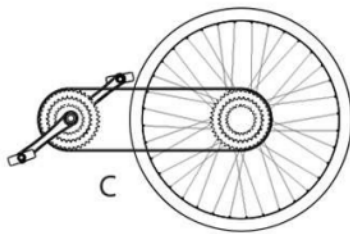
Option A:



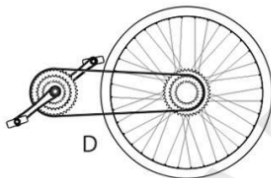
Option B:



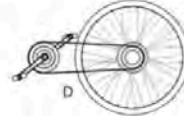
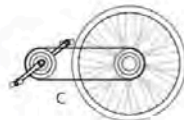
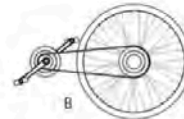
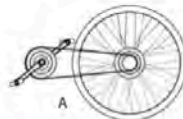
Option C:



Option D:



Solution:

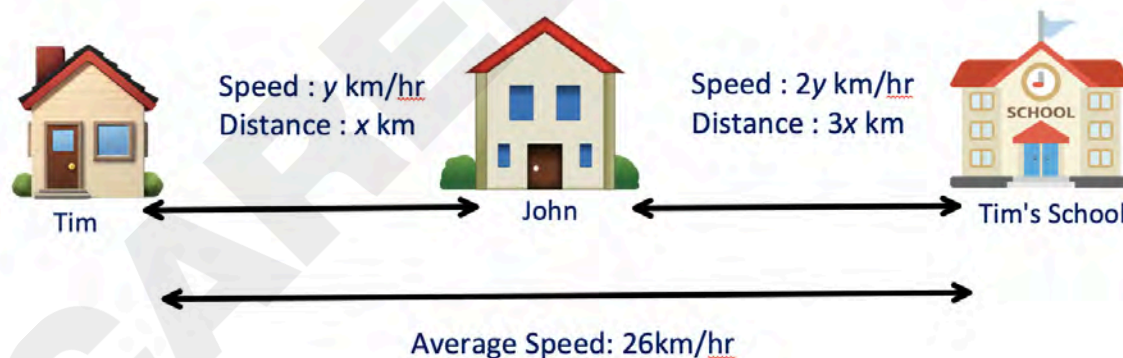


A typical bicycle has anything from three to thirty different gears—wheels with teeth, linked by the chain, which make the machine faster (going along the straight) or easier to pedal (going uphill). Bigger wheels also help you go faster on the straight, but they're a big drawback when it comes to hills. That's one of the reasons why mountain bikes and BMX bikes have smaller wheels than racing bicycles. It's not just the gears on a bicycle that help to magnify your pedaling power when you go uphill: the pedals are fastened to the main gear wheel by a pair of cranks: two short levers that also magnify the force you can exert with your legs. When you press the brake levers, a pair of rubber shoes (sometimes called blocks) clamps onto the metal inner rim of the front and back wheels. As the brake shoes rub tightly against the wheels, they turn your kinetic energy (the energy you have because you're going along) into heat—which has the effect of slowing you down.

Now if we see the position of gears we can easily eliminate option A, C and D
Hence, option B is correct.

Ques: Tim cycled from his house to his friend John's house and then on to his (Tim's) school without stopping. The average speed for his entire journey was 26 km/hr. The distance from John's house to Tim's school is 0.3 times the distance from Tim's house to John's house. Tim's speed from John's house to Tim's school was twice that of Tim's speed from Tim's house to John's house. What was Tim's average speed from John's house to Tim's school in km/hr?

Solution:



Time taken from Tim to John's house:

$$\text{Time} = \frac{\text{Distance}}{\text{speed}} = \frac{x}{y} \text{ hr}$$

Time taken from John to Tim's school:

$$\text{Time} = \frac{\text{Distance}}{\text{speed}} = \frac{3x}{2y} \text{ hr}$$

$$\begin{aligned} \text{Distance between Tim's house and school} &= x + 0.3x \\ &= 1.3x \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Total time} &: \frac{x}{y} + \frac{3x}{2y} = \frac{x}{y} \left[1 + \frac{0.3}{2} \right] \\ &= \frac{x}{y} [1 + 0.15] \end{aligned}$$

$$= 1.15 \frac{x}{y} km$$

The average speed between Tim's house and school = 26 km/hr

$$\frac{1.3x}{1.15 \frac{x}{y}} = 26$$

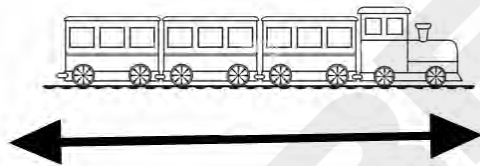
$$1.3y = 26 \times 1.15$$

$$y = \frac{26}{1.3} \times 1.15 = 23 \text{ km/hr}$$

$$\begin{aligned} \text{Tim's average speed from John's house to Tim's school } 2y &= 2 \times 23 \\ &= 46 \text{ km/hr} \end{aligned}$$

Ques: Two trains of unequal length have speeds of 60 and 50 km/hr. When they travel in opposite directions in straight-line tracks, they take 9 seconds to completely cross each other. When they travel in the same direction, a person on the faster train sees the slower train for 18 seconds. For how much time (in seconds) would a person in the slower train see the faster train when the trains travel in the same direction?

Solution:



Length = x m

Speed = 60 km/hr



Length = y m

Speed = 50 km/hr

Formula area: $Speed = \frac{\text{distance/length}}{\text{Time}}$

Relative speed in opposite direction: $60 + 50 = 110$ km/hr

$$\Rightarrow 110 \times \frac{5}{18} m/s$$

Time=9 sec.

Distance= $x + y = speed \times time$

$$= 110 \times \frac{5}{18} \times 9 = 275 m$$

- When they travel in the same direction, a person on the faster train sees the slower train for 18 seconds.

Relative speed in the same direction: $60 - 50 = 10 \text{ km/hr} = 10 \times \frac{5}{18} m/sec.$

The time taken by the slower train to cross is 18 seconds.

Length of slower train = $y \text{ m} = \text{Relative speed} \times \text{time} = \frac{50}{18} \times 18 = 50m$

The total length of both trains = 27 m

Length of faster train = $275 - 50 = 225m$

- For the person on the slower train

Relative speed in the same direction : $60 - 50 = 10 \text{ km/hr} = 10 \times \frac{5}{18} m/sec$

Length of faster train = 225m

Time taken by faster train to cross = $\frac{225}{\frac{50}{18}} \text{ sec} = 225 \times \frac{18}{50} = 81 \text{ sec}.$

CAREERS 360

Fundamental Principles of Motion/Mechanism

(e.g Hub-spoke Model)

Fundamental principles of motion/mechanism is an important topic for preparation of design competitive exams that comes under the large umbrella of observation in design thinking. Observation in design thinking is an important component of the design competitive exams as a lot of the questions asked in the exam are based on the student's ability for them and it is only when they have a better understanding of observation and design sensitivity that they will be able to solve those questions in the exam. Observation in design thinking is an immersion into the design for gathering insights and information. Fundamentals of Mechanisms of motion states that the mechanism is taking one type of motion as input and getting a different type of a motion as output. Observation is understanding the design in-depth and understanding the needs of your users and then coming up with practical, logical and critical solutions. It is through observation skills that a designer develops a good eye which is crucial for a good designer.

Significance of Fundamental Principles of Motion/Mechanism for design competitive exams and preparation

Design is all about the details, the more a design has good details, the more it will have depth. Therefore, it is a very crucial skill that every designer or design aspirant has to develop within themselves. With understanding of design, it is also important to observe and understand how objects move in the design process and therefore it is important for designers to understand basic principles of motion and its mechanism.

Design sensitivity is the sensitivity ability a designer should have that helps to analyze any change in the design and then respond accordingly to that change. Design sensitivity also helps a designer cast their ideologies and thoughts aside and gain a better understanding of what their users need. Therefore, understanding design sensitivity with fundamental understanding of motion/mechanism help designers to design better which not only have better visuals but also better feasibility, accessibility and ease in use.

Fundamentals of Mechanisms of motion

Fundamentals of Mechanisms of motion states that the mechanism is taking one type of motion as input and getting a different type of a motion as output. Simplest example to understand this is by looking at our childhood bicycles and remembering how we used to rush when our chains got down from the gears. Here, we can see that rotational motion provided by the chain and gear of

the bicycle works as an input with linear motion as we ride our bicycle and cover the linear distances as the output.

What is motion?

In physics, motion is defined as the change of position of an object with respect to its surroundings in a given interval of time. To understand motion see the example of a man moving in a straight line from position A to position B.



There are four types of motion:

- Linear Motion which is moving in a straight line.
For example: A train moving in a straight track from one position to another.
- Rotary Motion which is moving round in motion.
For example: Tyres of a vehicle moving in circular motion.
- Reciprocating Motion which is moving backwards and forwards in a straight line.
For example: Linear movement of a hand pump up and down to pull water.
- Oscillating Motion which is swinging backwards and forwards.
For example: Pendulum moving in a wall clock from left to right.

Newton's Laws of Motion

Sir Issac Newton has given three physical laws of motion that explains the relationship between an object, its motion and the forces acting upon it.

1. An object at rest remains at rest, and an object in motion remains in motion at constant speed and in a straight line unless acted on by an unbalanced force.
2. The acceleration of an object depends on the mass of the object and the amount of force applied.
3. Whenever one object exerts a force on another object, the second object exerts an equal and opposite on the first.

Some basic formulas:

$$F = m \times a$$

Here for any constant mass, force (F) equals mass (m) times acceleration (a).

Equations for motion:

1. First Equation of motion : $v = u + at$
2. Second Equation of motion : $s = ut + \frac{1}{2}at^2$
3. Third Equation of motion : $v^2 - u^2 = 2as$

Where u = initial velocity of the body

v = final velocity of the body

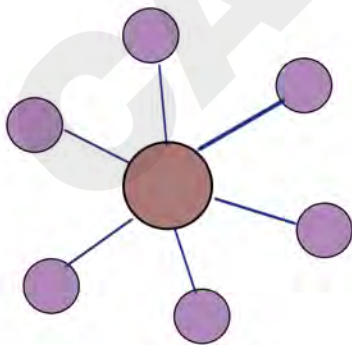
a = uniform acceleration of the body

t = time taken

s = distance traveled

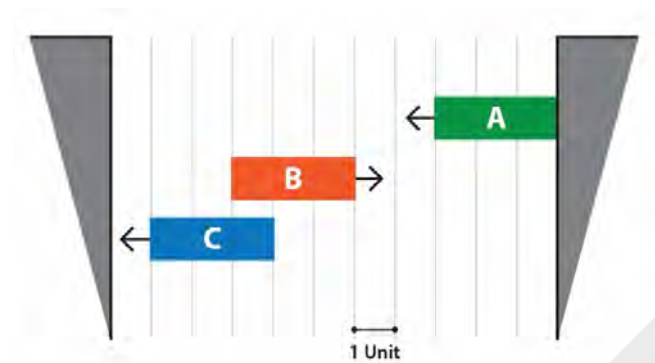
Hub-spoke Model

We can use the same example of our bicycle and understand the Hub-Spoke Model which is a distribution network that resembles the spikes and gears of the bicycle with hub in the middle and allows each of the spokes to meet at a central location and to move in one direction of delivery.

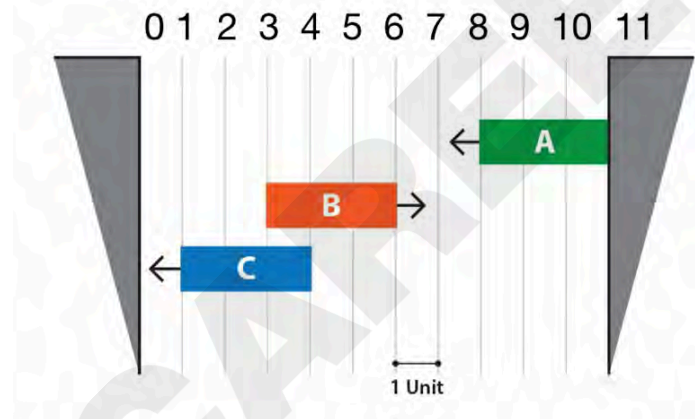


Previous Years Question asked from Fundamental Principles of Motion/Mechanism

Ques: A diagram of three blocks A, B and C and their direction of movement is shown below. The blocks move continuously in units and change directions after hitting the side walls. From the given position, if block A moves at a speed of 2 units per second, and block B and block C move at a speed of 1 unit per second, what is the least time (in seconds) that is required for all blocks to align exactly one below the other?



Solution:



We can see the correct position of A from the end is 8.

Current position of B = 3

Position of C = 1

Now A is moving at 2 units per sec, so position A

$8 \rightarrow 6 \rightarrow 4 \rightarrow 2 \rightarrow 0 \rightarrow 2 \rightarrow 4 \rightarrow 6 \rightarrow 8$ So on

Now position of B

$3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8$ [At 8 it will stop and moves back]

..... $5 \leftarrow 6 \leftarrow 7 \leftarrow 8$

Now position of C,

1 → 0 → 1 → 2 → 0 → 2 → 4 → 6 → 7.....

| Time(Sec) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-----------|---|---|---|---|---|---|---|---|---|
| A | 8 | 6 | 4 | 2 | 0 | 2 | 4 | 6 | 8 |
| B | 3 | 4 | 5 | 6 | 7 | 8 | 7 | 6 | 5 |
| C | 1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 6 |

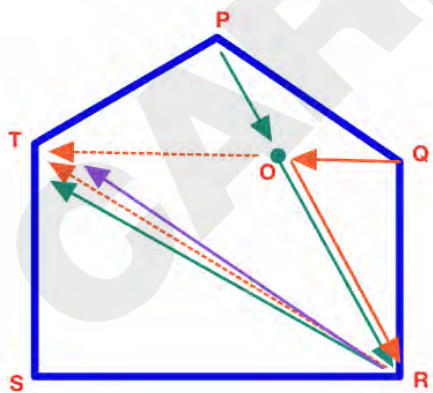
We can see at the 7th second the positions matter. Hence, T see is the correct answer.

Ques: Five friends Puru, Qadir, Roy, Sham and Tom live on five vertices of a regular pentagonal ground in a clockwise order. One day while Puru was walking to meet Roy, met Qadir who was on the way to meet Tom. Qadir changed his mind and decided to go with Puru to meet Roy. After meeting Roy, all three went to Tom's house for a cup of tea.

If all of them took the shortest routes cutting through the ground, which of the following statements is/are TRUE?

- A. Till Tom's place, Qadir walked more distance than Puru
- B. Till Tom's place, Puru walked more distance than Qadir
- C. Till Tom's place, Qadir walked double the distance than Roy
- D. While returning to their respective homes from Tom's place, Puru has to travel the least.

Solution:



Solution:

- P's travel is denoted by a green line (as shown above)
- Q's travel, denoted by an orange line (as shown above)
- R's travel, denoted by a purple line (as shown below)

ATQ,

P and Q started from their respective position, and they both met at the green dot (shown above). After they meet at the dot, they walk together and reach R from P's home, 3 that is P, Q and R travel to T's home.

Assuming that all the friends walk at the same speed.

Now check the options.

Option A: Actually, the distance traveled by P and Q to reach the green dot (O) is the same. $PO=QO$. Hence, the distance traveled by P and Q are the same.

Option B: Q is opposite to T, just like R is opposite to P. So till Tom's place, both P and Q travel the same distance.

Option C: Since $PO=QO$

$QO+OR=PO+RO$, which is equal to RT. R walked a distance RT while Q walked a distance $QO+OR+RT=2RT$

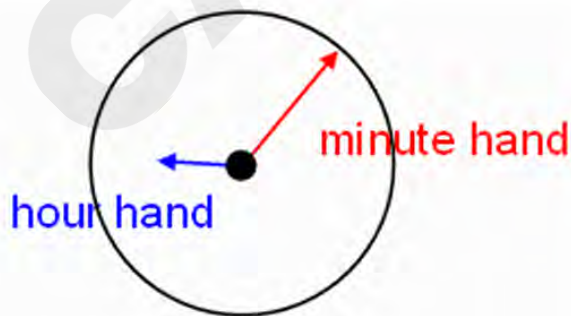
Option D: It is clear from the image that P traveled the least.

Hence, options C and D are correct.

Ques: Which of the following statements would you consider to be TRUE about the hour and minute hands of analogue clocks?

- A. The hour hand and the minute hand would make 90 degrees angle with each other 24 times in a day
- B. The hour hand and minute hand will overlap less than 24 times in a day
- C. The hour hand and minute hand will overlap exactly on the hour number marker only once every half-day
- D. The hour hand and minute hand will make acute angles to each other for almost as long as it will make obtuse angles to each other during the entire day

Solution:



Option A: The minute hand overtakes the hour hand on 44 occasions in 24 hours to give a 90-degree angle. Hence, the statement is false.

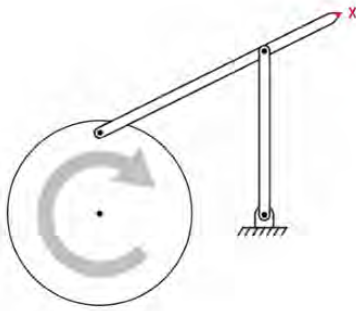
Option B: The hands overlap about every 65 minutes, not every 60 minutes. The hands coincide 22 times in a day. Hence, the statement is true.

Option C: This statement is also true.

Option D: This statement is also true.

Hence, B, C and D are correct answers.

Ques: The figure shows a mechanism with a disc, two bars and a static surface connected to each other with hinges. The disc rotates about the hinge at its center as shown. What is the path traced by point X (endpoint of the longest bar) in this planar set-up?



Option A:



Option B:



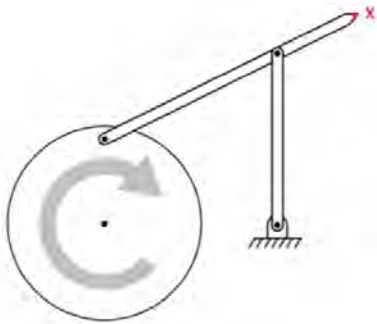
Option C:



Option D:



Solution:



The path traced point by X (endpoint of the longest bar) in the planar set-up will not make a sharp edge or point. Therefore, Options B and C are eliminated.

Now observe A and D we can eliminate A because the path traced here is thin by the hinge at the far point of the bar. Hence, D is correct.

Ques: Tim cycled from his house to his friend John's house and then on to his (Tim's) school without stopping. The average speed for his entire journey was 26 km/hr. The distance from John's house to Tim's school is 0.3 times the distance from Tim's house to John's house. Tim's speed from John's house to Tim's school was twice that of Tim's speed from Tim's house to John's house. What was Tim's average speed from John's house to Tim's school in km/hr?

Solution:



Time taken from Tim to John's house:

$$\text{Time} = \frac{\text{Distance}}{\text{speed}} = \frac{x}{y} \text{ hr}$$

Time taken from John to Tim's school:

$$\text{Time} = \frac{\text{Distance}}{\text{speed}} = \frac{3x}{2y} \text{ hr}$$

$$\begin{aligned} \text{Distance between Tim's house and school} &= x + 0.3x \\ &= 1.3x \text{ km} \end{aligned}$$

$$\text{Total time : } \frac{x}{y} + \frac{3x}{2y} = \frac{x}{y} \left[1 + \frac{0.3}{2} \right]$$

$$= \frac{x}{y} [1 + 0.15]$$

$$= 1.15 \frac{x}{y} km$$

The average speed between Tim's house and school = 26 km/hr

$$\frac{1.3x}{1.15 \frac{x}{y}} = 26$$

$$1.3y = 26 \times 1.15$$

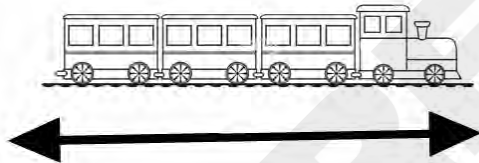
$$y = \frac{26}{1.3} \times 1.15 = 23 \text{ km/hr}$$

$$\text{Tim's average speed from John's house to Tim's school } 2y = 2 \times 23$$

$$= 46 \text{ km/hr}$$

Ques: Two trains of unequal length have speeds of 60 and 50 km/hr. When they travel in opposite directions in straight-line tracks, they take 9 seconds to completely cross each other. When they travel in the same direction, a person on the faster train sees the slower train for 18 seconds. For how much time (in seconds) would a person in the slower train see the faster train when the trains travel in the same direction?

Solution:



Length = x m

Speed = 60 km/hr



Length = y m

Speed = 50 km/hr

Formula area: $Speed = \frac{\text{distance/length}}{\text{Time}}$

Relative speed in opposite direction: $60 + 50 = 110$ km/hr

$$\Rightarrow 110 \times \frac{5}{18} m/s$$

Time=9 sec.

Distance= $x + y = speed \times time$

$$= 110 \times \frac{5}{18} \times 9 = 275 m$$

- When they travel in the same direction, a person on the faster train sees the slower train for 18 seconds.

Relative speed in the same direction: $60 - 50 = 10 km/hr = 10 \times \frac{5}{18} m/sec.$

The time taken by the slower train to cross is 18 seconds.

Length of slower train = $y m = Relative\ speed \times time = \frac{50}{18} \times 18 = 50m$

The total length of both trains = 27 m

Length of faster train = $275 - 50 = 225m$

- For the person on the slower train

Relative speed in the same direction : $60 - 50 = 10 km/hr = 10 \times \frac{5}{18} m/sec$

Length of faster train = 225m

Time taken by faster train to cross = $\frac{225}{\frac{50}{18}} sec = 225 \times \frac{18}{50} = 81 sec.$

Chapter 3: Design Thinking for Problem Solving

What is the significance of Design Thinking for Problem Solving for UCEED Exam

Design Thinking for Problem Solving has become one of the important criteria when preparing for UCEED Exams as the approach for UCEED has been changed from just analyzing students based on their logical and non-verbal reasoning to more design thinking skills. With incorporation of Human/User Centric Design Methods and Situation Based questions (Visual Communication of a solution for a given situation) into the UCEED Syllabus, it is now important to better understand the concepts.

Design thinking for problem solving is the design methodology process where complex issues are tackled by understanding and framing the problem to find the best solution in a human centric way. As it is important for any aspirant for design to develop design thinking, UCEED Exam questions are based in order to analyze how well a student can answer and come up with a solution that can be ideal for the real world.

How can you prepare for design thinking and problem solving

Let us start by understanding basic steps for design thinking and then problem solving, the first step is to mindfully identify the problem present. Once you have an in-depth understanding of the problem users are facing, it becomes easier to come up with the solution. The next step is to develop empathy towards the problem. Another step is to start generating plausible ideas. After these steps, you need to create a prototype for the solution of the problem. Next step is to start user-testing the prototype and see how efficient it is. Final step is to launch the solution to the end users. Now that we understand the steps, we can see and study case-studies which set exemplary examples for design solutions. To prepare for UCEED 2026 and questions related to this chapter, students need to see user problems around and start coming up with design solutions.

List of Topics under Design Thinking for Problem Solving

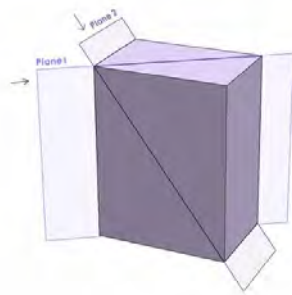
According to the UCEED syllabus 2026, Topics that are likely to be asked in the exam are explained below;

1. Paper Folding & Unfolding

Paper folding and paper cutting is one of the most important and trickiest concepts that are asked in the reasoning test. To understand this, let us start with understanding the concept of how Paper folding questions are usually asked. Paper is shown in figures in ascending order of their folds with mostly an arrow marked on how and in which direction the paper is being folded. Lastly a mark is made on the paper in the last folded stage. Students must answer how the paper will appear if it is unfolded completely from the options given. Paper folding and paper cutting examines the capability to follow the instructions and carry the shape and size of the figures and are the high-order thinking questions.

Questions that were asked previously related to this topic

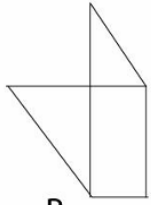
Ques: The rectilinear hollow box shown on the left is cut along plane 1 and plane 2. Which of the option(s) shows (s) the correct unfolded pieces?



Option A:

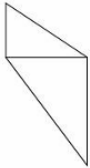


Option B



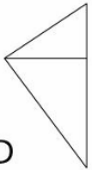
B

Option C:



C

Option D:



D

Solution:

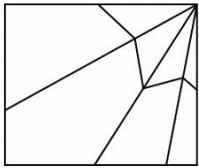


We can see the 2 right angles at the corner in all the pieces. Now go through each option. We can see options B and D are correct.

Ques: Which of the options shown on the right, when folded at the lines, will resemble the paper shown on the left?

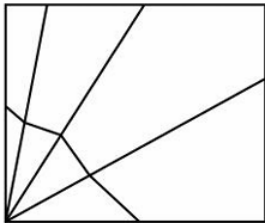


Option A:



A

Option B:



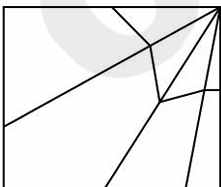
B

Option C:



C

Option D:



D

Solution:

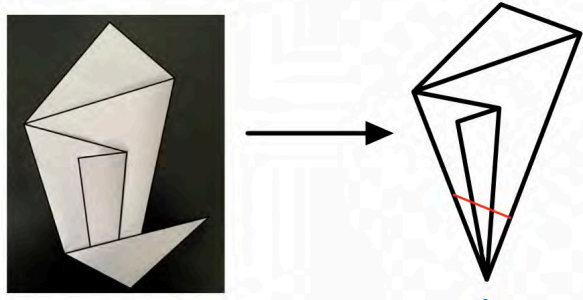
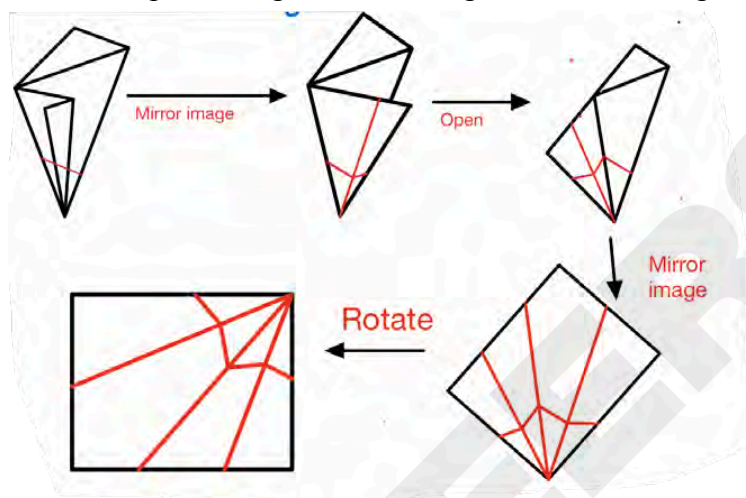


Figure 1

Figure 2

When we open the figure 2 we will get the mirror image.



So if we match it with options, we can clearly say that A is the correct answer.

2. Human/User Centric Design Methods

Human /User Centric Design method is an important approach where designers understand and research the problems that are more likely to be faced by the end users (general public) and then catering them tailor a solution that is designed for them, more appropriately working for them, It is to understand and then create according to the consumer's desires and needs. It is important to develop a better Human centric design approach in order to recognise right problems and therefore, create right solutions. Human Centric Design is about prioritizing consumer's needs over the whole system. This topic is important in UCEED 2026 Syllabus as the approach to analyze student's creative and inclusive thinking and then creating a design solution is changed from just judging them on their logical and quantitative reasonings.

Sample Question that was asked in previous years

Ques: Design Aptitude [50 Marks]

A six-year old girl is going to school for the first time. She needs to carry a lunch box in her school bag. Her lunch can contain typical Indian food items (both dry as well as liquid food items, such as Roti, Rice, Dosa, Dal, Sambar, etc.). Design a lunch box for her, considering her needs. Sketch your design, and visually explain the features of your design along with clear labels.

Note:

Use only a pencil. Do not use colors.

Explain your design only through visuals and short labels.

Do not write separate explanations.

Evaluation Criteria:

Appropriateness of three-dimensional form and visual graphics

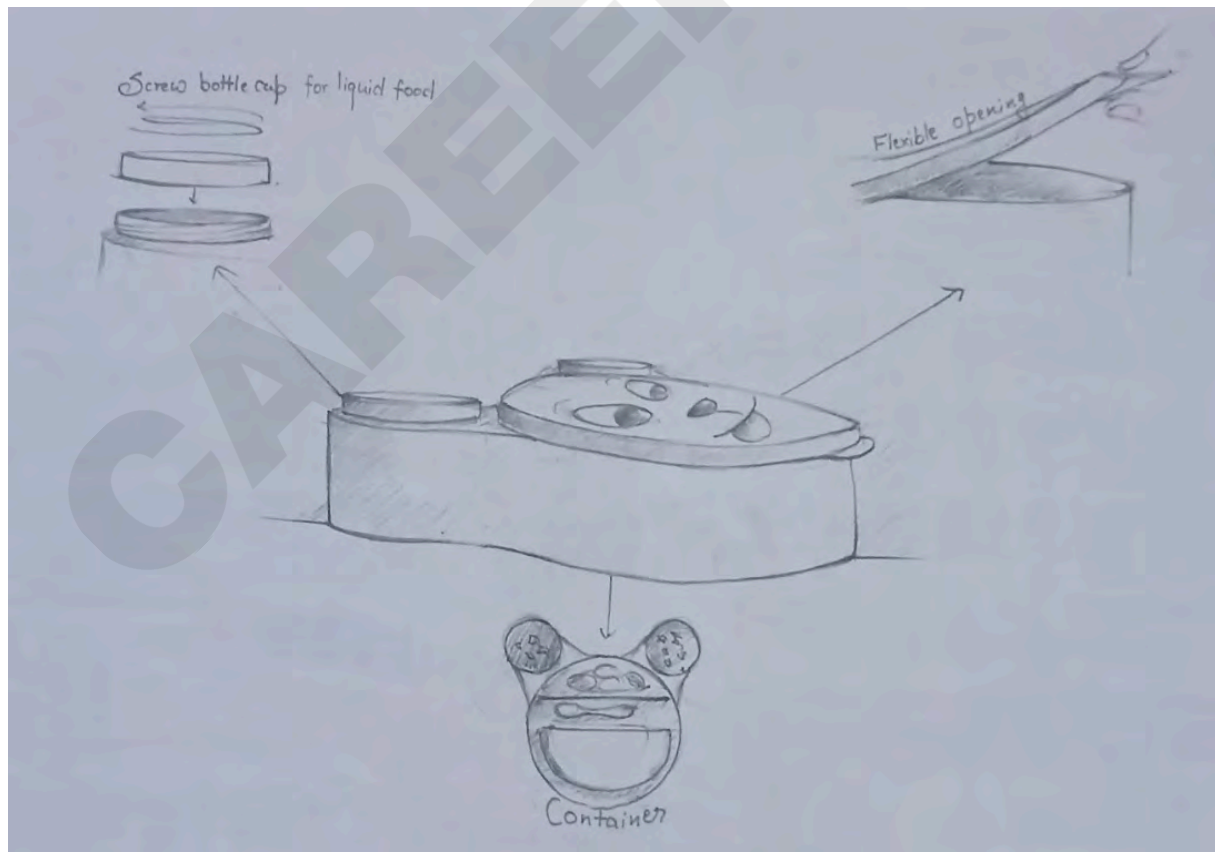
Provisions for fulfilling functional requirements

Considerations for product usability by the user

Attention to detail and explanation of features through visuals only

Clarity of the sketch and quality of presentation, and uniqueness of design.

Sample Solution:



3. Situation Based questions

(Visual Communication of a solution for a given situation)

Visual Communication of a solution is a method where the solution is conveyed through symbols and visual expressions. Images, videos, GIFs, infographics, artworks etc are all methods of visually communicating a solution. It is important to have a good understanding and knowledge of the visual communication methods in order to convey your message more clearly and appealing. Questions are asked in the UCEED Exam to create visual communication based solutions for a given situation based problems. Questions that are asked in the UCEED Exam are based on story telling, perspective sketching, and or poster making.

Sample Question that was asked in previous years

Ques: Drawing [50 Marks]

On a Sunday morning, 5-year-old Geet, her grandmother and father are cleaning their old garage. It is a big garage with large open windows near the ceiling. It has an old bicycle, a football and other objects. The father is cleaning the cobwebs. The grandmother, while cleaning, finds her old guitar which she used to play during her college days. She gets excited and starts playing it as Geet starts dancing around. The garage also has a lot of old memories of Geet's sporty grandmother and her studious father. Geet's school friend stands at the door of the garage watching this whole scene. Draw this scenario from the friend's point of view.

