Grade 10 Mathematics Presentation Script

Area of Sectors

Pre-Class Preparation

Materials Checklist:

- Graph paper (one sheet per group)
- Razorblade or scissors (one per group)
- Rulers (one per group)
- Protractors (one per group)
- Calculators (one per group)
- Chart paper for recording key takeaways
- Markers

Room Setup:

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

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

Opening Hook (2 minutes)

[DO] Display pictures of sectors in real life (pizza slices, pie charts, windscreen wipers, grazing areas).

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

[WAIT] Expected: They are parts of circles! They look like slices!

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

[WAIT] Expected: We need a formula!

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

[SAY] We will explore by cutting out a sector from a circle.

Anchor Activity Launch (3 minutes)

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

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

[SAY] Here is what you will do:

[SAY] Step 1: Draw a circle of radius 7 cm on graph paper.

[SAY] Step 2: Cut out the circle along its boundary.

[SAY] Step 3: Mark the centre of the circle.

[SAY] Step 4: Measure an angle of 30 degrees at the centre and cut out the sector.

[SAY] Step 5: Estimate the area by counting the squares enclosed by the arc and the two radii.

[SAY] Step 6: Express the angle (30 degrees) as a fraction of 360 degrees.

[SAY] Step 7: Multiply the fraction by the area of the circle.

[SAY] Step 8: Discuss and share your result with other groups.

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

Student Work Time (8 minutes)

[DO] Circulate among groups.

[ASK] To a group struggling with cutting: Did you mark the centre first? Can you measure 30 degrees with the protractor?

[WAIT] Expected: Students measure and cut the sector.

[SAY] Good! Now count the squares to estimate the area.

[ASK] To another group: What fraction of 360 degrees is 30 degrees?

[WAIT] Expected: 30 divided by 360 equals 1 divided by 12!

[SAY] Excellent! Now multiply that fraction by the area of the whole circle.

[WAIT] Expected: Students calculate the area.

[SAY] Perfect! What formula did you discover?

[DO] For struggling groups: Let us start by finding the area of the whole circle. What is the formula? Now, what fraction of the circle is this sector? Multiply the fraction by the area.

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

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 sector?

[WAIT] Expected: We multiply the fraction (angle divided by 360) by the area of the circle!

[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 sectors, let us formalize what we learned.

[WRITE] On the board: Area of Sectors

[SAY] A sector is a region bounded by two radii and an arc.

[DO] Draw a sector on the board.

[SAY] Minor sector is one whose area is less than half of the area of the circle.

[SAY] Major sector is one whose area is greater than half of the area of the circle.

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

[WRITE] Area of a Sector = (θ / 360) times π r squared

[SAY] Where θ is in degrees, r is the radius, and π approximately equals 3.142 or 22/7.

[ASK] Does everyone understand this formula?

[WAIT] Check for nods or questions.

Addressing Misconceptions:

[SAY] Let me address some common mistakes:

[SAY] Mistake 1: I can use the angle directly without dividing by 360. No, you must express the angle as a fraction of 360 degrees first.

[SAY] Mistake 2: The formula works for any angle unit. No, the angle must be in degrees. If given in radians, use a different formula.

[SAY] Mistake 3: A sector is the same as a segment. No, a sector includes the two radii, while a segment is the region between a chord and an arc.

[SAY] Mistake 4: I can use diameter instead of radius. No, the formula uses radius. If given diameter, divide by 2 first.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

Phase 3: Practice and Application (10 minutes)

Worked Example 1 (3 minutes)

[SAY] Let us work through an example together.

[WRITE] Example 1: Find the area of a sector of a circle of radius 7 cm if the angle subtended at the centre is 90 degrees.

[DO] Draw the sector on the board.

[SAY] Step 1: Identify the values.

[WRITE] $\theta = 90$ degrees, $r = 7$ cm

[SAY] Step 2: Write the formula and substitute.

[WRITE] Area = (θ / 360) times π r squared

[WRITE] Area = (90 / 360) times (22 / 7) times (7 squared)

[SAY] Step 3: Calculate.

[WRITE] Area = (1 / 4) times (22 / 7) times 49

[WRITE] Area = (1 / 4) times 22 times 7

[WRITE] Area = 38.5 cm squared

[SAY] The area of the sector is 38.5 cm squared.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

Worked Example 2 (3 minutes)

[SAY] Let us try another example.

[WRITE] Example 2: Find the area of a sector where θ = 45 degrees, r = 10 cm (use π = 3.142).

[DO] Draw the sector on the board.

[SAY] Step 1: Identify the values.

[WRITE] θ = 45 degrees, r = 10 cm

[SAY] Step 2: Write the formula and substitute.

[WRITE] Area = (45 / 360) times 3.142 times (10 squared)

[SAY] Step 3: Calculate.

[WRITE] Area = (1 / 8) times 3.142 times 100

[WRITE] Area = 39.275 cm squared

[SAY] The area of the sector is 39.275 cm squared.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

Worked Example 3: Windscreen Wiper (4 minutes)

[SAY] Let us try a real-world problem.

[WRITE] Example 3: The shaded region shows the area swept out by a windscreen wiper. The larger sector has radius 20 cm and angle 120 degrees. The smaller sector has radius 16 cm and angle 120 degrees. Calculate the area.

[DO] Draw the diagram on the board.

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

[WRITE] A = (120 / 360) times (22 / 7) times 20 squared = 419.05 cm squared

[SAY] Step 2: Find the area of the smaller sector.

[WRITE] A = (120 / 360) times (22 / 7) times 16 squared = 268.19 cm squared

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

[WRITE] Area = 419.05 minus 268.19 = 150.86 cm squared

[SAY] The area of the shaded region is 150.86 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. Calculate the area of a sector if r = 10 m and θ = 264 degrees.

2. A sector has an angle of 40 degrees and a radius of 8.4 cm. Find its area.

3. A goat is tethered at the corner of a fenced rectangular grazing field. If the length of the rope is 21 m, what is its grazing area? (Hint: The goat can graze in a quarter circle)

Differentiation Notes

For Struggling Learners:

- Provide pre-drawn circles with sectors 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 for sectors in radians.
- Explore real-world applications: pizza slices, pie charts, windscreen wipers.
- Investigate the relationship between sector area and arc length.
- Apply the concept to composite shapes involving multiple sectors.

Post-Lesson Reflection Prompts

- Did students successfully discover the sector formula through the anchor activity?
- Were students able to cut and measure the sector accurately?
- What misconceptions emerged, and how were they addressed?
- Did students understand the difference between a sector and a segment?
- What adjustments would improve this lesson?