CBC Grade 10 Mathematics

Step-by-Step Presentation Script

Surface Area in Real-Life

Pre-Class Preparation

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

- Materials Needed:
- • Paper and pencils
- • Calculators
- • Measuring tape (optional)
- • Formula reference chart
- • Exit tickets (one per student)
- Classroom Setup:
- • Display key inquiry question: "How do we use surface area calculations in everyday life?"
- • Prepare board space for formulas and worked examples
- • Have surface area formula chart visible

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 surface area calculations help us solve real-world problems involving coverage, cost, and material estimates."

[ASK] "Have you ever helped paint a room or wrap a gift? What did you need to know before starting?"

[LISTEN] Expected: How much paint to buy, how much paper needed, cost

[SAY] "Exactly! Surface area tells us how much material we need to cover an object. Engineers, manufacturers, architects, and homeowners all use surface area calculations every day."

[WRITE] On the board: "Surface Area in Real-Life"

[WRITE] Key inquiry question: "How do we use surface area calculations in everyday life?"

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

[SAY] "Imagine you want to paint parts of your house. You need to calculate how much paint to buy and how much it will cost. A small bucket of paint costs 500 ksh and covers 5 square meters."

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

[DO] Distribute paper, pencils, and calculators.

[SAY] "Task (a): Think about parts of your house or objects you may want to paint. List at least three examples."

[DO] Allow 3 minutes for brainstorming (Minutes 2-5).

[LISTEN] Expected: Pillars, walls, boxes, roof, doors, windows

[SAY] "Task (b): For each object, determine what kind of shape it is and estimate its dimensions."

[DO] Allow 4 minutes for shape identification (Minutes 5-9).

[DO] Circulate among groups asking probing questions.

[ASK] "Is the pillar a cylinder? Is the box a rectangular prism?"

[SAY] "Task (c): Determine whether you would paint the entire object or only parts of it."

[ASK] "Do you paint the top and bottom of a pillar, or just the curved side?"

[LISTEN] Expected: Just the curved side, not top/bottom

[SAY] "Task (d): Calculate the surface area for at least one object."

[SAY] "Task (e): Calculate how many buckets you need and the total cost."

[DO] Allow 6 minutes for calculations (Minutes 9-15).

[DO] Circulate to check calculations and unit conversions.

[TEACHING TIP] Remind students to convert cm to m before calculating

[ASK] "If your area is 3 square meters and one bucket covers 5 square meters, how many buckets do you buy?"

[LISTEN] Expected: One bucket (can't buy half a bucket)

[SAY] "Task (f): Share your findings. Why is accurate surface area calculation important?"

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

[LISTEN] Expected: Prevents waste, saves money, ensures enough material

Minutes 17-25: Phase 2 - Structured Instruction

[SAY] "Let me formalize what you discovered. Surface area is fundamental to many real-world applications."

[WRITE] "Surface area applications:"

[WRITE] "• Engineers: Heat transfer, cooling rates"

[WRITE] "• Manufacturers: Coating, painting, material estimates"

[WRITE] "• Architects: Cladding, tiling, irrigation coverage"

[WRITE] "• Homeowners: Paint, wallpaper, roofing materials"

[SAY] "Surface area calculations determine how much material is needed to cover an object. Accurate calculations reduce waste and help estimate expenses."

[SAY] "Critical rule: Always use consistent units before computing areas. Convert measurements when necessary."

[WRITE] "Unit Consistency: Convert cm to m BEFORE calculating"

[SAY] "Let me show you the formulas for common shapes."

[WRITE] Create table on board:

Shape	Lateral Surface Area	Total Surface Area
Cylinder	$2\pi rh$	$2\pi rh + 2\pi r^2$
Rectangular Prism	$2h(l + w)$	$2(lw + lh + wh)$
Pyramid	Sum of triangles	Lateral + base
Cone	πrl	$\pi rl + \pi r^2$
Sphere	N/A	$4\pi r^2$

[SAY] "Notice the difference between lateral and total surface area."

[SAY] "Lateral surface area: Only side surfaces, not bases. Use when painting a pillar without top/bottom."

[SAY] "Total surface area: All surfaces including bases. Use when wrapping a gift box completely."

[WRITE] "Lateral = sides only. Total = all surfaces including bases."

[SAY] "Surface area links directly to cost and planning. It determines how much material to purchase, total cost, and number of units needed."

Minutes 25-37: Phase 3 - Practice and Application

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

[EXAMPLE] Example 1: Painting a Cylindrical Pillar

[WRITE] "Pillar: 3 m tall, radius 15 cm. Paint costs 500 ksh per bucket, covers 5 m^2. Find cost."

[SAY] "Step 1: Standardize units. Height 3 m, radius 15 cm equals 0.15 m."

[WRITE] "h = 3 m, r = 0.15 m"

[SAY] "Step 2: Calculate lateral surface area—curved side only, not top/bottom."

[WRITE] "$A = 2\pi rh = 2 \times \pi \times 0.15 \times 3 = 0.9\pi \approx 2.827$ m^2"

[SAY] "Step 3: Determine buckets needed. Area is 2.827, coverage is 5. Since 2.827 is less than 5, we need 1 bucket."

[SAY] "Step 4: Calculate cost. 1 bucket times 500 equals 500 ksh."

