Topic

7

Activity Based on

Visualizing Solid Shapes

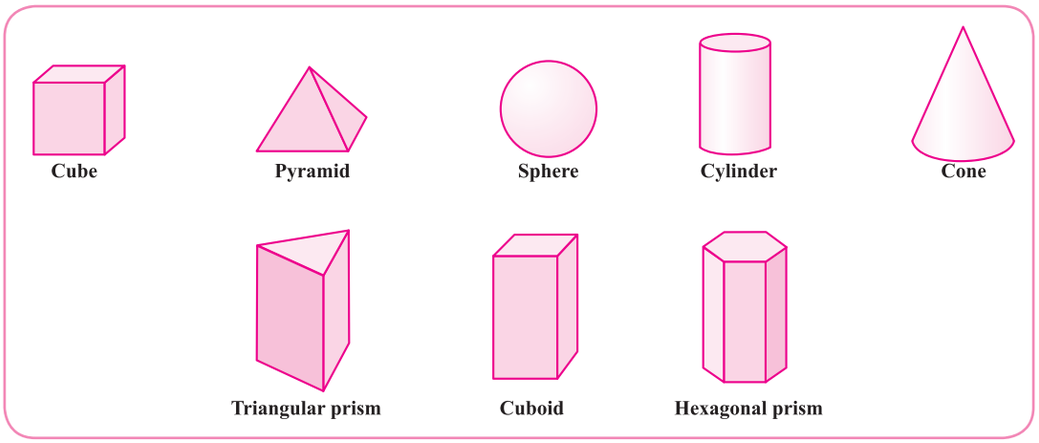
Introduction

Visualizing solid shapes is an essential skill in geometry that allows us to understand and analyze three-dimensional objects. Solid shapes, also known as 3D shapes, are objects that have *length, width,* and *height*. Unlike two-dimensional shapes, such as *squares* or *circles, solid shapes* have volume and occupy space.

One of the fundamental aspects of visualizing solid shapes is being able to recognize and identify different types of 3D objects. Some common examples of solid shapes include *cubes, cylinders, spheres, pyramids*, and *cones*. Each of these shapes has distinct properties and characteristics that make them unique. To visualize solid shapes accurately, it is crucial to understand their key attributes. For example,

(i) A cube: A cube is a solid shape with six square faces of equal size. It has eight vertices and twelve edges. Visualizing a cube involves picturing a solid object with straight edges and sharp corners.

(ii) Cylinder: Cylinder on the other hand, consist of two circular faces connected by a curved surface. They have two parallel bases of equal size and a height that represents the distance between the bases. Visualizing a cylinder requires imagining a solid figure with a curved surface and circular ends.



3D Spheres

(iii) Spheres: Spheres are perfectly round solid shapes that have no faces, edges, or vertices. They are characterized by their radii, which are the distances from the center of the sphere to any point on its surface. Visualizing a sphere involves picturing a three-dimensional object without any flat surfaces.

(iv) Pyramids: Pyramids have a polygonal base and triangular faces that meet at a single point called the apex. The number of faces, edges, and vertices of a pyramid depends on the shape of its base. Visualizing a pyramid requires envisioning a solid shape with a flat base and triangular sides converging at the apex.

(v) Cones : Cones, similar to pyramids, have a circular base and a pointed apex. They also have a curved surface that connects the base to the apex. Visualizing a cone involves picturing a solid object with a circular base and a tapering shape that narrows towards the apex.

In conclusion, visualizing solid shapes is an essential skill that enables us to understand and interpret three-dimensional objects. By recognizing and identifying various types of solid shapes, we can accurately represent and analyze objects in three-dimensional space. With this skill, we can explore the world of geometry and apply it to various disciplines.

Activity 7.1

Based on Front View / Side View of Solid Shapes

Scan this QR code to view demonstration of this activity

Objective

To draw shapes as viewed from different positions of some three dimensional shapes.

Pre-requisite Knowledge

1. Knowledge of making solid shapes using unit cubes.
2. Concept of front view the top view and the side view of a solid.

