Grade 10 Mathematics Presentation Script

Surface Area of Frustums

Pre-Class Preparation

Materials Checklist:

- Printable cone nets (one per group)
- Paper cups or cone-shaped fruit juice glasses
- Rulers or measuring tape (one per group)
- Scissors (one per group)
- Tape or glue
- Calculators (one per group)
- Formula sheets
- Worksheets for sketching and calculations

Room Setup:

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

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

Opening Hook (2 minutes)

[DO] Display pictures of frustums (lampshades, buckets, cooling towers, paper cups).

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

[WAIT] Expected: They have two circular bases! They look like cones with the top cut off!

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

[WAIT] Expected: We need a formula!

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

[SAY] We will explore by constructing frustum models from paper cups or cone nets.

Anchor Activity Launch (3 minutes)

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

[SAY] Here is your challenge: You will construct a frustum and calculate its surface area.

[SAY] Here is what you will do:

[SAY] Step 1: Take the cone net and cut off the top part parallel to the base.

[SAY] Step 2: Assemble the remaining portion to form a frustum.

[SAY] Step 3: Label the dimensions: larger base radius R, smaller top radius r, slant height l.

[SAY] Step 4: Calculate the surface area using the formula: Total Surface Area = π (R + r) l + π R squared + π r squared.

[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 make up the frustum?

[WAIT] Expected: Two circular bases and a curved surface!

[SAY] Good! How do we find the area of each surface?

[ASK] To another group: What is the formula for the curved surface area?

[WAIT] Expected: π (R + r) l!

[SAY] Excellent! Now add the base areas.

[DO] For struggling groups: Let us start with the bottom base area. What is the formula?

[DO] For early finishers: Given a full cone, how much surface area is lost when the top is cut off?

Class Discussion (2 minutes)

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

[ASK] What did you discover about the surface area of a frustum?

[WAIT] Expected: It is the curved surface area plus the areas of both bases!

[SAY] Excellent! What is the formula?

[WAIT] Expected: π (R + r) l + π R squared + π r squared!

[SAY] Today we will formalize this formula.

Phase 2: Structured Instruction (10 minutes)

Formalizing the Formula (10 minutes)

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

[WRITE] On the board: Surface Area of Frustums

[SAY] A frustum is formed when a cone is cut parallel to its base, removing the top portion.

[DO] Draw a frustum on the board.

[SAY] A frustum has two circular bases (one larger, one smaller) and a curved surface.

[SAY] The surface area of a frustum is found using this formula:

[WRITE] Total Surface Area = π (R + r) l + π R squared + π r squared

[SAY] Where R is the larger base radius, r is the smaller top radius, and l is the slant height.

[SAY] Components: π (R + r) l is curved surface, π R squared is bottom base, π r squared is top base.

[ASK] Does everyone understand this formula?

[WAIT] Check for nods or questions.

Addressing Misconceptions:

[SAY] Let me address some common mistakes:

[SAY] Mistake 1: A frustum is the same as a cone. No, a frustum is formed when the top of a cone is cut off.

[SAY] Mistake 2: I only need the curved surface area. No, you must add both base areas.

[SAY] Mistake 3: Slant height and vertical height are the same. No, slant height is along the side, vertical height is perpendicular.

[SAY] Mistake 4: I can use the cone formula directly. No, a frustum has two bases, so account for both.

[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 galvanized iron bucket.

[DO] Draw the diagram on the board.

[SAY] Complete the cone by adding a smaller cone of height x cm.

[SAY] Using similarity: x / 15 = (x + 20) / 20.

[WRITE] 20x = 15x + 300, so x = 60 cm.

[SAY] Surface area of frustum = Area of bigger cone curved surface - Area of smaller cone curved surface.

[WRITE] = π R L - π r l

[SAY] Surface area (Large) = (22 / 7) times 20 times square root of (80 squared + 20 squared) = 5183.33 cm squared.

[SAY] Surface area (Small) = (22 / 7) times 15 times square root of (60 squared + 15 squared) = 2915.62 cm squared.

[SAY] Difference = 5183.33 - 2915.62 = 2267.71 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 frustum of a square pyramid has top side 4 m, bottom side 6 m, slant height 5 m. Calculate total surface area.

2. A conical frustum has bottom radius 6 cm, no top, slant height 10 cm. Find curved surface area only.

3. A frustum is formed by cutting a cone (height 24 cm) into two parts. Smaller cone height 9 cm. Base radius 16 cm. Calculate total surface area.

4. Curved surface area 330 cm squared, top radius 5 cm, bottom radius 10 cm. Find slant height.

Differentiation Notes

For Struggling Learners:

- Provide pre-cut frustum models.
- Use frustums with simple dimensions.
- 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 using similarity.
- Explore real-world applications: lampshades, buckets, cooling towers.
- Investigate problems requiring Pythagorean theorem for slant height.
- Apply to composite solids.

Post-Lesson Reflection Prompts

- Did students successfully construct frustum models and calculate surface area?
- Were students able to identify the surfaces of a frustum?
- What misconceptions emerged, and how were they addressed?
- Did students understand the difference between a frustum and a cone?
- What adjustments would improve this lesson?