Grade 10 Mathematics Presentation Script

Area of Heptagons

Pre-Class Preparation

Materials Checklist:

- Graph paper or plain paper (one sheet per group)
- Compasses (one per group)
- Rulers (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 heptagon-shaped objects (British 50 pence coin, architectural features, logos).

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

[WAIT] Expected: They have seven sides!

[ASK] How many sides does a heptagon have?

[WAIT] Expected: Seven!

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

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

Anchor Activity Launch (3 minutes)

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

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

[SAY] Here is what you will do:

[SAY] Step 1: Draw a circle of any radius. Mark the center as O.

[SAY] Step 2: Draw a horizontal diameter measuring 10 cm through the center. Label the first point P1.

[SAY] Step 3: Use a protractor to measure angles of 360 degrees divided by 7 = 51.43 degrees from point P1. Mark each interval.

[SAY] Step 4: Connect the seven points in sequence.

[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 protractor: Remember, each angle should be 51.43 degrees. Use your protractor carefully.

[WAIT] Expected: Students draw the heptagon correctly.

[SAY] Good! Now count the sides.

[ASK] To another group: How many sides does your heptagon have?

[WAIT] Expected: Seven!

[SAY] Excellent! What about the angles?

[WAIT] Expected: They are all equal!

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

[DO] For struggling groups: Let us draw the first angle together. Make sure it is 51.43 degrees.

[DO] For early finishers: Can you find the sum of the interior angles?

Class Discussion (2 minutes)

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

[ASK] What did you discover about the heptagon?

[WAIT] Expected: It has seven equal sides! All angles are equal!

[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 Properties and Area Formula (10 minutes)

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

[WRITE] On the board: Area of a Heptagon

[SAY] A heptagon is a seven-sided polygon. It has seven edges and seven vertices.

[ASK] What is the sum of the interior angles?

[WAIT] Expected: 900 degrees!

[SAY] Correct! Let us derive this.

[WRITE] Sum of interior angles = (n minus 2) times 180 degrees

[WRITE] For a heptagon: (7 minus 2) times 180 degrees = 5 times 180 degrees = 900 degrees

[SAY] Now, how do we find the area?

[SAY] We can divide the heptagon into 7 triangles by drawing lines from the center to each vertex.

[DO] Draw a heptagon on the board with lines from the center to each vertex.

[SAY] Each triangle has an angle of 360 degrees divided by 7 = 51.43 degrees at the center.

[WRITE] Area of one triangle = (1/2) times a times b times sin(51.43 degrees)

[WRITE] Total Area = 7 times Area of one triangle

[SAY] Let us try an example.

Addressing Misconceptions:

[SAY] Let me address some common mistakes:

[SAY] Mistake 1: All polygons have the same interior angle sum. The sum depends on the number of sides.

[SAY] Mistake 2: I can just multiply the side length by 7 to get the area. That gives you the perimeter, not the area.

[SAY] Mistake 3: The exterior angle is the same as the interior angle. They are supplementary.

[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 regular heptagon measures 10 cm, find its area given the sum of its interior angles is 900 degrees.

[DO] Draw the heptagon on the board with triangles from the center.

[SAY] First, we need to find the area of one triangle.

[WRITE] Area of Triangle = (1/2) times a times b times sin(angle)

[WRITE] Area = (1/2) times 10 times 10 times sin 51.43 degrees

[WRITE] Area = (1/2) times 100 cm squared times 0.7818

[WRITE] Area = 39.0923 cm squared

[SAY] This is the area of one triangle.

[SAY] Now we multiply by 7 to get the total area.

[WRITE] Total Area = 7 times 39.0923 cm squared

[WRITE] Total Area = 273.65 cm squared

[SAY] The area of the heptagon is 273.65 cm squared.

[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. What is the sum of all interior angles of a heptagon?

2. How do we calculate the measure of one interior angle of a regular heptagon?

3. A regular heptagon has a radius of 8 cm. Find the area of one triangle formed by the center and two adjacent vertices.

Differentiation Notes

For Struggling Learners:

- Provide pre-drawn circles with center marked.
- Use simpler numbers for radius 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: architecture, coin design, logo design.

- Investigate the relationship between heptagon and other regular polygon areas.
- Apply trigonometry to find all angles and side lengths when given only the radius.

Post-Lesson Reflection Prompts

- Did students successfully construct the heptagon and identify the seven equal angles?
- Were students able to discover the properties of a heptagon by measuring angles and sides?
- What misconceptions emerged, and how were they addressed?
- Did students understand when to use the triangle method to find the area?
- What adjustments would improve this lesson?