CBC Grade 10 Mathematics

Step-by-Step Presentation Script

Area of a Part of a Circle in Real-Life

Pre-Class Preparation

Before students arrive, ensure the following materials and setup are ready:

- Materials Needed:
- • Oranges (one per group) and knives
- • Rulers, pens, and paper for recording
- • Plates
- • Calculators
- • Formula reference chart
- • Exit tickets (one per student)
- Classroom Setup:
- • Display key inquiry question: "How do we calculate the area of parts of circles in everyday situations?"
- • Prepare board space for formulas and worked examples
- • Have formula chart visible (sector, annulus, segment)
- • Pre-cut oranges for safety or demonstrate safe cutting technique

Lesson Overview (40 Minutes)

Phase	Duration
Phase 1: Problem-Solving and Discovery	0-15 minutes
Phase 2: Structured Instruction	15-25 minutes
Phase 3: Practice and Application	25-37 minutes
Phase 4: Assessment (Exit Ticket)	37-40 minutes

Minute-by-Minute Presentation Guide

Minutes 0-2: Introduction and Engagement

[SAY] "Good morning, class! Today we explore how to calculate the area of parts of circles—sectors, annuli, and segments—and apply these concepts to real-life situations."

[ASK] "Have you ever wondered how bakers determine pizza slice sizes, or how engineers design washers for bolts?"

[LISTEN] Expected: Pizza slices, cake slices, metal rings

[SAY] "Exactly! Today we'll learn three formulas that help us calculate areas of circle parts: sectors for pizza slices, annuli for washers, and segments for signal coverage."

[WRITE] On the board: "Area of a Part of a Circle in Real-Life"

[WRITE] Key inquiry question: "How do we calculate the area of parts of circles in everyday situations?"

Minutes 2-17: Phase 1 - Anchor Activity (Discovery)

[SAY] "We'll investigate orange slices to discover the concept of annulus—a ring-shaped region."

[DO] Organize students into groups of 2-3.

[DO] Distribute oranges, knives, rulers, plates, and paper.

[SAY] "Task (a): Cut the orange into two equal halves crossectionally to obtain a circular cross-section."

[DO] Demonstrate safe cutting or provide pre-cut oranges (Minutes 2-4).

[SAY] "Task (b): Slice the halves to obtain 5 slices, each being a part of a circle."

[DO] Allow 3 minutes for slicing (Minutes 4-7).

[SAY] "Task (c): Take one slice and measure two radii: internal radius from center to where juice sac ends, and external radius from center to the peel."

[DO] Circulate among groups to guide measurements (Minutes 7-11).

[ASK] "What shape is the edible part of the orange slice?"

[LISTEN] Expected: Ring, donut shape, circle with a hole

[SAY] "Task (d): Repeat measurements for other slices and record all data."

[SAY] "Task (e): Calculate the area of each annulus using the formula: $A = \pi(R^2 - r^2)$, where R is outer radius and r is inner radius."

[DO] Allow 4 minutes for calculations (Minutes 11-15).

[DO] Circulate to check calculations.

[ASK] "Why do we subtract the inner circle area from the outer circle area?"

[LISTEN] Expected: To get only the ring area, to remove the hole

[SAY] "Task (f): Share your results with classmates and compare."

[DO] Allow 2 minutes for class sharing (Minutes 15-17).

[TEACHING TIP] Emphasize: Annulus = Outer circle - Inner circle

Minutes 17-25: Phase 2 - Structured Instruction

[SAY] "Let me formalize what you discovered. Area of part of a circle refers to sectors, annuli, and segments."

[WRITE] "Real-life applications:"

[WRITE] "• Bakers: Pizza slice area"

[WRITE] "• Pastry chefs: Cake slice area"

[WRITE] "• Fruit sellers: Orange/watermelon slice pricing"

[WRITE] "• Engineers: Washer design, gear design"

[WRITE] "• Telecommunications: Signal coverage modeling"

[SAY] "We have three key formulas for three different shapes."