Note:

Use only pencil

Do not use colors

Evaluation Criteria:

Perspective

Proportion

Composition

Observation

Imagination

Quality of sketch

Attention to detail

Sample Solution:



CAREERS 360

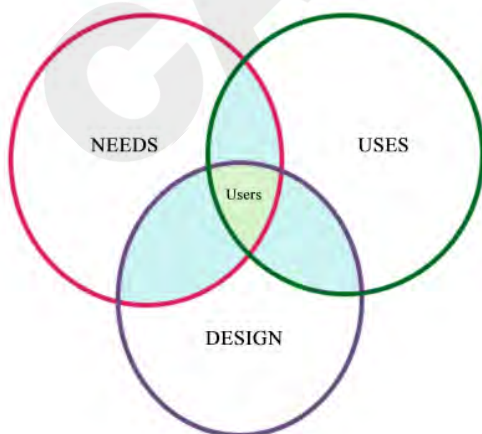
Human/User Centric Design Methods

Human /User Centric Design method is an important approach where designers understand and research the problems that are more likely to be faced by the end users (general public) and then catering them tailor a solution that is designed for them, more appropriately working for them, It is to understand and then create according to the consumer's desires and needs. It is important to develop a better Human centric design approach in order to recognise right problems and therefore, create right solutions. Human Centric Design is about prioritizing consumer's needs over the whole system. This topic is important in design competitive exams as the approach to analyze student's creative and inclusive thinking and then create a design solution is analyzed with their logical and quantitative reasonings. With the understanding of humans as their end users, it is important for the designers to understand their needs, behavior patterns, pain points and patterns and therefore it becomes easier to design for them and according to them. Therefore, it is crucial for aspiring designers to have basic knowledge of human centered design.

What is a human centered approach to design?

When a design problem is approached by a designer with the end user or humans they are designing the system or design solution for at the core or heart or center of the whole design process, then the approach is known to be a human centered design approach.

A human centered process starts with empathy with the users, which will help to better understand about users' context, their needs, and help to identify the focus points that will help designers to better understand what their design is targeted to solve and help create better solutions for their users.



Let us see some examples of human centered design from our daily lives to understand the topic better;

- **OTT platforms:** OTT platforms are used for online streamed content (movies and series mostly) and are a good example of human centered design. We can understand this as how we get similar content in recommendations as the one we search and watch. Algorithms for these platforms are revised based on the content consumed by their users.
- **Apple:** Apple is a highly human centered company and works on its products based on its users needs and patterns.
- **McDonald:** McDonald is a large globally based food chain who works on different flavors for its users depending on feedback they get and customizing according to the surrounding context of the users.
- **Spotify:** Spotify is largely used by today's generation for their music and podcasts listening purposes. Spotify's algorithm is largely based on the feedback, likes and saved albums their customers give and creating suggestions based on that.
- **Instagram:** Most popular social media platform and largely used instagram is famous because of its research on how its users pattern of consuming content is based. Instagram works on the algorithm based upon users pattern on using the platform and then creating solutions that will create more attention for users on site.

5 phases for Human Centered Design

1. Identify

The first step for human centered design is to identify its end users. For every design problem, there is a specific category of users that are most ideal and then a design solution is created keeping them in mind. This step includes identification of the user's needs, requirements and patterns. This phase also includes identifying pain points and emotional patterns of the end users.

2. Research

This step is typically important and is based upon primary and secondary research for the design problem, understanding user needs and then design solutions. This phase includes a lot of interviews, surveys, literature studies and collection of data points. The main purpose of this phase is to collect as much data as possible that will in turn help them create more informed design solutions.

3. Research

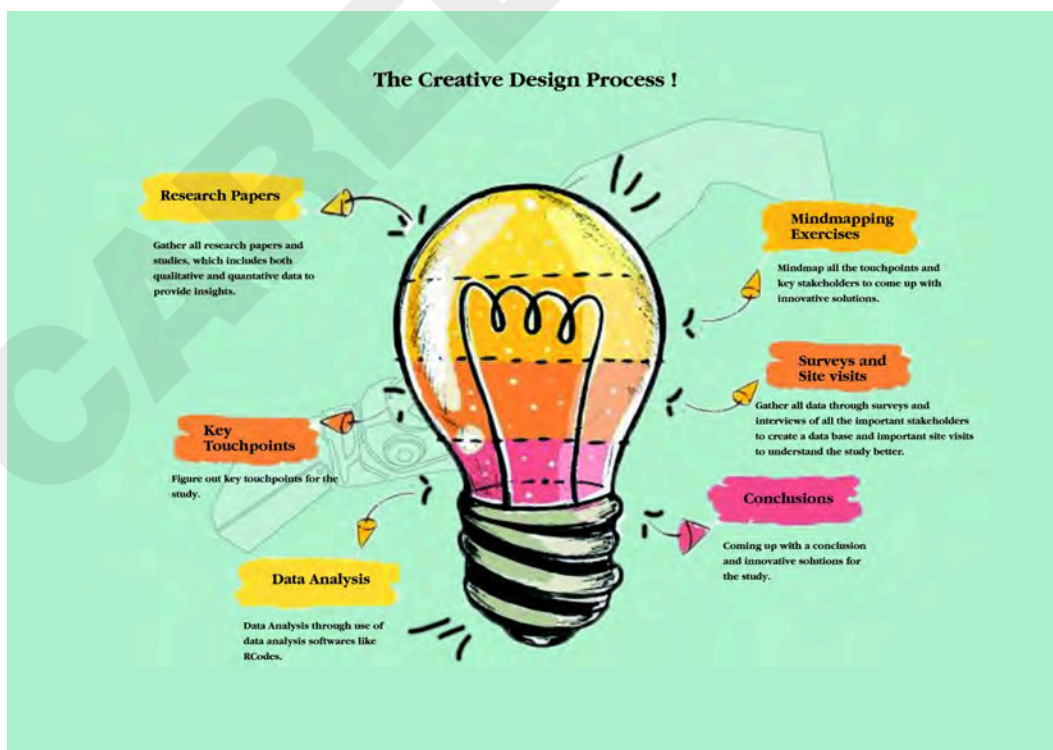
This step includes creating viable design solutions for the identified design problems. This is one of the main steps as this is the phase where designers need to create and provide solutions from the result of the previous two steps.

4. Prototype

In the prototype phase, 1 stage of solution is created with a prototype to test by the first set of the beta users and see viability and feasibility of the solution. This process can also be known as the implementation phase. During this stage, it is crucial to communicate the design solution to primary and secondary stakeholders.

5. Feedback

This stage is the last stage for any human centered design solution and it includes gathering feedback from various users and stakeholders. This step also includes working towards the bugs in the created initial solutions and modifying it further according to the feedback. Feedback is one of the most important phases in human centered design as this is primarily based upon users, information gathered for problems they might be facing and their future needs.



Things to keep in mind when designing for human centric solutions

- It is important for designers to keep in mind when designing solutions for human centered design that they need to keep their ideologies and sentiments aside and create unbiased solutions that cater to their end users and their needs.
- Designers need to keep in mind that their solutions should be accessible to the users.
- Solutions created should also be easy to understand by the users and therefore they become more popular.
- Solutions should be ethical to the users.

Previous Years Question asked from Human/User Centric Design Methods

Ques: Design Aptitude [50 Marks]

A six-year old girl is going to school for the first time. She needs to carry a lunch box in her school bag. Her lunch can contain typical Indian food items (both dry as well as liquid food items, such as Roti, Rice, Dosa, Dal, Sambar, etc.). Design a lunch box for her, considering her needs. Sketch your design, and visually explain the features of your design along with clear labels.

Note:

Use only a pencil. Do not use colors.

Explain your design only through visuals and short labels.

Do not write separate explanations.

Evaluation Criteria:

Appropriateness of three-dimensional form and visual graphics

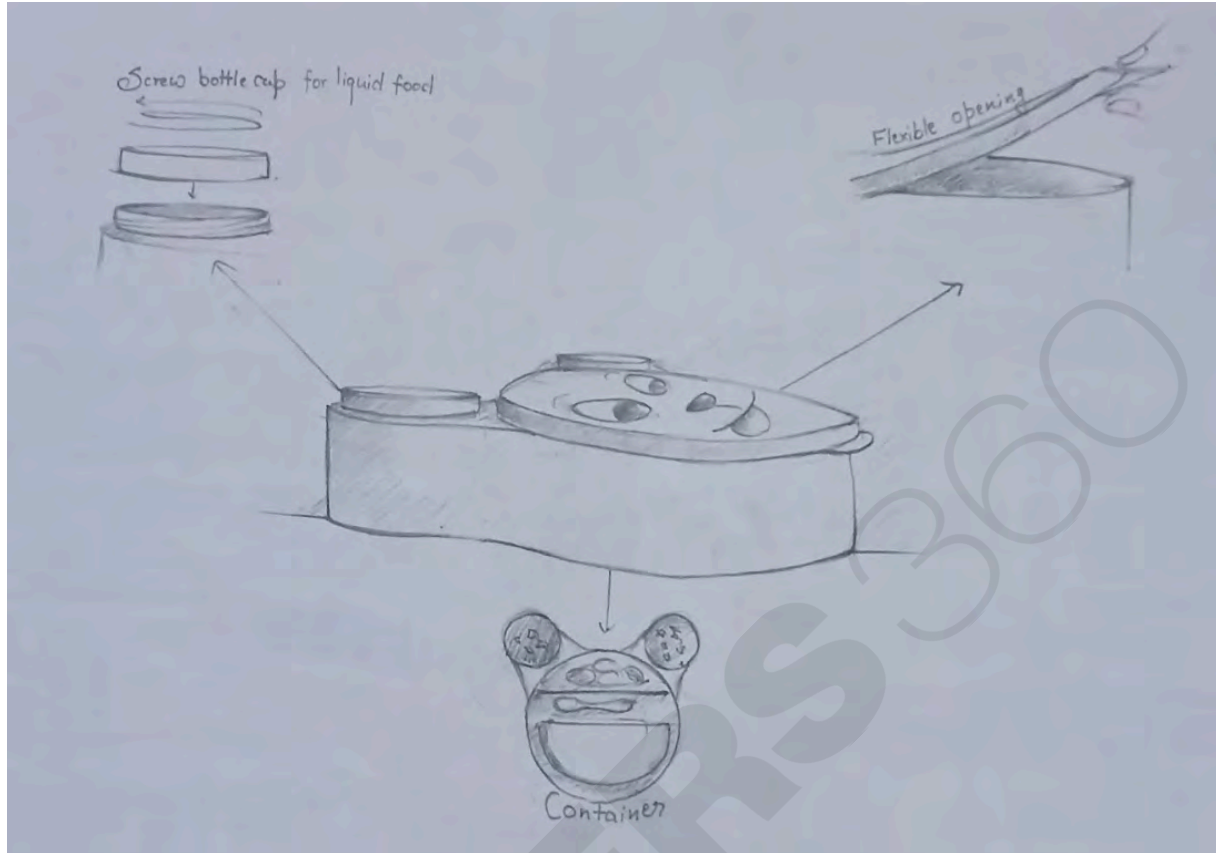
Provisions for fulfilling functional requirements

Considerations for product usability by the user

Attention to detail and explanation of features through visuals only

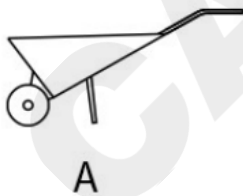
Clarity of the sketch and quality of presentation, and uniqueness of design.

Sample Solution:

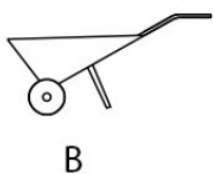


Ques: Construction materials are to be moved using the trolleys in the options. Assume friction is negligible. Which trolley requires the least amount of effort?

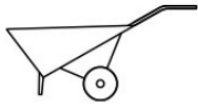
Option A:



Option B:

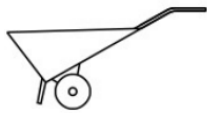


Option C:



C

Option D:

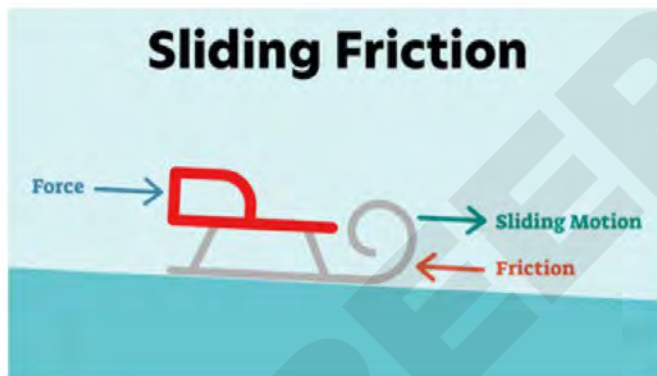


D

Solution:

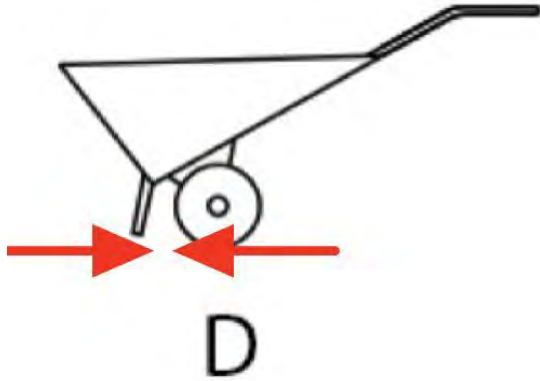
Friction is defined as the resistance offered by the surfaces that are in contact when they move past each other. Friction provides traction that is needed to walk without slipping.

For e.g.



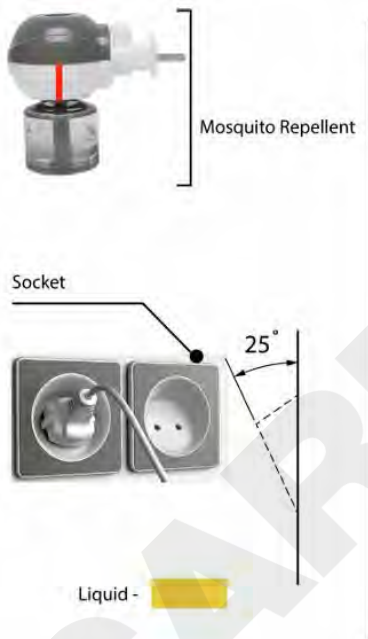
Now according to the question friction is negligible so when friction is negligible, it is typically a situation in which two opposing forces are not acting strongly against each other, resulting in minimal resistance.

Now we can see in option D only two opposing forces acting against each other is weak (as shown below).

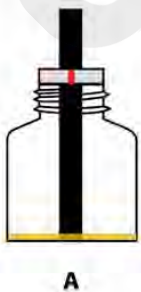


Hence, option D is correct.

Ques: The options show different configurations of refill bottles of mosquito repellent, for an atypical socket shown on the left. After fitting, the red mark on the refill bottle must align with the red mark on the machine. Which of the option(s) will allow all the liquid to be consumed?



Option A:



Option B:



Option C:



Option D:

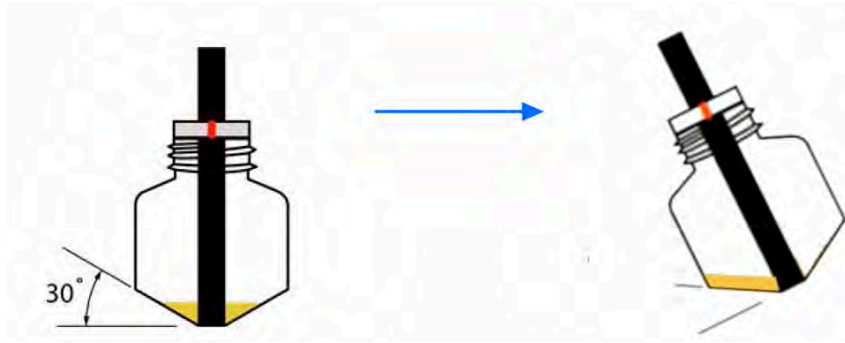


Solution:

Option A: When the refill bottle is tilted at 25 degrees, the black wick can't reach all the liquid.

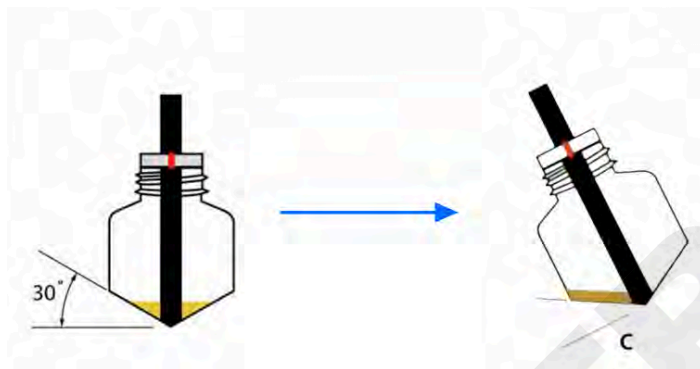


Option B:



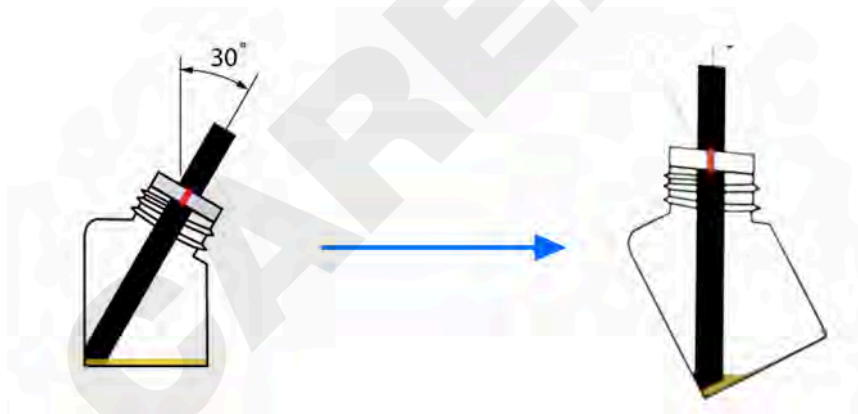
The black wick can reach all the liquid. Hence, it is correct.

Option C:



Hence, this option is correct because the black wick can reach all the liquid.

Option D:



The black wick can reach all the liquid. Hence, this option is correct.

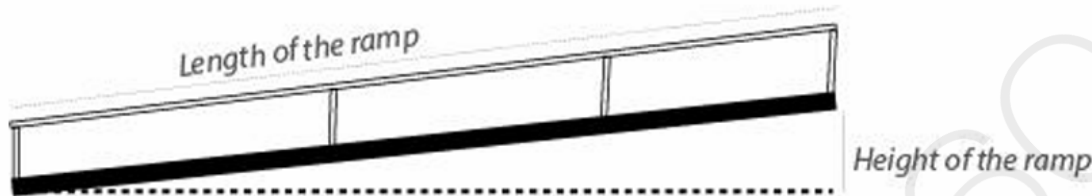
Ques: With reference to the image below, which of the statement(s) is/are false?

A. Ramps are a good solution for standard wheelchair users to access any building with entry above ground level.

B. Height along with the length of the ramp will determine if standard wheelchair users can use it without assistance.

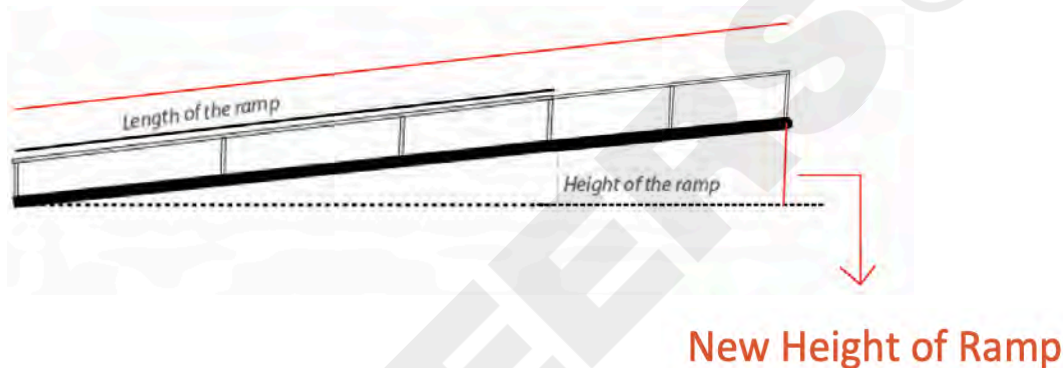
C. People on standard wheelchairs will need assistance to go up and down shorter-length ramps, irrespective of their height.

D. A shorter length of ramp is convenient for standard wheelchair users without assistance if the height of the ramp is high.



Solution:

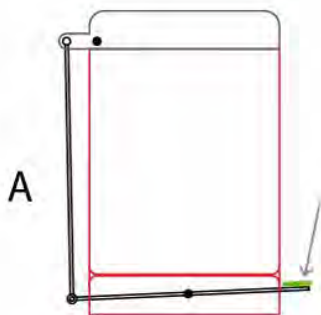
New length of ramp



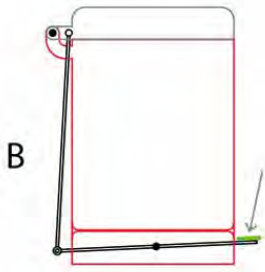
We can see that statements A and B are correct statements, but according to the question, we need a false statement. Therefore, statements C and D are the answer to this question.

Q.33 In which of the option(s) dust-bin lids will open?

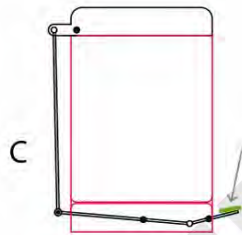
Option A:



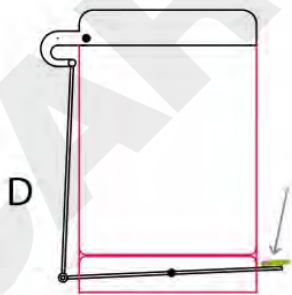
Option B:



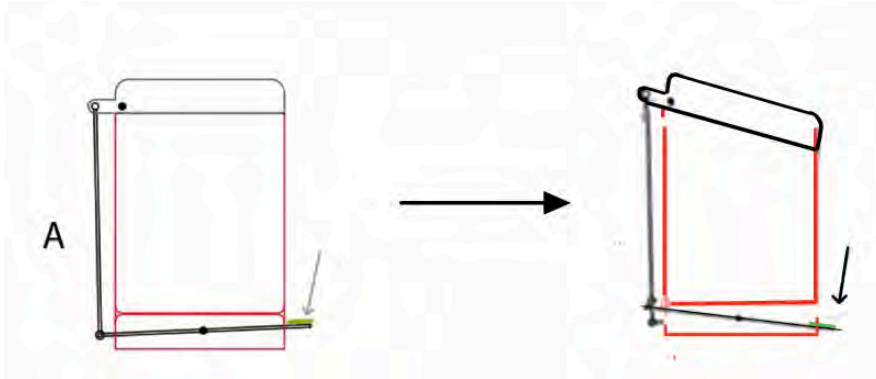
Option C:



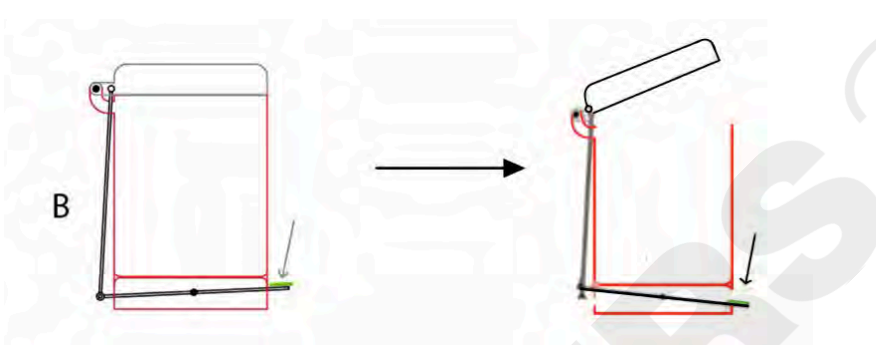
Option D:



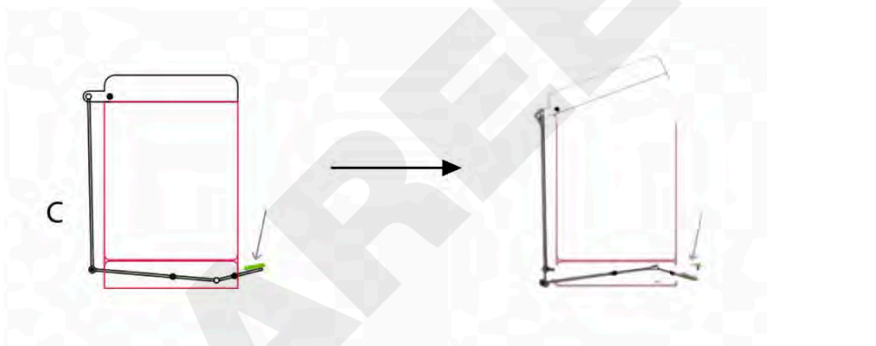
Solution:



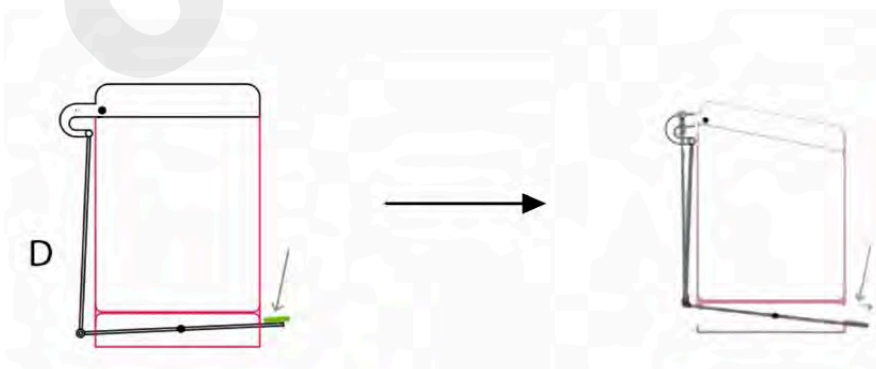
Dustbin lid will not open. Hence, this option is incorrect.



Dustbin lid will get open. Hence, this option is correct.



Dustbin lid will get open. Hence, this option is correct.

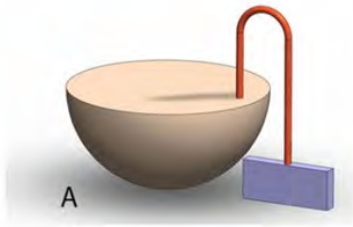


Dustbin lid will not open. Therefore, this option is incorrect.

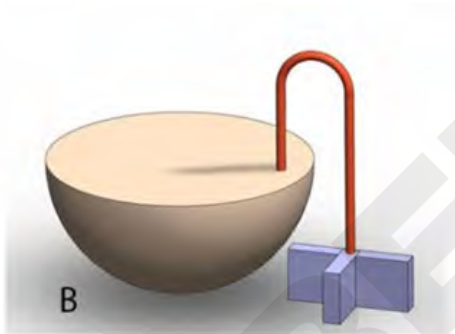
Hence, options B and C are correct.

Ques: Shown below are tables of a new design. Which table(s) will not tilt, if given a small perturbation in any direction?

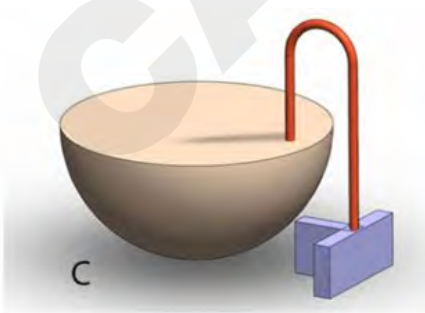
Option A:



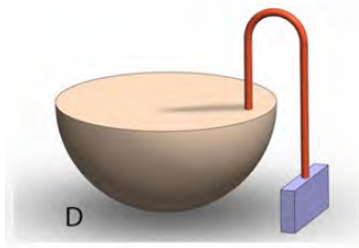
Option B:



Option C:



Option D:

**Solution:**

Perturbation means deviation from a particular position.

Now if we check the options we can observe that options C and d when given a small perturbation in any direction, will not tilt.

Hence, options C and D are correct.

Situation Based questions

(Visual Communication of a solution for a given situation)

Visual Communication of a solution is a method where the solution is conveyed through symbols and visual expressions. Images, videos, GIFs, infographics, artworks etc are all methods of visually communicating a solution. It is important to have a good understanding and knowledge of the visual communication methods in order to convey your message more clearly and appealing. Questions are asked in the design competitive exams to create visuals that communicate solutions for a given situation based problems. Questions that are asked generally in the design exams are based on story telling, perspective sketching, and or poster making. Visual communication of a solution for a given situation comes under the larger topic umbrella of Design Thinking. Design thinking for problem solving is the design methodology process where complex issues are tackled by understanding and framing the problem to find the best solution in a human centric way.

Significance of Visual Communication of a solution for a given situation for design competitive exams:

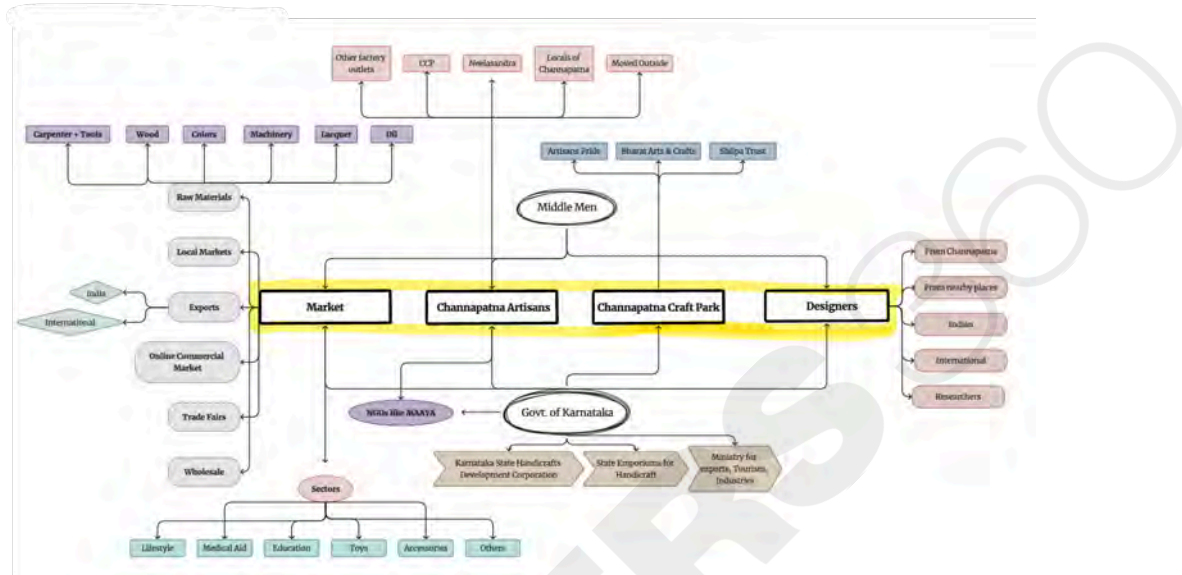
Design thinking for Problem Solving has become one of the important criteria when preparing for design competitive exams as the approach for them has been changed from just analyzing students based on their logical, qualitative and non-verbal reasoning to more design thinking and sketching skills. With incorporation of these topics in the design syllabus, it is now important to better understand the concepts and get better practice. As it is important for any aspirant for design to develop design thinking, Design competitive exam questions are based in order to analyze how well a student can answer and come up with a solution that can be ideal for the real world. Therefore, students need to understand and develop the skills for visual communication to provide better visually appealing solutions.

Steps for visual communication solution for a given situation:

1. Let us start by understanding basic steps for design thinking and then visually communicating for problem solving, the first step is to mindfully identify the problem present. Once you have an in-depth understanding of the problem, it becomes easier to come up with the solution.
2. The next step is to develop empathy towards the problem.

Interactive Maps:

Interactive maps allow users to actively explore and interact with the data, creating a more immersive and personalized experience unlike the traditional maps. Examples include, mind maps, empathy maps, stakeholder maps, etc.



