Vision Empower & XRCVC

Teacher Instruction KIT

Solids

Syllabus: Karnataka State Board
Subject: Mathematics
Grade: IV
Textbook Name: Mathematics Text cum Workbook
Chapter Number & Name: 18, Solids

1. OVERVIEW

1.1 OBJECTIVE & PREREQUISITES

Students will be able to

- identify different geometrical shapes and compare those with the shapes that, we see in day to day life,
- identify the faces, edges and vertices of solids,
- understand the differences between plane geometrical figures and solid geometric figures,
- draw three-dimensional shapes,
- create a shape by rotating a coin,
- make solid figures having 4 faces, 5 faces and 6 faces using specially formed nets.
- identify 2 dimensional plane figures & 3 dimensional solid figures.

Prerequisite Concept

- Identification of 2D and 3D figures.
  TIK_G3_GH1_Shapes

Content Index

*Kindly Note: Activities marked with * are mandatory*

GEOMETRICAL SHAPES AND ITS FEATURES

Activity 1: Identify different geometrical shapes and compare those with the shapes that we see in day to day life.

Activity 2: To identify the faces, edges and vertices of solids.

TO DRAW/MAKE SOLID FIGURES

Activity 1: Understand the differences between plane geometrical figures and solid geometrical figures and draw three-dimensional shapes.

Activity 2: To create a shape by rotating a coin and arranging bangles one above the other.

Activity 3: To make solid figures having 4 faces, 5 faces and 6 faces using specially formed nets.

IDENTIFY 2-D AND 3-D

Activity 1: To identify 2-dimensional plane figures and 3 dimensional solid figures

LET'S DISCUSS: RELATE TO DAILY LIFE*

EXERCISES & REINFORCEMENT

Activity 1: Practise Problems

IMPORTANT GUIDELINES*

Exercise Reading

Perform Textbook Activity

Provide Homework

2. LEARN

2.1 KEY POINTS

- Plane figures or 2-dimensional figures: A shape that only has two dimensions (such as width and height) and no thickness. Squares, Circles, Triangles, Hexagon, Rhombus are two-dimensional objects. Also known as 2D.
- Solid figures or 3-dimensional figures: In geometry, a three-dimensional shape can be defined as a solid figure or an object or shape that has three dimensions – length, width and height. Unlike two-dimensional shapes, three-dimensional shapes have thickness or depth. Also known as 3D.

2.2 LEARN MORE

3. ENGAGE

3.1 INTEREST GENERATION ACTIVITY

Activity 1: 2 Dimensional and 3 Dimensional

Materials Required: Ice-cream stick and clay/play dough

Prerequisites: Attributes of shapes.

Activity Flow

- *Divide the students into a group of 3 or 4.*
- *Distribute ice cream sticks and clay to each group.*
- *Ask the students to create a square, triangle, rectangle, hexagon and pentagon using ice cream sticks.*
- *And also ask them to create a ball, ice-cream cone, cylinder, shape of dice using the clay/play-dough.*
- *Discuss the difference between ice-cream stick figures and clay made figures.*
    - *A 2D shape is a shape with two dimensions, such as length and breadth; a 3D shape is a shape with three dimensions, such as width, height and depth.*
    - *2D shapes refer to all those shapes that we can lay on a flat piece of paper or any mathematical plane. For example, figures made by ice-cream sticks are flat in shape.*

OR

To make 3D objects

- *Use peas and toothpicks to create 3D model figures.*
- *Use peas to connect the toothpicks.*

3.2 CONCEPT INTRODUCTION ACTIVITIES

GEOMETRICAL SHAPES AND ITS FEATURES

Activity 1: Identify different geometrical shapes and compare those with the shapes that we see in day to day life.

Materials Required: Solid geometrical figures such as a sphere, cone, cube, cuboid and cylinder.

Prerequisites: Identification of 2D and 3D figures.

Activity Flow

- *Give them as many objects as possible that are used in day to day life and ask them to compare those with the geometrical shapes.*
  For example,
    - *soap, matchbox - cuboid in shape.*
    - *dice, Rubix cube - cube in shape*
    - *powder box - cylinder in shape*
    - *Ice cream cone - cone shape*

Activity 2: To identify the faces, edges and vertices of solids.

Materials Required: Cuboid Sponge/ wooden piece, Geometry box, Dice/ rubik's cube, cylindrical wooden piece/AA or AAA battery/Orio or Marie gold biscuit, Ice cream/ cone/carrot, ball, marble/globe.
Prerequisites: Identification of 2D and 3D figures.

Activity Flow

- *Put all the objects from all different geometrical solids such as cube, cuboid, cone, cylinder and sphere in a bag.*
- *Let the students come one at a time and ask them to pick an object from the bag.*
- *Depending on the solids they take, tell them what type of solid it is and explain what are the face, edge and vertex of an object.*
    - *The face is the surface of the sides, the edge is a line and vertex is a point.*
- *Let each of them count and state the number of faces, edges and vertices and discuss in the class to check whether everybody got the same numbers.*
    - *For example, all cuboids will have 6 faces, 12 edges and 8 vertices.*
- *Similarly, ask them to count the number of faces, edges and vertices of different types of solids like cube, cone, and sphere.*
    - *If it is a cube it will have 6 faces, 12 edges and 8 points. A cylinder will have 3 faces, 2 edges and no vertices. A cone will have 2 faces, 1 edge and 1 vertex. Sphere will have 1 face and no edges and vertex.*
- *In the same way, this activity can be extended and modified according to the interests of the students, by making two groups, as follows:*
- *The teacher will say the name of the solid object and one of the students from group 1 should come and pick the correct solid and should say the number of faces, edges and vertices of that solid. If it is correct then that group will get full points.*
- *Do the same for the other group.*

TO DRAW/MAKE SOLID FIGURES

Activity 1: Understand the differences between plane geometrical figures and solid geometrical figures and draw three-dimensional shapes.

