Grade 10 Mathematics Presentation Script

Area of an Annulus

Pre-Class Preparation

Materials Checklist:

- Circular objects (e.g., two different-sized cups, lids, or rings) - multiple sets per group
- Rulers or measuring tape (one per group)
- Pen and paper (or calculators)
- Chart paper for recording key takeaways
- Markers

Room Setup:

- Prepare board space for formula derivation
- Arrange desks for group work
- Have extra circular objects available
- Prepare examples on chart paper for display

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

Opening Hook (2 minutes)

[DO] Display pictures of ring-shaped objects (running tracks, pipes, wheels, washers).

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

[WAIT] Expected: They have a hole in the middle! They look like rings!

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

[WAIT] Expected: We need to subtract something!

[SAY] Exactly! These are called annuli (plural of annulus). Today we will learn how to find their area.

[SAY] We will explore by measuring circular objects.

Anchor Activity Launch (3 minutes)

[DO] Distribute circular objects, rulers, and calculators to each group.

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

[SAY] Here is what you will do:

[SAY] Step 1: Find two circular objects that fit inside each other.

[SAY] Step 2: Place the smaller object inside the larger one to see the ring shape.

[SAY] Step 3: Measure the radius of the larger circle (R) and the smaller circle (r).

[SAY] Step 4: Square both radii. Subtract the smaller squared radius from the larger squared radius. Multiply by 22/7 or 3.142.

[SAY] Step 5: Discuss with your group how to calculate the area of the annulus.

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

Student Work Time (8 minutes)

[DO] Circulate among groups.

[ASK] To a group struggling with measurement: Where is the center of the circle? How do we measure the radius?

[WAIT] Expected: Students measure from center to edge.

[SAY] Good! Now measure the radius of the smaller circle.

[ASK] To another group: What did you get when you squared both radii and subtracted?

[WAIT] Expected: Students share their calculation.

[SAY] Excellent! Now multiply by 22/7 or 3.142.

[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 larger circle. What is the formula? Now find the area of the smaller circle. What do we do next?

[DO] For early finishers: Can you write a general formula for finding the area of any annulus?

Class Discussion (2 minutes)

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

[ASK] What did you discover about finding the area of an annulus?

[WAIT] Expected: We subtract the area of the smaller circle from the area of the larger 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 annuli, let us formalize what we learned.

[WRITE] On the board: Area of an Annulus

[SAY] An annulus is the region between two concentric circles that share the same center but have different radii.

[DO] Draw two concentric circles on the board.

[SAY] The area of an annulus is found by subtracting the area of the smaller circle from the area of the larger circle.

[WRITE] A annulus = A outer circle minus A inner circle

[WRITE] = π R squared minus π r squared

[WRITE] = π (R squared minus r squared)

[SAY] Where R is the radius of the outer circle and r is the radius of the inner circle.

[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 diameter directly in the formula. No, the formula uses radius. If given diameter, divide by 2 first.

[SAY] Mistake 2: I subtract the radii first, then square. No, you must square each radius first, then subtract.

[SAY] Mistake 3: The two circles must touch. No, the circles are concentric (share the same center) but the inner circle is smaller.

[SAY] Mistake 4: I can use different centers for the two circles. No, both circles must share the same center.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

Phase 3: Practice and Application (10 minutes)

Worked Example 1 (5 minutes)

[SAY] Let us work through an example together.

[WRITE] Example 1: Find the area of an annulus where R = 10cm and r = 6cm.

[DO] Draw the annulus on the board.

[SAY] Step 1: Write the formula.

[WRITE] A = π (R squared minus r squared)

[SAY] Step 2: Substitute the values.

[WRITE] A = π (10 squared minus 6 squared)

[SAY] Step 3: Calculate.

[WRITE] A = π (100 minus 36)

[WRITE] A = 64π

[WRITE] A = 64 times 22/7

[WRITE] A = 201.06 cm squared

[SAY] The area of the annulus is 201.06 cm squared.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

Worked Example 2 (5 minutes)

[SAY] Let us try another example.

[WRITE] Example 2: A wheel has an outer radius of 40 cm, and its inner hub has a radius of 10 cm. Find the area of the wheel annular region.

[DO] Draw the wheel on the board.

[SAY] Step 1: Identify the values.

[WRITE] R = 40 cm, r = 10 cm

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

[WRITE] A = π (R squared minus r squared)

[WRITE] A = 22/7 (40 squared minus 10 squared)

[SAY] Step 3: Calculate.

[WRITE] A = 22/7 (1600 minus 100)

[WRITE] A = 22/7 times 1500

[WRITE] A = 4712.39 cm squared

[SAY] The area of the wheel annular region is 4712.39 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 ring-shaped garden has an outer radius of 12 meters and an inner radius of 7 meters. Find the area of the garden.

2. A circular tabletop has a hole in the middle for an umbrella. The outer radius of the table is 1.5m, and the hole has a radius of 0.5m. Find the area of the tabletop.

3. A circular swimming pool has an outer radius of 8 meters, and a smaller circular island is in the center with a radius of 2 meters. Find the area of the water surface.

Differentiation Notes

For Struggling Learners:

- Provide pre-measured circular objects with radii already labeled.
- Use simpler numbers 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 algebraically.
- Explore real-world applications: running tracks, pipes, wheels.
- Investigate the relationship between annulus width and area.
- Apply the concept to 3D shapes (hollow cylinders).

Post-Lesson Reflection Prompts

- Did students successfully discover the annulus formula through the anchor activity?
- Were students able to measure the radii accurately and calculate the area?
- What misconceptions emerged, and how were they addressed?
- Did students understand the difference between radius and diameter?
- What adjustments would improve this lesson?