

Grade 10 Mathematics Presentation

Script

Surface Area of Composite Solids

Pre-Class Preparation

Materials Checklist:

- Nets or templates for cylinders (one per group)
- Nets or templates for cones or hemispheres (one per group)
- Scissors (one per group)
- Glue or tape
- Rulers (one per group)
- String
- Calculators (one per group)
- Worksheets for recording calculations

Room Setup:

- Prepare board space for formula derivation
- Arrange desks for group work
- Have extra materials available
- Prepare composite solid examples on chart paper for display

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

Opening Hook (2 minutes)

[DO] Display pictures of composite solids (ice cream cones, buildings, water tanks, monuments).

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

[WAIT] Expected: They are made of different shapes! They have multiple parts!

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

[WAIT] Expected: We need to add the areas of all the parts!

[SAY] Exactly! These are composite solids. Today we will learn how to find their surface area.

[SAY] We will explore by building tree models.

Anchor Activity Launch (3 minutes)

[DO] Distribute nets, scissors, glue, and rulers to each group.

[SAY] Here is your challenge: You will build a tree model and calculate its surface area.

[SAY] Here is what you will do:

[SAY] Step 1: Build a tree model using a cylinder for the trunk and a cone or hemisphere for the top.

[SAY] Step 2: Label your dimensions: radius of trunk, height of trunk, radius of cone, slant height of cone.

[SAY] Step 3: Calculate the surface area. Remember: Do NOT count hidden surfaces!

[SAY] Step 4: Add all visible surfaces: lateral area of cone + lateral area of cylinder + base of cylinder.

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

Student Work Time (8 minutes)

[DO] Circulate among groups.

[ASK] To a group struggling: What surfaces are visible?

[WAIT] Expected: The lateral surface of the cone, the lateral surface of the cylinder, and the base of the cylinder!

[SAY] Good! Which surfaces are hidden?

[WAIT] Expected: The base of the cone and the top of the cylinder!

[SAY] Excellent! So we do not count those.

[DO] For struggling groups: Let us start with the lateral area of the cylinder. What is the formula?

[DO] For early finishers: How would the surface area change if you used a hemisphere instead of a cone?

Class Discussion (2 minutes)

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

[ASK] What did you discover about the surface area of composite solids?

[WAIT] Expected: We add all visible surfaces and exclude hidden surfaces!

[SAY] Excellent! Why do we exclude hidden surfaces?

[WAIT] Expected: Because they are not visible!

[SAY] Today we will formalize this concept.

Phase 2: Structured Instruction (10 minutes)

Formalizing the Concept (10 minutes)

[SAY] Now that you have explored composite solids, let us formalize what we learned.

[WRITE] On the board: Surface Area of Composite Solids

[SAY] A solid is a three-dimensional shape with width, length, and height.

[SAY] When two or more different solids are placed together, the result is composite solids.

[DO] Draw a composite solid on the board (cone on top of cylinder).

[SAY] The surface area of composite solids can be found by adding areas of all visible surfaces.

[SAY] Key principle: Surface Area = Sum of all visible surfaces.

[SAY] Important: Do NOT count surfaces that are hidden or covered.

[ASK] Does everyone understand this principle?

[WAIT] Check for nods or questions.

Addressing Misconceptions:

[SAY] Let me address some common mistakes:

[SAY] Mistake 1: I should add the surface areas of both solids completely. No, you must exclude hidden surfaces.

[SAY] Mistake 2: All surfaces are visible. No, some surfaces are hidden when solids are joined.

[SAY] Mistake 3: I can just use one formula. No, you must calculate each part separately, then add.

[SAY] Mistake 4: The order does not matter. While true, work systematically: identify visible surfaces, calculate each, then sum.

[ASK] Does everyone understand?

[WAIT] Check for understanding.

Phase 3: Practice and Application (10 minutes)

Worked Example (10 minutes)

[SAY] Let us work through an example together.

[WRITE] Example: Find the surface area of a cone on top of a cylinder.

[DO] Draw the diagram on the board.

[SAY] Given: Cone radius = 40 cm, Cone height = 30 cm, Cylinder radius = 40 cm, Cylinder height = 50 cm.

[SAY] Step 1: Surface area of cone = πr times l = 6,280 cm squared.

[SAY] Step 2: Curved surface area of cylinder = $2 \pi r$ times h = 12,560 cm squared.

[SAY] Step 3: Base area of cylinder = πr squared = 5024 cm squared.

[SAY] Step 4: Total = 12,560 + 6,280 + 5024 = 23,864 cm squared.

[SAY] Converting to m squared: 23,864 / 10,000 = 2.39 m 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. Ice cream cone with hemisphere on top. Will melted ice cream fit inside cone?
2. Frustum lampshade. Find lateral surface area.
3. Ice cream cone container. Find surface area.
4. Cylindrical cake with hemisphere top. Find total volume.

Differentiation Notes

For Struggling Learners:

- Provide pre-made composite solid models.
- Use simple dimensions.
- Pair with confident problem solvers.
- Provide step-by-step calculation templates.
- Break down the process into steps.

For Advanced Learners:

- Challenge with three or more solids combined.
- Explore real-world applications: buildings, monuments, containers.
- Investigate optimization problems.
- Design and build own composite solid models.

Post-Lesson Reflection Prompts

- Did students successfully build tree models and calculate surface area?
- Were students able to identify hidden surfaces?
- What misconceptions emerged, and how were they addressed?
- Did students understand composite solids surface area?
- What adjustments would improve this lesson?