

Vision Empower & XRCVC
Teacher Instruction KIT
Basic Geometrical Ideas

Syllabus: Karnataka State Board
Subject: Mathematics
Grade: 6
Textbook Name: Math Text cum workbook
Chapter Number & Name: 4, Geometrical Ideas

1. OVERVIEW

1.1 OBJECTIVE AND PREREQUISITES

Objective

- Students will learn interesting facts about geometric ideas about a point, line, curve, polygons, circle.

Prerequisite Concept

- Circles, Angles
TIK_MATH_G5_CH7_Circle, TIK_MATH_G5_Angles

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*Kindly Note: Activities marked with * are mandatory*

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2. LEARN

2.1. KEY POINTS

Point: A point in geometry is a location. It has no size i.e. no width, no length and no depth. A point is shown by a dot.

Line: A line is defined as a line of points that extends infinitely in two directions. It has one dimension, length.

Curve: A curve is a continuous and smooth flowing line without any sharp turns. One way to recognize a curve is that it bends and changes its direction at least once.

Polygons: A polygon is any 2-dimensional shape formed with straight lines. Triangles, quadrilaterals, pentagons, and hexagons are all examples of polygons. The name tells you how many sides the shape has. For example, a triangle has three sides, and a quadrilateral has four sides. A polygon is a flat figure that is made up of straight lines and is enclosed.

Circle: A circle is the locus of all points equidistant from a central point.

2.2. LEARN MORE:

None

3. ENGAGE

3.1. INTEREST GENERATION ACTIVITIES

INTRODUCTION OF BASIC GEOMETRY

Activity 1: Meaning of Geometry

Materials Required: None

Prerequisites: None

Activity Flow

- *Ask the following questions to the students.*
 - *What is meant by geo?*
 - *The word Geo means Earth. For example, Geography, Geocentric - these all terms are related to the earth.*
 - *Similarly, Metron means measurement.*
- *The term Geometry is the English equivalent of the Greek word Geometron.*
- *Geometry is a branch of mathematics that studies the sizes, shapes, positions angles and dimensions of things.*
- *Geometrical ideas are shaped up in ancient times, due to the need in art, architecture and measurement.*

For example, construction of palaces, temples, lakes, dams and cities, art and architecture propped up these ideas.

CONCEPT INTRODUCTION ACTIVITIES

POINT

Activity 2: Point

Materials Required: Geometry kit, Slate and stylus.

Prerequisites: None

Activity Flow

- *Ask the students, what is their idea about a point in mathematics?*
- *Let the students put dots on a paper with a stylus from a geometry kit.*

OR
- *The other way of putting dots on a sheet is using slate and stylus. Then, tell them that each dot on the slate is a point. Explain to the students that the point determines the location.*
- *Ask the students to put a dot on a sheet of paper using a stylus and then again ask them to put one more dot on the same sheet next to the first dot.*
- *Explain to the students, if you mark two points on a paper, you would be required to distinguish them. For this, they are denoted by a single capital. Tell the students that the first point is A and the second point is B.*

LINE

Activity 3: Line

Materials Required: Geometry kit, a sheet of paper and thread.

Prerequisites: None

Activity Flow

- *Ask the students, how will they draw a line without using the geometry kit?*
- *Ask the students to fold the paper and unfold it. Ask them to observe the raised line on the paper, which represents the line segment.*
- *Ask the two children to stretch and hold the thread or ask any one of them to hold the thread. Here, two children at both the ends represent the starting and ending point of a line or two hands holding ends represent the two endpoints respectively. Hence, a line is formed by joining the two extreme (end) points.*

Activity 4: Draw a line

Materials Required: Parchment sheet, Geometry kit and stylus.

Prerequisites: None

Activity Flow

- *Ask the students to take a parchment sheet and put a ruler on it then draw a line using a stylus. Then name the endpoints.*
- *Ask the students, does a line consist of only two points or many points.*
Answer: A line is a continuous arrangement of single dots. But we restrict it at both ends to get a line otherwise it extends indefinitely in both directions. Hence, we say two points determine a line.
- *Let the students first put two points A and B on a parchment paper. Then ask them to draw a number of possible lines which will connect both the points. I.e. a line common to both the points.*
- *Ask the student to stand in a line and ask the name of the first and last person. So, those two will be the endpoints of a line.*
- *Give some examples of a line. The edge of Taylor frame, Table, Book is a line.*
- *Tell the students to Put continuous dots on a paper using slate and stylus that gives a line segment.*
- *Show them the tactile model of the line.*

Activity 5: Intersecting lines

Materials Required: Geometry kit, tactile diagram of intersecting lines

Prerequisites: Lines

Activity Flow

- *Ask the students to put a point on a parchment paper using a stylus and to draw as many lines as possible such that every line should pass through the same point. Then we will come across lines crossing each at one point and those lines are called intersecting lines.*
- *Try the following things, with the students to explain the intersection of lines.*
- *Take a sheet of paper and make two folds such that they cross each other. That is, make the first fold then keep that fold as it is. Then, fold the paper from right to left or left to right. Ask the students to touch the point where both the lines intersect.*
- *Give the following examples for a pair of intersecting lines.*
 - *Two adjacent edges of your notebook.*
- *Show them the tactile diagram of intersecting lines.*

Activity 6: Parallel lines

Materials Required: Thread, Tactile ruler, Sheet of paper.