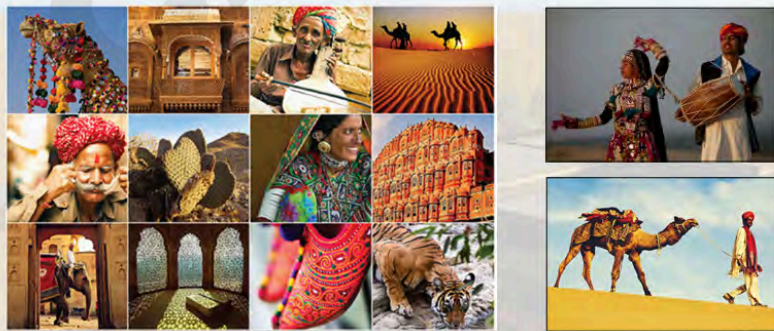
Photography:

Photography are the still pictures taken and used to show and explain something with better understanding as people could see and visualize better.

BACKGROUND OF THE PROJECT

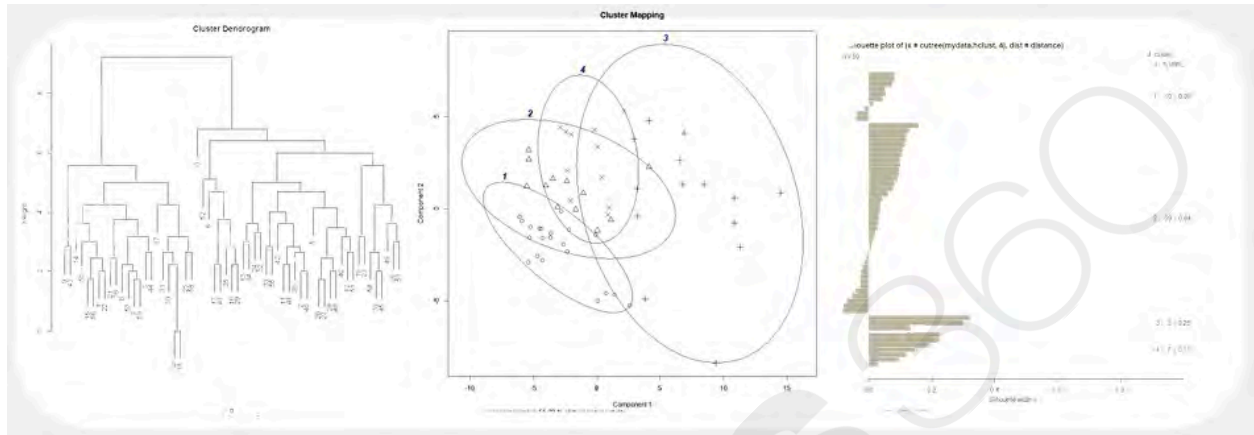
Culture is the lifeblood of a vibrant society, expressed in the many ways we tell our stories, celebrate, remember the past, entertain ourselves, and imagine the future. In addition to its intrinsic value, culture provides important social and economic benefits. With improved learning and health, increased tolerance, and opportunities to come together with others, culture enhances our quality of life and increases overall well-being for both individuals and communities.

The culture sector helps support the economy through direct and indirect job creation. It also helps spur innovation in other sectors in the form of productivity advancements, regional development, community branding, and increased local tourism.



Graphs:

Graphs are used to visually represent and clarify complex ideas. Graphs simplify the process of visualizing trends and data that happen over time.



Typography:

Typography is the art and practice of placing type in a way that makes written words readable and visually beautiful. Practice includes line size, type, color and spacing.

P O R T F O L I O
Avani Bhardwaj

tip tip barsa
paani !

Previous Years Question asked from Situation Based questions (Visual Communication of a solution for a given situation)

Ques: Drawing [50 Marks]

On a Sunday morning, 5-year-old Geet, her grandmother and father are cleaning their old garage. It is a big garage with large open windows near the ceiling. It has an old bicycle, a football and other objects. The father is cleaning the cobwebs. The grandmother, while cleaning, finds her old guitar which she used to play during her college days. She gets excited and starts playing it as Geet starts dancing around. The garage also has a lot of old memories of Geet's sporty grandmother and her studious father. Geet's school friend stands at the door of the garage watching this whole scene. Draw this scenario from the friend's point of view.

Note:

Use only pencil

Do not use colors

Evaluation Criteria:

Perspective

Proportion

Composition

Observation

Imagination

Quality of sketch

Attention to detail

Sample Solution:



Ques: Design Aptitude [50 Marks]

A six-year old girl is going to school for the first time. She needs to carry a lunch box in her school bag. Her lunch can contain typical Indian food items (both dry as well as liquid food items, such as Roti, Rice, Dosa, Dal, Sambar, etc.). Design a lunch box for her, considering her needs. Sketch your design, and visually explain the features of your design along with clear labels.

Note:

Use only a pencil. Do not use colors.

Explain your design only through visuals and short labels.

Do not write separate explanations.

Evaluation Criteria:

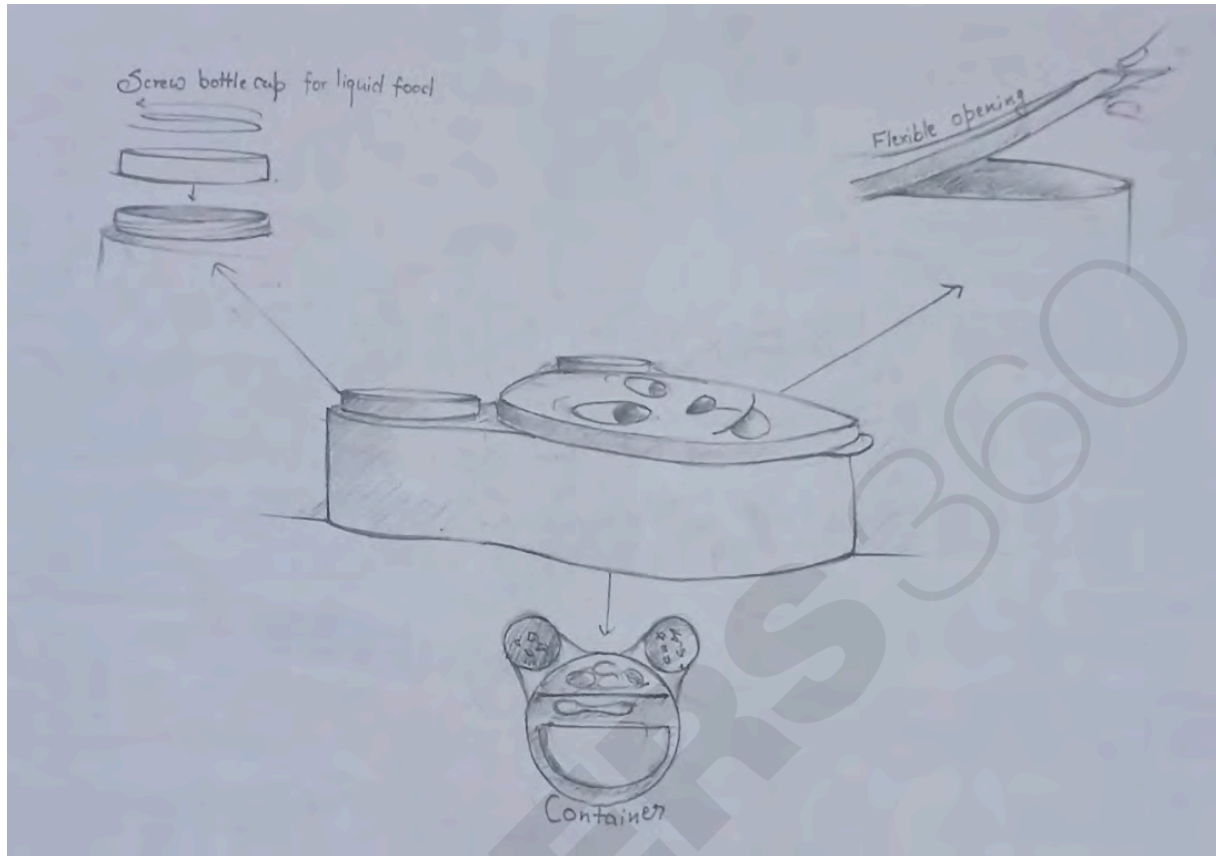
Appropriateness of three-dimensional form and visual graphics

Provisions for fulfilling functional requirements

Considerations for product usability by the user

Attention to detail and explanation of features through visuals only

Clarity of the sketch and quality of presentation, and uniqueness of design.

Sample Solution:

Ques: Read and visualize the following:

- A rat is spotted inside a school canteen.
- A school boy is afraid and standing on a stool/chair.
- A brave school girl is chasing the rat out of the canteen.
- A tiffin box is falling on the floor.
- Two school bags and two water bottles are kept on a table.
- A few plates are broken and lying on the floor.
- The canteen owner is watching this in shock, standing on top of the counter table. Sketch this scene from the canteen owner's point of view.

Note:

- Make a pencil sketch only
- Do not use colors

Evaluation Criteria:

- Perspective
- Proportion

- Composition
- Observation
- Imagination
- Quality of sketch
- Attention to detail

Sample Solution:

Chapter 4: Sketching Skills

Sketching skills-related questions that are included in UCEED Syllabus and most probable topics to be asked in the UCEED 2026 Exam are largely divided into two parts Technical Drawing and Non-Technical Drawing which will be explained in detail below in this article.

Significance of Sketching Skills for UCEED Preparation

As the approach for the UCEED Exam for analyzing students changed from mostly being logical, non-verbal and calculative skills to now giving more weightage to sketching and design skills, it has become crucial for students to start preparing for their sketching and drawing skills as soon as possible. If you fear that your drawing skills or sketches aren't good then that's okay as you can start practicing daily with a minimum of 1 sketch per day and evolve and enhance your skill with daily practice. Practicing daily will not only improve the quality of the drawing but also improve the time taken to make 1 sketch.

Parts of UCEED Sketching Skills

1. Technical Drawing

Technical drawings are made when a specific solution is needed to be shown visually. These drawings are generally made by following a set of rules and regulations. Specific tools (scale, compass, graph, etc.) are needed to create these drawings.

- Projection Based: Orthographic Projection -90 Degrees and Isometric Projection-30/45 Degrees
- Informative Drawings: Section View- Cut view for internal information, Exploded Views: showing Individual internal Parts and Assembly Drawings/Packaging
- Geometric Shapes + Volumes : Cover understanding of 2D shapes & 3D volumes

2. Non-Technical Drawing/Sketching

Non-technical drawings are free-flowing sketches that are made when a solution for any design problem is expressed visually. They, unlike technical drawings, don't have a specific set of rules for them. They don't have one specific meaning like technical drawings and can be interpreted by how their viewers see them. Non-technical drawings or sketches are a form of expression. Example: sketching for interior, fashion, travel, storytelling etc.

- Human Anatomy/Figure Drawing : Understanding of Human Anatomy
- Freehand Sketching for Products/Volumes : For Geometric or Non-Geometric Volumes
- Perspective Sketches : Based on Understanding of 1/2/3 point perspectives
- Doodling/Gesture/Life/Blind Contour Drawings : More Freehand

Things to consider while preparing for sketching skills for UCEED 2026

Students can start with looking at previous year questions to understand the type of questions that are generally asked in UCEED Exams. Start with situation based questions for drawing, Poster making, storyboards, and perspective drawings. Students should be smart about the questions and create designs which offer the best solution for the given questions. One important thing for students to keep in mind is to sit with the question, understand it completely, think for the best solution and then start with creating the solution and finally create the sketch. While preparing for the sketching section for UCEED 2026 aspirants should focus on bettering their pencil strokes, shading techniques and scale and proportion of the elements in the sketch. Start practicing for human figures with different angles and postures as it will help in making perspectives and also with practice, less time will be required in exams to sketch them.

UCEED Sketching Skills - List of Important Topics

According to the UCEED syllabus 2026, a brief introduction for each topic is provided below.

Technical Drawing

1. Projection Based

- **Orthographic Projection -90 Degree** - Orthographic projections is a technical drawing where 3-Dimensional forms are projected into 2-Dimensional shapes using different views of the form. When a 3-dimensional form is projected in 2-Dimensional shape using projection through each of the form's surface, edge and vertex on screen at an angle of 90 degrees then, the technical drawing is said to be orthographic projection at 90 degrees.
- **Isometric Projection-30/45 Degree** - The definition of an isometric drawing is a drawing of a 3-D form on a 2-D plane along a vertical line with at least two identified points. All the horizontal lines of the image are created from this vertical line at the angle of 30 or 45 degrees. These angles are a crucial part in creating the three-dimensional, isometric view.

2. Informative Drawings

- Section View- Cut view for internal information - Section views in technical drawings are used when you want to see a detailed view of a particular section of a 3-D object into a 2-D shape. These section views can be made by looking at a 3-D object from one face or cutting one face and looking at the cross-section for internal information for the details of the form.
- Exploded Views : showing Individual internal Parts - Exploded views are technical drawings where a 3-D object is exploded into individual parts and then details are made of the individual parts in 2-D drawings. These drawings are important where a complex object is needed to be broken into individual parts and details are needed to be shown.
- Assembly Drawings/Packaging - Assembly drawings are opposites of exploded drawings, here individual parts are taken and then assembled together into one complex object. They are usually made by taking 2-D shapes and making 3-D form out of them.

3. Geometric Shapes + Volumes : Cover understanding of 2D shapes & 3D volumes

All the shapes exist in a flat plane in plane geometry. You can understand a plane as a flat sheet with no thickness and which can go in both directions infinitely. Any shape on the plane is called a plane figure. Popular examples of plane figures are square, rectangle, triangle and circle. Plane figures have sides, corners and angles except in case of a circle which does not have any straight line. These plane figures are called 2-D shapes. When these 2-D shapes are given height and they start to occupy space, they are called solid figures. These shapes have faces, edges, and vertices. These figures are called 3-D shapes. 3-D shapes originate from plane figures when they are given height, similarly shown below are basic 2-D shapes that generate their 3-D forms; namely: Circle- Sphere, Rectangle- Cuboid, Square- Cube, Triangle- Pyramid. A basic shape is 3 or more line segments joined together. When equal line segments are joined at equal angles, they are called regular shapes. In a circle, the curve is created by joining points rather than joining line segments. When line segments of different lengths are joined at unequal angles, then they are referred to as irregular shapes. Curvy shapes that are not a circle (irregular) are created by free hand and are free flowing. When these shapes are given height, they become a form. Further, forms can be regular or irregular similar to shapes.

Non-Technical Drawing/ Sketching

1. Human Anatomy/Figure Drawing : Understanding of Human Anatomy

Drawing of human anatomy or human figure drawing is sketching human figures in different proportions and postures. It is about understanding human forms and gestures through detailed sketching. Students can prepare for human anatomy by sketching their own different postures of hands, legs, any posture that is visible to them. Practice for human anatomy is important as human figures are needed to be sketched in the sketching skills part of the UCEED Exam.

2. Freehand Sketching for Products/Volumes : For Geometric or Non-Geometric Volumes

Freehand sketching for products and volumes are drawings that are made without the use of any tools (like scale, ruler, compass etc). Freehand is basically using just your hand and pencil as the tool and creating your idea on the paper. It is important to prepare for freehand sketch for UCEED 2026 as there are a lot of questions that specifically define that use of tools are restricted, and since UCEED Exam is supervised, it is important to remember to follow these rules. For UCEED Preparation students need to start practicing on their line strokes as soon as possible as it is only through practice that they can get better visually appealing sketches for product ideas that can be conveyed easily.

3. Perspective Sketches : Based on Understanding of 1/2/3 point perspectives

When drawing/sketches are made with keeping in mind the orthogonal projection of every element in the sketch according to the vanishing points. Perspective is basically imagining how a view is seen and then drawing it out on paper. Perspective drawings are more realistic and appropriate. According to the vanishing points, 1/2/3 perspective of the drawing is termed. Examples for

1 point perspective: view of railway tracks meeting at 1 point.

2 point perspective: view of any space through human eye level.

3 point perspective: view from an extremely low or high eye level.

It is important to start practicing for UCEED 2026 and understand different perspective drawings as it is one of the most important topics that is asked in UCEED Syllabus.

4. Doodling/Gesture/Life/Blind Contour Drawings : More Freehand

Doodling/ Gesture/ Life/ Blind Contour Drawings are all types of free flowing and freehand drawings where there is more freedom and expression is needed to be shown. These drawings do not hold any set of rules or need any tools for creation, they are generally created with free flowing lines and curves. These drawings ideally should not take a lot of time to create but should be able to convey the needed information and message. A number of questions can be asked in the UCEED Exam where these drawings are needed and therefore, it is important to start practicing these for UCEED 2026 Preparation.

Sketching Skills UCEED Previous Years Questions and Answers

Ques: Sketching (30 minutes – 60 marks)

Nandu is giving a dance exam in online mode in front of a laptop kept on a table. His mother is prompting from behind. While the exam is going on, his pet cat Poco is running around tumbling over a glass of water, a plate of biscuits and a few books. No one can stop Poco and the exam must go on. Visualize and draw the whole situation as if you are sitting on the floor witnessing the scene.

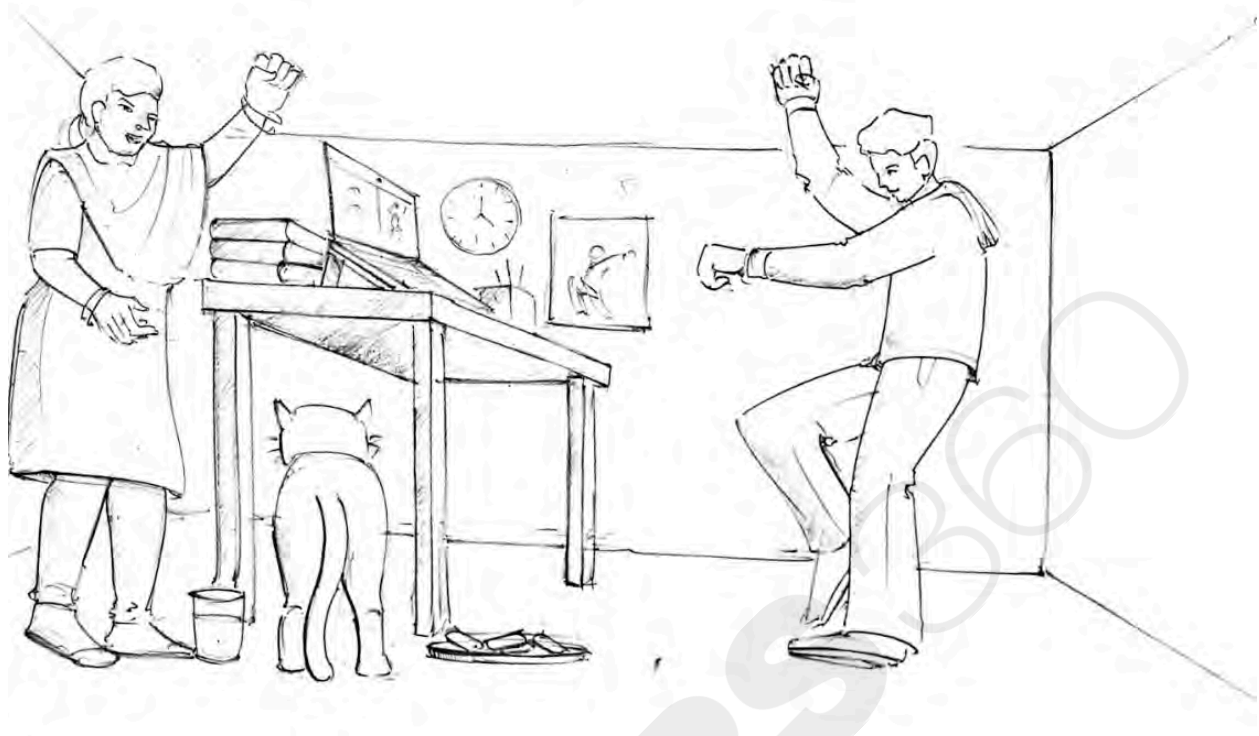
Note:

- Make pencil sketches only
- Do not use colors

Evaluation Criteria:

- Observation
- Imagination
- Selection & composition of objects
- Quality of lines
- Presentation
- Attention to details

Solution:



Ques: Read and visualize the following:

- A rat is spotted inside a school canteen.
- A school boy is afraid and standing on a stool/chair.
- A brave school girl is chasing the rat out of the canteen.
- A tiffin box is falling on the floor.
- Two school bags and two water bottles are kept on a table.
- A few plates are broken and lying on the floor.
- The canteen owner is watching this in shock, standing on top of the counter table. Sketch this scene from the canteen owner's point of view.

Note:

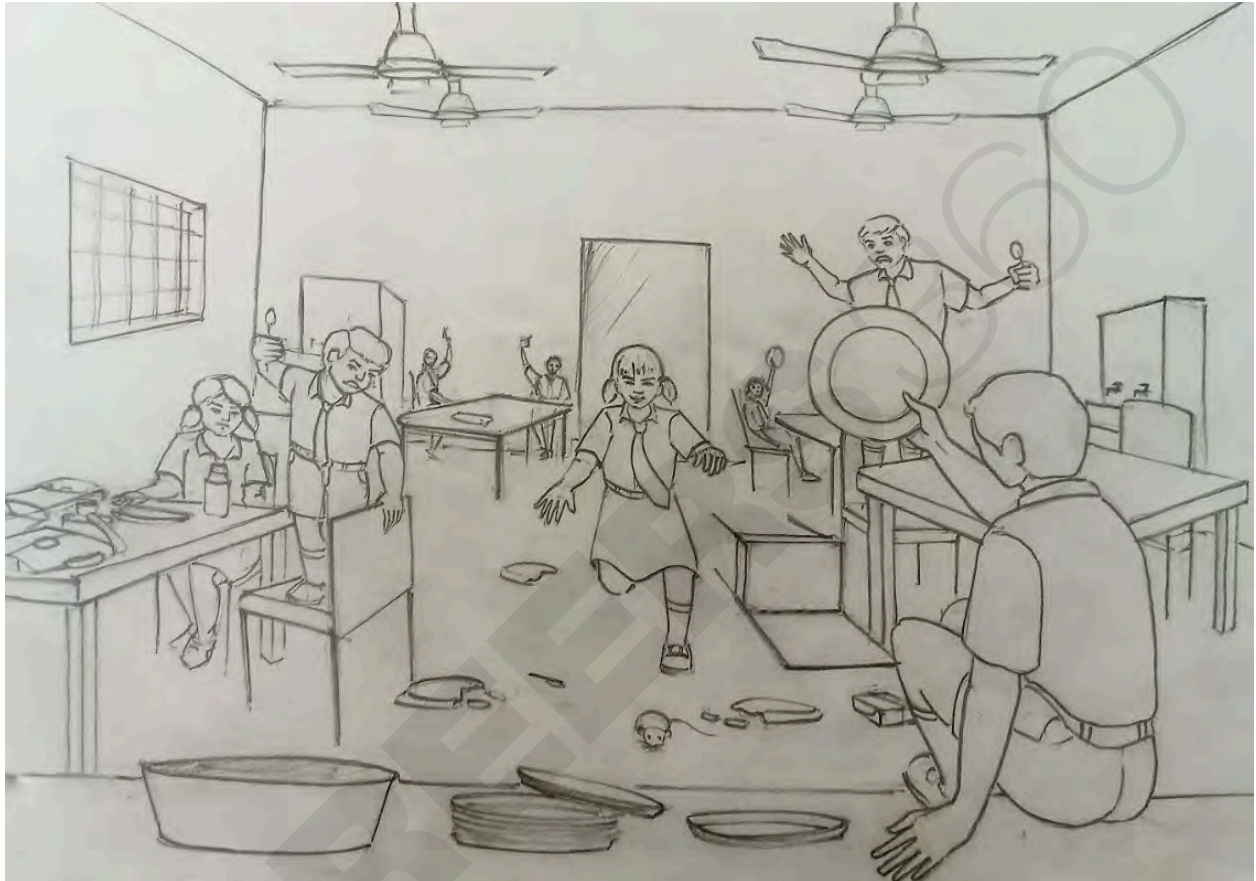
- Make a pencil sketch only
- Do not use colors

Evaluation Criteria:

- Perspective
- Proportion
- Composition

- Observation
- Imagination
- Quality of sketch
- Attention to detail

Solution:

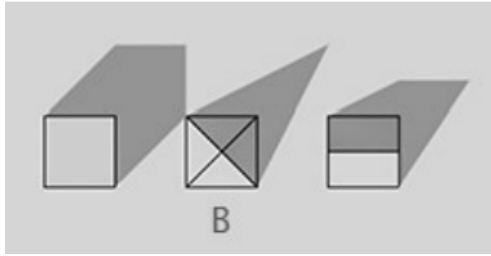


Ques: A cube, a triangular prism and a square pyramid of equal height are resting on a surface along a straight line, arranged in a random order. If the source of light is fixed and the light rays are parallel, which of the options shows the shadows correctly in the top view?

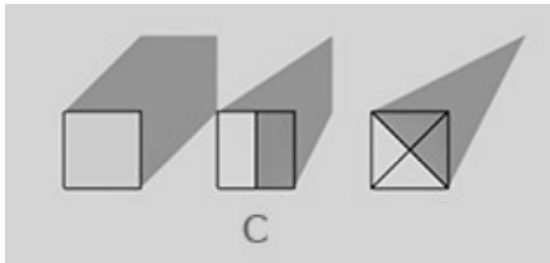
Option A:



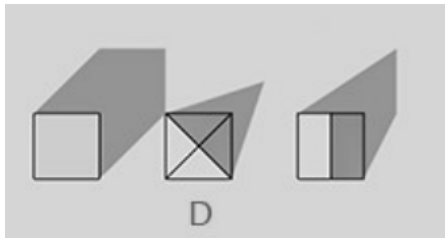
Option B:



Option C:

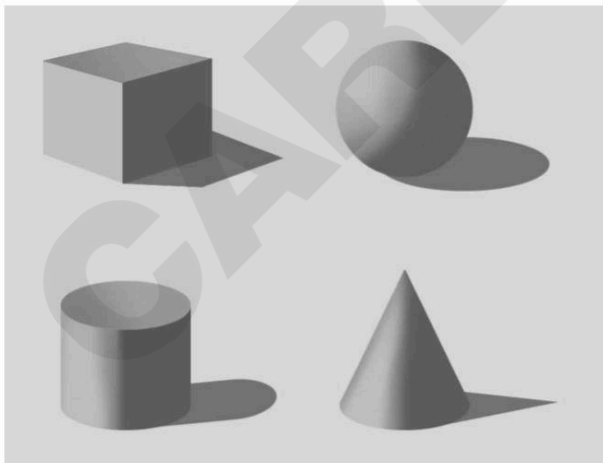


Option D:

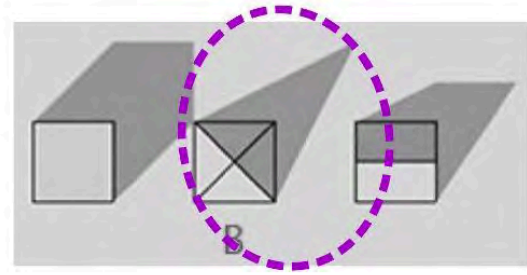
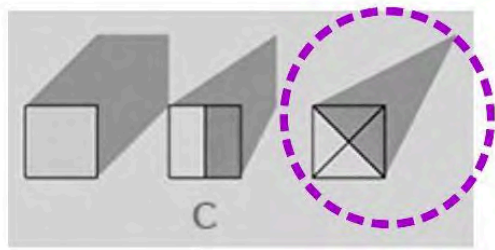


Solution:

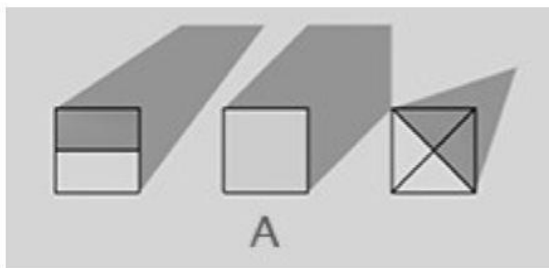
Below images show the shadow of different objects.



Now check each option one by one.



The shadow of a square pyramid cannot be bigger than its height. So option C and B is eliminated.



Now if we observe option A carefully we can see the cube has a big shadow which shows that light source is at a distance, but the square pyramid denies the fact of light source at a distance. Therefore, option A is wrong.

Hence, option D is correct.

Projection Based

(Orthographic Projection - 90 Degree Isometric Projection - 30/45 Degree)

This topic is asked under the skills to make technical drawings. Technical drawings are made when a specific solution is needed to be shown visually. These drawings are generally made by following a set of rules and regulations. Specific tools (scale, compass, graph, etc.) are needed to create these drawings. Projection based drawings are used to convert 2 dimensional drawings into 3 dimensional drawings by projecting the lines from the first drawing to generate another. There are majorly two types of projection based drawings present namely- Orthographic projection and Isometric projection. These drawings are more usually used in engineering technical drawings and architectural technical drawings. Aspiring designers need to have basic knowledge and basic understanding of the concept to understand and work with these drawings as they are used in many design fields.

Significance of Sketching Skills for competitive design exams preparation

As the approach for the competitive design Exams for analyzing students changed from mostly being logical, non-verbal and calculative skills to now giving more weightage to sketching and design skills, it has become crucial for students to start preparing for their sketching and drawing skills as soon as possible. If you fear that your drawing skills or sketches aren't good then that's okay as you can start practicing daily with a minimum of 1 sketch per day and evolve and enhance your skill with daily practice. Practicing daily will not only improve the quality of the drawing but also improve the time taken to make 1 sketch.

Projection Based Drawings

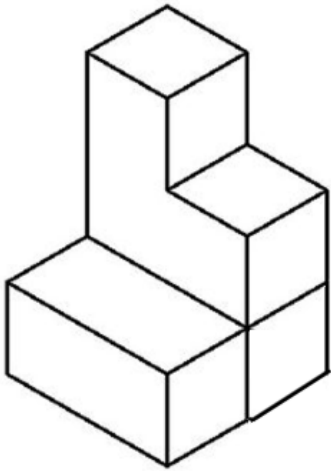
Orthographic Projection -90 Degree - Orthographic projections is a technical drawing where 3-Dimensional forms are projected into 2-Dimensional shapes using different views of the form. When a 3-dimensional form is projected in 2-Dimensional shape using projection through each of the form's surface, edge and vertex on screen at an angle of 90 degrees then, the technical drawing is said to be orthographic projection at 90 degrees.

These drawings are based on straight lines with presentations of views of top, front and side. These drawings are largely used in architectural drawings where plans and elevations are needed

to be represented by the architect for their proposed buildings. These drawings are used to show more detailed parts of a drawing and have measurements marked to them.

Let us understand this with help of an example,

Object:

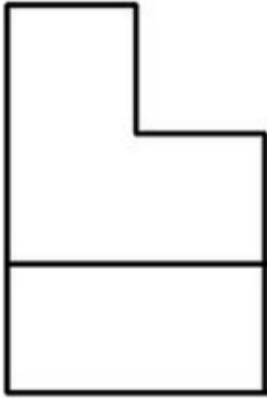


Now according to the orthographic projection drawings for the above object,

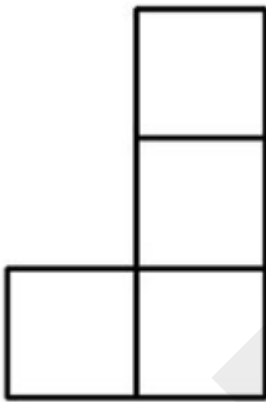
Top View:



Front View:



Side View:



Let us understand more from another example,

3-D Figure;

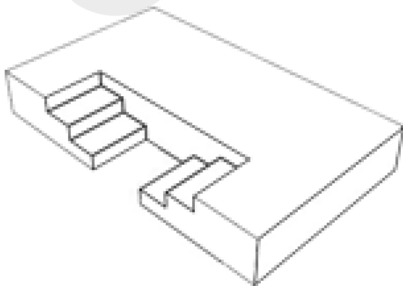
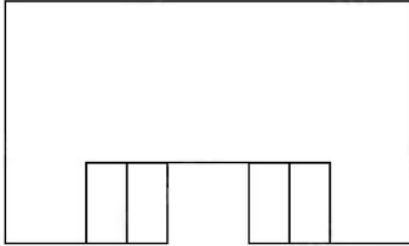


Figure given here is seen as a cuboid with a rectangular base which has 2 steps cut-out at 1 edge. Therefore, it can be seen from top side, bottom side and front side. A rectangle is seen when we view the above figure from left side, right side and back side (as steps cut-out are only at the 1 edge (front side), therefore, it is not visible on back view).

Top View:



Here, we can see a rectangle with a rectangular top view of 2 sets of steps in the middle from one edge. The empty space in the center between 2 sets of steps is shown with no line on the front edge as.

