

Vision Empower & XRCVC
Teacher Instruction KIT
Lines and Angles

Syllabus: Karnataka State Board
Subject: Math
Grade: 7
Textbook Name: Karnataka textbook cum workbook
Chapter Number & Name: 5.Lines and Angles

1. OVERVIEW

1.1 OBJECTIVE & PREREQUISITES

Objective

- To know about different types of lines and related angles
- To identify lines and angles

Prerequisite Concept

- Lines and Angles
TIK_MATH_G5_CH6_Angles
TIK_MATH_G6_CH4_Basic Geometrical Ideas
TIK_MATH_G6_CH5_Understanding Elementary Shapes
TIK_MATH_G6_CH4_Basic Geometrical Ideas

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*Kindly Note: Activities marked with * are mandatory*

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Supplementary angles

Adjacent angles

Linear pair

Vertically opposite angles

Intersecting lines

Transversal

Angles made by a transversal

Traversal of parallel lines

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2. Supplementary angles
3. Adjacent angles
4. Linear pair
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7. Transversal
8. Angles made by a transversal
9. Traversal of parallel lines

2.2 LEARN MORE

3. ENGAGE

3.1 INTEREST GENERATION ACTIVITY

Clay moulding

Activity 1: Clay moulding

Materials required: Clay

Prerequisites: Lines

Activity Flow

Start this lesson by taking a ball of clay and roll it into thin, long, strings; and while the student is making this, start mentioning the word 'line' in this context. Furthermore, run the student's hand along the edges of tables and doorways (to get the idea of the straight edge).

Paper folding

Activity 2: Paper folding

Materials required: A4 sheet

Prerequisites: Parallel and Intersecting lines

Activity Flow

- *Ask the student to feel both a pair of opposite edges of a paper. And tell what type of lines they observed.*
- *Then fold diagonals of the paper and now ask the student to feel a pair of opposite sides of the (triangular paper) to see intersecting lines*

Draw

Activity 3: Draw

Materials required: Parchment paper, Geometry kit.

Prerequisites: lines

Activity Flow

Make the students draw some points and lines. For points the students can use small bindis. Drawing lines can be done using parchment paper.

3.2 CONCEPT INTRODUCTION ACTIVITIES

Introduction

Activity 4: Introduction

Materials required: Geometry kit, parchment paper, clay/thread/string

Prerequisites: To draw lines and angles

Activity Flow

Lines: When talking about lines, talk about how they extend infinitely on both sides, and that this property of infinite length is represented by the arrows. Drive home the concept of infinite

length by allowing the student to make clay lines as long as they want, by allowing addition of clay. If they run out of clay, tell them they can extend the line using other items like craft wire, string, thread etc.

When teaching how to draw points and lines, keep the parchment paper kit ready. Points will be harder to draw on this, but lines can be easily drawn using this kit. Place the ruler and maintain its position using a firm grip of your hand, or drawing board pins (if the ruler has the grooves) and align the stylus along the edge of the ruler and make the line by applying pressure on the stylus and moving it along the edge. To draw the first few times, you will have to hold the hand of the student and guide him/her on how to do it.

Line segments are finite parts (i.e. segments) of the infinitely long lines while rays extend infinitely in only one direction and not both directions. Explain rays as lines with an origin point (like in the case of Sun rays).

It is essential to draw out lines, line segments and rays to understand this concept completely. Draw lines with the arrows at both the ends, line segments with no arrows at either end and a ray with an arrow only at one of the ends.

Intersecting lines: Make the student draw two intersecting lines on a parchment paper. Make the student draw them so that the two lines cover an A4 size sheet, and intersect somewhere in the middle area of the sheet. (These specifications will make it easier to mark out angles during the lesson). Ask the student to name the lines, point of intersection and then list out all the possible angles made. If the student misses some angles, bring those to their attention.

Angle: angles are formed when two rays or line segments meet at the vertex points, as well as when rays, lines and line segments intersect each other. Point out to the student that the angle is the part between the two arms of the angle and not the arms by themselves or the length of the arms.

Once you have defined an angle, follow it up by giving a lot of real life examples to ensure that the student does not think of angles as an abstract quantity. Make them feel the angles formed at the corners of their desks, chairs, Taylor frame, Slate, book and of other objects around them.

Related Angles

Activity 5: Complementary Angles

Materials required: Tactile diagram of complementary angles, geometry kit and parchment paper.

Prerequisites: Identifying and measuring angles

Activity Flow

When the sum of the measures of two angles are 90 degree, the angles are called complementary angles. Whenever two angles are complementary, each angle is said to be the complement of the other angle.

- Give them the tactile diagram of two different complementary angles and ask them to pair both whose sum of angle is 90 degree.
- Then ask them to draw complementary angles using the geometry kit on parchment paper.

Ask the following questions and let them verify by drawing the angles.

1. Can two acute angles be complementary to each other?
2. Can two obtuse angles be complementary to each other?
3. Can two right angles be complementary to each other?

Activity 6: Supplementary Angles

Materials required: Tactile diagram of supplementary angles, Geometry kit and Parchment paper.