[WRITE] "Cost = 500 ksh"

[EXAMPLE] Example 2: Roofing a Pyramid-Shaped Roof

[WRITE] "Roof: Square base 6×6 m, diagonal to top 5 m. Roofing costs 2000 ksh per m^2. Find cost."

[SAY] "Step 1: Identify triangle dimensions. Each side: a = 5 m, b = 5 m, c (base) = 6 m."

[SAY] "Step 2: Use Heron's Formula. Semi-perimeter s = (5+5+6)/2 = 8 m."

[WRITE] "s = 8 m"

[SAY] "Area = $\sqrt{[s(s-a)(s-b)(s-c)]} = \sqrt{[8\times3\times3\times2]} = \sqrt{144} = 12$ m^2"

[WRITE] "Area of one triangle = 12 m^2"

[SAY] "Step 3: Total roofing. Four identical triangles: 12 times 4 equals 48 m^2."

[SAY] "Step 4: Calculate cost. 48 times 2000 equals 96,000 ksh."

[WRITE] "Cost = 96,000 ksh"

[EXAMPLE] Example 3: Covering a Spherical Ball

[WRITE] "Ball: radius 15 cm. Leather costs 1200 ksh per m^2. Find area and cost."

[SAY] "Step 1: Convert. r = 15 cm = 0.15 m."

[SAY] "Step 2: Sphere surface area. $A = 4\pi r^2 = 4\pi(0.15)^2 = 0.09\pi \approx 0.283$ m^2."

[SAY] "Step 3: Cost = $0.09\pi \times 1200 \approx 339$ ksh."

[WRITE] "Area = 0.283 m^2, Cost = 339 ksh"

[EXAMPLE] Example 4: Wrapping a Gift Box

[WRITE] "Box: 40 cm × 30 cm × 25 cm. Find wrapping paper needed in m^2."

[SAY] "Step 1: Convert. l = 0.40 m, w = 0.30 m, h = 0.25 m."

[SAY] "Step 2: Total surface area. SA = 2(lw + lh + wh)."

[WRITE] "SA = 2(0.12 + 0.10 + 0.075) = 0.59 m^2"

[SAY] "Now try these individually:"

[WRITE] "Practice:"

1. 1. Cylindrical tank: r = 2 m, h = 5 m. Curved surface area?
2. 2. Conical tent: r = 3 m, slant height = 5 m. Lateral surface area?
3. 3. Cube: side = 50 cm. Total surface area in m^2?

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

[DO] Circulate to check unit conversions and formula application.

[TEACHING TIP] Emphasize: Convert units FIRST, then apply formula

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: Cylindrical pillar: r = 20 cm, h = 4 m. Lateral surface area in m^2? If paint costs 600 ksh per bucket (covers 6 m^2), find cost.

Q2: Why is unit consistency important in surface area calculations?

Q3: Explain lateral vs. total surface area. Give examples.

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

[DO] Collect exit tickets.

[SAY] "Great work! You now understand how surface area calculations help us solve real-world problems involving coverage, cost, and material estimates. Remember: Convert units first, identify which surfaces to include, apply the correct formula, and link area to cost!"

Teaching Tips and Strategies

Emphasis Points:

- • Surface area determines material needs and costs
- • Unit conversion is a separate explicit step (cm → m BEFORE calculating)
- • Lateral = sides only, Total = all surfaces including bases
- • Accurate calculations reduce waste and save money
- • Connect formulas to real applications (painting, roofing, wrapping)

Differentiation in Action:

- • For struggling learners: Formula cards, step-by-step templates, simpler shapes, visual diagrams
- • For advanced learners: Composite solids, optimization problems, irregular shapes, career connections
- • Use real costs to make math meaningful
- • Decompose complex objects into simpler shapes

Common Student Errors:

- • Forgetting to convert units (mixing cm and m)
- • Confusing lateral with total surface area
- • Using wrong formula for the shape
- • Not identifying which surfaces to include
- • Calculating area but forgetting to link to cost

Engagement Strategies:

- • Connect to students' homes and familiar objects
- • Use real costs (ksh) to make calculations meaningful
- • Emphasize practical value (saves money, prevents waste)
- • Show diverse applications (engineering, manufacturing, homeownership)

Assessment Guidance

Exit Ticket Evaluation Criteria:

- • Correct unit conversion (cm to m)
- • Proper formula selection and application
- • Accurate surface area calculation
- • Correct cost determination
- • Clear explanation of concepts

Mastery Indicators:

- • Student converts units before calculating
- • Student identifies which surfaces to include
- • Student applies correct formula for shape
- • Student links surface area to material needs and cost
- • Student explains lateral vs. total surface area

Follow-Up for Students Who Struggle:

- • Provide formula reference cards
- • Break into explicit steps: 1) Convert, 2) Formula, 3) Cost
- • Use visual diagrams showing which surfaces to paint
- • Focus on one shape type (cylinder) initially
- • Provide worked example templates

Post-Lesson Reflection Questions

After teaching this lesson, reflect on:

- • Did students successfully connect surface area to real-world applications?
- • Were students able to identify which surfaces to include?
- • What misconceptions emerged about units or formulas?
- • How engaged were students with the house painting activity?
- • Did students understand the link between surface area and cost?
- • What percentage demonstrated mastery on the exit ticket?
- • What adjustments would improve this lesson?