

Vision Empower & XRCVC

Teacher Instruction KIT

Understanding Elementary Shapes

Syllabus: Karnataka State Board

Subject: Mathematics

Grade: 6

Textbook Name: Math Text cum workbook

Chapter Number & Name: 5. Understanding Elementary Shapes

1. OVERVIEW

1.1 Objective and prerequisites

Objective

Students will be able to:

- Compare the length of two line segments
- To measure the angles using the protractor
- To classify triangles.

Prerequisite Concept

- Line segments, angles and its types, triangles, quadrilateral and polygons

TIK_MATH_G5_CH6_Angles

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*Kindly Note: Activities marked with * are mandatory*

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name : Understanding Elementary Shapes

run : 2019

org : VisionEmpower

number: VE_TIK_Math_G6-CH5

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short_description: Karnataka, Tamilnadu, Delhi, Kerala, Sixth grade, Math, Angles, Understanding elementary shapes, acute angle, Reflex angle, polygons.

2. LEARN

2.2 KEY POINTS

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

Angle: In-plane geometry, an angle is the figure formed by two rays, called the sides of the angle, sharing a common endpoint, called the vertex of the angle.

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.

Acute angle: When an angle measure is less than a right angle, it is called an acute angle.

Obtuse angle: When an angle measures more than a right angle but less than a straight angle, it is called an obtuse angle.

Reflex angle: When an angle measures more than a straight angle, it is called a reflex angle.

2.2 LEARN MORE

3. ENGAGE

3.1 INTEREST GENERATION ACTIVITY

Activity 1: Shapes around us.

Materials Required: Taylor frame, book, ball, piece of chalk

Prerequisites: Basic shapes.

Activity Flow

- *Ask the following questions to the students.*
 - *What is the shape of your Taylor frame?*
 - *What is the shape of a bus tyre?*
 - *What is the shape of a bucket?*
 - *What is the shape of your soap?*
- *Give the different shapes of objects and ask them to find the shape of each object?*
 - *For example, ball - sphere shape.*
 - *Book - rectangle shape, ask them to show the edges of the book.*
 - *Piece of chalk - Cylinder shape.*
- *Tell the students that they have to think of five objects which are in a cylinder shape, rectangular shape, square shape, triangle shape, and circle shape.*
- *Explain to the students, all the shapes we see around us are formed using curves or lines. For example, book - In all four sides, you can see a straight line.*
- *We can see corners, edges, planes, open curves and closed curves in our surroundings. We organise them into line segments, angles, triangles, polygons and circles.*

3.2 CONCEPT INTRODUCTION ACTIVITIES

Measuring line segments

Activity 2: Measuring line segments

Materials Required: Geometry kit, ice cream sticks, straws.

Prerequisites: None

Activity Flow

- *Students have learned what a line segment is. So, ask the students, what do they use to measure line segments?*
Answer: Tactile ruler
- *Ask them, what do they call the measure of line segment?*
Answer: Length
- *Give them the ice cream sticks and ask them to measure the length of an ice cream stick. Once they find the length of a single ice cream stick, ask them what would be the length of 2 ice cream sticks. Similarly, ask for 3, 4, 5, and so on randomly.*
- *Ask the students to measure the length of Taylor frame, book and slate. After they get the length of all the objects, ask them which is longer and how do they distinguish which is longer and shorter?*
- *Answer: By comparing lengths*

Measurement of an angle

Activity 3: Measurement of an angle

Materials Required: Geometry kit, pins, parchment sheet.

Prerequisites: Angles. Refer to TIK_MATH_G5_CH6_Angles, Activity 3.

Activity Flow

- *Ask the students to draw a big circle using a compass with a pen which fits approximately in an A4 sheet.*
- *Let them put a pin at the centre along with joining the initial point of the two paper strips.*
- *Now, let each of them make their own angles by keeping one side fixed and move the other side.*
- *Ask them, in which model of angle created and the angle formed is greater? Ask them, how do they do it?*

Answer: In order to answer the above question, let us understand how to measure an angle.

- *Ask the students to rotate the strip of paper from a fixed position. When this needle comes back to its original position, one rotation will be completed. We call this*

rotation as one complete angle. This one rotation will trace the complete circle. If the circle is equally divided into 360 parts, we get 360 angles. This one angle is called one degree. So the measure of one complete angle in a circle is 360 degrees.

