CBC Grade 10 Mathematics

Step-by-Step Presentation Script

Surface Area of Prisms

Pre-Class Preparation

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

- Materials Needed:
- • Solid cube or cuboid wood waste blocks (one per group)
- • Grid/graph paper or plain paper
- • Rulers
- • Pre-made nets of cubes or cuboids (optional)
- • Calculators
- • Exit tickets (one per student)
- Classroom Setup:
- • Display key inquiry questions: "How do we determine the surface area and volume of solids? Why do we determine the surface area and volume of solids?"
- • Arrange students into groups of 2-3
- • Prepare board space for formulas and diagrams
- • Have formula reference cards ready for struggling learners

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 surface area of prisms—the total area covering all faces of 3D objects."

[ASK] "Where have you seen surface area calculations used in real life?"

[LISTEN] Expected: Painting walls, wrapping gifts, packaging boxes, building construction

[SAY] "Exactly! Surface area helps us determine how much material we need to cover objects. Today we'll discover how to calculate surface area using nets."

[WRITE] On the board: "Surface Area of Prisms"

[WRITE] Key inquiry questions: "How do we determine the surface area and volume of solids? Why do we determine the surface area and volume of solids?"

Minutes 2-15: Phase 1 - Anchor Activity (Discovery)

[SAY] "We'll discover surface area by creating nets and calculating face areas."

[SAY] "Form groups of 2 or 3 students. Each group will receive a solid object—either a cube or cuboid."

[DO] Distribute materials: solid objects, grid paper, rulers (Minutes 2-3).

[SAY] "Step 1: Choose one solid object—cube or cuboid."

[SAY] "Step 2: Create a net for your object. You can unfold a model or draw the net on paper."

[SAY] "Step 3: Trace the faces onto grid paper or measure them using a ruler."

[SAY] "Step 4: Calculate the area of each face."

[SAY] "Step 5: Add up all face areas to find the total surface area."

[DO] Allow 8 minutes for group work (Minutes 3-11).

[DO] Circulate among groups, asking probing questions:

[ASK] "How many faces does your object have?"

[ASK] "Are all the faces the same size?"

[ASK] "How can you check if you've counted all the faces?"

[LISTEN] For student discoveries about the relationship between dimensions and surface area.

[SAY] "Now let's discuss: What will happen if the surface area doubles in size?"

[SAY] "Why do bigger cubes have more surface area?"

[DO] Allow 4 minutes for sharing and discussion (Minutes 11-15).

[TEACHING TIP] Use student solutions to bridge to formal instruction in Phase 2.

Minutes 15-25: Phase 2 - Structured Instruction

[SAY] "Let me formalize what you discovered. The surface area of a cube or cuboid is the total area of all its faces."

[WRITE] "Definition: Surface Area = Total area of all faces"

[SAY] "For a cube, all 6 faces are identical squares."

[WRITE] "Cube: Surface Area = $6s^2$ where s = side length"

[EXAMPLE] "If a cube has side 5 cm, Surface Area = $6(5^2) = 6(25) = 150$ cm^2"

[SAY] "For a cuboid, we have 6 rectangular faces. We can calculate the area of each pair of opposite faces."

[WRITE] "Cuboid: Surface Area = 2(lw + lh + wh) where l = length, w = width, h = height"

[EXAMPLE] "If a cuboid has length 6 cm, width 4 cm, height 3 cm:"

[WRITE] "Surface Area = $2(6\times4 + 6\times3 + 4\times3) = 2(24 + 18 + 12) = 2(54) = 108$ cm^2"

[SAY] "More generally, a prism has two identical parallel bases and straight sides connecting them."

[WRITE] "Prism: Surface Area = 2F + Pl"

[WRITE] "where F = area of base, P = perimeter of base, l = length"

[SAY] "This formula works for any prism—rectangular, triangular, pentagonal, or even cylinders."

[TEACHING TIP] Address misconceptions: Surface area ≠ perimeter, surface area ≠ volume, must count all faces

Minutes 25-37: Phase 3 - Practice and Application

[SAY] "Now let's apply these formulas to solve problems."

[EXAMPLE] Cube with Side 12 cm

[WRITE] "Problem: Work out the surface area of a cube whose side is 12 cm."

[SAY] "Step 1: Identify the shape—it's a cube, so all faces are identical."

[SAY] "Step 2: Use the formula: Surface Area = $6s^2$"

[WRITE] "Surface Area = $6(12^2) = 6(144) = 864$ cm^2"

[SAY] "Answer: The surface area is 864 cm^2."

