Grade 10 Mathematics Presentation Script

Area of Kites

Pre-Class Preparation

Materials Checklist:

- Graph paper or plain paper (one sheet per group)
- Rulers (one per group)
- Compasses (one per group)
- Protractors (one per group)
- Pencils and erasers
- Calculators (one per group)
- Chart paper for recording key takeaways
- Markers

Room Setup:

- Prepare board space for diagrams and formula derivation
- Arrange desks for group work
- Have extra materials available in case of breakage
- Prepare examples on chart paper for display

Phase 1: Problem-Solving and Discovery (15 minutes)

Opening Hook (2 minutes)

[DO] Display a picture of kite-shaped objects (flying kite, solar panel, landing zone).

[SAY] Look at these shapes. What do you notice about them?

[WAIT] Expected: They have four sides! They look like diamonds!

[ASK] What makes these shapes special?

[WAIT] Expected: Some sides look equal!

[SAY] Exactly! These are kites. Today we will learn about the properties of kites and how to find their area.

[SAY] We will explore kites by constructing them using geometry tools.

Anchor Activity Launch (3 minutes)

[DO] Distribute graph paper, rulers, compasses, protractors, and pencils to each group.

[SAY] Here is your challenge: You will construct a kite accurately and discover its properties.

[SAY] Here is what you will do:

[SAY] Step 1: Draw a vertical line of 10 cm. This is the longer diagonal. Label the midpoint as O.

[SAY] Step 2: At O, use a protractor to draw a perpendicular line. Mark 4 cm on each side of O. This is the shorter diagonal.

[SAY] Step 3: Label the four points where the diagonals intersect as A, B, C, and D. Connect them.

[SAY] Step 4: Check properties. Measure adjacent sides to ensure two pairs are equal. Verify that the diagonals are perpendicular.

[SAY] Step 5: Design your own kite patterns and justify why they would be aerodynamic.

[SAY] Work with your group. You have 10 minutes.

Student Work Time (8 minutes)

[DO] Circulate among groups.

[ASK] To a group struggling with the compass: Remember, the compass helps you draw perpendicular lines. Use your protractor to check.

[WAIT] Expected: Students draw the kite correctly.

[SAY] Good! Now measure the adjacent sides.

[ASK] To another group: What do you notice about the diagonals?

[WAIT] Expected: They are perpendicular!

[SAY] Excellent! What about the adjacent sides?

[WAIT] Expected: Two pairs are equal!

[SAY] Perfect! You have discovered the properties of a kite.

[DO] For struggling groups: Let us draw the first diagonal together. Make sure it is 10 cm long.

[DO] For early finishers: Can you calculate the area of your kite using the diagonals?

Class Discussion (2 minutes)

[DO] Call on 2-3 groups to share their findings.

[ASK] What did you discover about the kite?

[WAIT] Expected: Two pairs of adjacent sides are equal! The diagonals are perpendicular!

[SAY] Excellent! Did everyone discover these properties?

[WAIT] Check for understanding.

[SAY] Today we will formalize these properties and use them to find the area.

Phase 2: Structured Instruction (10 minutes)

Formalizing the Formula: Area = (1/2) x d1 x d2 (10 minutes)

[SAY] Now that you have explored kites, let us formalize what we learned.

[WRITE] On the board: Area of a Kite

[SAY] A kite is a quadrilateral with two pairs of adjacent sides equal in length and one pair of opposite angles equal.

[ASK] What did you notice about the diagonals?

[WAIT] Expected: They are perpendicular!

[SAY] Correct! The diagonals are perpendicular.

[WRITE] Properties of a Kite:

[WRITE] 1. Two pairs of adjacent sides are equal in length.

[WRITE] 2. One pair of opposite angles are equal.

[WRITE] 3. Diagonals are perpendicular.

[WRITE] 4. Since the diagonals are perpendicular, right-angled triangles are formed.

[WRITE] Formula: Area = (1/2) x d1 x d2

[SAY] where d1 and d2 are the lengths of the two diagonals.

[DO] Draw a kite on the board with both diagonals labeled.

[SAY] The perpendicular diagonals allow us to use this simple formula.

[SAY] Let us try an example.

Addressing Misconceptions:

[SAY] Let me address some common mistakes:

[SAY] Mistake 1: All sides of a kite are equal. Only two pairs of adjacent sides are equal.

[SAY] Mistake 2: The diagonals of a kite are equal. The diagonals are usually not equal, but they are perpendicular.

[SAY] Mistake 3: A kite is the same as a square. A square has all sides equal and all angles equal, while a kite has only two pairs of adjacent sides equal.

[ASK] Does everyone understand when to use this formula?

[WAIT] Check for nods or questions.

Phase 3: Practice and Application (10 minutes)

Worked Example (10 minutes)

[SAY] Let us work through an example together.

[WRITE] Example: A kite has diagonals of 16 cm and 12 cm. a) Find the area. b) Find the perimeter if one pair of adjacent sides is 10 cm. c) Find the angles using trigonometry.

[DO] Draw the kite on the board with diagonals labeled.

[SAY] First, let us find the area.

[WRITE] Area = (1/2) x d1 x d2

[WRITE] Area = (1/2) x 16 x 12

[WRITE] Area = 96 cm squared

[SAY] The area is 96 cm squared.

[SAY] Now let us find the perimeter.

[SAY] The diagonals bisect each other at right angles, so each half-diagonal forms a right-angled triangle.

[WRITE] d1 / 2 = 8 cm, d2 / 2 = 6 cm

[WRITE] Using Pythagoras: c squared = 8 squared + 6 squared = 64 + 36 = 100

[WRITE] c = 10 cm

[WRITE] Perimeter = 2(10 + 10) = 40 cm

[SAY] The perimeter is 40 cm.

[SAY] Now let us find the angles using trigonometry.

[WRITE] tan theta = 6 / 8 = 0.75

[WRITE] theta = tan inverse (0.75) = 36.87 degrees

[WRITE] Since the sum of angles is 360 degrees, the larger angle is:

[WRITE] 2 alpha = 360 - 2(36.87) = 286.26

[WRITE] alpha = 143.13 degrees

[SAY] The angles are 143.13 degrees, 143.13 degrees, 36.87 degrees, and 36.87 degrees.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

Phase 4: Assessment (5 minutes)

Exit Ticket

[SAY] Before we finish, I want to check your understanding. Please complete the exit ticket individually.

[DO] Display questions on the board or distribute exit ticket.

[SAY] You have 5 minutes to complete the questions.

Exit Ticket Questions:

1. Find the area of a kite with diagonals 10 cm and 8 cm.

2. A playground has a kite-shaped design with diagonals measuring 15 meters and 12 meters. Find its area.

3. Engineers are designing a kite-shaped solar panel with diagonals of 30 m and 18 m. What is the total solar-collecting area?

Differentiation Notes

For Struggling Learners:

- Provide pre-drawn kites with diagonals already labeled.
- Use simpler numbers for diagonal lengths.
- Pair with confident problem solvers.
- Provide step-by-step calculation templates.

For Advanced Learners:

- Challenge with deriving the formula themselves.
- Explore real-world applications: kite design, solar panel design, disaster management.
- Investigate the relationship between kite and other quadrilateral areas.
- Apply trigonometry to find all angles when given only the diagonals.

Post-Lesson Reflection Prompts

- Did students successfully construct the kite and identify the perpendicular diagonals?
- Were students able to discover the properties of a kite by measuring sides and angles?
- What misconceptions emerged, and how were they addressed?
- Did students understand when to use the kite formula versus other quadrilateral formulas?
- What adjustments would improve this lesson?