Materials Required

Unit cubes, sketch pens, etc.

Basic

In Arithmatics, a cube is a number multiplied by itself three times.

It is also a three-dimensional shape where each of the six sides is a square.

Procedure

Step 1. Take some unit cubes and make the shape shown in Fig. 8.1

Step 2. Now, draw shapes when viewed from front, side and top.

Step 3. Repeat the activity by making other shapes as shown in Fig. 8.2 to Fig. 8.4.

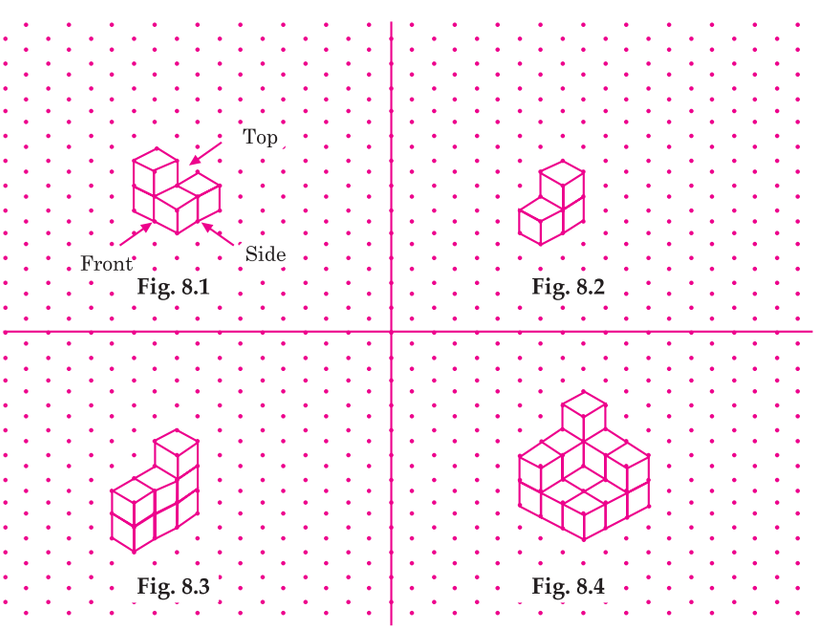


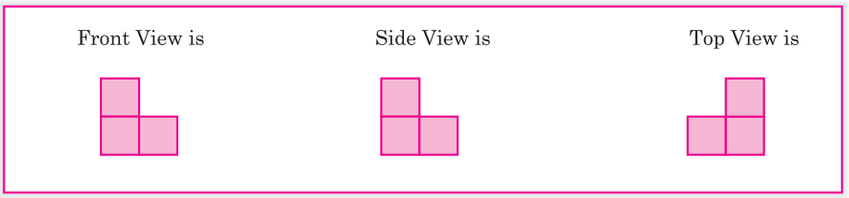
Fig. 8.1 Fig. 8.2

Fig. 8.3 Fig. 8.4

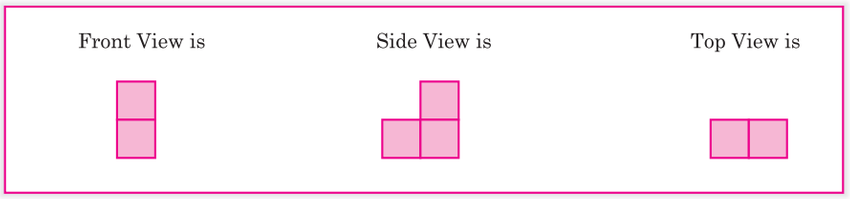
Do it on Isometric Dot Paper

Observations

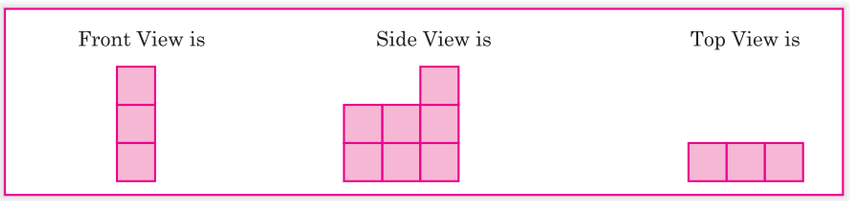
1. For Fig. 8.1.



