Vision Empower & XRCVC

Teacher Instruction KIT

Practical Geometry

Syllabus: Karnataka State Board
Subject: Mathematics
Grade: 6
Textbook Name: Math Text cum workbook
Chapter Number & Name: 14. Practical Geometry

1. OVERVIEW

1.1 OBJECTIVE & PREREQUISITES

Objective

Students will be able to

- use different tools in the geometry kit.
- construct a circle when its radius is known.
- construct a line segment of a given length.
- construct a copy of a given line segment.
- construct a perpendicular line to a line through a point on it.
- construct perpendicular to a line through a point not on it.
- construct perpendicular bisectors of a line segment.
- construct an angle of a given measure.
- construct of a copy of an angle of unknown measure.

Prerequisite Concept

- Know the use of ruler, compass, protractor, set squares
- Construction of lines, angles, circles using the appropriate instruments in the geometry kit.

TIK_G5_CH7_Circles, TIK_G5_CH6_Angles.

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*Kindly Note: Activities marked with * are mandatory*

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user: admin@example.com

2. LEARN

2.1 KEY POINTS

- A line segment has two endpoints. This makes it possible to measure its length with a ruler.

2.2 LEARN MORE

3. ENGAGE

3.1 INTEREST GENERATION ACTIVITY

INTRODUCTION TO THE CONCEPT

Activity 1: Creating parallel lines, line segments and intersecting lines

Materials Required: Wikki sticks or toothpicks or ice-cream sticks.

Prerequisites: None

Activity Flow

- *Distribute the toothpicks to the students.*
- *Ask them to make line segments, parallel lines, intersecting lines, obtuse angle and perpendicular lines using toothpicks.*

To make lines and Angles

- *Parallel lines - placing two toothpicks parallely.*
- *Line segment - Placing a toothpick horizontally/vertically.*
- *Intersecting lines- placing a toothpick horizontally and top it placing the other toothpick diagonally.*
- *Perpendicular lines- placing a toothpick vertically and on top it placing the other toothpick horizontally.*

OR

Simon says

- *Play a game of Simon Says, in which students need to use their hands and arms to form different geometric figures.*
- *Use this activity to introduce or review types of lines, angles, and more. When forming lines and segments, students use an open, pointed hand to represent an arrow, and a closed fist to represent a point.*

For example

To represent a ray, ask them to stand straight and open their arms. one side it should be an open hand and the other side it should be a pointed hand.

3.2 CONCEPT INTRODUCTION ACTIVITIES

Activity 2: Different tools in the geometry kit

Materials Required: Geometry kit

Prerequisites: None

Activity Flow

The ruler:

Description- A ruler along its length, has markings of dots and lines. Distance between two lines is one centimetre. And the distance from line to a dot is 0.5 centimetre.

Use - To draw line segments and to measure their lengths.

The Compasses:

Description- A compasses has a pointer on one end and pen or pencil on the other end.

Use - To mark off equal lengths but not to measure them. To draw arcs and circles.

The divider:

Description- A pair of pointers

Use - To compare lengths.

Set-Squares:

Description- Two triangular pieces – one of them has 45 degree, 45 degree and 90 degree angles at the vertices and the other has 30 degree, 60 degree and 90 degree angles at the vertices.

Use - To draw perpendicular and parallel lines.

The protractor:

Description- A semi circular device graduated into 180 degree parts. The measure starts from zero degrees on the right hand side and ends with 180 degrees on the left hand side and vice versa.

A long line with a dot below is measured as 30 degrees, and small lines in between is 10 degrees.

Use- To draw and measure angles.

- *We are going to consider ruler and compass constructions, using a ruler to draw lines and compasses only to draw arcs.*

Some tips:

- *Draw lines and mark points*
- *Maintain instruments with sharp tips and fine edges.*
- *Have a sharp tip pencil or pen which can be inserted into the compass.*

CONSTRUCTION OF A CIRCLE AND LINE SEGMENT

Activity 3: Construction of a circle when its radius known

Materials Required: Geometry kit, tactile diagram of a circle.

Prerequisites: Introduction to compass

Activity Flow

- *Show them the tactile diagram of a circle. Let them explore and ask their opinion about the shape and the speciality of this shape. Ask them to mention a few such objects.*
- *Suppose we want to draw a circle of radius* 3 cm*. We need to use our compasses. Here are the steps to follow.*
- *Open the compasses, keep one of the pointers on the measuring scale and by dragging the other pointer having a pen/pencil measure required radius of* 3 cm*.*
- *Put one of the pointers on the sheet, which will be the centre of the circle to be.*
- *Keeping that pointer as the centre turns the compasses slowly to draw the circle. Be careful to complete the movement around in one instant.*

Activity 4: Construction of a line segment of a given length.
Materials Required: Geometry kit, tactile diagram of a circle, stylus, tactile calliper
Prerequisites: Constructing line of particular length

Activity Flow

A better method would be to use compasses to construct a line segment of a given length.

