Vision Empower & XRCVC

Teacher Instruction KIT

Symmetry

Syllabus: Karnataka State Board
Subject: Mathematics
Grade: 7
Textbook Name: Text cum Workbook (Revised) – Seventh standard
Chapter Number & Name: 14. Symmetry

1. OVERVIEW

1.1 OBJECTIVE & PREREQUISITES

Objective

- To learn about line and rotational symmetry

Prerequisite Concept

- Symmetry

TIK_Math_G5_CH18_Symmetrical figures
TIK_Math_G6_CH13_Symmetry

Content Index

*Kindly Note: Activities marked with * are mandatory*

2. LEARN

2.1 KEY POINTS

1. Symmetry
2. Axis of symmetry
3. Rotational symmetry

2.2 LEARN MORE

3. ENGAGE

3.1 INTEREST GENERATION ACTIVITY

Identify symmetric and asymmetric figures

Activity 1: Identify symmetric and asymmetric figures

Materials required: Tactile diagrams of symmetric figures such as car, leaves, symbols, handkerchief, book, table, house, circle, square and tactile diagrams of asymmetric figures such as trapezium, irregular shapes, plant and 3 hands fan.
Prerequisites: To identify axis of symmetry

Activity Flow

Give students the tactile diagrams of symmetric figures such as car, leaves, symbols, handkerchief, book, table, house, circle, square and tactile diagrams of asymmetric figures such as trapezium, irregular shapes, plant and 3 hands fan.
Now, shuffle all the diagrams and them to segregate it into symmetric and asymmetric figures with reasons.

Draw symmetrical figures

Activity 2: Draw symmetrical figures

Materials required: Geometry kit, parchment paper, push pins
Prerequisites: To construct shapes

Activity Flow

Ask the students to give examples for symmetrical shapes by drawing it on the parchment paper with its axis of symmetry.

3.2 CONCEPT INTRODUCTION ACTIVITIES

Lines of symmetry for regular polygons

Activity 3: Lines of symmetry for regular polygons
Materials required: A4 sheets, the tactile diagram of triangle, square, pentagon and hexagon having all its lines of symmetry, punching machine/stick
Prerequisites: Construct shapes, lines, line of symmetry

Activity Flow

Axis of symmetry or line of symmetry is just the line that divides the shape into identical looking parts.
Ask the students to draw equilateral triangles, regular polygons like square, pentagon and hexagon. Then before they start to draw the lines of symmetry ask them the total number of lines of symmetries which can be drawn for each shape. Later they can check it by drawing.

Show the students the tactile diagrams of a triangle, a square, a pentagon and a hexagon having all their lines of symmetry. Also ask them to try doing this by paper folding.

Play this punching game:
Fold a sheet into two halves. Punch a hole with a punching machine or using a stick then unfold the sheet and see the two holes on either side of the symmetric fold.
Similarly, ask students to fold a sheet and make how many ever holes they want then unfold and observe the symmetrical design.

Rotational symmetry

Activity 4: Rotational symmetry
Materials required: Model of clock, tactile diagram of a square with bindi in one of its corners
Prerequisites: Axis of symmetry, angle

Activity Flow

Explain with the help of a model of a clock that the hands of a clock rotate in only one direction, about a fixed point, the centre of the clock-face. Rotation in the direction of movement of the hands of a clock, is called a clockwise rotation; movement in the opposite direction is said to be anticlockwise.

If you spin the wheel of a bicycle, it rotates. It can rotate in either way: both clockwise and anticlockwise. Give three examples each for (i) a clockwise rotation and (ii) anticlockwise rotation. When an object rotates, its shape and size do not change.
The rotation turns an object about a fixed point. This fixed point is the centre of rotation. Ask the students what is the centre of rotation of the hands of a clock?