Front View:



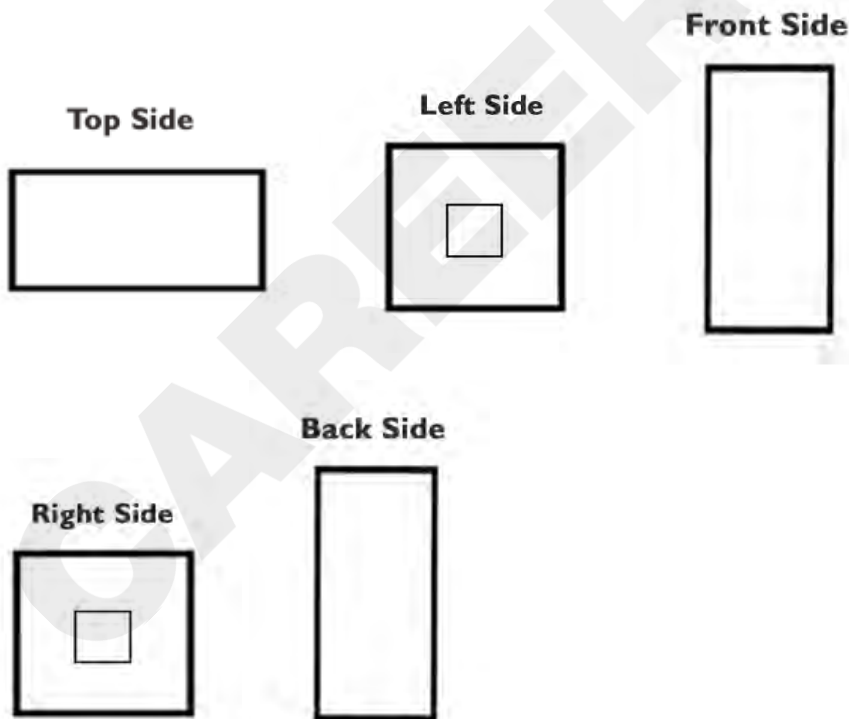
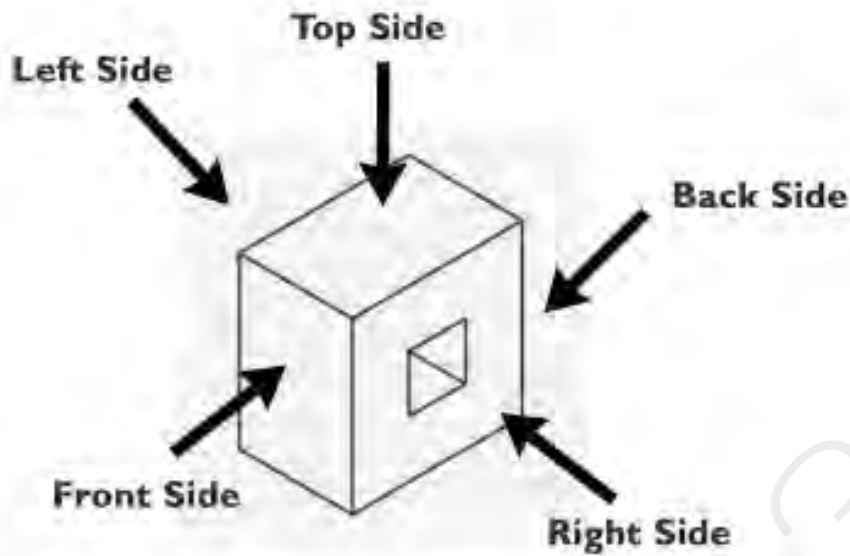
Here, we can see that the heights of the steps can be seen. Lines can be seen at top and bottom edge as these are the lines that are seen for the edges behind the steps.

Right and Left Side View:



Here we can see, as steps are not visible at the right and left sides, therefore only a rectangle can be seen defining the height and base of the 3-D figure from the side.

Isometric Projection-30/45 Degree - The definition of an isometric drawing is a drawing of a 3-D form on a 2-D plane along a vertical line with at least two identified points. All the horizontal lines of the image are created from this vertical line at the angle of 30 or 45 degrees. These angles are a crucial part in creating the three-dimensional, isometric view.



These views are 2-D faces determined when we see a 3-D form from its different faces. Here we can see, as a cuboid has 6 faces, it can be viewed in 6 directions namely; **top side** (view when the figure is seen directly from above), **bottom side** (view when the figure is seen directly from below), **front side** (view when the figure is seen directly from front face), **back side** (view when

the figure is seen directly from back face), **left side** (view when the figure is seen directly from left face) and **right side** (view when the figure is seen directly from right face) . Questions in the exams are generally asked to determine any or all views of a given figure.

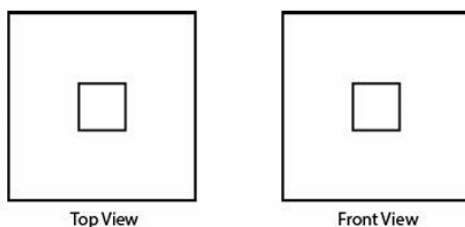
For example, in the figure given above, a cuboid is given with a square cut out through its center. As the figure given is a cuboid, its top and bottom view can be seen as rectangles. Similarly, as the cut-out is through the center and cannot be seen on other faces, its front and back views will also appear as rectangles as shown in the figure above. Now, when the figure is seen from the right face, we can easily see the square cut out, and therefore, the right view will appear to us as a larger square with a small square in the middle. Similarly for the left face, which is similar to the right face, the left view will also similar to right view appear as a large square with a smaller square in the middle.

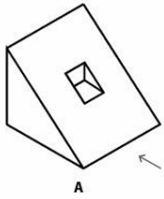
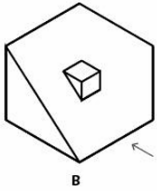
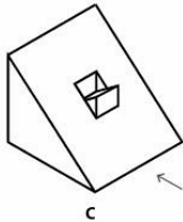
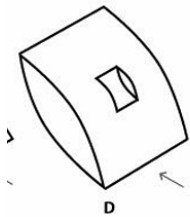
Difference between a isometric projection and orthographic projection drawing

Since both the drawings are used to represent a 3-D object into 2-D shapes, it can be confusing to differentiate between the two technical drawings. The major difference between the two drawings is they are shown, with orthogonal projection is represented by perpendicular to one straight surface on which results in showing it in two surfaces and actual sizes whereas in an isometric projection, 3-D figure is seemed to be shown as by looking through one corner of the object and therefore the figure appears smaller to the viewer from its actual size.

Previous Years Question asked from Projection Based Orthographic Projection and Isometric Projection

Ques: Which of the object(s) given in the options can produce the top and front view as shown in the figure? The arrow shows the direction of the front view.



Option A:**Option B:****Option C:****Option D:****Solution:**

Option A: The front view and top view are correct.

Option B: The front view and top view are correct.

Option C: The front view and top view are correct.

Option D: As the image has a curved surface but when it is viewed from the top and front it appears a square.

Hence, all options are correct.

The trick here is to notice that in the question object(s) is mentioned instead of just object so more than 1 option could be correct.

Ques: An artwork on a paper creates an illusion of a ladder resting on a wall when the paper is folded and viewed from a specific angle as shown in the image. Which of the options correctly depicts this artwork on the paper when unfolded?



Option A:



A

Option B:



B

Option C:



C

Option D:



D

Solution:



Fig 1

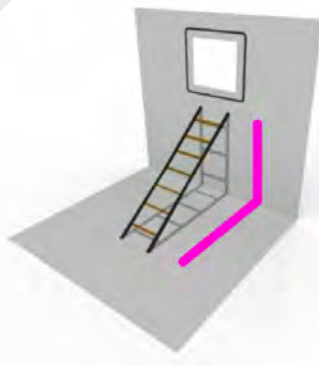


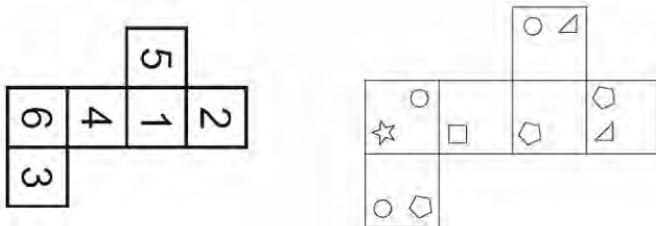
Fig 2

Looking at the middle, the ladder looks straight from the angle (figure 1) but in reality it is bent (figure 2) and the bend seen in the shadow will actually be straight in order for the illusion to occur. So now check each option.

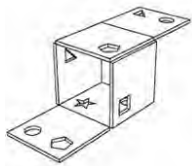
Option A and D are eliminated because in both the option shadow and ladder both are bent.

Now option B is also eliminated as bars of ladder are close to each other so it can't be distorted . Hence, option C is correct.

Ques: The image below shows the developed surface of a cube. Which of the options will NOT open up as the shown image?

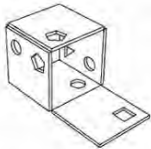


Option A:



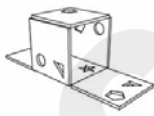
A

Option B:



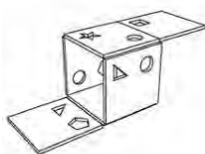
B

Option C:



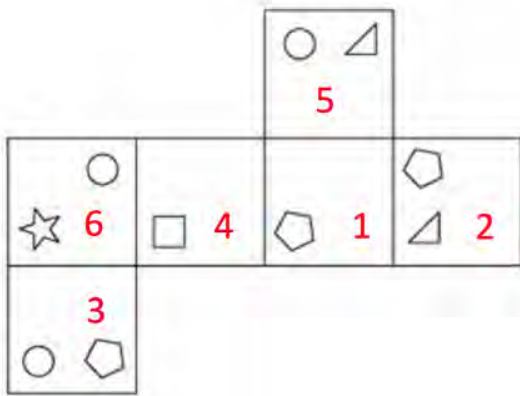
C

Option D:



D

Solution:

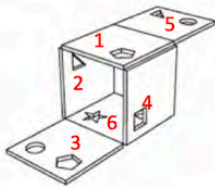


Name the cubes (as shown above)

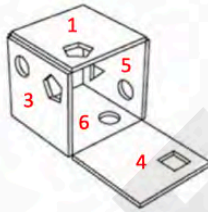
5 is adjacent to 3

6 is adjacent to 1

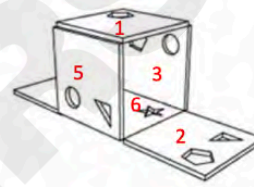
4 is adjacent to 2



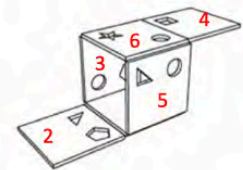
A



B



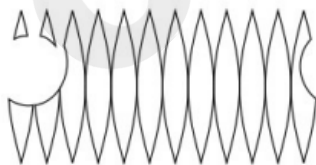
C



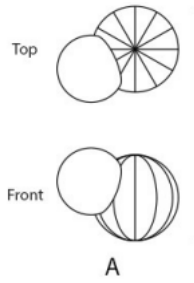
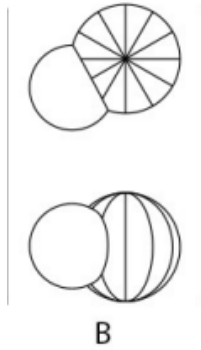
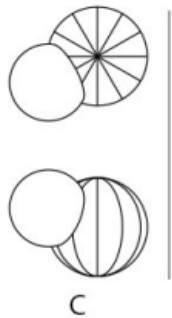
D

Option B is not possible, as the cube with No. 5 has an incorrect orientation of triangle. Hence, option C is the answer.

Ques: Given on the left is the unwrapped surface of a hollow sphere that was intersected by a smaller solid sphere. Which of the options would result in this unwrapped surface?



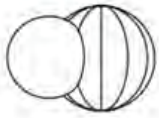
Option A:

**Option B:****Option C:****Option D:****Solution:**

A hollow sphere is a sphere that has been thinned out, has space and a cavity inside, and is not solid.

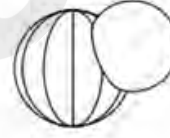
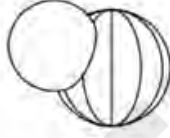
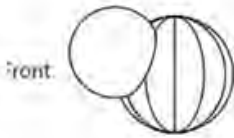
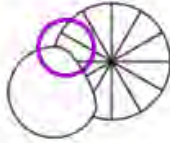
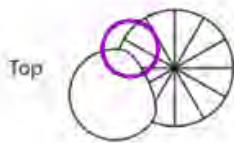
Now use the elimination method.

Option B:



B

A straight line (as highlighted) makes this option wrong because the top view is straight, but the front view does not.



A

C

D

The position in option C (as highlighted) is wrong, as the distance is greater in C. Therefore, A and D are the correct answers.

Informative Drawings

More weightage to sketching and design skills is given for design competitive exams as the approach changed from analyzing students on mostly logical, non-verbal and calculative skills. Therefore, it is now important for aspiring students to start preparing for their sketching and drawing skills. Sketching skills-related questions are largely divided into two parts Technical Drawings and Non-Technical Drawings, where technical drawings are made when a specific solution is needed to be shown visually. These drawings are generally made by following a set of rules and regulations. Specific tools (scale, compass, graph, etc.) are needed to create these drawings. Under the large umbrella of technical drawing, Informative drawing questions are asked. Informative drawings are structured drawings that are used to show particular details and information visually. They are generally used more when it is needed to make a larger audience understand a concept with help of the drawings.

Informative Drawings

Informative drawings are detailed technical drawings that are used to show/represent part of the complete component in more detail visually for a larger audience to understand better than just keeping it to the technical audience. These drawings are made with the help of tools like scale, protractor, mathematical compass, etc. These are detailed drawings that are used to show measurements, shapes and other important details where needed for a section of the complete drawing. Question based on this topic generally asked from the following subtopics that are given below,

- **Section View- Cut view for internal information**

Section views in technical drawings are used when you want to see a detailed view of a particular section of a 3-D object into a 2-D shape. These section views can be made by looking at a 3-D object from one face or cutting one face and looking at the cross-section for internal information for the details of the form. Section views are used more generally in engineering drawings and architectural drawing to show details of measurements and height.

Let us understand with the help of an example;

3-D object:



Section Cut-View:



Here, we can see the section view as a table cut from the center, we can understand the height of the table and detail for material from which table is made of.

- **Exploded Views : showing Individual internal Parts**

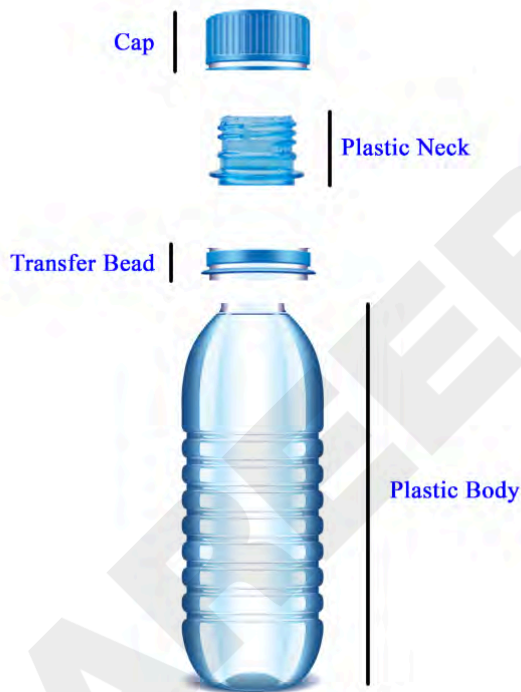
Exploded views are technical drawings where a 3-D object is exploded into individual parts and then details are made of the individual parts in 2-D drawings. These drawings are important where a complex object is needed to be broken into individual parts and details are needed to be shown.

Let us understand with the help of an example;

3-D object:



Exploded View:



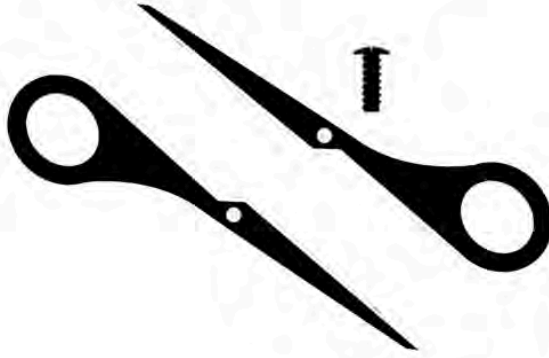
Here, we can see the details of the plastic bottle in the exploded view.

- **Assembly Drawings/Packaging**

Assembly drawings are opposites of exploded drawings, here individual parts are taken and then assembled together into one complex object. They are usually made by taking 2-D shapes and making 3-D form out of them.

Let us understand with the help of an example;

3-D object exploded view :



Assembly drawing:



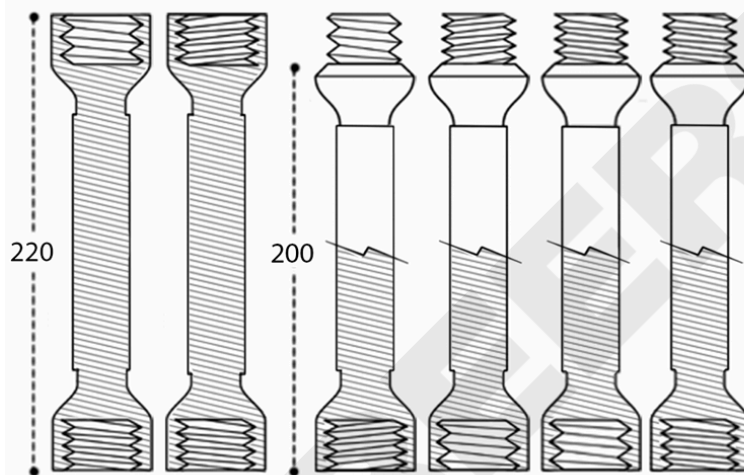
Tips for preparation for sketching skills for design competitive exams

Students can start with looking at previous year questions to understand the type of questions that are generally asked in design exams. One important thing for students to keep in mind is to sit with the question, understand it completely, and think for the best option for the solution. While preparing for the sketching section for the design exam, aspirants should focus on bettering their pencil strokes, shading techniques and scale and proportion of the elements in the sketch. If you fear that your drawing skills or sketches aren't good then that's okay as you can start practicing daily with a minimum of 1 sketch per day and evolve and enhance your skill with

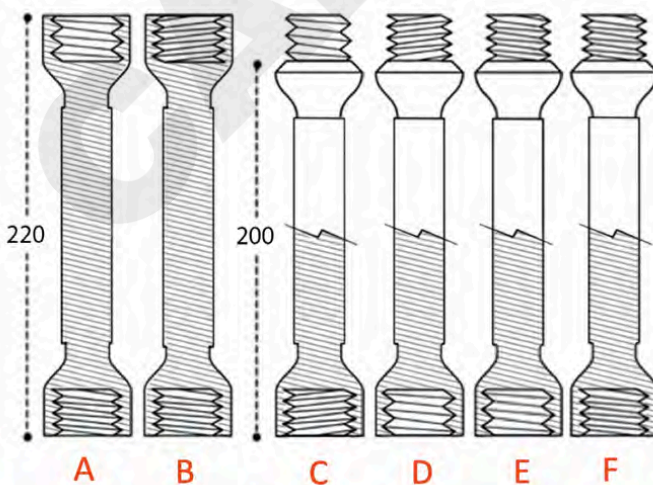
daily practice. Practicing daily will not only improve the quality of the drawing but also improve the time taken to make 1 sketch. Start with easy objects and have less details, with time you can start with more details and complex objects. Observation skills here are the key important technique to understand and develop here for aspiring students. More the students observe and make detailed sketches, the more they remember while sketching for solutions in the exams.

Previous Years Questions asked from Informative Drawings

Ques: The figure shows illustrations of six metal rods which have internal or external screw thread patterns at their ends. The shaded portion in the figure shows the cross-section view. What is the maximum length possible by connecting the rods? Threads cannot be connected partially.



Solution:

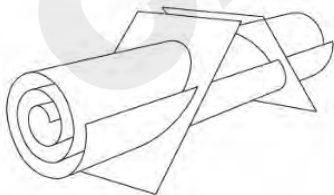


Let's Name all 6 Metal Rods as AB C D E and F if we observe the external or internal screw thread Pattern we obtain the maximum length possibly by connecting the rods

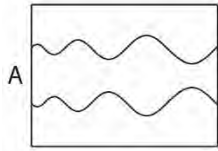


We can observe that the thread pitch of tools A, C, D and E on the side are different. They have 3 threads, while the other threads of the tools have 4 threads. So, all we need is to be careful while fixing them. One of the possible sequences can be D-B-E-C-F which adds up to $200+220+200+200+200=1020$
So the answer is 1020

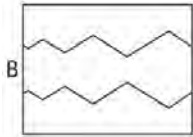
Ques: A paper strip is rolled and then cut with two planes at 45 degrees as shown below. The middle part of the cut paper is unrolled. Which of the options represents this part?



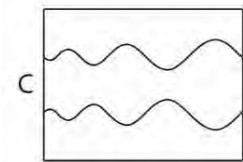
Option A:



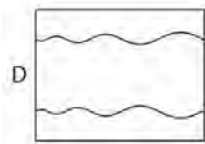
Option B:



Option C:



Option D:

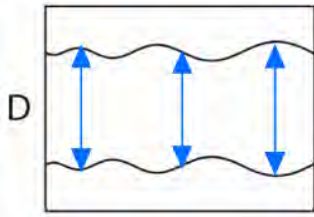


Solution:

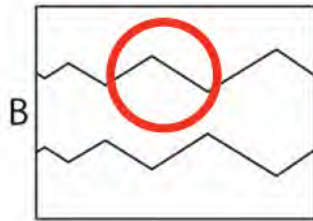


We know that whenever paper is rolled it is rolled tightly together, and when we cut that they will be in zigzag and at equal distance. Now when we see the image given above, we can notice the internal roll is small (that circle is small) whereas the outer rolled part has a bigger circle formed.

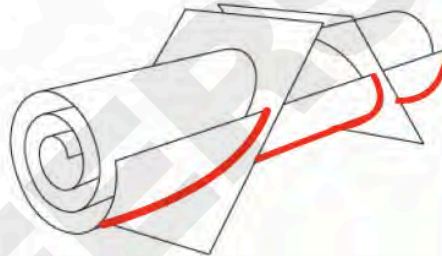
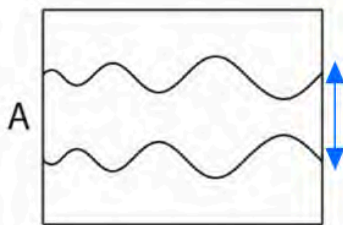
Option D: Eliminated as small and big circles can't form the same image at equidistant.



Option B: Eliminated as circle formed when cut can't make triangular zigzag



Option A:

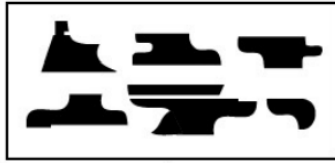


We can see on the right side image that the distance is increasing, but this option is not showing appropriately. Hence, A is wrong. Therefore, option C is correct.

Ques: Which collection when arranged correctly will result in the silhouette of the pen shown below?



Option A:



A

Option B:



B

Option C:



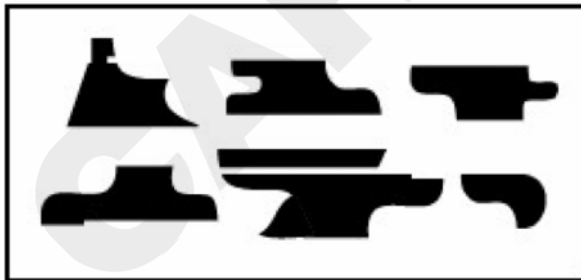
C

Option D:



D

Solution:

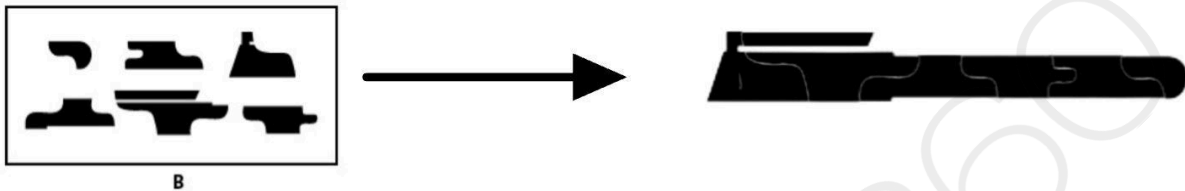


A

When the parts are rearranged, we get an image as shown below.

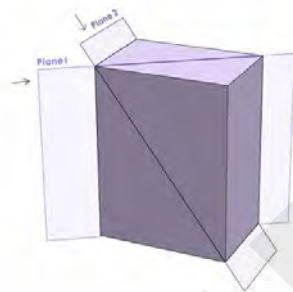


This does not resemble the original pen figure. Hence, option A is wrong.



This figure of pen resembles the original pen figure. Therefore, option B is correct.

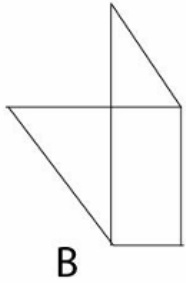
Ques: The rectilinear hollow box shown on the left is cut along plane 1 and plane 2. Which of the option(s) shows (s) the correct unfolded pieces?



Option A:



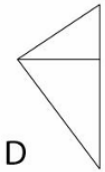
Option B



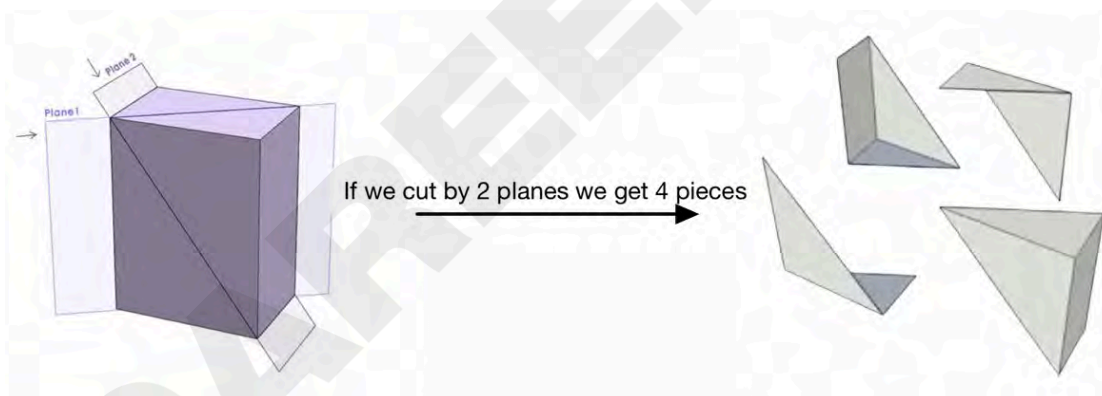
Option C:



Option D:



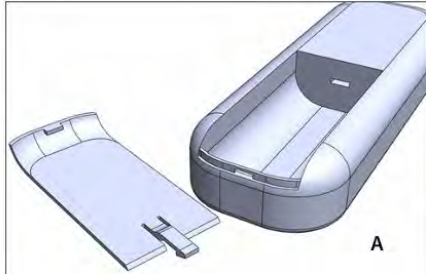
Solution:



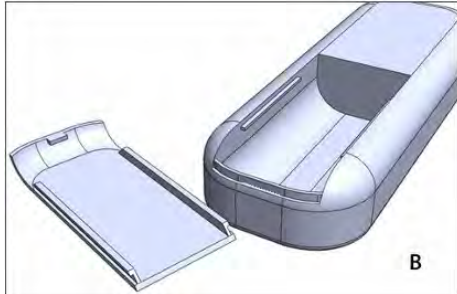
We can see the 2 right angles at the corner in all the pieces. Now go through each option. We can see options B and D are correct.

Ques: The options show designs for a remote control and its battery cover. Which design will be feasible?

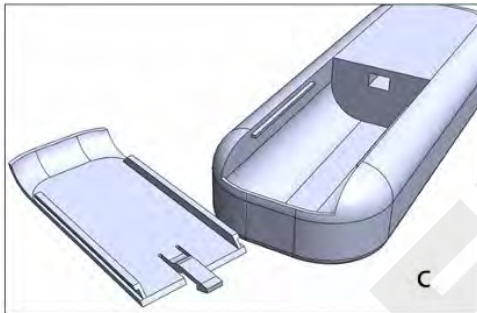
Option A:



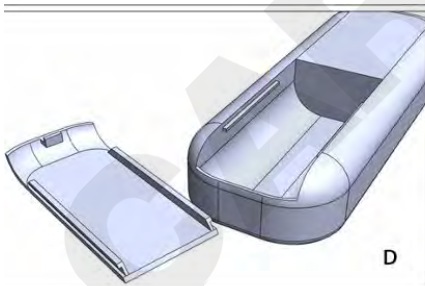
Option B:



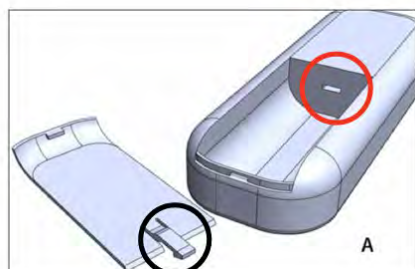
Option C:



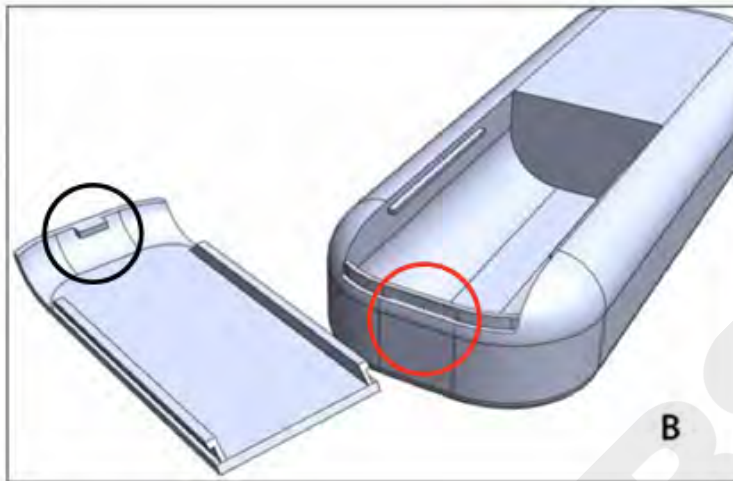
Option D:



Solution:



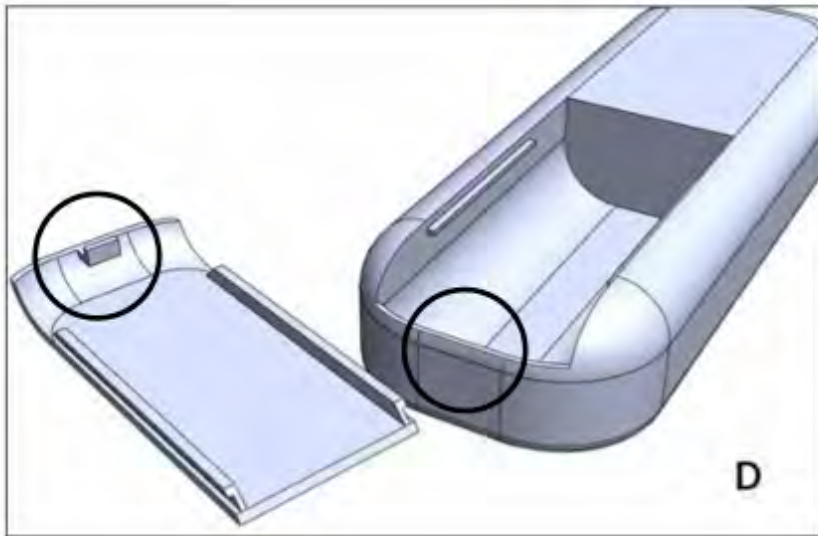
If we see this catch (black) which has to be locked (Red) this hole should be a little higher and broader but in the real image, it is not there. Hence, this is wrong.



If we see there is no slot made for this (Black) latch, so again this is incorrect.



Here the latch and hole are correctly placed. Hence, this option is correct.



If we see there is no slot made for this (block) latch, so again this is incorrect.

Geometric Shapes and Fundamentals of Geometry

Geometry:

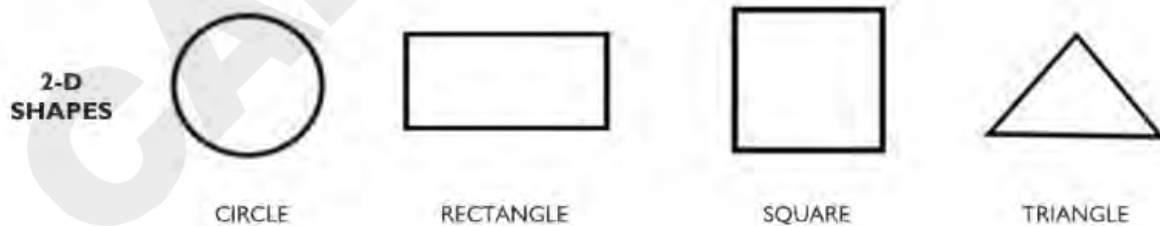
As taken from ancient Greek (geōmetría), (ge) means land or earth, (metron) which means a measure of something. Geometry is a branch of mathematics that deals with the measurement properties such as distance, shape, size and angle.

