Grade 10 Mathematics Presentation Script

Surface Area of Cones

Pre-Class Preparation

Materials Checklist:

- Paper (one per group)
- Pencils
- Rulers (one per group)
- Calculators (one per group)
- Chart paper for recording key takeaways
- Markers

Room Setup:

- Prepare board space for formula derivation
- Arrange desks for group work
- Have extra paper and calculators available
- Prepare cone diagrams on chart paper for display

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

Opening Hook (2 minutes)

[DO] Display pictures of cones (ice cream cones, traffic cones, conical tents).

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

[WAIT] Expected: They are cones! They have a circular base and taper to a point!

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

[WAIT] Expected: We need a formula!

[SAY] Exactly! These are cones. Today we will derive the formula for their surface area.

[SAY] We will explore by identifying the faces and using geometry.

Anchor Activity Launch (3 minutes)

[DO] Write the problem on the board: If a cone has height h and base radius r, show that surface area is π r squared + π r square root of (r squared + h squared).

[SAY] Here is your challenge: You will derive the formula for the surface area of a cone.

[SAY] Here is what you will do:

[SAY] Step 1: Sketch and label a cone with height h, radius r, and slant height l.

[SAY] Step 2: Identify the faces. What shapes make up the cone?

[SAY] Step 3: Calculate the curved surface area by thinking of it as thin triangles.

[SAY] Step 4: Use the Pythagorean theorem to find the slant height.

[SAY] Step 5: Find the base area and curved surface area.

[SAY] Step 6: Add them to get the total surface area.

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

Student Work Time (8 minutes)

[DO] Circulate among groups.

[ASK] To a group struggling: What faces make up the cone?

[WAIT] Expected: A circular base and a curved surface!

[SAY] Good! How can we find the area of the curved surface?

[ASK] To another group: How do we find the slant height?

[WAIT] Expected: Use the Pythagorean theorem!

[SAY] Excellent! What is the formula?

[WAIT] Expected: l = square root of (r squared + h squared)!

[SAY] Perfect! Now calculate the areas.

[DO] For struggling groups: Let us start with the base area. What is the formula for the area of a circle?

[DO] For early finishers: Can you derive the formula for a cone without a base?

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 cone?

[WAIT] Expected: It is the base area plus the curved surface area!

[SAY] Excellent! What is the formula?

[WAIT] Expected: π r squared + π r l!

[SAY] Today we will formalize this formula.

Phase 2: Structured Instruction (10 minutes)

Formalizing the Formula (10 minutes)

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

[WRITE] On the board: Surface Area of Cones

[SAY] A cone is a three-dimensional shape with a circular base and a curved surface that tapers to a point.

[DO] Draw a cone on the board.

[SAY] The net of a cone consists of a circular base and a curved surface (sector).

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

[WRITE] Surface Area = π r squared + π r l

[SAY] Where r is the radius and l is the slant height.

[SAY] We can find l using the Pythagorean theorem: l = square root of (r squared + h squared).

[WRITE] Alternative form: Surface Area = π r squared + π r square root of (r squared + h squared)

[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 cone is the same as a cylinder. No, a cone tapers to a point, while a cylinder has two parallel bases.

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

[SAY] Mistake 3: Height and slant height are the same. No, slant height is along the curved surface, while height is perpendicular to the base.

[SAY] Mistake 4: I can use height directly in the formula. No, you must use slant height, calculated with the Pythagorean theorem.

[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: Given a cone with radius 14 cm and angle 60 degrees. Find the surface area.

[DO] Draw the diagram on the board.

[SAY] Step 1: Find the area of the sector (curved surface).

[WRITE] Area = (60 / 360) times (22 / 7) times 14 times 14 = 102.67 cm squared

[SAY] Step 2: Find the area of the circular base.

[WRITE] Area = (22 / 7) times 14 times 14 = 616 cm squared

[SAY] Step 3: Find the total surface area.

[WRITE] Surface area = 102.67 + 616 = 718.67 cm squared

[SAY] The surface area is 718.67 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 circular cone has a base radius of 5 cm and a slant height of 12 cm. Calculate the total surface area.

2. A cone has a base diameter of 16 cm and a height of 15 cm. Find the slant height, then calculate the total surface area.

3. A conical container has a base radius of 10 cm and a slant height of 18 cm. Find the curved surface area only (no base).

4. A conical tent has a radius of 4.2 m and a slant height of 7.5 m. Find the fabric area needed (no base).

Differentiation Notes

For Struggling Learners:

- Provide pre-drawn cone diagrams.
- Use cones 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 curved surface area formula.
- Explore real-world applications: ice cream cones, traffic cones, tents.
- Investigate problems requiring Pythagorean theorem for slant height.
- Apply to composite solids.

Post-Lesson Reflection Prompts

- Did students successfully derive the cone surface area formula through the anchor activity?
- Were students able to identify the faces of a cone?
- What misconceptions emerged, and how were they addressed?
- Did students understand the difference between height and slant height?
- What adjustments would improve this lesson?