- *Fix the two end points of the ruler with pins and draw a line l, with the help of a stylus. Mark a point on a line l.*
- *Also, place the compasses pointer on the zero mark of the ruler. Open it to place the pencil/pen point up to the* 4.5 cm *mark.*
- *Taking caution that the opening of the compasses has not changed, place the pointer on the point A of the line and swing an arc across the line with the other pointer to cut l at B.*
- *AB is a line segment of required length.*
- *Similarly, ask them to draw a line segment of length* 7.5 cm *using a ruler and .*

CONSTRUCTION OF A COPY OF A GIVEN LINE SEGMENT

Activity 5: Construction of a copy of a given line segment without measuring the actual length of the line.
Materials Required: Geometry kit and ruler.
Prerequisites: None

Activity Flow

A better approach would be to use a ruler and compasses for making this construction.

- *To make a copy of any given line AB.*
- *Given line AB whose length is not known.*
- *Fix the compasses pointer on A and the pencil end on B. The opening of the instrument now gives the length of line AB.*
- *Draw any line l. Choose a point C on l. Without changing the compasses setting, place the pointer on C.*
- *Swing an arc that cuts l at a point say D. Now CD is a copy of AB.*
- *Ask the students to do it for their own length of line and make a copy by following the above procedure.*

Activity 6: Construction perpendicular to a line through a point on it.

Materials Required: Geometry kit, tactile diagram of perpendicular lines, parchment paper and stylus

Prerequisites: None

Activity Flow

- *Show them the tactile diagram of perpendicular lines and discuss that two lines are said to be perpendicular if they intersect such that the angles formed between them are right angles.*
- *Draw a vertical line on parchment paper with the help of a ruler and stylus and mark the centre point on the line. Then fold the sheet along the centre point and hold half of the sheet perpendicular to the other half, in which we can see the lines are also perpendicular to each other with an angle of 90 degree.*
- *Also ask them to draw perpendicularly using a ruler and a set square.*
- *Draw a line l on the parchment paper and mark point P on the line.*
- *Place a set square with one of its edges along the line. Then slide the set square until its right angled corner coincides with P.*
- *Hold the set square firmly in this position. Draw a line along the edge of the set square.*
- *Then remove the set square and observe the figure drawn.*

Method of ruler and compasses:

- *Draw line and mark the centre of the line as P.*
- *Keep one of the pointers of the compass at the centre point of the line and with some measure of radius construct an arc intersecting the line at two points A and B.*
- *With A and B as centres and a radius greater than AP construct two arcs, which cut each other at Q.*
- *Join PQ. Then line PQ is perpendicular to l.*

CONSTRUCTION OF PERPENDICULAR

Activity 7: Construction of perpendicular to a line through a point not on it.
Materials Required: Ruler, compass, setsquare
Prerequisites: Construction of a line segment

Activity Flow

Method using ruler and a set square

- *Draw a line l and mark point P anywhere slightly above the line.*
- *Place a set square on the line such that one edge or arm of its right angle aligns along the line.*
- *Place a ruler along the edge opposite to the right angle of the set square and fix it with the help of pins such that it should not move.*
- *Slide the set square along the ruler till the point P touches the other edge or arm of the set square.*
- *Join PM along the edge through P and M, the centre point of the line. Now line PM is perpendicular to the line l.*

Method using ruler and compasses:

A more convenient and accurate method, of course is the ruler compass method.

- *Draw a line l and mark point P anywhere slightly above the line.*
- *With P as centre, draw an arc on the other side of the line which intersects line l at two points A and B using compasses.*
- *Using the same radius and with A and B as centres, construct two arcs that intersect at a point say Q on the other side.*
- *Join PQ. Thus PQ is perpendicular to line l.*

Ask them to draw perpendicular for a line using both methods.

Activity 8: Construction of perpendicular bisector of a line segment
Materials Required: Compass, ruler
Prerequisites: Line segment, construction of circle using compass

Activity Flow

Construction using ruler and compasses:

- *Draw a line segment AB of any length and mark A and B.*
- *With A as the centre, using compasses, draw a circle. The radius of the circle should be more than half the length of AB.*

- *With the same radius and with B as centre, draw another circle using compasses. Such that it cuts the previous circle at two points called C and D.*
- *Join CD. It cuts line AB at O. Use divider to verify that O is the midpoint of AB. Also verify COA and COB are right angles. Therefore CD is the perpendicular bisector of AB.*

CONSTRUCTION OF AN ANGLE

Activity 9: Construction of an angle of a given measure
Materials Required: Protractor, ruler
Prerequisites: None

Activity Flow

Suppose we want an angle of measure 60 degrees.
Here are the steps to follow:

- *Draw line AB of any length.*
- *Place the centre of the protractor at A and its edge along line AB.*
- *Start reading from right to left on protractor and mark point at 60 degrees. Then remove the protractor. Name the point as C.*
- *Join AC. Angle BAC is the required angle.*

Activity 10: Construction of a copy of an angle of unknown measure
Materials Required: Ruler, compass
Prerequisites: Draw an arc

Activity Flow

Suppose an angle whose measure we do not know is given and we want to make a copy of this angle.