[WRITE] Create table on board:

Shape	Formula	Example
Sector	$A = (\theta/360) \times \pi r^2$	Pizza slice
Annulus	$A = \pi(R^2 - r^2)$	Washer, orange
Segment	A = A_sector - A_triangle	Signal overlap

[SAY] "Sector: A pie-shaped region bounded by two radii and an arc. Formula: $A = (\theta/360) \times \pi r^2$. The fraction $\theta/360$ represents what portion of the full circle the sector occupies."

[SAY] "Annulus: A ring-shaped region between two concentric circles. Formula: $A = \pi(R^2 - r^2)$. Subtract the inner hole from the outer circle."

[SAY] "Segment: A region bounded by a chord and an arc. Formula: A = A_sector - A_triangle. The segment is the leftover area after removing the triangle from the sector."

[WRITE] "Choosing the right formula:"

[WRITE] "• Sector: Two radii + arc (pizza slice)"

[WRITE] "• Annulus: Ring between circles (washer)"

[WRITE] "• Segment: Chord + arc (signal overlap)"

Minutes 25-37: Phase 3 - Practice and Application

[SAY] "Now let's apply these formulas to real-world problems."

[EXAMPLE] Example 1: Slicing a Pizza

[WRITE] "Pizza: radius 12 inches, sliced into 8 equal pieces. Find area of each slice."

[SAY] "Step 1: Identify the shape. Each slice is a sector."

[SAY] "Step 2: Determine central angle. $\theta = 360°/8 = 45°$."

[WRITE] "$\theta = 45°$"

[SAY] "Step 3: Apply sector formula. $A = (\theta/360) \times \pi r^2$."

[WRITE] "$A = (45/360) \times \pi(12)^2 = (1/8) \times \pi(144) = (1/8) \times 452.57 = 56.57$ in^2"

[SAY] "Each pizza slice has an area of approximately 56.57 square inches."

[EXAMPLE] Example 2: Designing a Metal Washer

[WRITE] "Washer: outer radius 5 cm, inner radius 2 cm. Find area."

[SAY] "Step 1: Identify the shape. A washer is an annulus."

[SAY] "Step 2: Identify radii. R = 5 cm, r = 2 cm."

[SAY] "Step 3: Apply annulus formula. $A = \pi(R^2 - r^2)$."

[WRITE] "$A = \pi(5^2 - 2^2) = \pi(25 - 4) = \pi(21) = (22/7) \times 21 = 66$ cm^2"

[SAY] "The washer area is 66 square centimeters."

[EXAMPLE] Example 3: Overlapping Signal Ranges

[WRITE] "Tower signal: radius 10 km, central angle 60°. Find segment area."

[SAY] "Step 1: Identify the shape. Overlapping area is a segment."

[SAY] "Step 2: Calculate sector area. $A_{sector} = (60/360) \times \pi(10)^2 = (1/6) \times 100\pi \approx 52.36$ km^2."

[SAY] "Step 3: Calculate triangle area. $A_{triangle} = (1/2)r^2\sin(\theta) = (1/2)(10)^2\sin(60°) = 50 \times (\sqrt{3}/2) \approx 43.30$ km^2."

[SAY] "Step 4: Calculate segment. $A_{segment} = A_{sector} - A_{triangle} = 52.36 - 43.30 = 9.06$ km^2."

[WRITE] "$A_{segment} = 9.06$ km^2"

[EXAMPLE] Example 4: Circular Garden Path

[WRITE] "Garden: radius 10 m. Path width: 2 m. Find path area."

[SAY] "Step 1: Identify the shape. Path is an annulus."

[SAY] "Step 2: Determine radii. Inner r = 10 m, Outer R = 10 + 2 = 12 m."

[SAY] "Step 3: Apply formula. $A = \pi(12^2 - 10^2) = \pi(144 - 100) = \pi(44) = 138.29\ m^2$."