- This can be observed in rotating the regulator, steering, tap etc.

Measurement using protractor:

- In order to introduce a protractor which is an instrument to measure an angle, a few activities are as follows.
- Ask the children to measure the bottom of the book, Taylor frame, table, bench and slate using the protractor.
- So, there is an instrument in a geometry box called a protractor. Ask them to observe the shape. We can measure the angle using a protractor. In this protractor 0 to 180 degree is marked. So the maximum angle measured by this protractor is 180 degrees.
- Hence, measuring an angle using a protractor, an angle has two arms. While measuring arms. While measuring the angle, either of the arms can be coincided with the 0-degree line of the protractor, then reading from left to right till the second arm. That measurement will be the angle.
- Ask them to give examples which have 180 degrees.

Activity 4: 90 and 180 Degrees

Materials Required: A4 sheet.

Prerequisites: Angles. Refer to TIK_MATH_G5_CH6_Angles, Activity 4.

Activity Flow

- Ask them to fold the paper twice into half and then quarter then unfold and see that the paper is divided into 4 equal parts of 90 degrees each. And if we combine two parts then the angle would be 180 degrees which is an angle of a straight line.

Instructions to fold the paper:

- Simply fold the bottom half to the top half, making sure the edges meet. Then fold the paper from again, the right edge should touch the left edge of the paper.
- Ask them, what do they know about directions as north, south, west and east?
- Tell them that the Sun rises in the east and sets in the west. There are four main directions. They are North (N), South (S), East (E) and West (W).
- Ask any four students to stand in four directions and one in the middle. The distance between the student in the middle and all four should be one arm distance. And ask the student in the middle to stand facing east and ask who is standing in that particular direction. So, students in the middle should turn clockwise to the east. Then we say, you

have turned 90 degrees which is a right angle. Follow this by a 'right-angle-turn', clockwise. You now face south. If you turn 90 degrees anti-clockwise, which direction will you face? It is East again.

- *Similarly, the concept of right angles and straight angles can be shown with the help of a clock.*

Activity 5: Right Angle

Materials Required: Circular sheet, Parchment paper and the geometry kit.

Prerequisites: Angles. Refer to TIK_MATH_G5_CH6_Angles, Activity 4.

Activity Flow

Right angle: An angle of 90 degrees.

- *Give the following example to the students.*
 - *Every 3'clock, 6'clock, 9'clock and 12'clock will make 90 degrees in a clock.*
- *Ask them to fold the circular paper twice along its centre. Then unfold and ask them to observe. Then explain to them that each quadrant is a 90-degree angle.*
- *Also, ask them to construct the right angle using ice cream sticks.*
 - *To construct, they have to place one stick horizontally and the other stick vertically. One end of the vertical stick should touch the one end of the horizontal stick.*
- *Ask them to draw at a right angle using a protractor on a parchment sheet.*

Acute, Obtuse, Reflex angle

Activity 6: Acute Angle

Materials Required: Parchment paper, ice-cream sticks and the geometry kit.

Prerequisites: Angles. Refer to TIK_MATH_G5_CH6_Angles, Activity 4.

Activity Flow

Acute angle: The angles are less than 90 degrees or when the measure of an angle is less than a right angle, it is called an acute angle.

- *Give the following examples to the students.*
 - *Time 4: 30 and 5:30 will be an acute angle.*
 - *The ladder kept inclined to a wall.*
- *Ask them to stretch their fingers in the hand and the angle between fingers will form an acute angle except for the angle between thumb and forefinger.*
- *And ask them to draw an acute angle using a protractor on a parchment sheet.*

- *Show them the tactile model of an acute angle.*
- *Ask them to construct using ice-cream sticks.*

Activity 7: Obtuse Angle, Reflex angle

Materials Required: Parchment paper, Ice-cream sticks, tactile model of obtuse angle and reflex angle, and the geometry kit.

Prerequisites: Angles. Refer to TIK_MATH_G5_CH6_Angles, Activity 4.

Activity Flow

Obtuse angle: When an angle measures more than a right angle but less than a straight angle, it is called an obtuse angle.