Prerequisites: Identifying and measuring angles

Activity Flow

Give them the tactile diagram of supplementary angles and ask them to measure the angles and to sum it up. The sum of the measures of the angles are 180 degree. Such pairs of angles are called supplementary angles. When two angles are supplementary, each angle is said to be the supplement of the other.

Also ask them the following questions and see if they can analyze the problem without verifying by drawing. Otherwise ask them to verify by drawing.

1. Can two obtuse angles be supplementary?
2. Can two acute angles be supplementary?
3. Can two right angles be supplementary?

Activity 7: Adjacent Angles

Materials required: Tactile diagram of adjacent angles, geometry kit and parchment paper.

Prerequisites: Identifying and measuring angles

Activity Flow

Explain them with the following examples:

1. When you open a book and have some pages in the middle as common to both the first and last few pages of the book, we find a pair of angles, placed next to each other.
2. The steering wheel of a car. At the centre of the wheel we find three angles being formed, lying next to one another.
3. Show them a tactile diagram of adjacent angles and explain.

4. Also ask them to draw adjacent angles.

These angles are such that:

- (i) They have a common vertex
- (ii) They have a common arm
- (iii) The non-common arms are on either side of the common arm.

Such pairs of angles are called adjacent angles. Adjacent angles have a common vertex and a common arm but no common interior points.

Ask them the following questions

1. Can two adjacent angles be supplementary?
2. Can two adjacent angles be complementary?
3. Can two obtuse angles be adjacent angles?
4. Can an acute angle be adjacent to an obtuse angle?

Activity 8: Linear Pair

Materials required: Tactile diagram of linear pair and non linear pair, geometry kit and Parchment paper.

Prerequisites: Identifying and measuring angles

Activity Flow

A linear pair is a pair of adjacent angles whose noncommon sides are opposite rays and their sum of adjacent angles will be 180 degree.

Explain by showing them the tactile diagram of linear pair and non linear pair. Linear pair is an adjacent angle.

Also ask them if they can provide examples for linear pairs like a vegetable chopping board where a knife is attached to a board.

Ask them the following questions

1. Can two acute angles form a linear pair?
2. Can two obtuse angles form a linear pair?
3. Can two right angles form a linear pair?

Activity 9: Vertically Opposite Angles

Materials required: Tactile diagram of vertically opposite angles, geometry kit and parchment paper.

Prerequisites: Identifying and measuring angles

Activity Flow

- *When two lines intersect, the vertically opposite angles so formed at the intersecting point are equal.*
- *Show them the tactile diagram of vertically opposite angles and let them observe and explore the diagram and say which are vertically opposite angles.*
- *Later ask them to draw intersecting lines. Also ask them if they can give examples to form vertically opposite angles such as by cross folding the two hands, Intersecting tactile rulers.*
- *Give them a tactile diagram so that they should identify the vertically opposite angles.*
- *When they cross hands, the two hands intersect at one point. They also can observe the vertically opposite angles.*

Pairs of Lines

Activity 10: Intersecting Lines

Materials required: Tactile diagram of intersecting lines, geometry kit and parchment paper.

Prerequisites: Identifying and drawing lines

Activity Flow

Intersecting lines: Two lines l and m intersect if they have a point in common. This common point O is their point of intersection

Keep tactile diagrams of several pairs of intersecting lines ready and allow the student to feel these diagrams for however long they want. Also have a diagram ready with multiple distinct intersecting lines so that the student understands that you can have multiple lines that all intersect each other and that lines can intersect at varying angles. You will also have to point out how lines that are not parallel will always intersect at some point, even if the point of intersection has not been drawn on the diagram. When explaining this point, recall the idea of the infinite length of lines and tell them how to extend the lines (on the actual diagram as well as in their mind).

For drawing intersecting lines on parchment paper, draw one line on it. Then lift the ruler and move it to draw the next line. To do this, place the ruler so that it partially overlaps a part of the first line that was drawn. Having placed the ruler in this fashion, draw the second line that intersects the first line. Using this method, ask the student to draw more sets of intersecting lines.

Keep in mind that if the student isn't comfortable with drawing lines, then you will have to use the hand over hand technique to help them draw the lines.

Ask the students to find examples from their surroundings where lines intersect at right angles.

Activity 11: Transversal

Materials required: Tactile diagram of transversal

Prerequisites: Identifying and drawing lines

Activity Flow

A line that intersects two or more lines at distinct points is called a transversal.

Let them explore the varied tactile diagrams of transversal and give their observations based on those that have discussion in the class.

Example: A road crossing two or more roads or a railway line crossing several other lines.

Activity 12: Angles made by a Transversal

Materials required: Tactile diagram of transversal

Prerequisites: Identifying and drawing lines and angles

Activity Flow

Make the student draw two parallel lines on a parchment paper, with a distance of about 6-8 cm between them. Then ask the student to make a transversal passing through these two lines, making sure that the transversal is not perpendicular to the parallel lines. Make the student draw the figure so it covers an A4 size sheet and the spacing is easy to navigate. (These specifications will make it easier to mark out angles during the lesson). Ask the student to name the lines, points of intersection and then list out all the angles made. If the student misses some angles, bring those to their attention.