Prerequisites: Lines

Activity Flow

- *Ask the students to hold the two independent threads in both the hands such that the positions of both the hands are at the same level.*
- *Similarly, in place of thread, ask them to hold a scale (ruler).*
- *Ask them to observe the opposite sides of the book, Taylor frame, Slate, Table.*
- *Ask the students to place a ruler on the parchment sheet and draw the two opposite lines using a stylus. And ask them to observe the distance between two lines at different points. And ask them to share what they have observed.*
- *Here, the two threads or scale or the opposite lines on the scale represent the lines which will never meet and the distance between them is constant. And such a pair of lines are called parallel lines.*

RAY

Activity 7: Ray

Materials Required: Tactile model of a ray

Prerequisites: None

Activity Flow

Show them the tactile model of ray, and explain that ray is a portion of the line which starts at one point and goes endlessly in the other direction.

Examples: Sun rays, a ray of light in a torch.

CURVES

Activity 8: Curves

Materials Required: Geometry kit, Thread, Tactile model of the curve.

Prerequisites: Circles

Activity Flow

- *Ask them to draw a line which is not straight, on a parchment sheet using a geometry kit. Also, let them draw an outline of their palm and discuss the nature of lines of those figures.*
- *Similarly, give them the thread and ask them to make a shape which will not have straight lines. Then using that shape explain the concept of curves to the children.*
- *Show them the tactile model of curves and its types such as simple, closed and open curves. Then ask them to give examples for each.*
 - *Simple curve: A curve which does not have a cross in itself. Example: a curved line*
 - *Closed curve: A curve which is closed. Example: Bangle, circle*
 - *Open curve: A curve which is open. Example: Tactile model or open curve thread.*
- *Meanwhile, explain to them that in a closed curve, thus, there are three parts.*
 - *Interior ('inside') of the curve.*
 - *Boundary ('on') of the curve.*
 - *Exterior ('outside') of the curve.*
 - *The interior of a curve together with its boundary is called its "region".*

POLYGONS

Activity 9: Polygons

Materials Required: Geometry kit, ice cream sticks or toothpicks, paper fold, a tactile model of polygons and cycle wall tube with barbeque stick or toothpick.

Prerequisites: Square, triangle, rectangle.

Activity Flow

- *Any simple closed figure made up of line segments is called a polygon.*
- *Tell them that, the triangle being the simplest closed figure which is made up of three sides.*
- *Similarly, ask them to give examples of polygons having different sides.*
Example: square, rectangle, pentagon, hexagon.
- *Ask them to construct polygons of different sides using ice cream sticks.*
 - *Ask them to construct a polygon using three ice cream sticks.*

- Ask them to construct a polygon using four ice cream sticks.
- Ask them to construct a polygon using five ice cream sticks.
- Explain to them that the line segments forming a polygon are called its sides. The meeting point of a pair of sides is called its vertex. Any two sides with a common endpoint are called the adjacent sides of the polygon
- We can also construct polygons using cycle wall tubes as hinges to connect sticks for different sided polygons.

Example: Square ABCDA, has 4 vertices A, B, C and D. Sides are AB, BC, CD and DA. Diagonals are drawn from one vertex point to the opposite vertex point, so a square can have two diagonals in it.

ANGLES

Activity 10: Angles

Materials Required: Geometry kit (parchment sheet), Cardboard box, Ice cream sticks, a tactile model of an angle, Paper fold, the model of the clock.

Prerequisites: Introduction to angle and representation of an angle. Refer to TIK_MATH_G5_CH6_Angles.

Activity Flow

An angle is made up of two rays starting from a common initial point. The two rays forming the angle are called the arms or sides of the angle. The common initial point is the vertex of the angle. i.e. Angles are made when corners are formed.

- Explain to them how to construct an angle using a geometry kit on a parchment sheet.
- Show them the real cardboard box having an opening lid. I.e. the edge of an opening lid and an edge of a box which shares a common initial point forming corner will make an angle.
- Ask the students to use Icecream sticks to make an angle.
- Show them the tactile model of an angle and explain the concept of interior and exterior angle.
- Also, explain to them the other way of forming an angle by folding a paper and moving hands of the clock will form an angle.