- *An example of an obtuse angle.*
 - *Time 7 o'clock, 8 o'clock, 9:30 will be an obtuse angle.*
- *Ask them to draw an obtuse angle using a protractor on a parchment sheet.*
- *Show them the tactile model of an obtuse angle.*
- *Ask them to construct using ice-cream sticks.*

Reflex angle: A reflex angle is larger than a straight angle.

- *An example of a reflex angle:*
 - *The time 5:50, 7:10 etc.*
- *Ask them to draw a reflex angle using a protractor on a parchment sheet.*
- *Show them the tactile model of a reflex angle.*
- *Ask them to construct using ice cream sticks.*
- *Let students give examples of all types of angles.*

Perpendicular lines

Activity 8: Perpendicular lines

Materials Required: Parchment paper, ice-cream sticks, tactile diagram of perpendicular lines and reflex angle, and the geometry kit.

Prerequisites: Angle

Activity Flow

Perpendicular lines:

- *When two lines intersect and the angle between them is a right angle, then the lines are said to be perpendicular.*
- *Show them the tactile diagram of perpendicular lines.*

- Ask them to draw perpendicular lines on a parchment sheet using a tactile ruler.
- Let them construct the perpendicular lines using ice cream sticks.
- Explain to them about the perpendicular bisector which bisects the length into two segments with the help of tactile diagram in the book.
- Ask the students to give examples for perpendicular lines.

Classification of triangles

Activity 9: Classification of triangles

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

Prerequisites: Vertices, Angles, Sides

Activity Flow

- 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 the tactile ruler.
- 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).

OR

- Give a square size of paper to each student and ask them to fold the paper diagonally. The left side edges of the paper should touch the bottom side edges of the paper.
- They will get the triangle shape by folding the square shape paper diagonally. Using this paper triangle, explain the sides, vertices and angles to the students.

Naming triangles based on sides:

- Ask the student to construct at least 3 triangles on a parchment sheet.
- Ask them to find the length of sides of all the triangles. Tell them about the types of triangles. A triangle having all three unequal sides is called a scalene triangle. A triangle having two equal sides is called an isosceles triangle and a triangle having three equal sides is called an equilateral triangle.
- Once they learn the different types of triangles based on the length of sides, ask them to construct a scalene, isosceles and equilateral triangle using ice cream sticks, Taylor frame and parchment paper.

Naming triangles based on angles:

- Ask the student to construct at least 3 triangles on a parchment sheet.
- Ask them to find the angle of all three sides for all the triangles and see if there is a triangle with each angle less than 90 degrees. It is called an acute-angle triangle. Or if

any one angle is a right angle then the triangle is called a right-angle triangle. If one angle is greater than 90 degrees, then the triangle is called an obtuse-angled triangle.

Quadrilateral

Activity 10: Quadrilateral

Materials Required: Ice cream sticks, geometry kit, model of 4 set squares.

Prerequisites: None

Activity Flow

A quadrilateral is a geometric figure which has four sides.

Let the students work in pairs and use the set squares to construct the following quadrilaterals.

- *Ask the students to arrange those two set squares such that the longest sides should face each other. And ask them what shape is formed. So, ask them to measure the length of all sides and see opposite sides are equal. Also, ask them to measure angles in all 4 sides.*

Answer: Rectangle

- *Ask the students to arrange those two set squares such that the longest sides should face each other. And ask them what shape is formed. So, ask them to measure the length of all sides and see that all sides are equal.*

Answer: Square

- *Ask the students to arrange the set squares one below the other opposite to each other such that the longest side of both set squares should touch each other. So, ask them to measure the length of all sides and see that opposite sides are parallel.*

Answer: parallelogram

- *Give them the tactile diagram of rhombus and let them explore the shape.*
- *Ask the students to arrange the two set squares next to each other such that the largest sides in both the triangles face in opposite directions. Arrange the rest of the two set squares below the above two triangles in a similar manner. Then, ask them to measure the length of all sides and observe that all sides are equal but diagonals are not equal.*

Answer: Rhombus

- Ask the students to use two set squares to make a triangle, then place a single set square next to the side of the rectangle. And ask them what shape is formed. So, ask them to measure the length of all sides and see opposite sides are equal.