Geometric Shapes:

Any figure with a closed boundary and which is made by any line segment, curves or points of definite amount.

2-D Geometric Shapes:

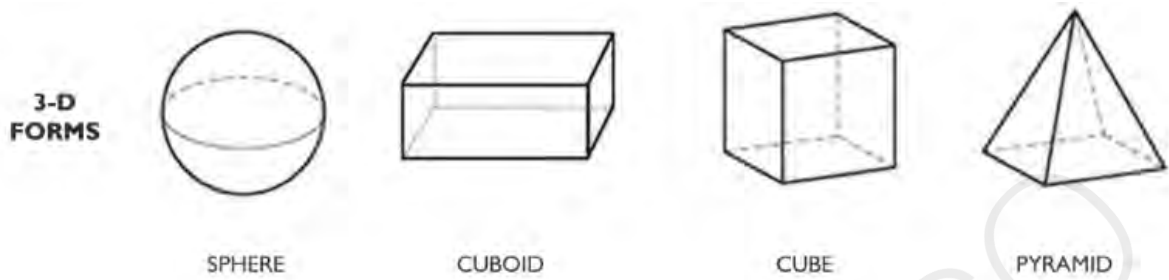
All the shapes exist in a flat plane in plane geometry. You can understand a plane as a flat sheet with no thickness and which can go in both directions infinitely. Any shape on the plane is called a plane figure. Popular examples of geometric shapes are square, rectangle, triangle and circle. Geometric shapes have sides, corners and angles except in the case of a circle which does not have any straight line. These plane figures are called 2-D shapes. A basic geometric shape is 3 or more line segments joined together. When equal line segments are joined at equal angles, they are called regular shapes. In a circle, the curve is created by joining points rather than joining line segments. When line segments of different lengths are joined at unequal angles, then they are referred to as irregular shapes. Curvy shapes that are not a circle (irregular) are created by free hand and are free flowing.



3-D Geometric Shapes:

When these 2-D shapes are given height and they start to occupy space, they are called solid figures. These shapes have faces, edges, and vertices. These figures are called 3-D shapes. 3-D shapes originate from plane figures when they are given height, similarly shown below are basic

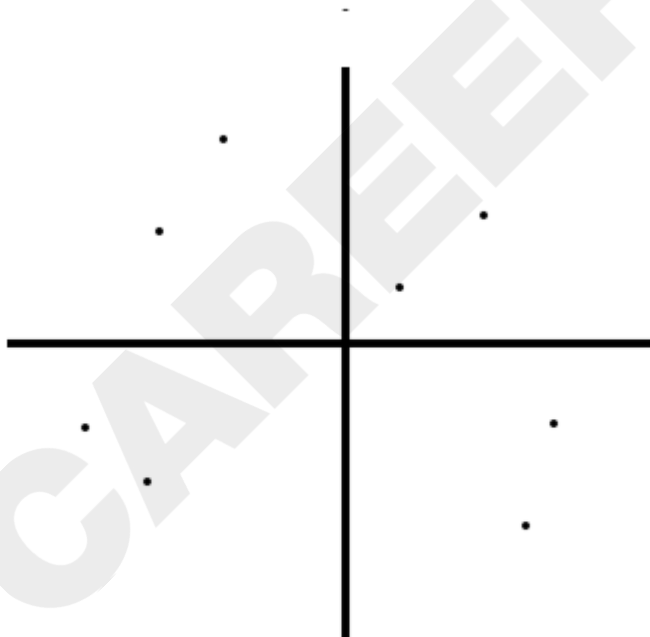
2-D shapes that generate their 3-D forms; namely: Circle- Sphere, Rectangle- Cuboid, Square- Cube, Triangle- Pyramid.



Fundamentals of Geometry :

1. Points:

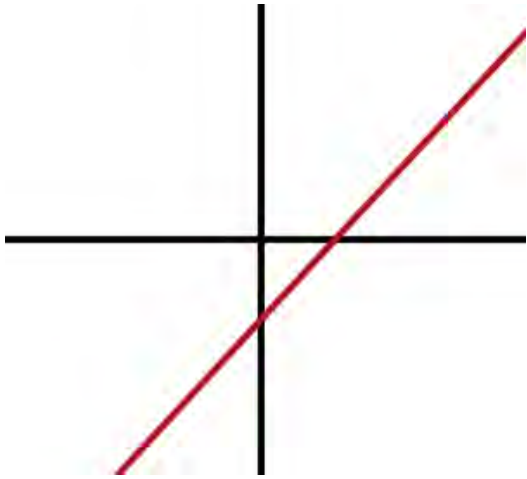
A point is an exact location in a plane which does not have any dimensions or occupy any space. To understand better, imagine a dot in a space.



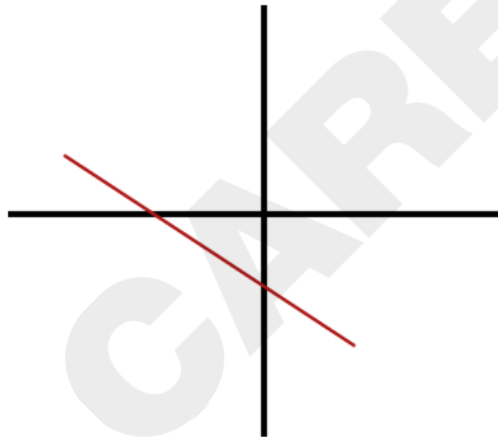
2. Lines and Line segments:

A line is a one-dimensional, straight shape that has only length and no breadth. A line goes in both directions indefinitely. Whereas, a line segment similar to line is also one-dimensional and has only length and no breadth but its length is definite.

Line:

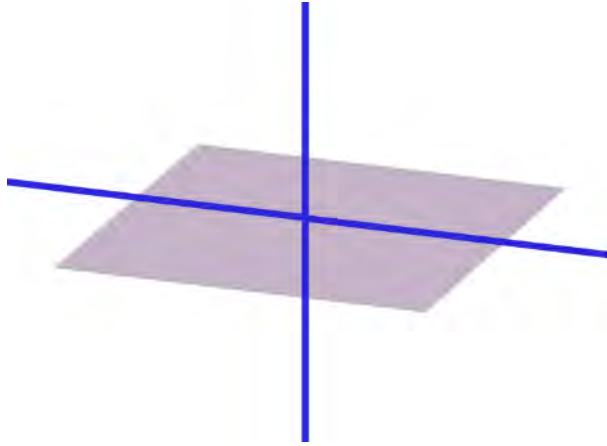


Line Segment:



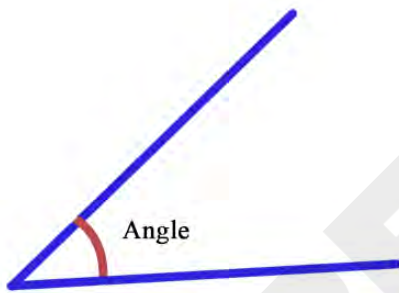
3. Plane:

You can understand a plane as a flat sheet with no thickness and which can go in both directions indefinitely. A plane similar to a line goes in both directions indefinitely but instead of a line it is a 2-dimensional surface.



4. Angles:

You can understand an angle as the rotational distance between two line segments. The common point where the 2 line segments meet is called a vertex.



Significance of geometric shapes and fundamentals of Geometry for preparation of UCEED 2026

Knowledge and understanding of geometric shapes and fundamental concepts of geometry is important for aspiring students for the UCEED Exam as a lot of pictorial and diagrammatic questions are asked in the exam. Questions are generally based on geometric solutions for visualization of geometric figures, pattern recognition or to find mathematical solutions like area or volume depending on the instructions given in the question.

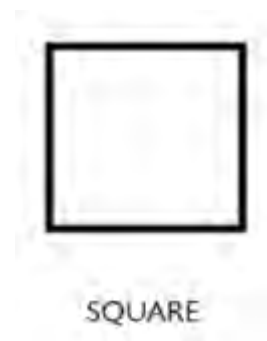
Area: Area is a measurement of a 2-dimensional region or a shape.

Volume: Volume is a measurement of a 3-dimensional region or space.

Different mathematical formulas are set and given for different 2-D and 3-D geometric shapes and figures.

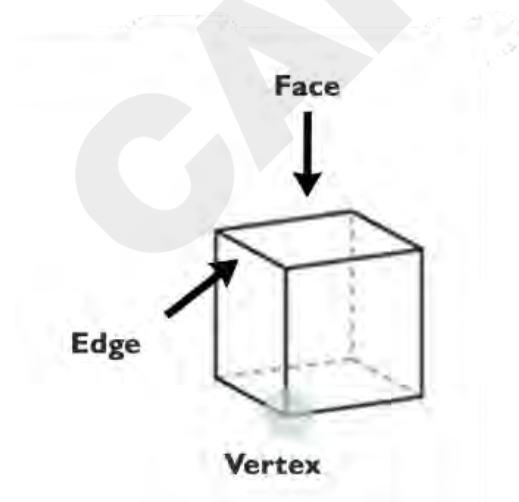
For example, let's take the most basic shape- a square;

A square is a 2-dimensional figure with a definite length and a definite breadth. It has 4 sides with opposite sides being parallel and all the sides being of the same size. All the vertices of a square are at 90 degrees angle.



Area for square is the measurement of the space enclosed by the square. Therefore; **area: length multiplied by its breadth.**

A cube is a 3-D form of the 2-D shape square when given height. All faces and sides of a cube are equal. The edges are equal. There are 6 faces, 12 edges, and 8 vertices in a cube.

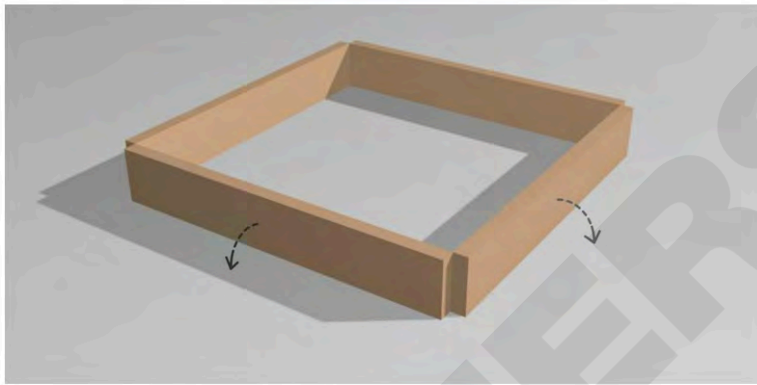


Volume for a cube is the measurement of the 3-dimensional space enclosed by the cube.

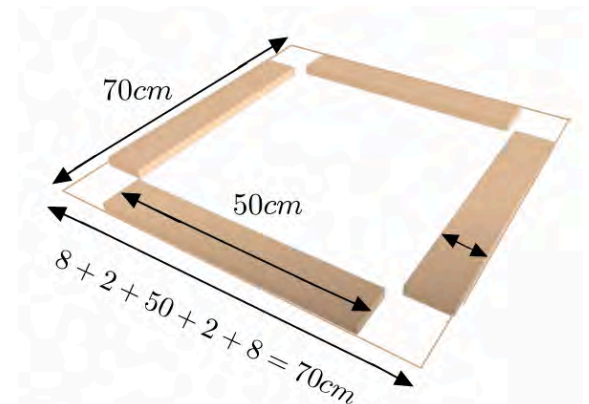
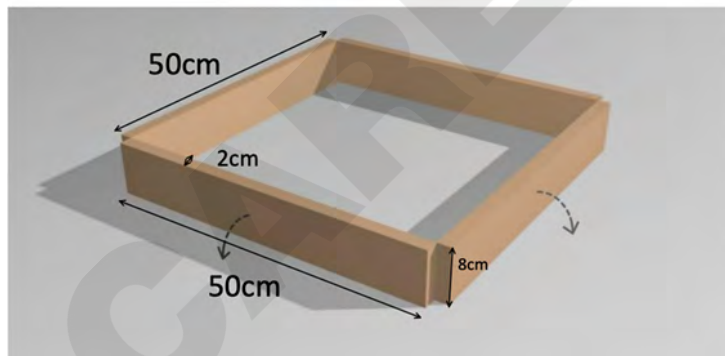
Therefore; **volume: length multiplied by its breadth and then multiplied by its height.**

Previous Years Question asked from Geometric Shapes and Fundamentals of Geometry in the UCEED Exam

Ques: Four identical pieces of wood of length 50 cm x 8 cm x 2 cm are arranged as shown in the figure. Another larger square is generated by rotating all the wooden panels along the outer edges and extending the outermost edges till they touch each other. What is the area of this larger square thus constructed?



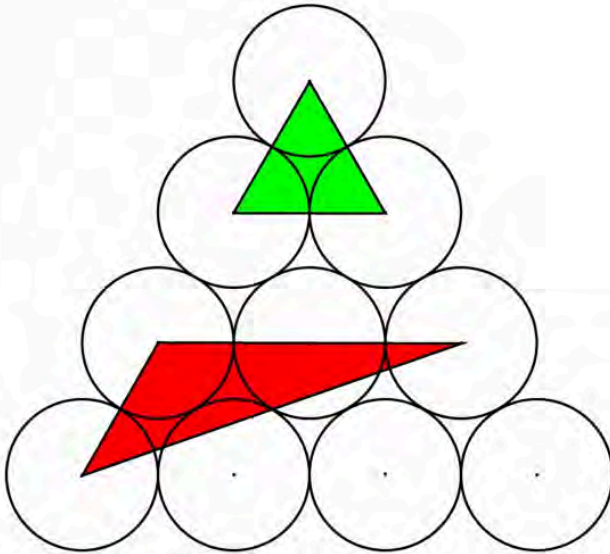
Solution:



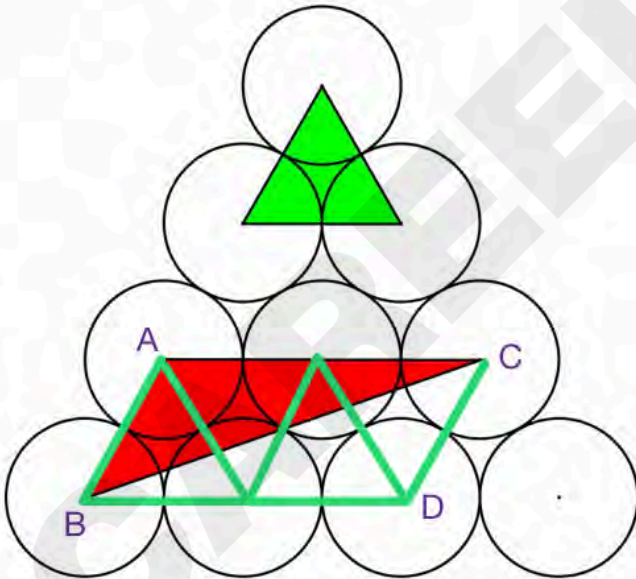
As it is a square so side = 70 cm

$$\begin{aligned} \text{Area of square} &= \text{side}^2 \\ &= 70^2 \\ &= 4900 \text{ sq cm} \end{aligned}$$

Ques: The corners of the green and red triangles coincide with the centers of the circles. All the circles have equal diameters, and adjacent circles touch each other. If the area of the green triangle is 3.14, what is the area of the red triangle?



Solution:



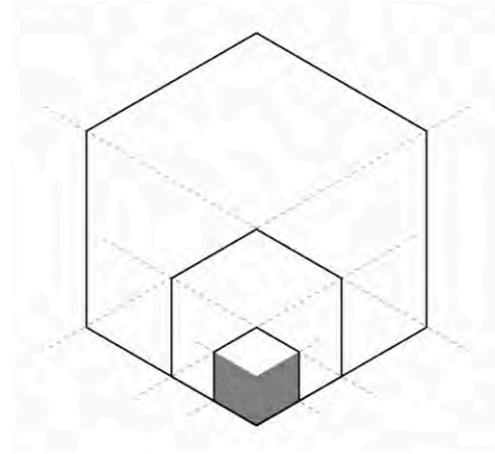
Area of green triangle = 3.14

Area of parallelogram (ABCD) = Area of 4 green triangle
 $= 4 \times 3.14$

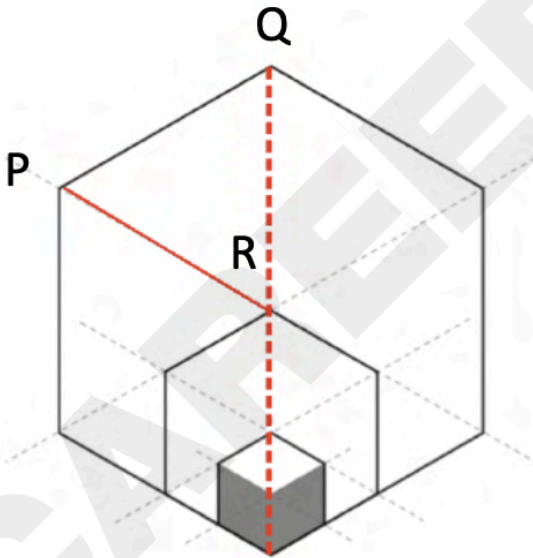
Area of red triangle $= \frac{1}{2} \times \text{Area of parallelogram}$
 $= \frac{1}{2} \times 4 \times 3.14$
 $= 2 \times 3.14$

$$= 6.28$$

Ques: In the figure given below, the area of the largest regular hexagon is 720 units. What is the area of the shaded portion?

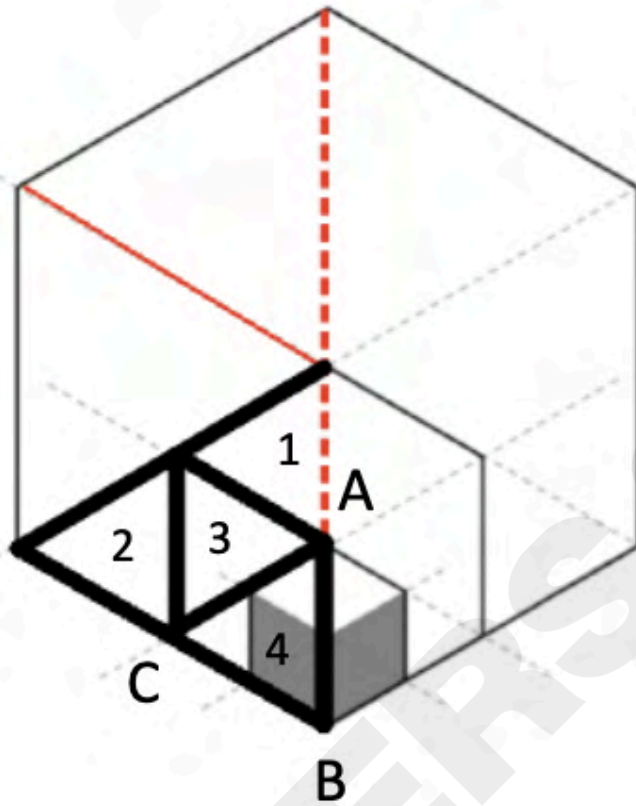


Solution: The area of the largest regular hexagon is 720 units.
We just need to find a relation between the shaded portion and the largest regular polygon.



So this triangle PQR is $\frac{1}{6}th$ part of the largest hexagon.

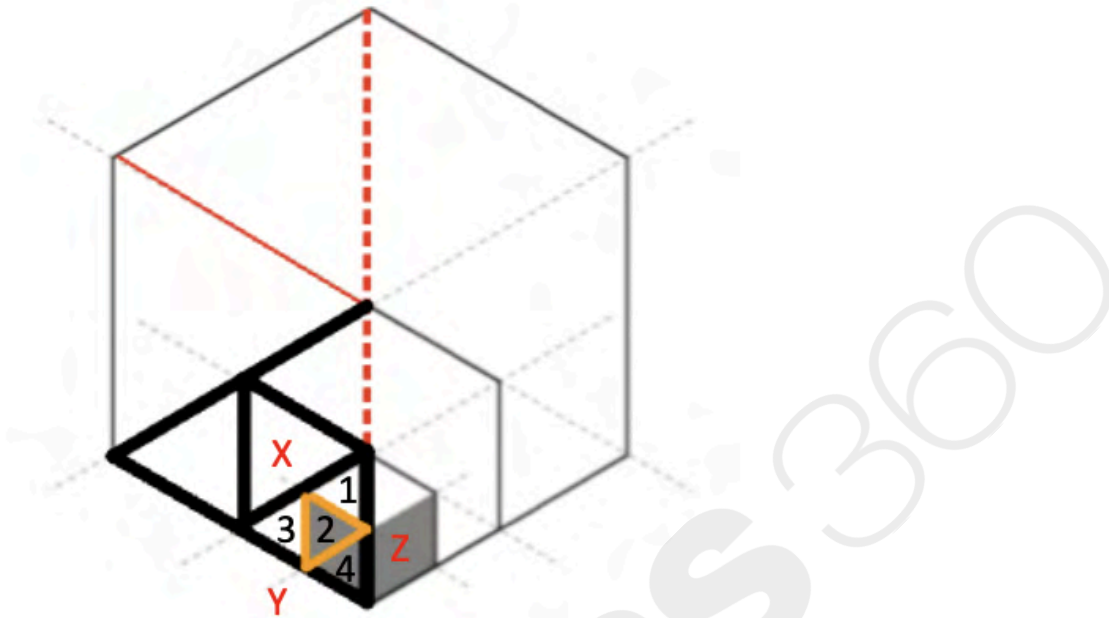
$$\therefore \text{Area of } \Delta PQR = \frac{1}{6} \times 720 = 120 \text{ units}$$



Then we again divide the triangle into smaller units, we can say that there are 4 such triangles.

$$\therefore \text{Area of } \triangle ABC = \frac{1}{4} \text{Area of } \triangle PQR$$

$$\begin{aligned} \text{Area of } \triangle ABC &= \frac{1}{4} \times 120 \\ &= 30 \text{ unit} \end{aligned}$$



Then we again divide the triangle ABC into smaller units, we can say that there are 4 such triangles.

$$\therefore \text{Area of } \Delta XYZ = \frac{1}{4} \text{Area of } \Delta ABC$$

$$\begin{aligned} \text{Area of } \Delta XYZ &= \frac{1}{4} \times 30 \\ &= 7.5 \text{ unit} \end{aligned}$$

So in the shaded area, we have 4 such triangles

$$\text{So shaded area} = 4 \times 7.5 = 30 \text{ units.}$$

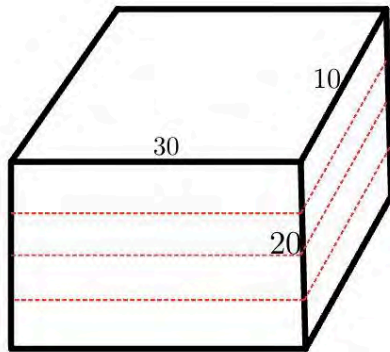
Ques: A wooden block of dimension 10cm x 20cm x 30cm is cut into equal-sized planks. The cut planks are stacked one above the other to achieve a total height of 100cm exactly. If the minimum number of planks are cut to achieve this height, then what is the volume of each plank in cm³?

Solution:

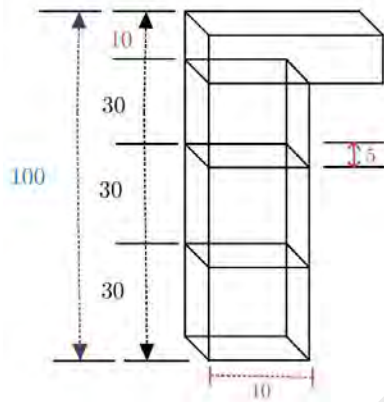
Given,

Wooden block dimension = 10cm × 20cm × 30cm

Total height = 100 cm

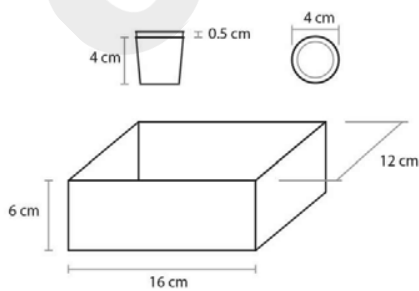


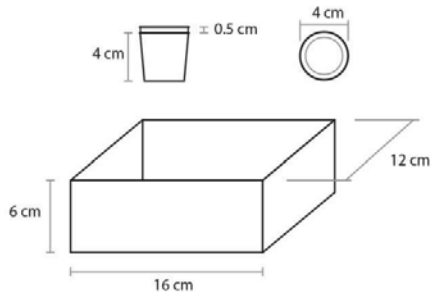
So cut it alongside having 20 cm dimension (as shown above with a red dotted line) to get a minimum no. of planks of equal size, now put them (cutouts) one on another. So we will image something like shown below.



$$\begin{aligned} \text{Now the volume of each plank} &= L \times B \times H \\ &= 10 \times 5 \times 30 \\ &= 1500 \text{ cm}^3 \end{aligned}$$

Ques: Shown below are two stacked paper cups and a box with their dimensions. If stacking is allowed, then what is the maximum number of cups that can be stored in the box without deforming the cups?



Solution:

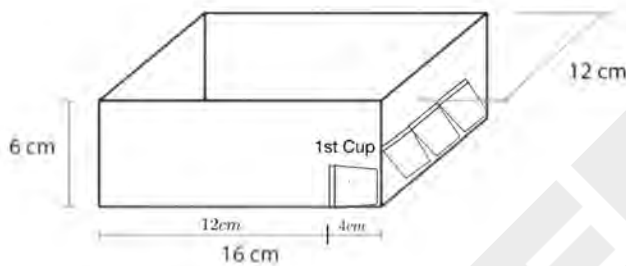
There are 3 possibilities to placing cup of 4 cm

i) along 4cm

ii) along 6cm

iii) along 16 cm

Put along 16 cm (as shown below)



We can see 1 cup has been placed now the left space=12 cm (16 cm-4cm)

Now 0.5 cm space is required for stacking

$$\frac{12}{0.5} = 24 \text{ cup}$$

Total=24+1=25 cup in 1 row

We have 3 rows

Total no of cups= $25 \times 3 = 75 \text{ cups}$

Human Anatomy/ Figure Drawing:

Understanding of Human Anatomy

Drawing of human anatomy or human figure drawing is sketching human figures in different proportions and postures. It is about understanding human forms and gestures through detailed sketching. Human anatomy/Figure drawing comes under the topic of non-technical sketching. Non-technical drawings are free-flowing sketches that are made when a solution for any design problem is expressed visually. They, unlike technical drawings, don't have a specific set of rules for them. They don't have one specific meaning like technical drawings and can be interpreted by how their viewers see them. Non-technical drawings or sketches are a form of expression. Example: sketching for interior, fashion, travel, storytelling etc. There are some rules and guidelines present for better understanding of the proportions and sizes for different human body parts but these are not strict rules and only there for better understanding. Students can with practice master the idea of how and what proportions they can make in human anatomy.

Significance of Human Anatomy/Figure Drawing

As the approach for the design exams for analyzing students changed from mostly being logical, non-verbal and calculative skills to now giving more weightage to sketching and design skills, it has become crucial for students to start preparing for their sketching and drawing skills as soon as possible. Since a lot of questions are based on perspective drawing, storytelling and situation based questions which involve solutions with human figures in them and hence it is important to understand and practice human anatomy to make accurate drawings.

Understanding of Human Anatomy

Human Anatomy is the study of understanding in details of the human body, its structure, bones, muscles, joints and postures. Artists and designers study human anatomy to make more proportionate and better detailed human figures and postures. Human anatomy is important when we need to make human figures at different angles and frames and standing at different distances when drawing to show a design frame.



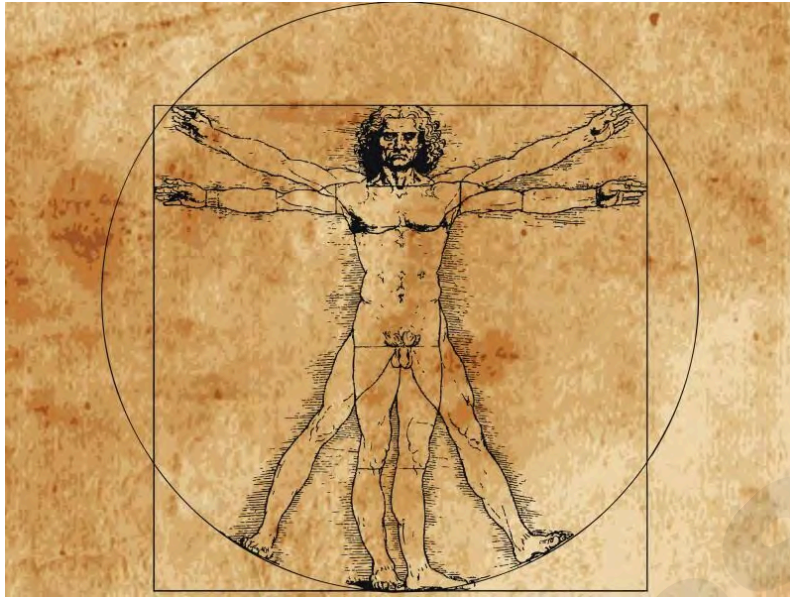
Steps to learn human Anatomy

1. Start with simple figures such as stick figures, simple lines and circles and then move to give them structure and muscles.
2. Best way is to work with one figure and its different postures without going into gender specific details like hair, facial features etc.
3. Once you have a hang on postures and proportions, you can start with more than one figure in one frame at different distances and see how their sizes change as their point of view is changed.
4. Next step is to start understanding and making details. Start with making details of small segments like hand, face, legs etc.
5. When these steps are mastered, gender specific details like hips and breasts for women, muscles and abs for men can be practiced.
6. Best way to master figure drawing is to make a detailed sketch for live frames and then go with imagination as it will help you with developing the skill with better accuracy.

Examples for live figure drawing:



Leonardo da Vinci's Vitruvian Man represents the "perfect man," based on the ancient knowledge of ratios and proportions present in human anatomy.



Tips to prepare for Design Competitive Exams

- If you fear that your drawing skills or sketches aren't good then that's okay as you can start practicing daily with a minimum of 1 sketch per day and evolve and enhance your skill with daily practice. Practicing daily will not only improve the quality of the drawing but also improve the time taken to make 1 sketch.
- Students can prepare for human anatomy by sketching their own different postures of hands, legs, any posture that is visible to them. Practice for human anatomy is important as human figures are needed to be sketched in the sketching skills part of the design competitive exams.
- Students can start with looking at previous year questions to understand the type of questions that are generally asked in design competitive exams.
- Start with situation based questions for drawing, Poster making, storyboards, and perspective drawings.
- Students should be smart about the questions and create designs with only human figures and their postures when and if they offer the best solution for the given questions.
- One important thing for students to keep in mind is to sit with the question, understand it completely, think for the best solution and then start with creating the solution and finally create the sketch.

Previous Years Question asked from Human Anatomy/Figure Drawing

Ques: Sketching (30 minutes – 60 marks)

Nandu is giving a dance exam in online mode in front of a laptop kept on a table. His mother is prompting from behind. While the exam is going on, his pet cat Poco is running around tumbling over a glass of water, a plate of biscuits and a few books. No one can stop Poco and the exam must go on. Visualize and draw the whole situation as if you are sitting on the floor witnessing the scene.