TRIANGLE

Activity 11: Triangle

Materials Required: Geometry kit, parchment paper, paper fold, a tactile model of a triangle, Ice cream sticks.

Prerequisites: The shape of a triangle.

Activity Flow

As we know, a triangle is a three-sided polygon. It is the polygon with the least number of sides.

- *Show them to construct triangles on a parchment sheet using tactile rulers.*
- *Give them ice cream sticks and ask them to construct triangles with it. Also, show them the tactile model of the triangle and explain to them the number of sides, vertices and angles (interior and exterior).*
- *Also, show them the triangle formed by folding paper.*
 - i) Take a rectangular sheet of paper and make half fold and crease it then unfold. The line in the middle will divide the single sheet into two small rectangles.*
 - ii) Now, make a fold diagonally in the two small rectangular sheets and crease it. Then we will end up with a triangle.*

QUADRILATERALS

Activity 12: Quadrilaterals

Materials Required: Geometry kit, parchment sheet, a tactile model of a quadrilateral, ice cream sticks, paper fold.

Prerequisites: None

Activity Flow

A four-sided polygon is a quadrilateral. It has 4 sides and 4 angles.

- *Show them to construct a quadrilateral on a parchment sheet using a tactile ruler.*
- *By showing them the tactile model of a quadrilateral, explain about the adjacent and opposite angles.*
- *Also, ask them to construct a quadrilateral using Ice cream sticks. Ask them to give examples of quadrilaterals.*

Example: Square, Rectangle, Parallelogram, Trapezium.

CIRCLE

Activity 13: Circle

Materials Required: Geometry kit, parchment sheet, a tactile model of a circle, a real model of a circle (bangle, ring), circular sheet of paper, tactile diagrams of circle with center, radius, diameter, chord.

Prerequisites: Circle construction. Refer to TIK_MATH_G5_CH7_Circles.

Activity Flow

- *A circle is a path of a point moving at the same distance from a fixed point. The fixed point is the centre, the fixed distance is the radius and the distance around the circle is the circumference.*
- *A chord of a circle is a line segment joining any two points on the circle.*
- *A diameter is a chord passing through the centre of the circle.*
- *A sector is a region in the interior of a circle enclosed by an arc on one side and a pair of radii on the other two sides.*
- *A segment of a circle is a region in the interior of the circle enclosed by an arc and a chord.*
- *The diameter of a circle divides it into two semi-circles.*
- *We see many things that are round, a wheel, a bangle, a coin, a ring etc. We use the round shape in many ways. It is easier to roll a heavy steel tube than to drag it. A circle is a simple closed curve which is not a polygon.*
- *Ask the students to make a trace of circular objects on a parchment sheet.*
- *Show them to construct a circle on a parchment sheet using a ruler, divider.*
- *And by showing them the tactile model of parts of the circle, explain the different parts of a circle such as centre, radius, circumference, chord and sector.*
- *Ask them to make half a fold of circular paper and tell them that it is called a semicircle.*
- *Ask the students to list the uses of circular objects in our daily life.*

3.3 LET'S DISCUSS: RELATE TO DAILY LIFE

Geometrical ideas are reflected in all the forms of art, measurements, architecture, cloth designing etc, you observe and use different objects such as tiffin boxes, boxes, tables, books and balls. All of these objects have different shapes. Also, one of the best examples of the application of geometry in daily life will be the stairs which are built-in homes in consideration to angles of geometry constructed at 90 degrees.

4. EXERCISES & REINFORCEMENT

4.1 PRACTICE EXERCISES

Activity 14: Practice and Recall

Materials Required: None

Prerequisites: None

Activity Flow

1. *How many lines can pass through (a) one given point? (b) two given points?*
2. *Draw rough diagrams to illustrate the following:*
 - a. *Open curve*
 - b. *Closed curve*
3. *Draw any polygon and mark its interior.*
4. *Illustrate, if possible, each one of the following with a rough diagram:*
 - (a) *A closed curve that is not a polygon. (using thread or bangles)*
 - (b) *An open curve made up entirely of line segments. (using toothpicks or ice-cream sticks)*
 - (c) *A polygon with two sides.*
5. *Is every diameter of a circle also a chord?*
6. *Is every chord of a circle also a diameter?*
7. *Draw any circle and mark its center.*
8. *Say true or false :*
 - (a) *Two diameters of a circle will necessarily intersect.*
 - (b) *The centre of a circle is always in its interior*

Teaching Tips

None

References

None

4.2 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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