Once after going through the tactile diagram of angles made by a transversal, make sure that they have observed, explain the following concepts with the tactile diagrams.

Interior angle: angles formed between parallel lines when a third line (transversal) that intersects them.

Exterior angle: angles formed outside parallel lines when a third line (transversal) that intersects them.

Pairs of corresponding angles: A pair of corresponding angles lie on the same side of the transversal. Corresponding pair of angles comprises one exterior angle and another interior angle. Not all corresponding angles are equal. Corresponding angles are equal if the transversal intersects two parallel lines.

Pairs of alternate interior angles: When two lines are crossed by another line (called the transversal): Alternate interior angles are a pair of angles on the inner side of each of those two lines but on opposite sides of the transversal.

Pairs of alternate exterior angles: When two lines are crossed by another line (called the transversal): Alternate exterior angles are a pair of angles on the outer side of each of those two lines but on opposite sides of the transversal.

Pairs of interior angles on the same side of the transversal: Same side interior angles are two angles that are on the same side of the transversal and on the interior of (between) the two lines.

Activity 13: Transversal of parallel Lines

Materials required: Tactile diagram of transversal of parallel lines

Prerequisites: Identifying, measuring lines

Activity Flow

They are lines on a plane that do not meet anywhere.

- *If two parallel lines are cut by a transversal, each pair of corresponding angles are equal in measure.*
- *If two parallel lines are cut by a transversal, each pair of alternate interior angles are equal*
- *If two parallel lines are cut by a transversal, then each pair of interior angles on the same side of the transversal are supplementary*

Show them the appropriate tactile diagram of transversal of parallel lines and show them the corresponding angles, alternate interior angles, pair of interior angles equal in measure.

Draw a pair of parallel lines and a transversal. Verify the above three statements by actually measuring the angles.

Activity 14: Checking for Parallel Lines

Materials required: Tactile diagram of parallel lines, tactile diagram of transversal cutting two lines and having corresponding angles, tactile diagram of transversal cutting two lines and having alternate interior angles.

Prerequisites: Identifying and measuring lines and angles

Activity Flow

Parallel lines: When explaining parallel lines, recall the idea of the infinite length of lines. Then define parallel lines and give several examples. Allow the student to completely imbibe this idea. Keep a tactile diagram of a pair of distinct parallel lines ready and allow the student to feel this diagram for however long they want. Also have a diagram ready with multiple

distinct parallel lines so that the student understands that you can have multiple lines that are all parallel to each other, as well as the transitive property of parallel lines (Parallel lines are two or more lines that lie in the same plane but never intersect).

For drawing parallel lines on parchment paper, draw along two opposite edges of the ruler. This is the simplest example. Then move on to placing the ruler so that one of its edges is aligned with only one of the drawn lines. Once the ruler has been placed in this manner, draw along the other edge of the ruler where there is no line drawn already. Lift the ruler, and now you have 3 lines drawn that are parallel to each other.

Keep in mind that if the student isn't comfortable with drawing lines, then you will have to use the hand over hand technique to help them draw the lines.

When a transversal cuts two lines, such that pairs of alternate interior angles are equal, the lines have to be parallel.

When a transversal cuts two lines, such that pairs of corresponding angles are equal, then the lines have to be parallel.

Explain to the students there are two following ways to check for parallel lines with help of tactile diagram of transversal cutting the two lines which results to have pair of corresponding angles are equal and tactile diagram of transversal cutting two lines which results have alternate interior angles are equal then the lines have to be parallel. Ask them to draw one of each type on the parchment paper and verify.

3.3 LET'S DISCUSS: RELATE TO DAILY LIFE*

- Edges of surfaces and edges of flat objects/ flat surfaces of objects.
- Opposite edges of rectangular paper are examples for parallel lines
- Adjacent edges of rectangular paper are examples for intersecting lines

4. EXERCISES & REINFORCEMENT

4.1 EXERCISES & REINFORCEMENT

Practice and Recall

Activity 15: Drawing parallel, intersecting lines and transversal

Materials required: Parchment paper, geometry kit

Prerequisites: Parallel, intersecting and transversal lines

Activity Flow

Once the student has had enough practice drawing pairwise parallel lines and pairwise intersecting lines, draw multiple lines in one diagram, where some pairs are of parallel lines, and some are pairs of intersecting lines. For example, draw a few lines that are all parallel to each other and then draw transversals through all these lines.

Activity 16: Identify parallel, intersecting lines

Materials required: None

Prerequisites: Parallel, intersecting lines

Activity Flow

Ask students to identify parallel and intersecting lines by picking a pair of edges of 2D and 3D shapes.

Activity 17: Drawing lines and angles

Materials required: Parchment paper, geometry kit

Prerequisites: Identify and measure angles and lines

Activity Flow

Quiz the student on the theory learned and ask the student to draw some pairs of intersecting lines independently and mark out the pairs of angles and state what pairs they are then make them identify the pairs in that diagram.

Teachers can draw and give some diagrams to identify types of angles and lines discussed in this chapter to the students.

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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