Materials Required: Tactile diagram of a plane triangle, square, rectangle and solid geometrical figures such as a cube, cuboid and cylinder.
Prerequisites: Identification of 2D and 3D figures.

Activity Flow

- *Give them a tactile diagram of a plane triangle, square, rectangle and solid geometrical figures such as a cube, cuboid and cylinder. Ask them to observe both plane and solid figures. And list the differences they find in both and discuss in the class.*
- *The difference is a plane figure has two dimensions namely length and breadth. A solid figure has three dimensions namely length, breadth and height.*
    - *Length is the distance along an object from end to end.*
    - *Height is the distance from the lowest point to the highest point of an object*
    - *Breadth is the distance from one side of an object to the other side.*

Activity 2: To create a shape by rotating a coin and arranging bangles one above the other.

Materials Required: circular tangram shape/coin, Bangles of equal diameters, tangrams
Prerequisites: Identification of 2D and 3D figures.

Activity Flow

- *Rotate a circular tangram shape or coin from your forefinger and observe the geometrical shape generated by the rotation of the coin.*
    - *When we rotate, we will get to see a sphere that is 3 dimensional.*
- *Ask them to take 10 to 15 bangles of the same diameter. Now tell them to arrange the bangles one above another.*
  For example, place the first bangle, on top of the first bangle place the second one and on the top of the 2nd bangle place the 3rd one. Similarly, arrange all the bangles. If they arrange the bangles one above another, they will get a cylinder shape. They can touch and feel the shape after they arrange the bangles one above the other. Also, ask them to feel the space inside the heap of bangles.
- *Also, ask them if they can make any solid 3D figure using any of the tangram shapes.*
- *Ask them to arrange the same size 5 rupee coins one above the other to get the cylinder shape.*

Activity 3: To make solid figures having 4 faces, 5 faces and 6 faces using specially formed nets.

Materials Required: Nets of 4 faces, 5 faces and 6 faces.
Prerequisites: Identification of 2D and 3D figures.

Activity Flow

- *The net of the triangular based pyramid has 4 faces and folding along the edges will give the solid figure.*
- *Net of a square-based pyramid and triangular prism has 5 faces and folding along the edges will give the solid figure.*
- *Net of the cube and cuboid has 6 faces and folding along the edges will give the solid figure.*
- *Geometry net is a 2-dimensional shape that can be folded to form a 3-dimensional shape or a solid. Or a net is a pattern made when the surface of a three-dimensional figure is laid out flat showing each face of the figure.*

Here are some steps to determine whether a net forms a solid:

- *Make sure that the solid and the net have the same number of faces and that the shapes of the faces of the solid match the shapes of the corresponding faces in the net.*
- *Visualize how the net is to be folded to form the solid and make sure that all the sides fit together properly.*
- *Nets are helpful when we need to find the surface area of the solids.*

IDENTIFY 2-D AND 3-D

Activity 1: To identify 2-dimensional plane figures and 3 dimensional solid figures
Materials Required: Nets of cube, cuboid, cylinder, cone, sphere, real objects such as a ball, matchbox, dice, pipe, ice cream cone/birthday cap (in the shape of a cone) and book
Prerequisites: Identification of 2D and 3D figures.

Activity Flow

- *Ask the students to randomly pick the net and match the net with the real object.*
- *Also, ask them to give real examples for the net of solid they have selected before matching with the available real objects.*

3.3 LET'S DISCUSS: RELATE TO DAILY LIFE*

Shapes exist in our 3D world.
For example,

- Shoebox -cuboid shape.
- Kitchen storage container/ jar - cylindrical shape
- Water bottle - cylindrical shape.

4. EXERCISES & REINFORCEMENT

4.1 PRACTICE EXERCISES

Materials Required: None
Prerequisites: Identification of 2D and 3D shapes

Activity Flow

I. *Write whether the following statements are true/ false.*
    1. *A cube has 8 vertices, 12 edges and 6 faces.*
    2. *A cuboid has 8 vertices, 6 edges and 12 faces.*
    3. *A cone has 1 vertex, 1 plane surface, 1 curved edge and 1 curved surface.*
    4. *A cylinder has 2 plane surfaces 1 curved surface, 2 curved edges and without any vertices.*
    5. *A sphere has 2 curved surfaces.*

II. *Make a list of solid figures that you see in your house.*

4.1 IMPORTANT GUIDELINES*

Exercise Reading
It is very important that the children practice their learnings as well as their Reading. Hence have the children read out the newly learned concepts from their textbooks or other available resources.

Perform Textbook Activity
It is good practice to have the children perform the textbook activities. Your textbook activities might not be accessible hence go through this resource to learn how to make textbook content accessible

Provide Homework
To evaluate their understanding and to help the student revise and implement the new learnt concept ensure to provide them with homework. Students should perform one or two of the questions mentioned above or from the textbook exercises with the teacher in Class and the remaining may be given for homework. Also, ensure that the student knows their special skills linked to independently using their accessible books as it will be critical to doing homework independently

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