[WRITE] "$A = 138.29\ m^2$"

[SAY] "Now try these individually:"

[WRITE] "Practice:"

1. 1. Pizza: radius 14 inches, 10 equal slices. Area of each slice?
2. 2. Washer: outer radius 6 cm, inner radius 3 cm. Area?
3. 3. Pool: radius 8 m. Deck width: 3 m. Deck area?

[DO] Give students 7 minutes (minutes 30-37) for individual practice.

[DO] Circulate to check formula selection and calculations.

[TEACHING TIP] Emphasize: Match shape to formula (sector = pie, annulus = ring, segment = chord)

Minutes 37-40: Phase 4 - Assessment (Exit Ticket)

[SAY] "Excellent work! Complete this exit ticket to show your understanding."

[DO] Distribute exit tickets.

[SAY] "You have 3 minutes."

[WRITE] Display questions:

Q1: Circular cake: radius 15 cm, sliced into 12 equal pieces. Area of each slice?

Q2: Metal ring: outer radius 8 cm, inner radius 5 cm. Area?

Q3: Explain the difference between sector, annulus, and segment. Give one example for each.

[DO] Students work silently (minutes 37-40).

[DO] Collect exit tickets.

[SAY] "Great work! You now understand how to calculate areas of circle parts and apply them to real-life situations like pizza slicing, washer design, and signal coverage. Remember: Sector = pie slice, Annulus = ring, Segment = chord region!"

Teaching Tips and Strategies

Emphasis Points:

- • Visual identification: sector = pie slice, annulus = ring, segment = chord region
- • Sector formula: $\theta/360$ represents fraction of full circle
- • Annulus formula: Subtract inner hole from outer circle
- • Segment formula: Sector minus triangle

- • Match shape to formula based on boundaries

Differentiation in Action:

- • For struggling learners: Formula cards with diagrams, physical models, step-by-step templates, focus on one shape initially
- • For advanced learners: Annular sectors, optimization problems, career connections, overlapping circles, derive formulas
- • Use real objects (pizza, washer, orange) to reinforce concepts
- • Connect formulas to subtraction logic

Common Student Errors:

- • Confusing sector, annulus, and segment shapes
- • Using wrong formula for the shape
- • Forgetting to calculate central angle for sectors
- • Not subtracting inner area in annulus formula
- • Forgetting to subtract triangle in segment formula

Engagement Strategies:

- • Hands-on orange slicing activity
- • Connect to familiar objects (pizza, cake, washer)
- • Emphasize practical applications (food, engineering, telecommunications)
- • Use visual diagrams to distinguish shapes

Assessment Guidance

Exit Ticket Evaluation Criteria:

- • Correct shape identification
- • Proper formula selection
- • Accurate central angle calculation (for sectors)
- • Correct area calculation
- • Clear explanation of differences between shapes

Mastery Indicators:

- • Student distinguishes sector, annulus, and segment visually
- • Student applies correct formula for each shape
- • Student calculates central angle for equal sectors
- • Student subtracts inner area in annulus problems
- • Student explains real-life applications for each shape

Follow-Up for Students Who Struggle:

- • Provide formula reference cards with visual diagrams
- • Use physical models (pizza slices, washers, orange slices)

- • Break into explicit steps: 1) Identify shape, 2) Select formula, 3) Calculate
- • Focus on one shape type (sector) initially
- • Provide worked example templates

Post-Lesson Reflection Questions

After teaching this lesson, reflect on:

- • Did students successfully distinguish between sectors, annuli, and segments?
- • Were students able to apply the correct formula for each shape?
- • What misconceptions emerged about the formulas or shapes?
- • How engaged were students with the orange slicing activity?
- • Did students connect the concepts to real-world applications?
- • What percentage demonstrated mastery on the exit ticket?
- • What adjustments would improve this lesson?