Answer: Trapezium

- For different quadrilaterals we could see that the quadrilaterals having opposite sides are parallel or equal and all sides are equal.
- Similarly, ask the students to name the quadrilaterals having opposite angles equal, by measuring the angles of each side in all quadrilaterals.

Note: The same activity can be done by constructing a rectangle, square, parallelogram, rhombus and trapezium. And draw the opposite diagonals and find the following. Quadrilateral with opposite sides parallel or equal, all sides are equal, opposite angles equal, diagonals equal or perpendicular.

Polygons

Activity 11: Polygons

Materials Required: Geometry kit, ice cream sticks.

Prerequisites: Shapes and its sides. Refer to TIK_MATH_G5_CH18_Solids.

Activity Flow

- We have seen polygons of 3 and 4 sides, such as triangles and quadrilaterals respectively.
- Similarly, if we extend the number sides to 5, 6, 7 and 8, we get pentagon, hexagon, heptagon and octagon respectively.
- Ask the students to construct regular and irregular polygons having 5, 6, 7 and 8 sides separately using required instruments from the geometry kit. I.e. Regular polygons which have sides of equal length and an irregular polygon having sides of unequal lengths.
- Also, ask the students to construct the polygons using ice cream sticks.

Three Dimensional Shapes:

- 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.
- Ask the students to give examples of three-dimensional shapes and 2 dimensional shapes and compare them. .

Example: Ball, Dice, Book, Instrument box, pyramid, water bottle, Taylor frame etc.

- Ask the students to write the number of faces, edges for all the 3D shapes mentioned above.
- I.e. Each side of the surface in a 3D shape is a flat surface called a flat face. Two faces meet at a line segment called an edge. Three edges meet at a point called a vertex.
- Example: Dice which is 3D shape of square which is also called a cube has 6 faces, 12 edges or line segments and 8 vertices or points.

3D Song:

*3D shapes are fat not flat.
Find a cone in a birthday hat!
You see a sphere in a basketball,
And a cuboid in a building so tall!
You see a cube in the dice you roll,
And a cylinder in a shiny flag pole!*

3.3 LET'S DISCUSS: RELATE TO DAILY LIFE*

- In a clock, the two hands together make different sets of lines from a common point. These sets of lines from a common point are called angle. The two hands form different angles every minute of the time. A clock forms an example of angles in real life.
- We make different angles in different postures while doing yoga and exercises.
- The windows make right angles and perpendicular lines.
- Appliances such as computer monitors use rectangular shapes from 90 degrees, cellular phones come in various shapes, wall clocks are using 360 degrees, spiders construct their webs in exotic angles.
- Tree trunks make a right angle with flat ground.

4 EXERCISES & REINFORCEMENT

4.1 PRACTICE PROBLEMS

Activity 12: Practice and Recall

Materials Required: None

Prerequisites: Angles

Activity Flow

1. What fraction of a clockwise revolution does the hour hand of a clock turn through,

when it goes from

(a) 3 to 9

(b) 4 to 7

(c) 7 to 10

2. Which direction will you face if you start facing

(a) east and make $\frac{1}{2}$ of a revolution clockwise?

(b) east and make $1\frac{1}{2}$ of a revolution clockwise?

(c) west and make $\frac{3}{4}$ of a revolution anti-clockwise?

(d) south and make one full revolution?

3. How many right angles do you make if you start facing

(a) south and turn clockwise to west?

(b) north and turn anti-clockwise to east?

(c) west and turn to west?

(d) south and turn to north?

4. Say True or False :

(a) The measure of an acute angle greater 90 degree.

(b) The measure of an obtuse angle lesser 90 degree.

(c) The measure of a reflex angle greater 180 degree.

(d) The measure of one complete revolution = 360 degree

5. Fill in the blanks with acute, obtuse,

6. right or straight :

(a) An angle whose measure is less than that of a right angle is ___.

(b) An angle whose measure is greater than that of a right angle is ___.

(c) An angle whose measure is the sum of the measures of two right angles is ___.

(d) When the sum of the measures of two angles is that of a right angle, then each one of them is ___.

(e) When the sum of the measures of two angles is that of a straight angle and if one of them is acute then the other should be ___.

Say True or False :

(a) Each angle of a rectangle is a right angle.

(b) The opposite sides of a rectangle are equal in length.

(c) The diagonals of a square are perpendicular to one another.

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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