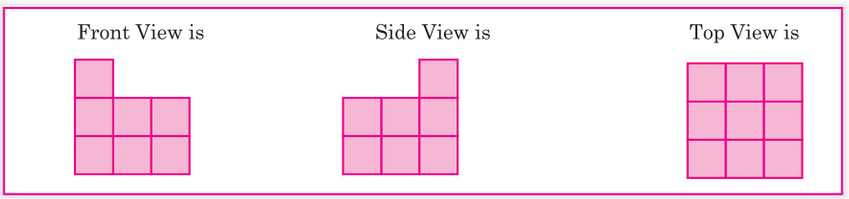
2. For Fig. 8.2.



3. For Fig. 8.3.



4. For Fig. 8.4.



Conclusions

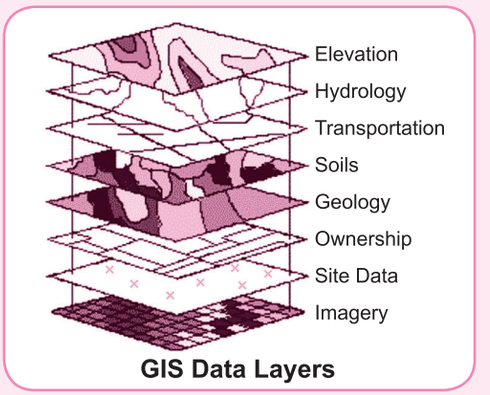
You may extend this activity by drawing different views of some more 3D objects from real life.

Applications of Visualizing Solid Shapes in Real-life

Real life applications of visualizing solid shapes are abundant and plays a crucial role in various fields. By representing three-dimensional objects in a two-dimensional space, visualizing solid shapes allows for better understanding, analysis, and practical applications. Here are some real life applications where this visualization technique is employed:

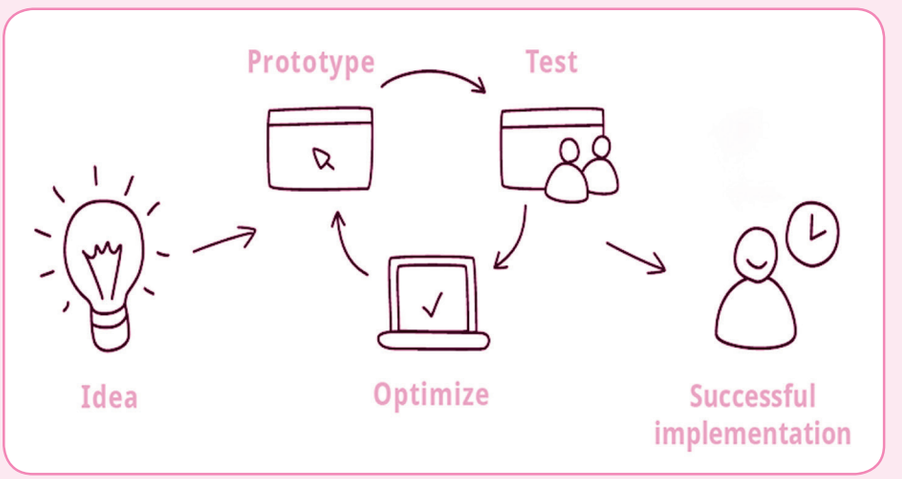
1. **Gaming and Animation:** The gaming and animation industries heavily rely on visualizing solid shapes to create immersive and realistic virtual environments. By using 3D modeling and animation software, game developers and animators can *bring characters, objects*, and *environments* to life, enhancing user experiences and storytelling capabilities.

2. **Geographic Information Systems (GIS):** GIS technologies utilize visualizing solid shapes to represent geographical data and analyze spatial relationships. Applications range from urban planning and land management to environmental monitoring and emergency response systems. By visualizing solid shapes, GIS enables professionals to make informed decisions based on spatial patterns and relationships.