- *Teacher should draw some angle A and give it to the students to construct the same copy.*
- *Draw a line l and choose a point on it.*
- *Place the compasses at the given angle A and draw an arc to cut the rays of angle A at B and C.*
- *Use the same compasses setting to draw an arc with P as centre l in Q.*
- *Set your compasses to the length BC with the same radius.*
- *Place the compass pointer at Q and draw the arc to cut the arc drawn earlier. Mark the other end of the arc as R.*

- *Join PR. This gives us angle P. It has the same measure as angle A. This means angle QPR has the same measure as angle BAC.*

BISECTOR OF AN ANGLE AND ANGLES OF SPECIAL MEASURE

Activity 11: Bisector of an angle

Materials Required: Ruler and compass
Prerequisites: Construction of an arc

Activity Flow

Construction with ruler and compasses

- *Draw an angle A and with A as the centre and using a compass, draw an arc that cuts both rays of angle A. Label the points of intersection as B and C.*
- *With B as centre, draw an arc whose radius is more than half the length BC in the interior of angle A.*
- *With the same radius and with C as centre, draw another arc in the interior of angle A. Let the two arcs intersect at D and join point A and D. Then AD is the required bisector of angle A.*

Activity 12: Angles of special measures

Materials Required: Ruler, compass and protractor
Prerequisites: Bisector of an angle

Activity Flow

There are some accurate methods to construct some angles of special sizes which do not require the use of the protractor.

- *Constructing an angle of 60 degree:*
- *Draw a line PQ and mark a point O on it.*
- *Place the pointer of the compasses at O and draw an arc of convenient radius which cuts the line PQ at some point and marks that point as A.*
- *With the pointer at A as centre, now draw an arc that passes through O.*
- *Let the two arcs intersect at B. Join OB. We get BOA whose measure is 60 degrees and verify using a protractor.*

Constructing an angle of 30 degree:

Construct an angle of 60 degrees as shown earlier. Now, bisect this angle. Each angle is 30 degrees and verified by using a protractor.

Constructing an angle of 120 degree:
An angle of 120 degrees is nothing but twice of an angle of 60 degrees. Therefore, it can be constructed as follows.

- *Draw any line PQ and take a point O on it.*
- *Place the pointer of the compasses at O and draw an arc of convenient radius which cuts the line and mark that point as A.*
- *Without disturbing the radius on the compasses, draw an arc with A as centre which cuts the first arc and mark that point as B.*
- *Again without disturbing the radius on the compasses and with B as centre, draw an arc which cuts the first arc and mark that point as C.*
- *Join OC, angle COA is the required angle whose measure is 120 degree. Verify with a protractor.*

Constructing an angle of 90 degree:
To construct an angle 90 degree, it is easy if we construct a perpendicular to a line from a point on it.

3.3 LET'S DISCUSS: RELATE TO DAILY LIFE*

Geometry has many practical uses in everyday life, such as measuring circumference, area and volume, when you need to build or create something.

Geometric shapes also play an important role in common recreational activities, such as video games, sports, quilting and food design. Without geometry, engineers and architects wouldn't be able to design and construct houses, buildings, cars and tools that make life easier and more enjoyable.

Without geometry, you wouldn't have sports, athletic fields or equipment that enable competition and challenge participants to achieve the desired goals. For example, as a basketball, soccer, hockey or football kicker, they use geometry to determine how much arc you need to score from a certain distance. Geometry allows you to mark off athletic fields, such as rectangles for football, soccer and hockey and more complex diamond shapes for baseball or semicircle shapes for track and field. Geometry allows you to cut cakes and pies into equal-sized portions in a variety of shapes, such as triangles, squares or rectangles.

4.EXERCISES & REINFORCEMENT

4.1 REINFORCEMENT

Activity 13: Practice and Recall
Materials Required: Geometry kit
Prerequisites: None

Activity Flow

1. *Draw a circle 4 cm.*
2. *With the same centre point, draw two circles of radii* 4.5 cm and 2.5 cm
3. *Draw a line segment of length* 7.5 cm *using a ruler.*
4. *Construct a line segment of length* 5.5 cm *using ruler and compasses.*
5. *Draw any line segment PQ, without measuring PQ, construct a copy of PQ.*
6. *Given some line segment AB, whose length you do not know, construct PQ such that the length of PQ is twice that of AB.*
7. *Draw AB of length* 7.5 cm *and construct its perpendicular bisector.*
8. *Draw a line of length* 8 cm *and find its axis of symmetry.*
9. *Draw angle ABC of measure 50 degree.*
10. *Draw an angle of measure 75 degree and bisect it.*
11. *Draw an angle of 175 degrees and find its line of symmetry.*

Teaching Tips:
If there are any additional teaching tips then utilize this section to mention them.

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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