Grade 10 Mathematics Presentation Script

Area of Segments

Pre-Class Preparation

Materials Checklist:

- Compasses (one per group)
- Rulers (one per group)
- Protractors (one per group)
- Scientific calculators (one per group)
- Worksheets with given radii and angles
- Chart paper for recording key takeaways
- Markers

Room Setup:

- Prepare board space for formula derivation
- Arrange desks for group work
- Have extra compasses and protractors available
- Prepare examples on chart paper for display

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

Opening Hook (2 minutes)

[DO] Display pictures of segments in real life (cake slices, mudguards, architectural arches).

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

[WAIT] Expected: They are parts of circles! They have curved and straight edges!

[ASK] How would we find the area of these shapes?

[WAIT] Expected: We need a formula!

[SAY] Exactly! These are called segments. Today we will learn how to find their area.

[SAY] We will explore by drawing circles with chords.

Anchor Activity Launch (3 minutes)

[DO] Distribute compasses, rulers, protractors, and worksheets to each group.

[SAY] Here is your challenge: You will discover the formula for finding the area of a segment.

[SAY] Here is what you will do:

[SAY] Step 1: Use a compass to draw a circle of radius r.

[SAY] Step 2: Draw a chord across the circle using a ruler.

[SAY] Step 3: Use a protractor to measure the angle subtended at the center by the chord. Shade the segment formed.

[SAY] Step 4: Find the area of the segment part and record your results.

[SAY] Step 5: Repeat with different angles like 70 degrees, 90 degrees, 120 degrees.

[SAY] Step 6: Discuss your work with other learners.

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

Student Work Time (8 minutes)

[DO] Circulate among groups.

[ASK] To a group struggling with drawing: Did you use the compass correctly? Can you draw a chord with the ruler?

[WAIT] Expected: Students draw circles and chords.

[SAY] Good! Now measure the angle at the center with the protractor.

[ASK] To another group: What shapes do you see in the segment?

[WAIT] Expected: A sector and a triangle!

[SAY] Excellent! How do we find the area of the segment?

[WAIT] Expected: We subtract the triangle area from the sector area!

[SAY] Perfect! Calculate both areas.

[DO] For struggling groups: Let us find the area of the sector first. Then find the area of the triangle. What do we do next?

[DO] For early finishers: Can you write a general formula for any segment?

Class Discussion (2 minutes)

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

[ASK] What did you discover about finding the area of a segment?

[WAIT] Expected: We subtract the area of the triangle from the area of the sector!

[SAY] Excellent! Did everyone get the same formula?

[WAIT] Check for understanding.

[SAY] Today we will formalize this formula.

Phase 2: Structured Instruction (10 minutes)

Formalizing the Formula (10 minutes)

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

[WRITE] On the board: Area of Segments

[SAY] A segment is the region of a circle bounded by a chord and an arc.

[DO] Draw a segment on the board.

[SAY] The area of a segment is found using this formula:

[WRITE] Area of a segment = Area of sector minus Area of triangle

[SAY] Where Area of sector = (θ / 360) times π r squared

[SAY] And Area of triangle = (1 / 2) a b sin θ

[SAY] θ is the angle at the center, r is the radius, and a and b are the two radii.

[ASK] Does everyone understand this formula?

[WAIT] Check for nods or questions.

Addressing Misconceptions:

[SAY] Let me address some common mistakes:

[SAY] Mistake 1: A segment is the same as a sector. No, a segment is bounded by a chord and an arc, while a sector is bounded by two radii and an arc.

[SAY] Mistake 2: I add the areas. No, you subtract the triangle area from the sector area.

[SAY] Mistake 3: I can use any triangle formula. No, you must use the sine formula because you know the two sides and the angle.

[SAY] Mistake 4: The angles are different. No, the angle in both formulas is the same angle at the center.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

Phase 3: Practice and Application (10 minutes)

Worked Example (10 minutes)

[SAY] Let us work through an example together.

[WRITE] Example: A chord in a circle of radius 7 cm subtends an angle of 75 degrees at the center. Find the area of the segment.

[DO] Draw the diagram on the board.

[SAY] Step 1: Find the area of the sector.

[WRITE] A = (75 / 360) times (22 / 7) times 7 squared

[WRITE] A = (5 / 24) times (22 / 7) times 49

[WRITE] A = 32.0833 cm squared

[SAY] Step 2: Find the area of the triangle.

[WRITE] A = (1 / 2) times 7 times 7 times sin 75 degrees

[WRITE] A = (1 / 2) times 49 times sin 75 degrees

[WRITE] A = 23.6652 cm squared

[SAY] Step 3: Subtract to find the segment area.

[WRITE] A = 32.0833 minus 23.6652 = 8.4181 cm squared

[SAY] The area of the segment is 8.4181 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. A circular table has a radius of 15 cm. A slice of cake is cut out, forming a 75 degree segment. Find the area of the cake slice not covered by the straight cut.

2. A wheel of a car has a radius of 30 cm. A mudguard covers a 60 degree segment of the wheel. Find the area of the covered segment.

Differentiation Notes

For Struggling Learners:

- Provide pre-drawn circles with chords already outlined.
- Use simpler angles for initial practice.
- Pair with confident problem solvers.
- Provide step-by-step calculation templates.
- Break down the formula into steps.

For Advanced Learners:

- Challenge with deriving the formula using coordinate geometry.
- Explore real-world applications: cake slices, mudguards, architectural designs.
- Investigate problems where the chord length is given.
- Apply the concept to find major segments.

Post-Lesson Reflection Prompts

- Did students successfully discover the segment formula through the anchor activity?

- Were students able to draw chords and measure angles accurately?
- What misconceptions emerged, and how were they addressed?
- Did students understand the difference between a segment and a sector?
- What adjustments would improve this lesson?