GIS Data Layers

3. **Industrial Design and Prototyping:** Visualizing solid shapes is crucial in industrial design and prototyping. Industrial designers use 3D modeling software to create virtual prototypes of products, allowing them to visualize and evaluate designs before physical production. This helps reduce development costs, optimize product aesthetics and functionality, and streamline the manufacturing process.



VIVA-VOCE

1. What do you mean by the three dimensions in geometry ?

Ans. An object with three dimensions (such as height, width and depth) like any object in the real world. For example : our body is three-dimensional.

2. What is the definition of a cube in maths ?

Ans. In math, a cube is a number multiplied by itself three times. The cube of 2 is 8 ($2 \times 2 \times 2$). Cube is also a three-dimensional shape where each of the six sides is a square or something shaped like a cube, such as an ice cube or meat cut into cubes).

3. How is the word cube used in geometry ?

Ans. In geometry, a cube is a three-dimensional solid object bounded by six square faces. Each square face has the same side length and thus all faces have the same size. A cube has 6 faces, 12 edges and 8 vertices.

4. What is a perfect cube with concept of Arithmetic ?

Ans. A perfect cube is the result of multiplying a number three times by itself, $a \times a \times a = a^3$. We can also say that perfect cubes are the numbers that have exact cube roots. For example, 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, 1331, 1728, 2197, 2744 etc. are the perfect cube of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,13, 14, etc.

5. What is a unit cube ?

Ans. A unit cube, is a cube whose sides are 1 unit long. The volume of a 3-dimensional unit cube is 1 cubic unit, and its total surface area is 6 square units.

6. What is the volume of each unit cube ?

Ans. A unit cube, sometimes called a cube of side 1, is a cube whose sides are 1 unit long. The volume of a 3-dimensional unit cube is 1 cubic unit, and its total surface area is 6 square units.

7. How do you calculate the volume of a cube ?

Ans. Following steps are for calculation of volume of a cube :

(i) *Measure the length, width* and *height* of a single unit in either inches or meters, whichever unit of measurement we use, measure all dimensions in the same unit of measurement.

(ii) Multiply the length, width and height of the unit together.

8. What is a cube in algebra ?

Ans. In arithmetic and algebra, the cube of a number n is its third power; the result of the number multiplied by itself thrice : $n^3 = n \times n \times n$. It is also the number multiplied by its square. It determines the side of the cube of a given volume.

MULTIPLE CHOICE QUESTIONS

(Only 1 Option is Correct)

1. If volume of cube is 4913 cm^3 then length of side of cube is _____ .

(*a*) 16 cm ☐ (*b*) 17 cm ☐

(*c*) 18 cm ☐ (*d*) 19 cm ☐

2. Number 343 is cube of _____ .

(*a*) 9 ☐ (*b*) 7 ☐

(*c*) 8 ☐ (*d*) 6 ☐

3. If length of one side of cube is 20 cm then volume of cube must be_____ .

(*a*) 8000 cm^3 ☐ (*b*) 800 cm^3 ☐

(*c*) 4000 cm^3 ☐ (*d*) 6000 cm^3 ☐

4. 9^3 (cube of 9) is equal to_____ .

(*a*) 525 ☐ (*b*) 343 ☐

(*c*) 729 ☐ (*d*) 512 ☐

5. Cubic root of 216 is_____ .

(*a*) 5 (*b*) 6

(*c*) 11 (*d*) 9

6. If one root of equation $x^2 - 3x + a = 0$ is 2, then the value of a is _____ .

(*a*) a = –2 (*b*) a = 2

(*c*) a = 0 (*d*) a = –3

7. Sum of all three cube roots of unit is_____ .

(*a*) 1 (*b*) –1

(*c*) 3 (*d*) 0

ANSWERS

1. (*b*) **2.** (*b*) **3.** (*a*) **4.** (*c*) **5.** (*b*) **6.** (*b*) **7.** (*d*)