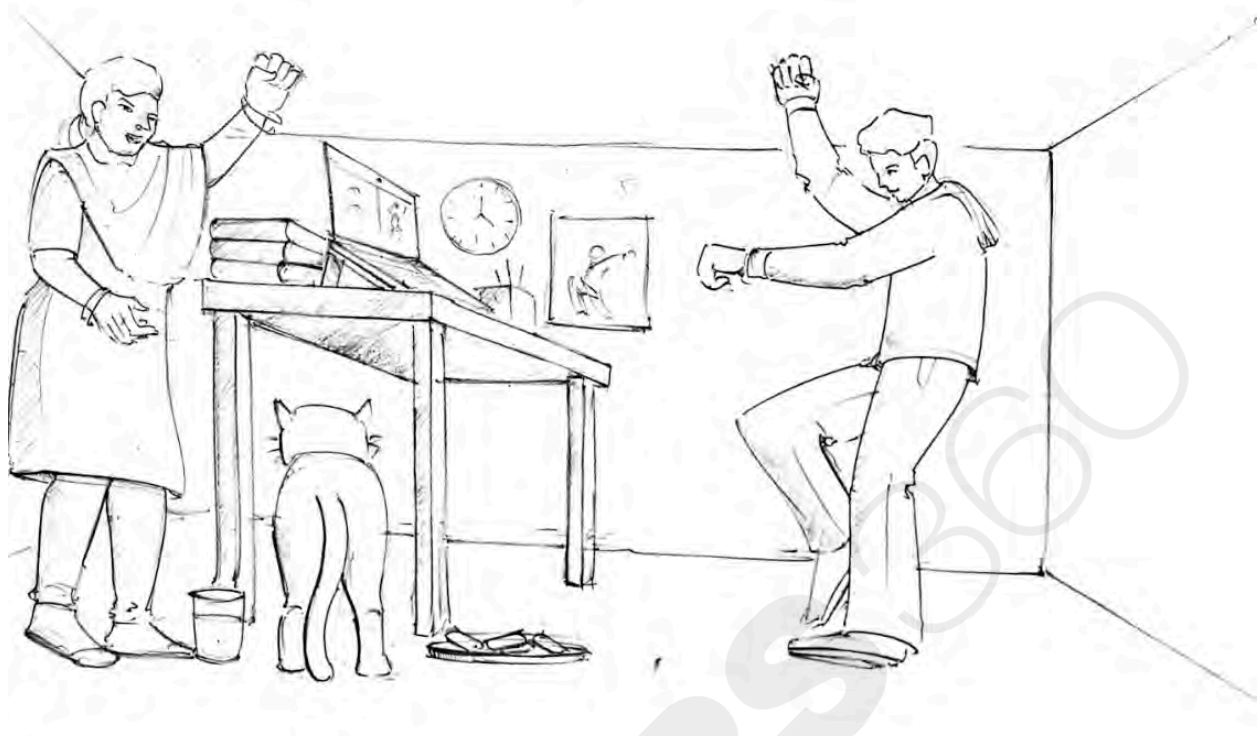
Note:

- Make pencil sketches only
- Do not use colors

Evaluation Criteria:

- Observation
- Imagination
- Selection & composition of objects
- Quality of lines
- Presentation
- Attention to details

Solution:



Ques: Read and visualize the following:

- A rat is spotted inside a school canteen.
- A school boy is afraid and standing on a stool/chair.
- A brave school girl is chasing the rat out of the canteen.
- A tiffin box is falling on the floor.
- Two school bags and two water bottles are kept on a table.
- A few plates are broken and lying on the floor.
- The canteen owner is watching this in shock, standing on top of the counter table. Sketch this scene from the canteen owner's point of view.

Note:

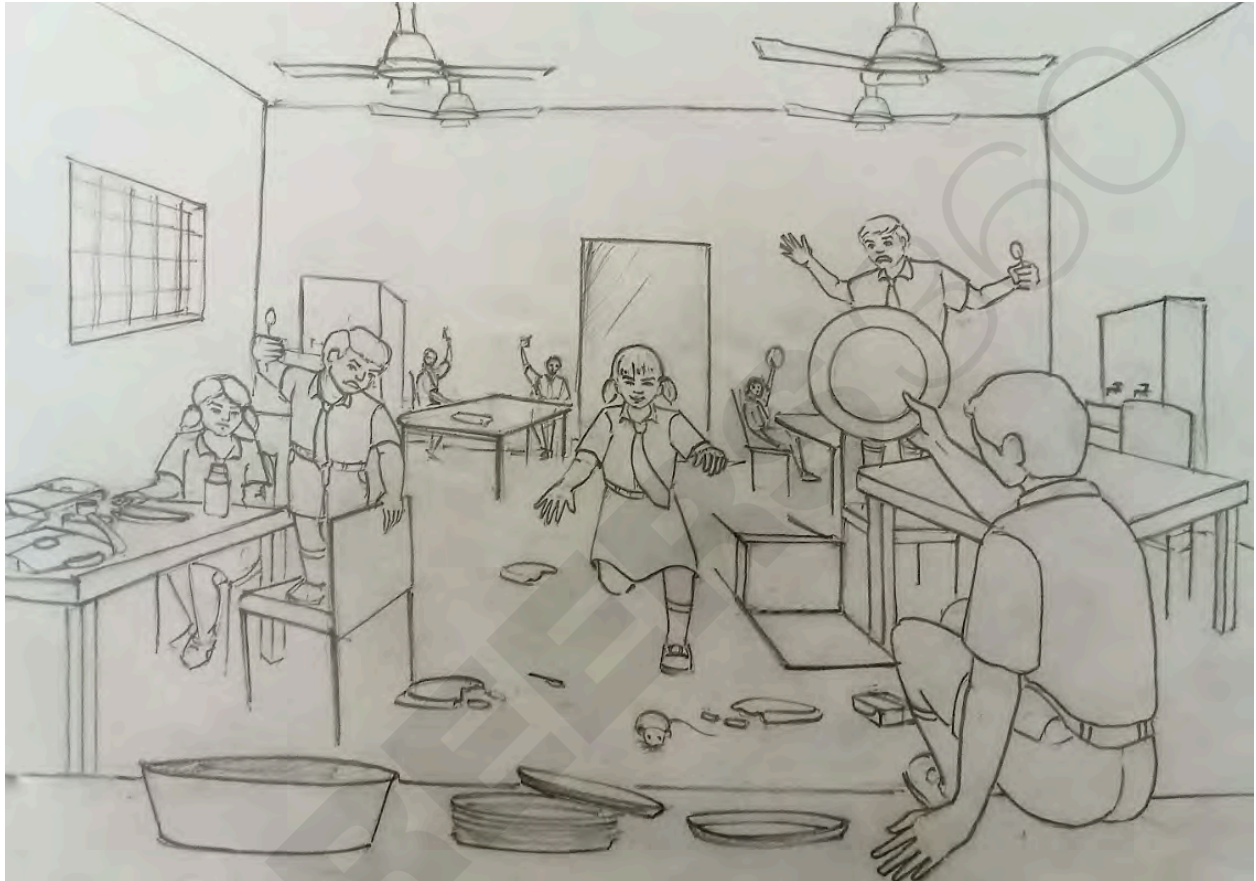
- Make a pencil sketch only
- Do not use colors

Evaluation Criteria:

- Perspective
- Proportion
- Composition

- Observation
- Imagination
- Quality of sketch
- Attention to detail

Solution:



Ques: Drawing [50 Marks]

On a Sunday morning, 5-year-old Geet, her grandmother and father are cleaning their old garage. It is a big garage with large open windows near the ceiling. It has an old bicycle, a football and other objects. The father is cleaning the cobwebs. The grandmother, while cleaning, finds her old guitar which she used to play during her college days. She gets excited and starts playing it as Geet starts dancing around. The garage also has a lot of old memories of Geet's sporty grandmother and her studious father. Geet's school friend stands at the door of the garage watching this whole scene. Draw this scenario from the friend's point of view.

Note:

Use only pencil

Do not use colors

Evaluation Criteria:

Perspective
Proportion
Composition
Observation
Imagination
Quality of sketch
Attention to detail

Solution:

Freehand Sketching for Products/Volumes

(For Geometric or Non-Geometric Volumes)

Sketching skills-related questions that are included in syllabus for design competitive exams and most probable topics to be asked in the exam are largely divided into two parts Technical Drawing and Non-Technical Drawing. Freehand Sketching for products/volumes come under the larger umbrella of Non-Technical Drawing. Non-technical drawings are free-flowing sketches that are made when a solution for any design problem needs to be expressed visually. They, unlike technical drawings, don't have a specific set of rules for them. They don't have one specific meaning like technical drawings and can be interpreted by how their viewers see them. Freehand sketching for products and volumes are drawings that are made without the use of any tools (like scale, ruler, compass etc). Freehand is basically using just your hand and pencil as the tool and creating your idea on the paper. Freehand sketching is also based on ability and observation skills for imagination as no live model is used to make them.

Significance of Sketching Skills for UCEED Preparation

It is important to prepare for freehand sketching for design competitive exams as there are a lot of questions that specifically define that use of tools are restricted, and since these exams are supervised, it is important to remember to follow these rules. For further preparation, students need to start practicing on their line strokes as soon as possible as it is only through practice that they can get better visually appealing sketches for product ideas that can be conveyed easily. As the approach for the design competitive exams for analyzing students changed from mostly being logical, non-verbal and calculative skills to now giving more weightage to sketching and design skills, it has become crucial for students to start preparing for their sketching and drawing skills as soon as possible. If you fear that your drawing skills or sketches aren't good then that's okay as you can start practicing daily with a minimum of 1 sketch per day and evolve and enhance your skill with daily practice. Practicing daily will not only improve the quality of the drawing but also improve the time taken to make 1 sketch.

Things to consider while preparing for Freehand Sketching

Students can start with looking at previous year questions to understand the type of questions that are generally asked in the design competitive exams. Students should be smart about the questions and create designs which offer the best solution for the given questions. One important

thing for students to keep in mind is to sit with the question, understand it completely, think for the best solution and then start with creating the solution and finally create the sketch. While preparing for the sketching section for exams, aspirants should focus on bettering their pencil strokes, shading techniques and scale and proportion of the elements in the sketch. Start practicing with easy objects first and then go for more complex objects so you have less difficulty in sketching the later. It is advised to first start sketching with live objects or inspiration to improve observation skills that will help in exams where students have to create sketches from their imagination.

Freehand Sketching

Freehand Sketching in the most simple sense can be explained as sketching without depending or using any tools or instruments like ruler, drawing compass, protractor etc. and only sketching by hand. Freehand sketching is based only on the observation skill of the artist and presence of live model or any inspiration is not there.

It might be difficult in the start to directly make sketches through freehand sketching, and might look impossible to some students but with practice and time students can cultivate skills for freehand sketching. Creating sketches without sketching instruments can be difficult to students but with daily practice and mastering strokes and shading techniques, students can master freehand sketching for design competitive exams.

What does a Product mean?

A product is a physical item that is a result of a manufacturing process and is usually made for sale.

Geometric Volume

In mathematical terms, volume is the space for a 3-D object. When 2-D shapes or plan figures are given height and they start to occupy space, they are called solid figures. These shapes have faces, edges, and vertices. These solid figures are generally called 3-D objects.

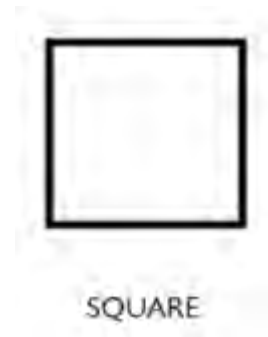
Any figure with a closed boundary and which is made by any line segment, curves or points of definite amount can be defined as geometric shapes and volumes for these geometric shapes are called geometric volumes.

Volume: Volume is a measurement of a 3-dimensional region or space.

Different mathematical formulas are set and given for different 2-D and 3-D geometric shapes and figures.

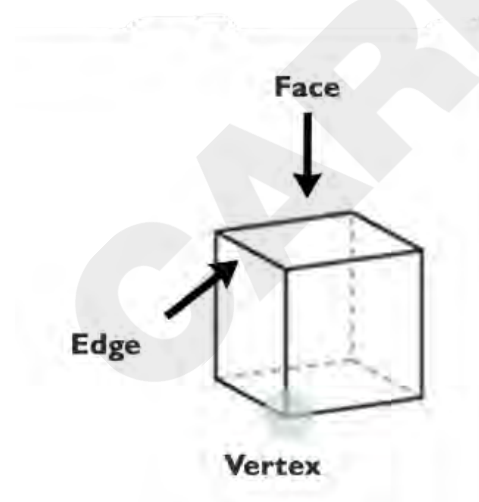
For example, let's take the most basic shape- a square;

A square is a 2-dimensional figure with a definite length and a definite breadth. It has 4 sides with opposite sides being parallel and all the sides being of the same size. All the vertices of a square are at 90 degrees angle.



Area for square is the measurement of the space enclosed by the square. Therefore; **area: length multiplied by its breadth.**

A cube is a 3-D form of the 2-D shape square when given height. All faces and sides of a cube are equal. The edges are equal. There are 6 faces, 12 edges, and 8 vertices in a cube.



Volume for a cube is the measurement of the 3-dimensional space enclosed by the cube. Therefore; **volume: length multiplied by its breadth and then multiplied by its height.**

Non-Geometric Volume

Non-geometric volumes are the volumes for the 2-D shapes that cannot be mathematically defined. A non geometric shape can be defined as shapes with irregular contours, and whose edges are not straight.

Some basic examples of non geometric volumes can be an irregular stone, crushed paper, lump of clay etc. Most of the non geometric shapes and volumes are found in the natural world.

Previous Years Question asked from Freehand Sketching for Products/Volumes

Ques: Design Aptitude [50 Marks]

A six-year old girl is going to school for the first time. She needs to carry a lunch box in her school bag. Her lunch can contain typical Indian food items (both dry as well as liquid food items, such as Roti, Rice, Dosa, Dal, Sambar, etc.). Design a lunch box for her, considering her needs. Sketch your design, and visually explain the features of your design along with clear labels.

Note:

Use only a pencil. Do not use colors.

Explain your design only through visuals and short labels.

Do not write separate explanations.

Evaluation Criteria:

Appropriateness of three-dimensional form and visual graphics

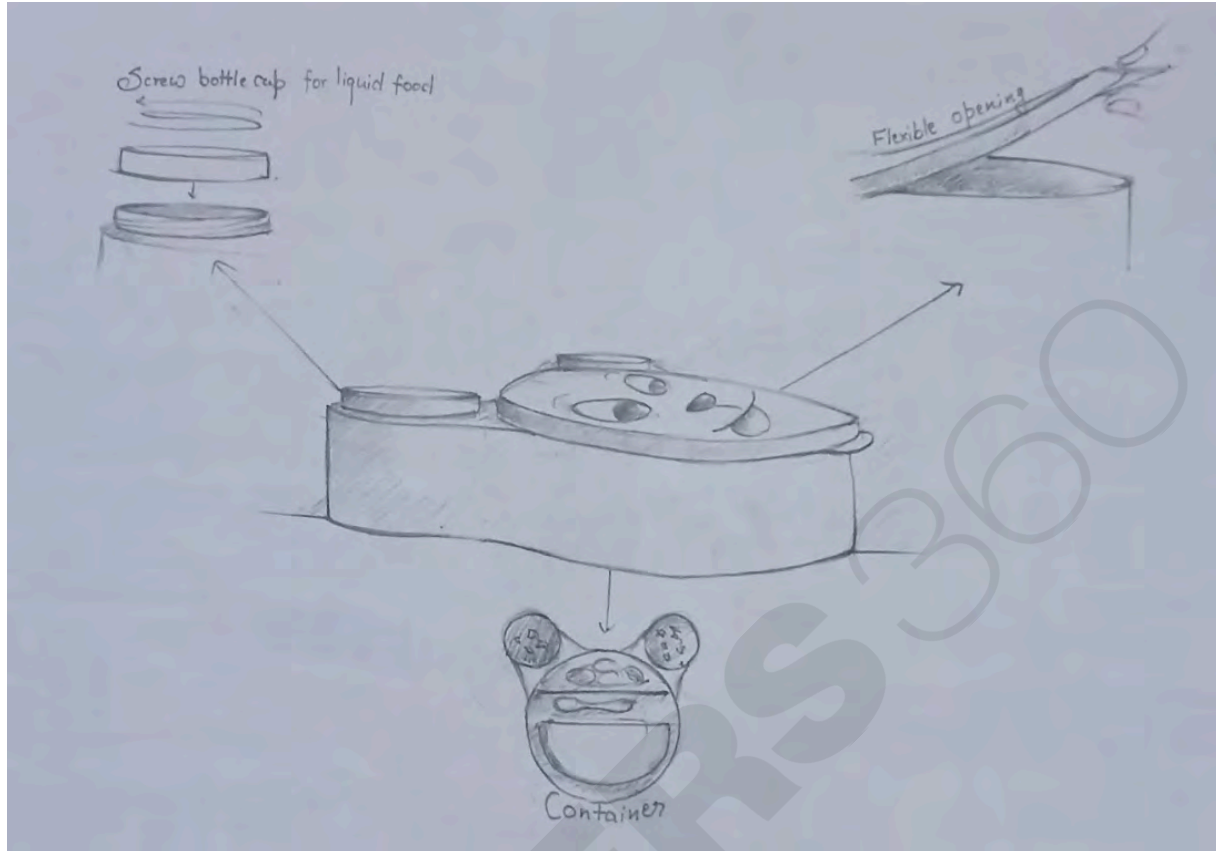
Provisions for fulfilling functional requirements

Considerations for product usability by the user

Attention to detail and explanation of features through visuals only

Clarity of the sketch and quality of presentation, and uniqueness of design.

Sample Solution:



Ques: Sketching (30 minutes – 60 marks)

Nandu is giving a dance exam in online mode in front of a laptop kept on a table. His mother is prompting from behind. While the exam is going on, his pet cat Poco is running around tumbling over a glass of water, a plate of biscuits and a few books. No one can stop Poco and the exam must go on. Visualize and draw the whole situation as if you are sitting on the floor witnessing the scene.

Note:

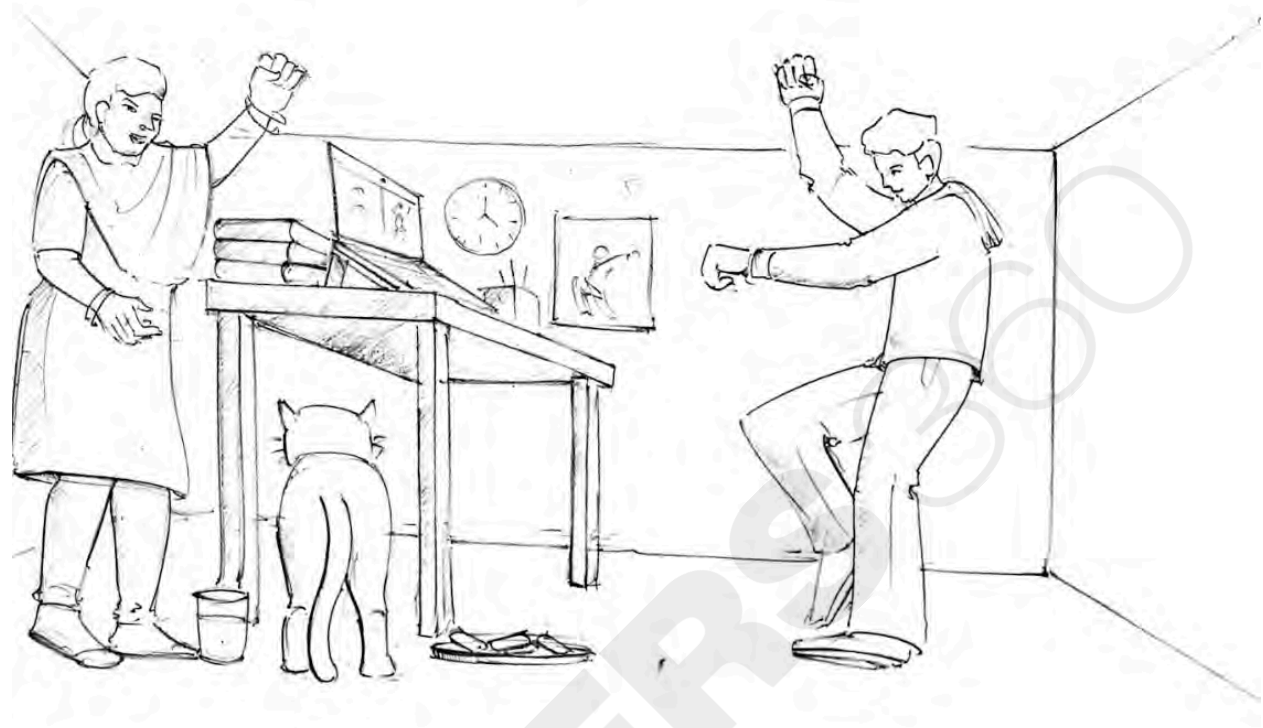
- Make pencil sketches only
- Do not use colors

Evaluation Criteria:

- Observation
- Imagination
- Selection & composition of objects
- Quality of lines
- Presentation

- Attention to details

Solution:



Ques: Read and visualize the following:

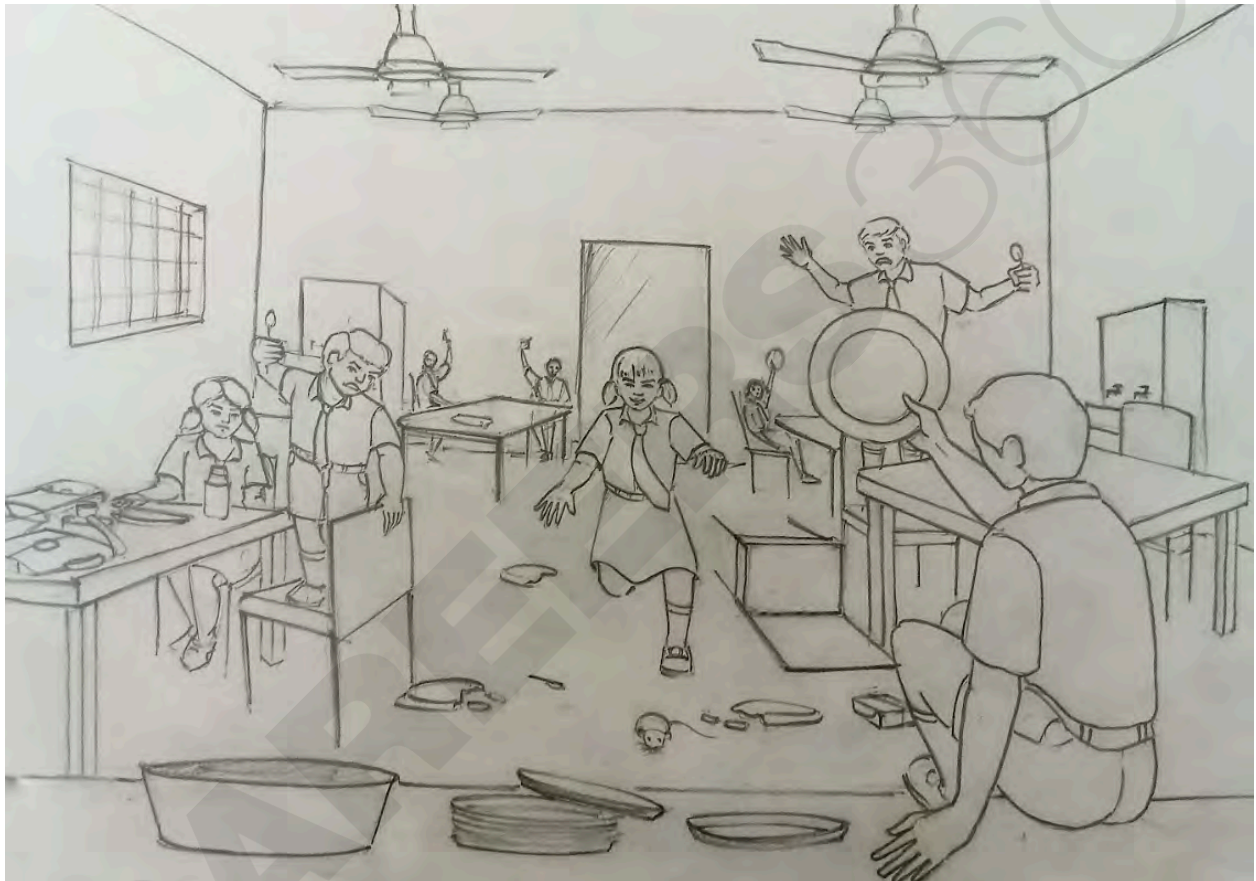
- A rat is spotted inside a school canteen.
- A school boy is afraid and standing on a stool/chair.
- A brave school girl is chasing the rat out of the canteen.
- A tiffin box is falling on the floor.
- Two school bags and two water bottles are kept on a table.
- A few plates are broken and lying on the floor.
- The canteen owner is watching this in shock, standing on top of the counter table. Sketch this scene from the canteen owner's point of view.

Note:

- Make a pencil sketch only
- Do not use colors

Evaluation Criteria:

- Perspective
- Proportion
- Composition
- Observation
- Imagination
- Quality of sketch
- Attention to detail

Solution:

Perspective Sketches

Based on Understanding of 1/2/3 point perspectives

When drawings/sketches are made with keeping in mind the orthogonal projection of every element in the sketch according to the vanishing point or points, it is called perspective sketching. Perspective is basically imagining how a view is seen and then drawing it out on paper. Perspective drawings are more realistic and appropriate according to how different objects can appear in a frame from a defined eye level. Perspective sketches are freehand drawings. Sketching skills-related questions that are included in syllabus for design competitive exams are largely divided into two parts Technical Drawing and Non-Technical Drawing. Freehand Sketching comes under the larger umbrella of Non-Technical Drawing. Non-technical drawings are free-flowing sketches that are made when a solution for any design problem needs to be expressed visually. Freehand sketching for perspective drawings are also based on memory ability and observation skills for imagination as no live frame is used to make them.

Significance of Sketching Skills (Perspective Drawing) for Design competitive exams preparation

It is important to prepare for freehand sketching for design competitive exams as there are a lot of questions that specifically define that use of tools are restricted, and since these exams are supervised, it is important to remember to follow these rules. Most of these questions include sketches for a scenario when looked at different eye levels by pre-defined details asked within the question, therefore perspective drawing becomes one of the most important skills to prepare when preparing for the sketching skills section for any design competitive exam.

Tips to prepare for perspective drawing for design competitive exams

- For preparation, students need to start practicing on their line strokes as soon as possible as it is only through practice that they can get better visually appealing sketches.
- If you fear that your drawing skills or sketches aren't good then that's okay as you can start practicing daily with a minimum of 1 sketch per day and evolve and enhance your skill with daily practice.
- Practicing daily will not only improve the quality of the drawing but also improve the time taken to make 1 sketch.

- Students initially can use scales to mark vanishing lines and height of objects just to get a better idea of vanishing points, but it is advisable to start sketching without scale/ruler to better their vanishing lines and better straighter line strokes.
- Start with guiding boxes for objects and then create details for objects into the boxes, it will help in better creating heights and widths for objects.

Freehand Sketching

Freehand Sketching in the most simple sense can be explained as sketching without depending or using any tools or instruments like ruler, drawing compass, protractor etc. and only sketching by hand. Freehand sketching is based only on the observation skill of the artist and presence of live model or any inspiration is not there.

It might be difficult in the start to directly make sketches through freehand sketching, and might look impossible to some students but with practice and time students can cultivate skills for freehand sketching. Creating sketches without sketching instruments can be difficult to students but with daily practice and mastering strokes and shading techniques, students can master freehand sketching for design competitive exams.

Perspective sketching

Perspective drawing or sketching is the art and technique of creating the illusion of the 3-D objects and how they will appear on a 2-D sheet or paper with depth. Perspective sketches depend largely on the eye level from which the sketch is made and vanishing points.

What is eye level?

Eye level in perspective drawing is the horizontal visual line from which the observer is seeing the view. It is from the physical height of the viewer and eye level when looking at different objects in the view frame. View frame could be interior or exterior depending on the viewer's position.

What is Vanishing Point?

When we look at railway tracks, we get a visual illusion of the two parallel tracks meeting at a single point. This point is known as the vanishing point. A vanishing point is a point where parallel lines merge into the horizon.

According to the vanishing points, 1/2/3 perspective of the drawing is termed. Examples for

- **1 point perspective:** view of railway tracks meeting at 1 point.
- **2 point perspective:** view of any space through human eye level.
- **3 point perspective:** view from an extremely low or high eye level.

It is important to start practicing and understanding different perspective drawings as it is one of the most important topics that is asked in the design syllabus for competitive exams.

1 Point Perspective

According to the 1 Point Perspective, for an eye level it is the method to show how objects in a drawing frame appear and merge into a single vanishing point on the horizon line. Objects as they move from closer to the eye level to farther away, appear smaller and smaller with respect to the distance from the eye level. This vanishing point need not be present always in the center of the frame, it can be anywhere depending on the frame, eye level and need of the subject to be conveyed in the sketch.

1 Point Perspective drawings have 1 vanishing point.

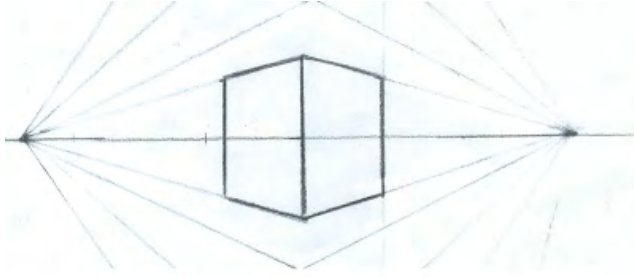
Let us understand more with the help of an example:



We can see here, how all the lines tend to merge into one point present at the right side of the frame. As the objects move away from the eye level, they are appearing smaller in size.

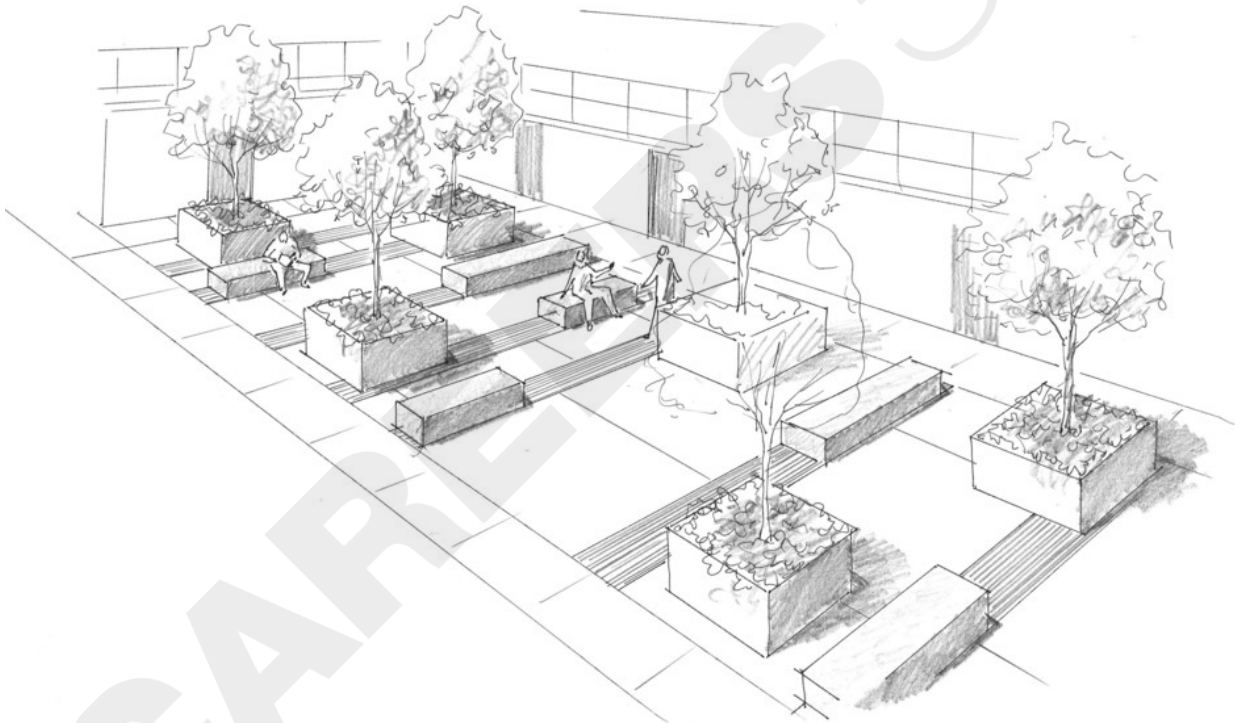
2 Point Perspective

According to the 2 Point Perspective, for an eye level it is the method to show how objects in a drawing frame appear and merge into two separate vanishing points on the horizon line. Objects as they move from closer to the eye level to farther away, appear smaller and smaller with respect to the distance from the eye level. These vanishing points are generally present on the two sides (left and right) of the frame. 2 point perspective drawings can more easily be understood as looking at a cube from the edge (center) and understanding how two lines from that edge on both sides (top and bottom) seem to move away into two vanishing points.



2 Point Perspective drawings have 2 vanishing points.

Let us understand more with the help of an example:

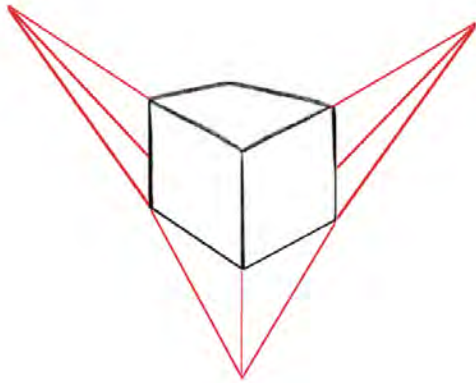


We can see here, how all the lines tend to merge into two separate points present at the right and left sides of the frame. As the objects move away from the eye level, they are appearing smaller in size.