[EXAMPLE] Cube with Side 8 cm

[WRITE] "Problem: Work out the surface area of a cube whose side is 8 cm."

[WRITE] "Surface Area = $6(8^2) = 6(64) = 384$ cm^2"

[EXAMPLE] Triangular Prism

[WRITE] "Problem: Find the surface area of a triangular prism with base 8 cm, triangle height 3 cm, and length 12 cm."

[SAY] "Step 1: Find the area of one triangular face."

[WRITE] "Area of triangle = ½ × 8 × 3 = 12 cm^2"

[SAY] "Step 2: Two triangular faces."

[WRITE] "Two faces = 2 × 12 = 24 cm^2"

[SAY] "Step 3: Find the perimeter. Using Pythagorean theorem, slant sides = 5 cm each."

[WRITE] "Perimeter = 8 + 5 + 5 = 18 cm"

[SAY] "Step 4: Calculate lateral area."

[WRITE] "Lateral area = 18 × 12 = 216 cm^2"

[SAY] "Step 5: Add all areas."

[WRITE] "Total Surface Area = 24 + 216 = 240 cm^2"

[SAY] "Now try these individually:"

[WRITE] "Practice:"

1. 1. A cube has side length 9 cm. Find its total surface area.
2. 2. A rectangular box measures 12 cm by 7 cm by 5 cm. Calculate its total surface area.
3. 3. A pet shop wants to construct a cube-shaped aquarium with a side length of 1.2 meters. The aquarium needs to be made entirely of glass, including the base and all four vertical sides, but the top will remain open. If the cost of glass is Ksh. 750 per square meter, find the total cost of constructing the aquarium.

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

[DO] Circulate to check formula selection and calculation accuracy.

[TEACHING TIP] Remind: Identify shape → Select formula → Calculate face areas → Add all areas

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: A cube has side length 9 cm. Find its total surface area.

Q2: A rectangular box measures 12 cm by 7 cm by 5 cm. Calculate its total surface area.

Q3: A pet shop wants to construct a cube-shaped aquarium with a side length of 1.2 meters. The aquarium needs to be made entirely of glass, including the base and all four vertical sides, but the top will remain open. If the cost of glass is Ksh. 750 per square meter, find the total cost of constructing the aquarium.

Q4: A cuboid-shaped water tank measures 4 m by 3 m by 2 m. Only the four walls and the base are painted. Find the area painted.

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

[DO] Collect exit tickets.

[SAY] "Great work! You now understand how to calculate surface area of prisms. Remember: Surface area is the total area of all faces, measured in square units!"

Teaching Tips and Strategies

Emphasis Points:

- • Surface area is the total area of all faces
- • Each face must be counted exactly once
- • Surface area is measured in square units (cm^2, m^2)
- • Cubes have simpler formulas because all faces are identical
- • Nets help visualize all faces of 3D objects

Differentiation in Action:

- • For struggling learners: Pre-drawn nets, color coding, formula cards, calculators, peer tutors
- • For advanced learners: Design challenges, optimization problems, real-world investigations
- • Use visual demonstrations with nets
- • Connect to real-world applications

Common Student Errors:

- • Confusing surface area with volume
- • Forgetting to count all faces
- • Using linear units instead of square units
- • Confusing perimeter with area
- • Miscalculating face areas

Engagement Strategies:

- • Hands-on activity with nets and solid objects

- • Connect to familiar scenarios (gift wrapping, painting, packaging)
- • Emphasize real-world applications
- • Use visual diagrams and physical models

Assessment Guidance

Exit Ticket Evaluation Criteria:

- • Correct identification of shape type (cube vs. cuboid)
- • Proper formula selection
- • Accurate calculation of face areas
- • Correct addition of all face areas
- • Appropriate use of square units

Mastery Indicators:

- • Student correctly identifies shape type
- • Student selects appropriate formula
- • Student calculates face areas accurately
- • Student adds all face areas correctly
- • Student uses square units consistently

Follow-Up for Students Who Struggle:

- • Provide pre-drawn nets with labeled dimensions
- • Use color coding for different faces
- • Provide formula reference cards
- • Allow calculators for all calculations
- • Pair with peer tutors
- • Use physical models to reinforce concepts

Post-Lesson Reflection Questions

After teaching this lesson, reflect on:

- • Did students successfully create nets and identify all faces?
- • Were students able to distinguish surface area from volume?
- • Did students understand the formulas for cubes and cuboids?
- • What misconceptions emerged about counting faces?
- • How engaged were students with hands-on net activity?
- • Did students connect surface area to real-world applications?
- • What percentage demonstrated mastery on exit ticket?
- • What adjustments would improve this lesson?