The angle of turning during rotation is called the angle of rotation. A full turn means a rotation of 360 degree.
The degree measure of the angle of rotation for a half-turn means rotation by 180 degree; a quarter-turn is rotation by 90 degree.
When it is 12 O'clock, the hands of a clock are together. By 3 O'clock, the minute hand would have made three complete turns; but the hour hand would have made only a quarter-turn.
Ask the students what about clock hands positions at 6 O'clock?
Give the tactile diagram of a square with bindi in one of its corners to observe the rotation.
Let us perform quarter-turns about the centre of the square. However if you rotate it by 90 degree about the fixed point, the square will look exactly the same.
Thus a square has a rotational symmetry of order 4 about its centre. Observe that in this case,

(i) The centre of rotation is the centre of the square.
(ii) The angle of rotation is 90 degree
(iii) The direction of rotation is clockwise.
(iv) The order of rotational symmetry is 4

Every object has a rotational symmetry of order 1, as it occupies the same position after a rotation of 360 degree.

For rotational symmetry, make them hold the diagram with their finger at the point of rotation and then rotate the diagram and see how it looks different and some point during the rotation, but comes back to the original picture after regular intervals. To reinforce the concept of rotational symmetry, give the student a cut out of a regular polygon. Make them put their index finger on the centre point of the polygon and then slowly rotate the polygon and observe what happens to the orientation of the polygon.

Example: Give them the tactile diagram of letter L. Ask them after how many quarter rotations (90 degree) the letter will be back to its original position.

After two turns of 90 degrees the letter L will be upside down. Then again after two rotations the letter L will be back to its original form.

Line symmetry and Rotational symmetry

Activity 5: Line symmetry and Rotational symmetry

Materials required: Geometry kit, parchment paper
Prerequisites: Construct circle

Activity Flow

The circle is the perfect symmetrical figure, because it can be rotated around its centre through any angle and at the same time it has an unlimited number of lines of symmetry. Observe any circle pattern. Every line through the centre (that is every diameter) forms a line of (reflection) symmetry and it has rotational symmetry around the centre for every angle.

Ask the students to draw a circle then let them draw lines of symmetry.
Also ask them to give examples for both line symmetry and rotational symmetry.

3.3 LET'S DISCUSS: RELATE TO DAILY LIFE*

- Many Window grills
- Many wallpapers/ wall art pieces
- Many tiling's
- Objects in the shapes of symmetric polygons as well as circular objects
- Symmetry of human body
- Symmetry of roads, i.e. they are rectangular with a central road divider, and there is (usually) a footpath at the outer ends of the road.
- Most chairs are symmetric (along a vertical axis)
- Many shapes, slice of certain fruits, vegetables (onion, ladies finger, tomato, tree trunk, coin) the cross-sections are shapes with rotational symmetry
- Symmetry in nature – Butterfly, leaves, flowers, insects, fruits.

4. EXERCISES & REINFORCEMENT

4.1 EXERCISES & REINFORCEMENT

Practice and Recall

Activity 6: To identify symmetry and axes of symmetry

Materials Required: Books, slate, bottle, plate, spoon, handkerchief, geometry box, ball, pyramid and cone
Prerequisites: Symmetry

Activity Flow

In addition to examples on paper, give the student objects to hold and recognize the symmetry of objects. Give the students standard 3D shapes, and other objects like erasers, pencil sharpeners, keys, etc. to identify which of those are symmetric (and recognize the lines/ axes of symmetry) and which of those are not symmetric.

Homework

Activity 7: Homework

Materials required: Geometry kit, parchment paper, push pins,
Prerequisites: Line of symmetry

Activity Flow

1. *State the number of lines of symmetry for the following figures:*

(a) An equilateral triangle (b) An isosceles triangle (c) A scalene triangle (d) A square (e) A rectangle (f) A rhombus (g) A parallelogram (h) A quadrilateral (i) A regular hexagon (j) A circle

2. Give three examples of shapes with no line of symmetry.

3. What other name can you give to the line of symmetry of (a) an isosceles triangle?
(b) A circle?

4. Think of some more examples for rotational symmetry. Discuss in each case:
(i) The centre of rotation
(ii) The angle of rotation
(iii) The direction in which the rotation is affected
(iv) The order of the rotational symmetry.

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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