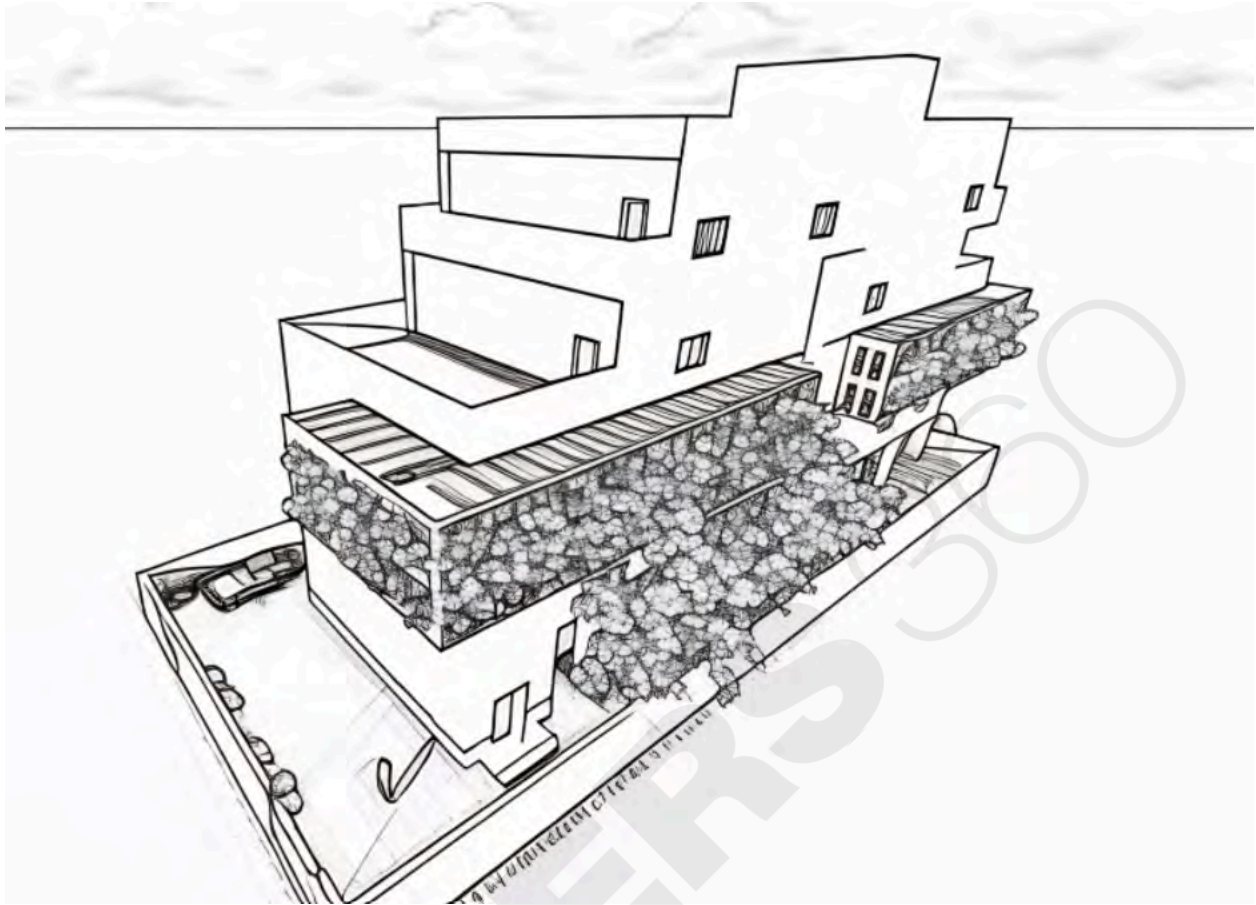
3 Point Perspective

According to the 3 Point Perspective, for an eye level it is the method to show how objects in a drawing frame appear and merge into three separate vanishing points on the horizon line. Objects

as they move from closer to the eye level to farther away, appear smaller and smaller with respect to the distance from the eye level. These vanishing points are generally present on the two sides (left and right) and one either on the top or bottom of the frame. Third vanishing point is added to the 2 point perspective to show how heights or depth will appear to the viewer and therefore are more realistic than the other two perspective drawings. In 3 point perspective, the top surface or the bottom surface of the objects are visible depending on the eye level of the frame. 3 point perspective drawings can more easily be understood as looking at a cube from the edge (center) and understanding how two lines from that edge on both sides (top and bottom) seem to move away into two vanishing points with a third vanishing point defining height/depth of the cube.



3 Point Perspective drawings have 3 vanishing points.



We can see here, how all the lines tend to merge into two separate points present at the right and left sides of the frame with one vanishing point at the bottom of the frame defining height of the building.

Previous Years Question asked from Perspective Sketches

Ques: Sketching (30 minutes – 60 marks)

Nandu is giving a dance exam in online mode in front of a laptop kept on a table. His mother is prompting from behind. While the exam is going on, his pet cat Poco is running around tumbling over a glass of water, a plate of biscuits and a few books. No one can stop Poco and the exam must go on. Visualize and draw the whole situation as if you are sitting on the floor witnessing the scene.

Note:

- Make pencil sketches only
- Do not use colors

Evaluation Criteria:

- Observation
- Imagination
- Selection & composition of objects
- Quality of lines
- Presentation
- Attention to details

Solution:

Ques: Read and visualize the following:

- A rat is spotted inside a school canteen.
- A school boy is afraid and standing on a stool/chair.
- A brave school girl is chasing the rat out of the canteen.
- A tiffin box is falling on the floor.
- Two school bags and two water bottles are kept on a table.
- A few plates are broken and lying on the floor.

- The canteen owner is watching this in shock, standing on top of the counter table. Sketch this scene from the canteen owner's point of view.

Note:

- Make a pencil sketch only
- Do not use colors

Evaluation Criteria:

- Perspective
- Proportion
- Composition
- Observation
- Imagination
- Quality of sketch
- Attention to detail

Solution:

Ques: Drawing [50 Marks]

On a Sunday morning, 5-year-old Geet, her grandmother and father are cleaning their old garage. It is a big garage with large open windows near the ceiling. It has an old bicycle, a football and other objects. The father is cleaning the cobwebs. The grandmother, while cleaning, finds her old guitar which she used to play during her college days. She gets excited and starts playing it as Geet starts dancing around. The garage also has a lot of old memories of Geet's sporty grandmother and her studious father. Geet's school friend stands at the door of the garage watching this whole scene. Draw this scenario from the friend's point of view.

Note:

Use only pencil

Do not use colors

Evaluation Criteria:

Perspective

Proportion

Composition

Observation

Imagination

Quality of sketch

Attention to detail

Solution:



CAREERS 360

Doodling/ Gesture/ Life/ Blind Contour Drawings

(More Freehand)

Sketching skills-related questions that are included in syllabus for design competitive exams where non-technical drawings are free-flowing sketches that are made when a solution for any design problem needs to be expressed visually. Freehand Sketching like Doodling, Gesture drawing, Life drawing, and Blind Contour drawings are Non-Technical drawings. Freehand sketching are drawings that are made without the use of any tools (like scale, ruler, compass etc). Freehand is basically using just your hand and pencil as the tool and creating your idea on the paper. Freehand sketching is also based on ability and observation skills for imagination as no live model is used to make them. Doodling/ Gesture/ Life/ Blind Contour Drawings are all types of free flowing drawings where there is more freedom and expression is generally shown. They are generally created with free flowing lines and curves. These drawings ideally should not take a lot of time to create but should be able to convey the needed information and message. A number of questions can be asked in the design competitive exams where these drawings are needed and therefore, for aspiring students it is important to start practicing these on regular intervals.

Freehand Drawings

Freehand Sketching in the most simple sense can be explained as sketching without depending or using any tools or instruments like ruler, drawing compass, protractor etc. and only sketching by hand. Freehand sketching is based only on the observation skill of the artist and presence of live model or any inspiration is not there. It might be difficult in the start to directly make sketches through freehand sketching, and might look impossible to some students but with practice and time students can cultivate skills for freehand sketching. Creating sketches without sketching instruments can be difficult to students but with daily practice for mastering strokes and shading techniques, students can master freehand sketching for design competitive exams.

Let us understand this more with help of a sample sketch,



Significance of Doodling/Gesture/Life/Blind Contour Drawings for Design competitive exams

It is important to prepare for freehand sketching like Doodling, Gesture drawing, Life drawing, and Blind Contour drawings for design competitive exams as there are a lot of questions that specifically define that use of tools are restricted, and since these exams are supervised, it is important to remember to follow these rules. As the approach for the design competitive exams for analyzing students changed from mostly being logical, non-verbal and calculative skills to now giving more weightage to sketching and design skills, it has become crucial for students to start preparing for their sketching and drawing skills as soon as possible. If you fear that your drawing skills or sketches aren't good then that's okay as you can start practicing daily with a minimum of 1 sketch per day and evolve and enhance your skill with daily practice. Practicing daily will not only improve the quality of the drawing but also improve the time taken to make 1 sketch.

Let us further understand these terms in more detail,

Doodling

Doodling sketches are simple sketches that are very easy to make even while not thinking about them so much or when fast sketches are needed to be made. Doodle sketches aren't necessarily to be made with fine line strokes or any fine shading techniques. Despite doodles being fast and rough sketches, they are meaningful and hold power where fast information needs to be presented visually. While doodling no tools or measurement instruments are used and they have sketchy lines. Doodles usually include human figures, objects, live scenes etc.

Let us understand this more with help of a sample doodle sketch,



Gesture Drawings

Gesture drawings are quick, fast and made with rough lines, they are made for live subjects especially human figures. These drawings are made with gesture lines with gesture lines generally being curvy lines that go from top to bottom without breaks in between and are used by the artists to practice their hand gestures. These drawings are made without any in-depth details about the figure but to overview the overall essence of the figure. Gesture drawings are used to sharpen the skills for observation and hand movements by the artists.

Let us understand this more with help of a sample gesture drawing,



Life Drawings

A traditional life drawing is sketching or drawing a human figure/object with in depth details and highly used shading techniques with the help of a live model present (generally nude as it was done traditionally). Making life drawings were started in the age of renaissance for training practices of budding artists. These drawings are based on high observation skills and high details are needed to master and draw for these drawings therefore, making them difficult for the general audience to draw. These drawings are not generally asked in design competitive exams to make as they require high time in making and students are given only a scheduled limited time in these exams but students still need to have knowledge of the basics of these drawings.

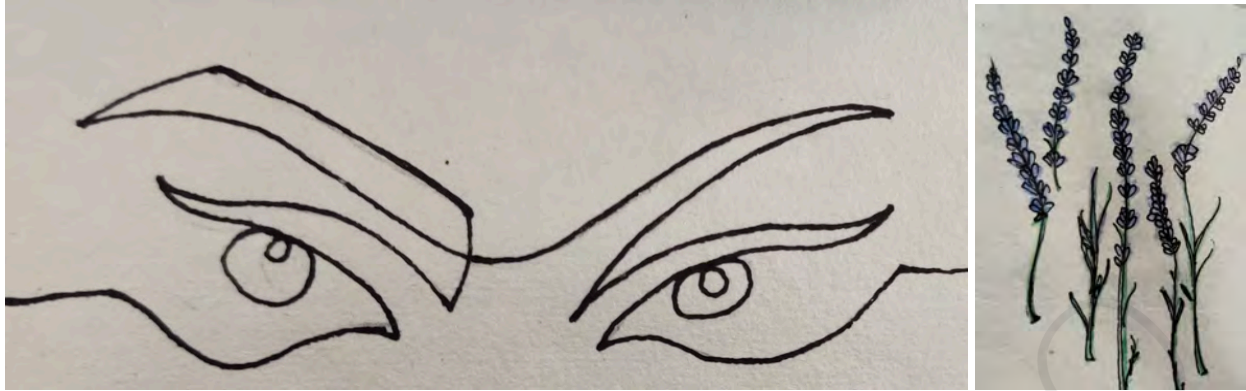
Let us understand this more with help of a sample Life drawing,



Blind Contour Drawings

Blind contour drawings are a particular drawing practice where sketching is done blindly without looking at the sketch or pen/pencil. In this particular method of drawing, live sketches are done by observing the frame and creating its outline on the paper without raising the hand from the paper/ sheet or looking at paper, sketch or the medium you are drawing with. This method of blind contour drawing is coined to strengthen the connection between sketcher's eye and hands and therefore, making the observation skill better. This method looks difficult and distorted drawings are made initially but with practice, results can shock students.

Let us understand this more with help of a sample Blind Contour drawing,



Previous Years Question asked from Doodling/Gesture/Life/Blind Contour Drawings

Ques: Design Aptitude [50 Marks]

A six-year old girl is going to school for the first time. She needs to carry a lunch box in her school bag. Her lunch can contain typical Indian food items (both dry as well as liquid food items, such as Roti, Rice, Dosa, Dal, Sambar, etc.). Design a lunch box for her, considering her needs. Sketch your design, and visually explain the features of your design along with clear labels.

Note:

Use only a pencil. Do not use colors.

Explain your design only through visuals and short labels.

Do not write separate explanations.

Evaluation Criteria:

Appropriateness of three-dimensional form and visual graphics

Provisions for fulfilling functional requirements

Considerations for product usability by the user

Attention to detail and explanation of features through visuals only

Clarity of the sketch and quality of presentation, and uniqueness of design.

Sample Solution:



Ques: Sketching (30 minutes – 60 marks)

Nandu is giving a dance exam in online mode in front of a laptop kept on a table. His mother is prompting from behind. While the exam is going on, his pet cat Poco is running around tumbling over a glass of water, a plate of biscuits and a few books. No one can stop Poco and the exam must go on. Visualize and draw the whole situation as if you are sitting on the floor witnessing the scene.

Note:

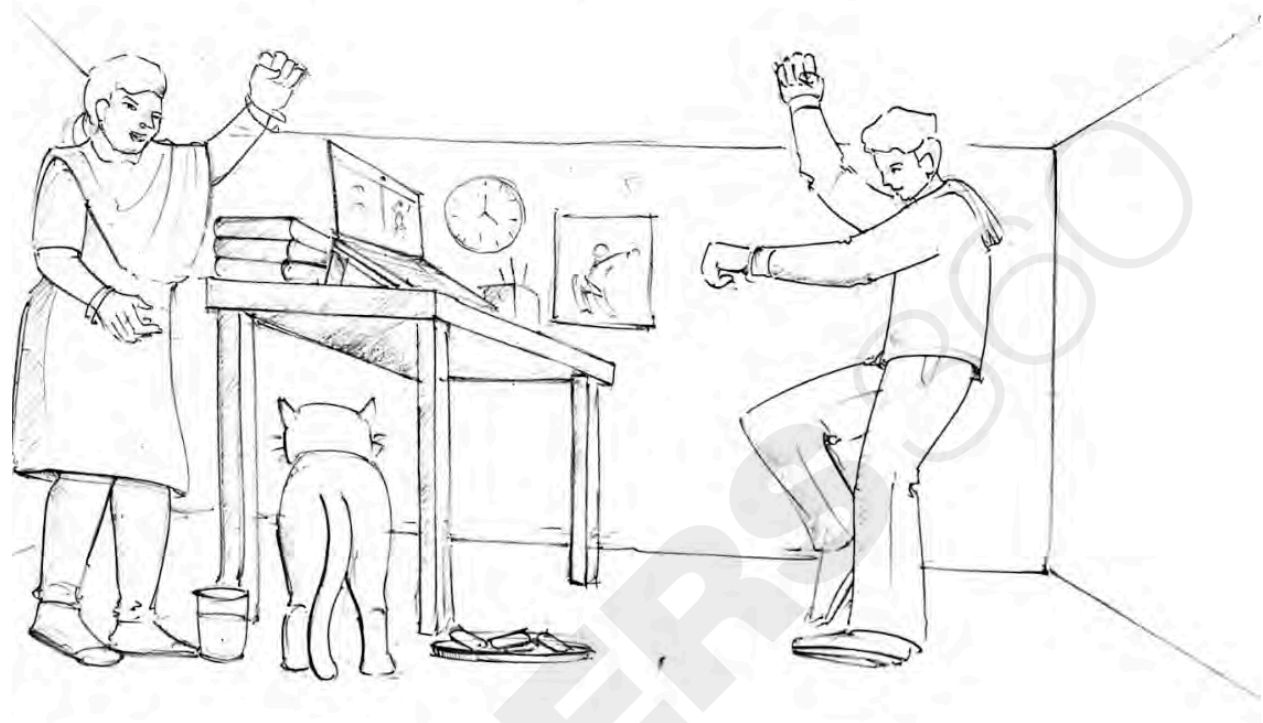
- Make pencil sketches only
- Do not use colors

Evaluation Criteria:

- Observation
- Imagination
- Selection & composition of objects
- Quality of lines

- Presentation
- Attention to details

Solution:



Ques: Read and visualize the following:

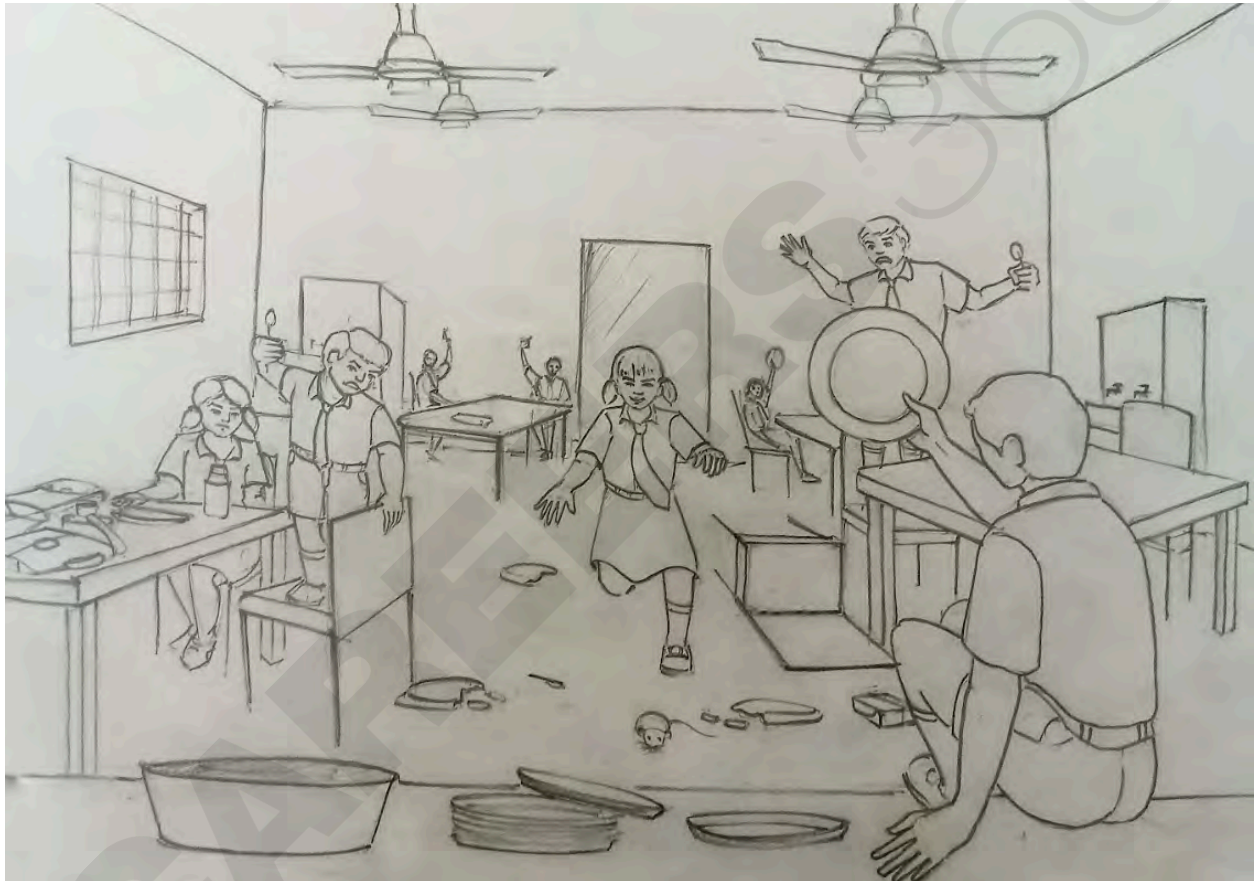
- A rat is spotted inside a school canteen.
- A school boy is afraid and standing on a stool/chair.
- A brave school girl is chasing the rat out of the canteen.
- A tiffin box is falling on the floor.
- Two school bags and two water bottles are kept on a table.
- A few plates are broken and lying on the floor.
- The canteen owner is watching this in shock, standing on top of the counter table. Sketch this scene from the canteen owner's point of view.

Note:

- Make a pencil sketch only
- Do not use colors

Evaluation Criteria:

- Perspective
- Proportion
- Composition
- Observation
- Imagination
- Quality of sketch
- Attention to detail

Solution:

Chapter 5: Analytical and Logical Reasoning

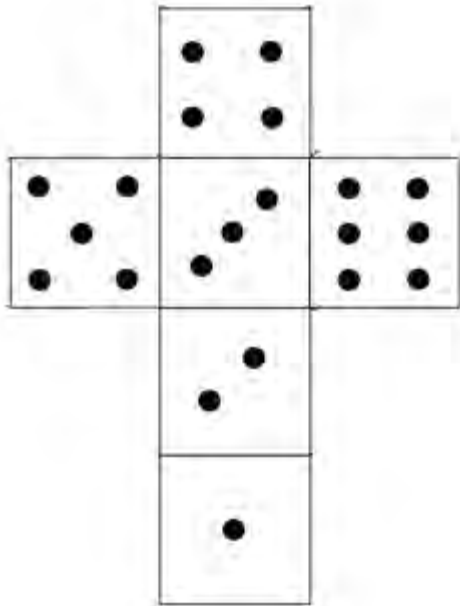
Dice, cubes and printed patterns related questions come under the topic Analytical and logical reasoning. Analytical ability is the ability of a student to analyze patterns, conditions or situations based on the information and factors given to them. Logical reasoning is the ability to find logical solutions or next order in steps for a problem given to them. It is important to analyze students based on analytical and logical reasoning to understand how better solutions can be made by students and better decisions can be taken by them. It is important for any aspiring designers to build logical and analytical ability as it helps in evaluating all the possible solutions for a given problem and then coming up with the most viable solution. Dice, cubes and printed pattern questions are asked under non-verbal section as all these questions are present in diagrammatic or abstract form.

What is a dice?

A dice is a physical cube which has numbers from 1 to 6 present on each face. It is generally used in board games where it is supposed to be shaken and thrown in order to get one face up and depending on the number that comes on top face of the dice, the game proceeds.



To understand the dice better, let us look at the exploded version of a dice and understand different faces present in it.



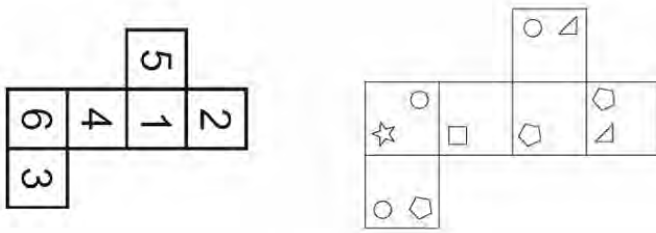
Questions that are generally asked in design competitive exams are to either make the folded version of the exploded view and select from the options or to select the correct exploded view from a given figure of a dice. Another type of question that can be asked in the exam is to figure out what number will appear on the face that is not visible in the figure given in the question itself.

Trick to solve these questions:

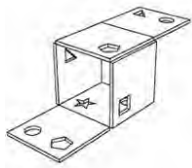
1. Look at the side faces and see the numbers that appear adjacent to each other and then see if they are present in the options.
2. Look at the opposite faces and see the numbers present and look for the correct option that can be made out in the options given.
3. The easiest trick for questions where the number on the hidden face is asked, take your eraser, make the markings according to the questions and figure out what number is asked for the hidden face.

Previous Years Question asked from Dice

Ques: The image below shows the developed surface of a cube. Which of the options will NOT open up as the shown image?

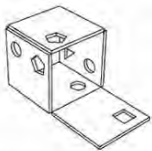


Option A:



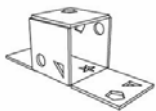
A

Option B:



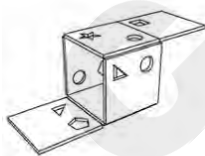
B

Option C:



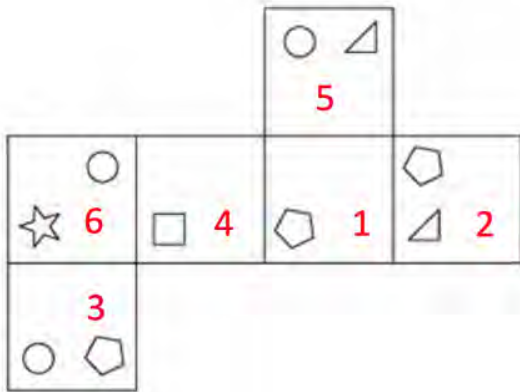
C

Option D:



D

Solution:

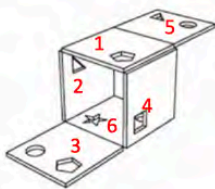


Name the cubes (as shown above)

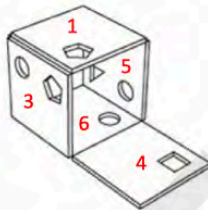
5 is adjacent to 3

6 is adjacent to 1

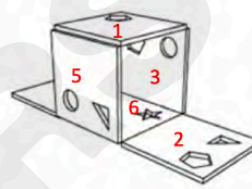
4 is adjacent to 2



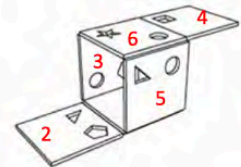
A



B



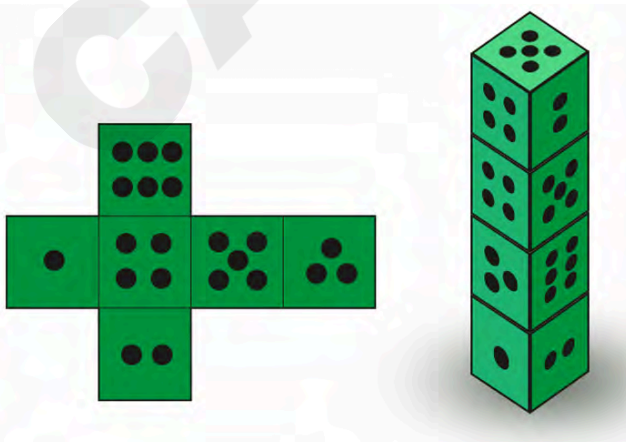
C

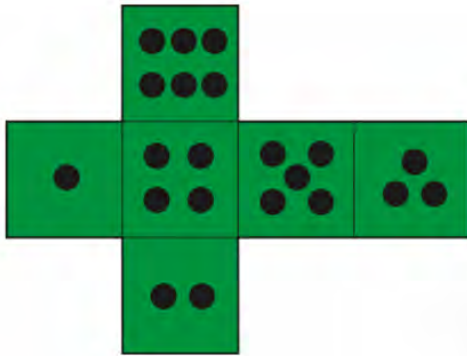


D

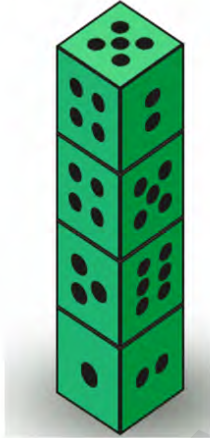
Option B is not possible, as the cube with No. 5 has an incorrect orientation of triangle. Hence, option B is the answer.

Ques: The Figure to the left shows an unfolded pattern of a die. If four such identical dice are stacked one on top of another, as shown on the right, what is the sum of the numbers appearing on the faces which are parallel to the ground?



Solution:

In the above dice,
 6 is adjacent to 2
 1 is adjacent to 5
 4 is adjacent to 3

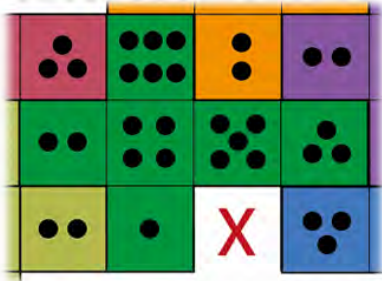


- In the first row of the above image, 1 and 2 dots are visible. So, their adjacent faces shall be, 5 and 6. Therefore, the leftover pair (3,4)
- For the dice in the second row (from the bottom), dots 3 and 6 are visible. So, their adjacent faces shall be 4 and 2 respectively, Therefore, the leftover part is (1,5)
- For the dice in the third row (from the bottom), dots 4 and 5 are visible. So their adjacent faces shall be 3 and 1 respectively, Therefore the leftover part is (2,6).
- In the topmost row, 5 is visible at the top of the dice.
- So, its corresponding pair is 1 (1,5)

Hence, numbers pair parallel to the ground are (3,4) (1,5) (2,6) (1,5)

Therefore, the sum is $3+4+1+5+2+6+1+5=27$.

Ques: Seven identical playing dice are unfolded in an identical manner. Six of the unfolded dice are laid out on a flat surface and are arranged to touch each other without overlapping. The figure shows a portion of the arrangement. Which face(s) from the seventh unfolded dice CAN NOT replace X if overlap must be avoided?



Option A:



A

Option B:



B

Option C:



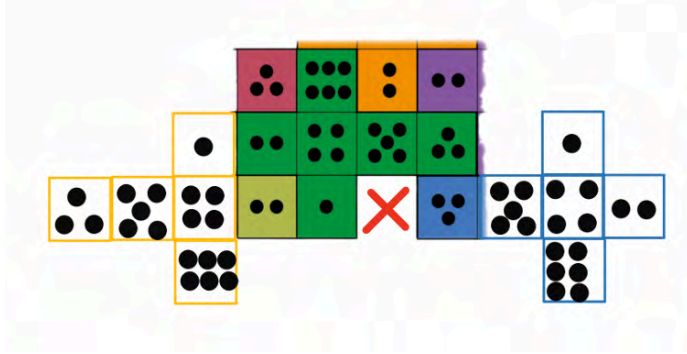
C

Option D:



D

Solution:



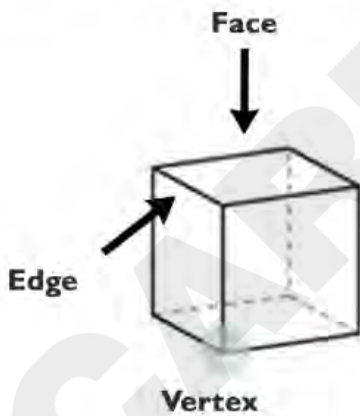
The above shows one of the possible orientations for the yellow and blue dice.

This X can be filled by 4 dots, 5 dots, or 6 dots.

So we can have more than 1 solution to this question.

Cubes

A cube is a 3-D form of the 2-D shape square when given height. All faces and sides of a cube are equal. The edges are equal and are at 90 degrees to each other. There are 6 faces, 12 edges, and 8 vertices in a cube.



Volume for a cube is the measurement of the 3-dimensional space enclosed by the cube.

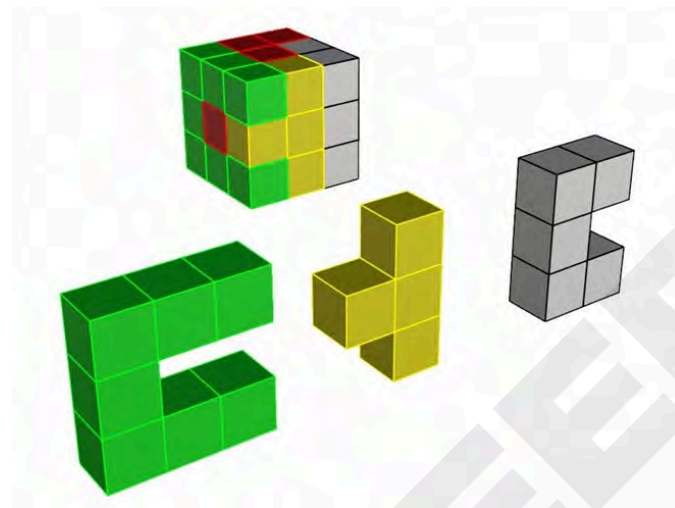
Therefore; **volume: length multiplied by its breadth and then multiplied by its height.**

Questions that are generally asked under cube and patterns related to cube involve finding out the mathematical quantities like area or volume, or to figure out the pattern that should come next in the order. Patterns created through staging different cubes together can also be asked in the exam in order to analyze what next pattern can come in the order.

Questions can also arrive from the topic cube in similar fashion to what we have seen in dice but instead of numbers on faces, different patterns can be present and students need to analyze the pattern and then find the solution.

Previous Years Question asked from Cube

Ques: The figure below shows a 3×3 cube with 4 colors. The same coloured shapes are detached and shown separately for reference. Identify the shape of the red block from the given options.



Option A:



A

Option B:



B

Option C:



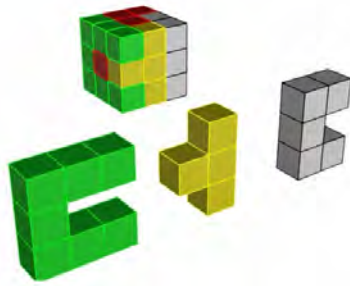
C

Option D:



D

Solution:



First count total no of blocks i.e. Its $3 \times 3 \times 3$

So 1 layer has 9 cubes and 3 layers have 27 cubes.

Now count no of cubes in the shapes those are detached and shown separately

Green color=7 cubes

Yellow color=4 cubes

Grey color=5 cubes

So we can say red should have $=27-(7+4+5)$

$$=27-16$$

$$=11 \text{ cubes.}$$

Option A has 10 cubes

Option has 11 cubes

Option C has 9 cubes

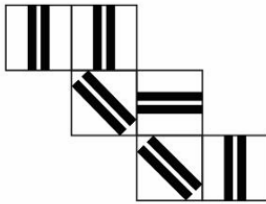
Option D has 12 cubes

Hence, option B is correct.

Ques: Shown on the left are all the 6 faces of a cube. Which option can be folded into this cube?

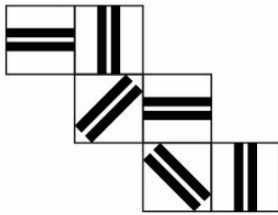


Option A:



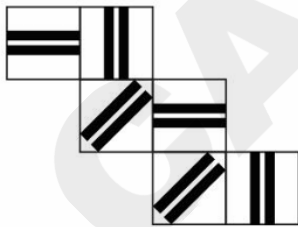
A

Option B:



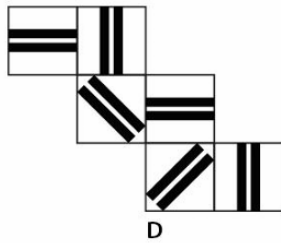
B

Option C:

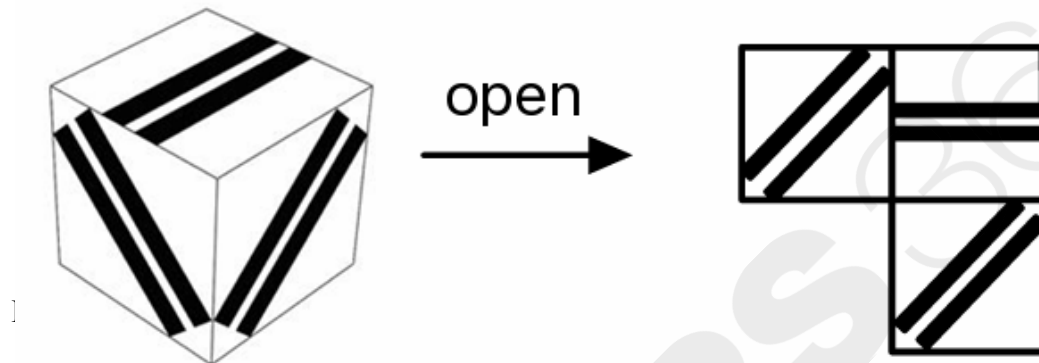


C

Option D:



Solution:



Now if we try to find a particular combination (figure 2) we can find it in option C
Hence, option C is correct.

Printed Patterns

Printed patterns are repetitive designs that are decorative and made using different shapes, curves, lines and are generally used on textile, furniture, etc. It is important to analyze and understand different patterns for any aspiring designer to create better and visually pleasing patterns for designs. It is also important to see and understand patterns to develop a better and sharper eye for details by the students.

Questions asked on printed patterns are generally based on figuring out the most probable pattern that will be set into the large print which is done to ensure how details are viewed and understood by the students. Questions are based on figuring out the next pattern that should appear in the series from the options given below. Another type of pattern question that is asked is to figure out the correct pattern cutout that will align perfectly with the pattern given in question.

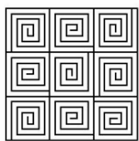
How to solve questions related to printed patterns?

- To solve printed pattern related questions, students need to look for tiniest details that can be seen in the pattern and that differs from the answer pattern than the other options.
- Best way to do so is to make one shape that is repeated to make the pattern and then look in the options if the flow and shape is being maintained.
- With the help of an elimination method, students can figure out the correct options.

Previous Years Question asked from Printed Patterns

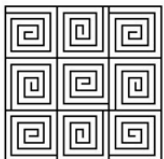
Ques: The following patterns are made on a wall by using ceramic tiles. Which of the given patterns is/are made from a single type of tile?

Option A:



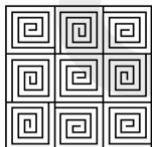
A

Option B:



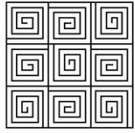
B

Option C:



C

Option D:

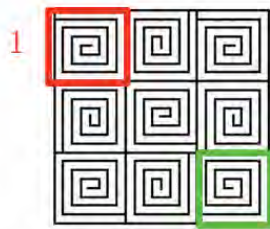


D

Solution:

A

If we check the first tile we can see the spiral is going anti clockwise. Now if we see the starting point of the spiral is in an upward direction whereas ending is just opposite to it i.e. In downward direction . This condition is followed by every other tile.

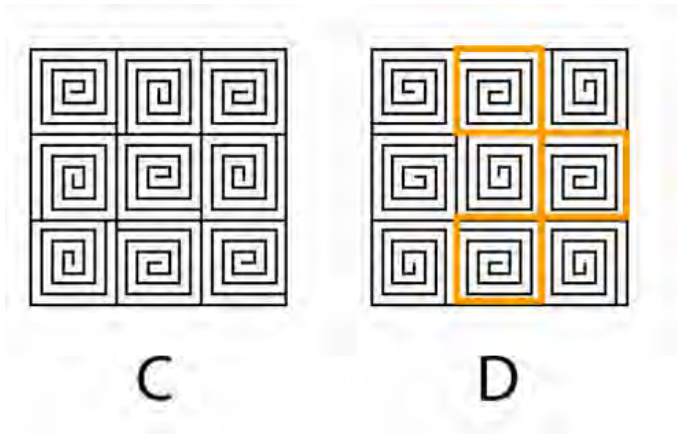


B

If we first tile, we can see the spiral is going anticlockwise. Now if we see the starting point of the spiral is in upward direction whereas ending is just opposite to it i.e. In downward direction. This condition is violated by the last tile (Highlighted by green).

Here it is going clockwise. Hence, B is eliminated.

Similarly, if we check for option C and D we can find option D has mismatched (as shown below).



Hence, option A and C are correct.

Ques: Which option will replace the question mark?

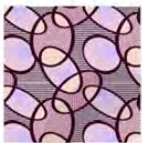


Option A:



A

Option B:



B

Option C:



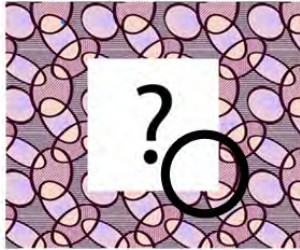
C

Option D:

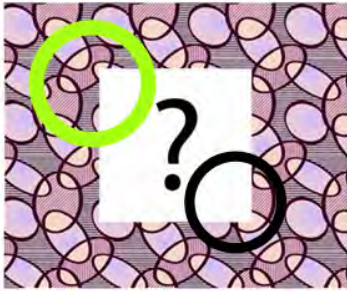


D

Solution:



To complete this pattern we need a minor part of the oval shape .
So option C and D is eliminated.



To complete this we need a small oval which needs to be completed and also an oval whose line is cut. So option B is correct.

Ques: Which option will replace the question mark?



Option A:



A

Option B:



B

Option C:



C

Option D:

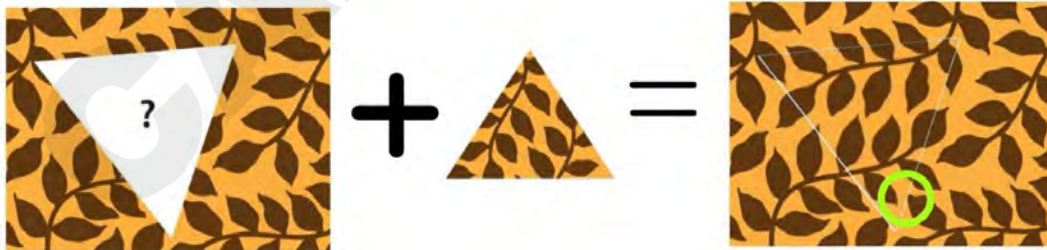


D

Solution:

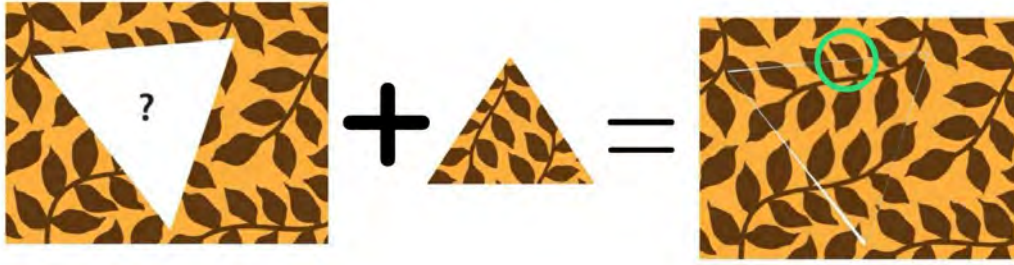
In such a question check each option one by one.

Option A:



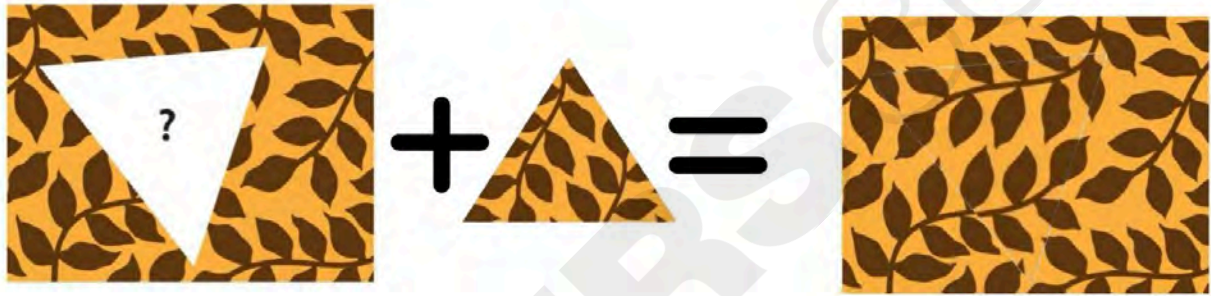
In this, the lighted part shows that the leaf's tip is incomplete.
Hence, option A is wrong.

Option B:



This lighted part shows that the leaf is not maintaining a proper curve.
Hence, option B is wrong.

Option C:



Hence, the question mark will be replaced by option C.

Cubes & Dices

Cubes and dice problems are recurring in many design aptitude tests, including NID and UCEED. These questions test a candidate's spatial visualisation skills, analytical ability, and attention to detail. This article provides a detailed overview of how to approach cubes and dice problems, essential concepts, and tips for solving them effectively.

The questions are asked interchangeably for cubes and dice, where the cubes are treated as dice and vice versa.

Introduction to Cubes and Dice

What is a Cube:

- A cube is a three-dimensional geometric shape with six equal square faces, twelve equal edges, and eight vertices.
- All internal angles in a cube are right angles (90 degrees).
- Each cube's edge is of equal length, and the cube is symmetric along its axes.

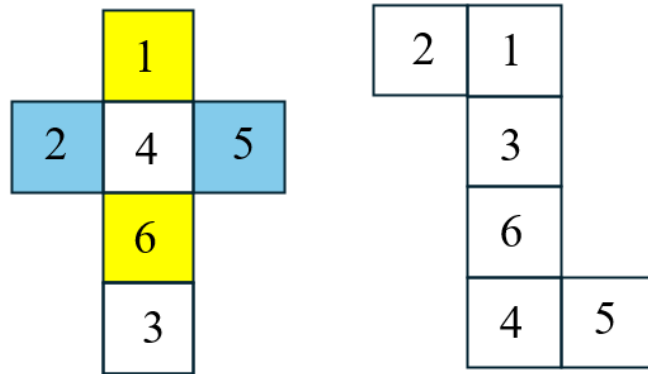


What is a Dice:

- A die is a type of cube used in various games, typically numbered from 1 to 6.
- Standard dice have opposite faces that add up to 7 (1-6, 2-5, 3-4).
- The numbers are arranged so that no two consecutive numbers are adjacent.



***Fact: The sum of the opposite side of the cube is seven(07); e.g. the opposite faces 1-6 sum to 7, similarly for the 3-4 & 2-5 pairs of opposite sides.**



Types of Cube and Dice Problems

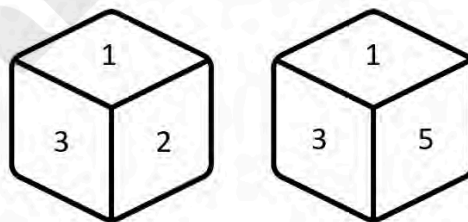
Type 01 : Identification of Opposite Faces:

These problems ask you to identify which faces are opposite in a cube.

Opposite Side sum Rule: For a standard dice it has opposite pairs like (1-6), (2-5), and (3-4) and the sum of the number on the opposite side is seven.

Commonly asked questions focus on Identifying these pairs is crucial for solving related questions.

What number is opposite to 1?

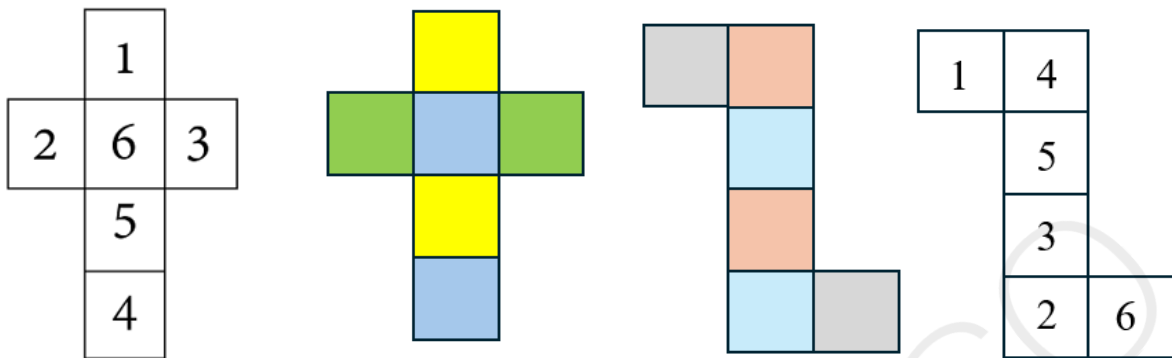


Type 02 : Cube/Dice Folding and Unfolding

These problems require understanding how a 2D net of a cube can be folded into a 3D shape.

Example: Given a net of a cube with numbered faces, determine which numbers will be on opposite faces when the net is folded.

* **Hint:** The alternate faces are always opposite to each other.

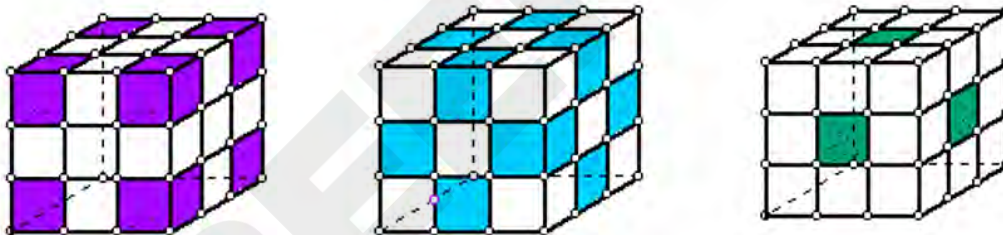


In an arrangement, the alternate boxes are marked by same colours for an unfolded view

Type 03 : Painted or Coloured Cubes

These questions often involve a large cube painted on the outside and then cut into smaller pieces.

Questions : Identify how many smaller cubes have a specific number of painted faces.



Key Concepts and Techniques for Solving Cubes/Dice Questions

a. Cube Visualisation

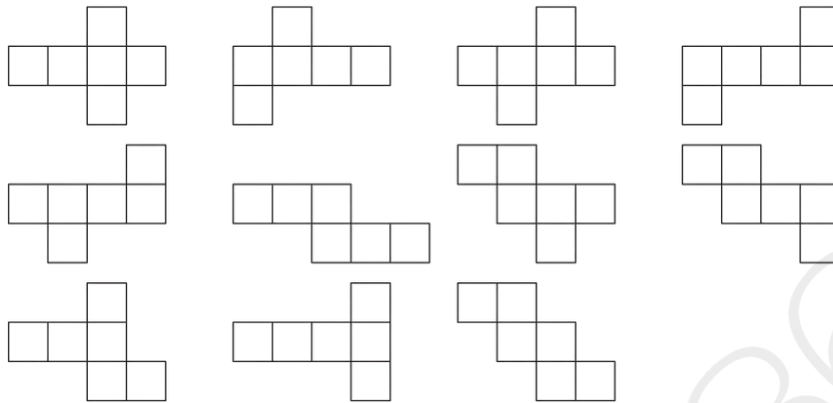
Practise visualising how a cube would look from different perspectives.

Activity : Familiarise yourself with how different patterns and numbers align when a cube is rotated by making the paper cubes, and rotating.



b. Practising Cube Nets

A 2-dimensional pattern or arrangement of squares that may be folded into a 3-dimensional cube is called a cube net. There are 11 possibilities of unfolding a dice/cube as shown below.



It is a flat depiction of a cube's surface that displays all six of its square faces. A geometric shape called a cube net can be used to investigate and comprehend a cube's characteristics, such as its volume and surface area.

Important Attributes of Cube-Nets

- Six squares, one for each face of the cube, make up a cube net.
- To guarantee that the squares can be folded into a cube, they are organised in a particular way.
- There are several conceivable cube net arrangements; for a regular cube (without rotations and reflections), 11 such configurations have been found as shown below.

Tips to approach the Cube/Dice Questions

a. Practice with Nets:

- Regularly practise folding **cube nets** on paper to improve spatial visualisation.
- Memorise standard net configurations to save time during exams.

b. Use Elimination:

- For multiple-choice questions, use the approach of elimination by visualising which options cannot be correct. **Mostly focus on eliminating the wrong choices over finding the right option.**

c. Annotate and Sketch:

- In problems involving painted or large cubes cut into smaller ones, sketching can help track which cubes have painted faces.

d. Count Techniques:

- For painted cube problems, start counting from the corners, edges, and finally, the faces to avoid missing any cubes.

Application of Cube and Dice Concepts in Real-World Design

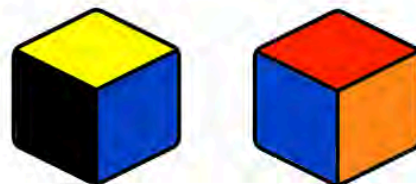
- Designers utilise three-dimensional thinking to create innovative products, packaging, and architectural structures.
- Visualisation and manipulation of three-dimensional forms help achieve space optimization and aesthetic appeal in product design..
- Efficient packaging solutions: Optimising space and materials by understanding three-dimensional forms.



Practise Questions from the previous year's Exams.

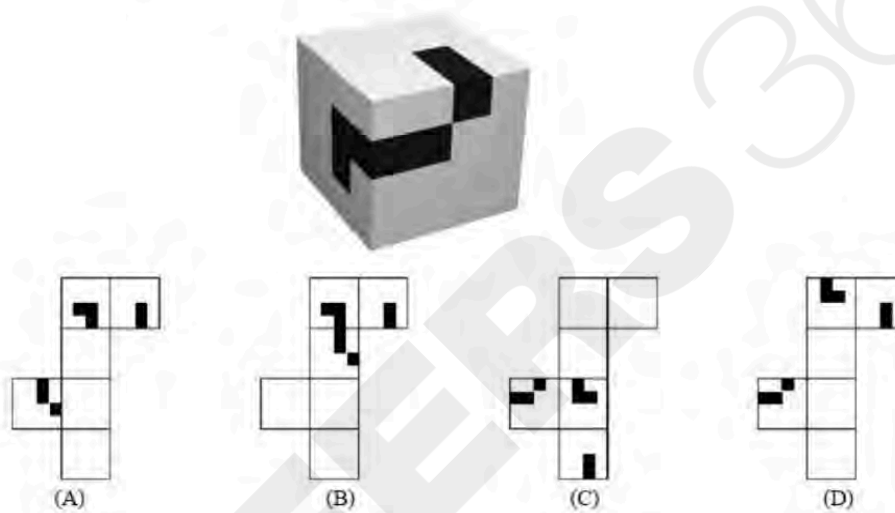
Q1 What is the opposite face of “Red”?

- A. Red
- B. Blue
- C. Yellow
- D. Black



***Approach** - Comparing both cubes together and taking out blue as common we can see that yellow is opposite to red.

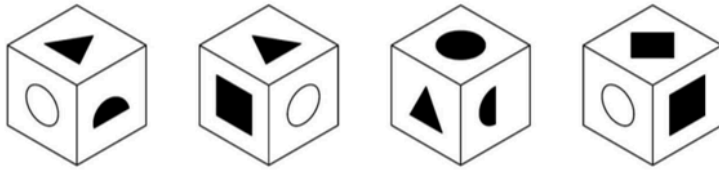
Q2 Which of the paper sets when folded along the intermediate borders can form the cube as given in the image below?



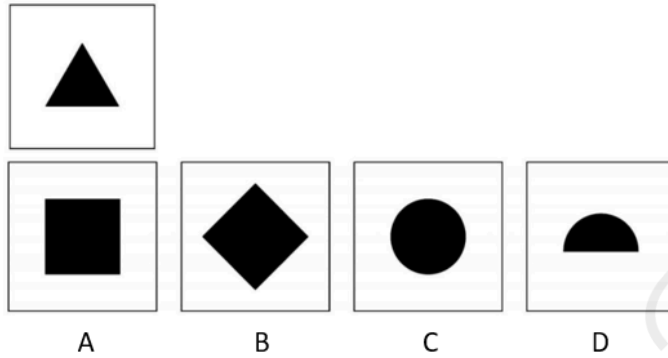
***Approach** - Compare the three folding faces together and match the common shape or figure, We can see that option “B” is the answer.

Important Sample Questions for NID/UCEED

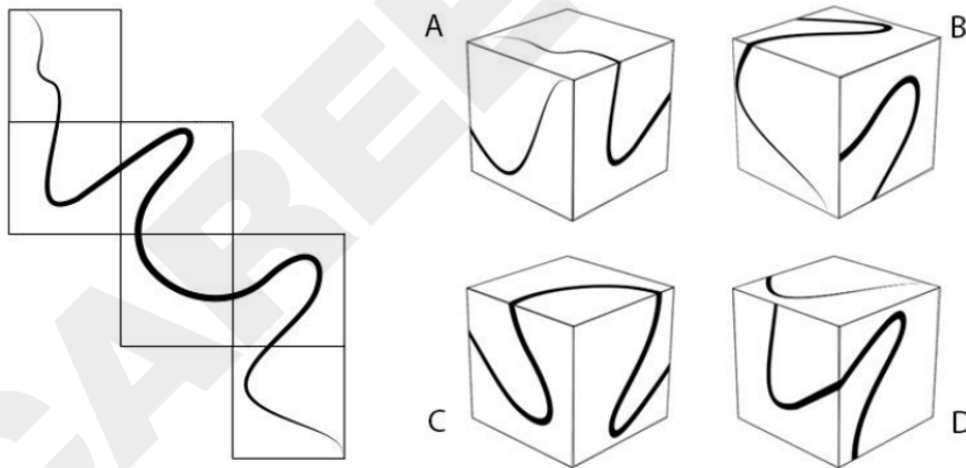
Q1 Depicted below are four various orientations of the same cube:



Select from the options given below, the face which is located opposite to the face depicting the triangle.



Q2 Shown on the left is the development of a cube. Which of the options can be created when the shown development is folded?



Data Sufficiency

Two of the assessment elements widely applied in DAT exams are information provided compared with asked logic to justify the answer, which reflect the candidate's capability of quantifying whether the data provided is sufficient to solve a given problem. In this section, a student's ability for critical analysis, logical approach to the problem, and capability to choose the relevant information from the given information set is being checked.

Data sufficiency tests are different from other problem-solving aptitude tests where a candidate is supposed to identify whether or not the problem can be solved using the available data without necessarily solving it.

Different Types of Questions: Data Sufficiency

Commonly, there are 04 types of questions asked in the Design-Aptitude Exams conducted by various organisations. There may be more than four types of questions. However, the most relevant to the topic are the following types of questions:

1. **Basic Logic and Reasoning**
2. **Numerical and Quantitative Reasoning**
3. **Pattern Recognitions**
4. **Spatial Reasoning**

Let's Try to understand each type with the relevant examples.

Type 1. Basic Logic and Reasoning

Basic Reasoning and Logic questions in data sufficiency evaluate a candidate's capacity to derive the logic and thus conclude from the information given in the question.

For example, deducing which statement is required to conclude from the given statements.

Q1: Who is the tallest among the four brothers, P, Q, R, and S?

Statement 1: R is shorter than only Q

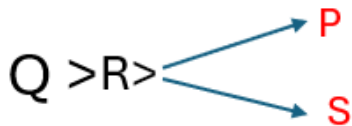
Statement 2: S is taller than only P

Conditions are given as,

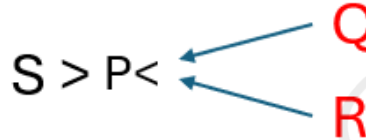
- i) Statement 1 alone is sufficient



- ii) Statement 2 alone is sufficient
- iii) Both Statement 1 and Statement 2 together are sufficient
- iv) Both Statement 1 and Statement 2, even together are not sufficient.



From Statement i, alone we can conclude Q is tallest of them all as decoded in the figure.



From Statement ii, it can clearly be concluded that P is the shortest, but the information for tallest is still insufficient from this statement

SOLUTION: From the above two statements, it is clear that information from statement I, alone is sufficient to identify the tallest among the four brothers **thus, Option (i) is the right answer.**

Type 2. Numerical and Quantitative Reasoning

Numerical Data Sufficiency section, evaluates the numerical and quantitative reasoning to check a particular candidate's ability to decide whether the given numerical or quantitative data is sufficient to solve a certain problem. Arithmetic problems sometimes with measurements, areas, quantities, proportions and other characteristics that can be measured are often incorporated in these problems.

Condition: For a more clearer explanation, let us understand through an example where the dimensions of the , the rectangle and the triangle are known and the width of the rectangle and the height of the triangle are not given.

Problem Statement

Is the area of the rectangle greater than the area of the triangle?

Statement 1: The rectangle's width is twice the triangle's height.

Statement 2: The rectangle has a surface area of 96 square centimetres.

Conditions:

- i) Statement 1 alone is sufficient.
 ii) Statement 2 alone is sufficient.
 iii) Both statements together are sufficient.
 iv) Each statement alone is sufficient.
 v) Neither statement is sufficient.

SOLUTION:**Step 01: Interpretations of given Statements**

Statement 1. Alone doesn't fulfil the condition to find the triangle height,

Statement 2. The rectangle has a given surface area of 96 square cm(Centimetres)..

$$\text{Area of Rectangle}(96) = L \times W$$

$$96 = 12 \times W$$

$$\text{Width (W)} = 8 \text{ cm.}$$

But still, the comparison is not feasible for not having the sufficient data required.

STEP 02:

- 2a. Checking to find the relationship between given statements, can this fulfil the Question requirements.
- 2b. Now, in statement 01, the relationship is given, "**The rectangle's width is twice the triangle's height,**" and thus making the comparison of areas possible.

To conclude, condition iii) Both statements are sufficient and the correct answer.

Type 3. Pattern Recognitions

The capacity to recognise and comprehend recurrent themes, patterns, or arrangements in a series of shapes, numbers, or symbols is tested in data sufficiency courses using pattern recognition. Applicants must decide if the provided data is adequate to identify the underlying trend.



Let's understand with a Sample Question

Question : Looking at the following sequence of shapes, Based on the pattern, what is the next shape in the sequence ?



- **Statement 1:** The sequence alternates between two colours: red and blue.
- **Statement 2:** The sequence alternates between three shapes: square, circle, and triangle.

Conditions:

- i) Statement 1 alone is sufficient.
- ii) Statement 2 alone is sufficient.
- iii) Both statements together are sufficient.
- iv) Each statement alone is sufficient.
- v) Neither statement is sufficient.

Solution : Analysing the Patterns based on information from the given statements.

C. From Relative Analysis of Statement 01 :

Red and Blue figures are taken in turns in the sequential manner. This assertion comes in harmony with the noted pattern whereby each step has got its colours being red and blue in an alternating manner. But this assertion by itself does not qualify for guessing the next shape. . Altogether, **Statement 1 only is insufficient**, although it predicts the colour, it does not help to establish the shape in any way.

Analysis of Statement 02 :

Three shapes are alternated in the sequence: They include; triangle shape, circle shape, and square shape. This pattern is repeated within the sequence and it starts with a square, then circle, triangle and then back to square, circle. It doesn't however tell you what colour the following form will be.

In conclusion, Statement 2 alone is insufficient while it could help verify the shape, it gives no hint in identifying the colour.

Combined Analysis of Statement 01 & Statement 02:

- The series of forms (square, circle, triangle) and the sequence of colours (red, blue) align to anticipate the next shape in the sequence when both statements are combined.
- The last shape in the sequence is a red circle. Following the colour pattern, the next shape should be blue. Following the shape pattern, the next shape should be a triangle.
- **Final Conclusion : The sum of the two statements is sufficient.** (A blue triangle will be the following shape in the sequence.)

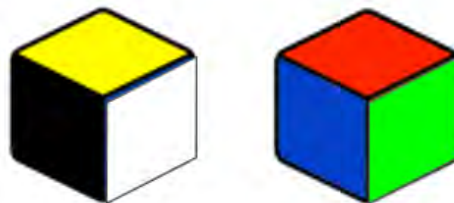
Type 4. Spatial Reasoning

Spatial Reasoning part of data sufficiency, which challenges the cognitive aptitudes of visualisation based questions, objects-in-space, manipulation, sample questions will centre on spatial intelligence. This also determines the perception or position of shapes, objects or spaces in relation by concerning the ways they fit or align.

Unlike other types here the visual clues and the information given are evaluated in comparison to the given statements.

Let's understand with a Sample Question

Question : You are given a cube that has its **6 faces painted with different colours: Red, Blue, Green, Yellow, White and Black.** The cube is rotated along the different axis. Determine which colour will be on the top after a series of rotation.



Problem Statement:

- What colour will be on the top face after the cube is rotated 90 degrees to the right and then 180 degrees upward ?
 - **Statement 1:** Initially, the Red face is on top.
 - **Statement 2:** The Blue face is on the front.

Conditions:

- i) Statement 1 alone is sufficient.
- ii) Statement 2 alone is sufficient.
- iii) Both statements together are sufficient.
- iv) Each statement alone is sufficient.
- v) Neither statement is sufficient.

A. Analysis of Statement 01 :

We can deduce the new orientation following the rotations by knowing that the Red face is initially in the lead, but in order to calculate the final location of the faces, we also need to know which face is in front. Thus **Statement 1, alone is not sufficient.**

B. Analysis of Statement 02 :

Knowing that the Blue face is in the front initially, we can figure out the relationship between the front and top faces, but we need to know the initial top face to track the rotations. Thus **Statement 2, alone is not sufficient.**

C. Combined Analysis of Statement 01 & Statement 02

It can precisely be identified from the information provided in the beginning that the top is (Red) and the front face is (Blue).

From this it can be concluded that The option (iii) The sum of the two statements is sufficient. Yellow is the last top face to appear in the end post rotations.

Projection Based (Orthographic Projection -90 Degree)

(Isometric Projection-30/45 Degree)

Other Useful Resources

UCEED Previous Year's Question Papers with Solutions PDF

DOWNLOAD NOW 

UCEED Official Sample Question - Solution Creation

DOWNLOAD NOW 

Best Wishes

Warm Regards
Team Careers360

