

Grade 10 Mathematics Presentation

Script

Surface Area of Pyramids

Pre-Class Preparation

Materials Checklist:

- Colored paper or cardstocks (one per group)
- Scissors (one per group)
- Rulers (one per group)
- Glue or tape
- Markers
- Chart paper for recording key takeaways

Room Setup:

- Prepare board space for formula derivation
- Arrange desks for group work
- Have extra paper and scissors available
- Prepare pyramid net examples on chart paper for display

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

Opening Hook (2 minutes)

[DO] Display pictures of pyramids (Egyptian pyramids, tent roofs, food containers).

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

[WAIT] Expected: They are pyramids! They have triangular faces!

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

[WAIT] Expected: We need a formula!

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

[SAY] We will explore by constructing pyramid nets from paper.

Anchor Activity Launch (3 minutes)

[DO] Distribute colored paper, scissors, rulers, and tape to each group.

[SAY] Here is your challenge: You will discover the formula for finding the surface area of a pyramid.

[SAY] Here is what you will do:

[SAY] Step 1: Observe the net of the pyramid in your textbook.

[SAY] Step 2: Draw the net on your colored paper. Draw four triangles with equal sides and heights.

[SAY] Step 3: Cut off the extra paper to remain with the pyramid net.

[SAY] Step 4: Fold along the edges to form a pyramid. Use tape to hold it together.

[SAY] Step 5: Measure the base height and slant height with your ruler.

[SAY] Step 6: Calculate the surface area of your pyramid.

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

Student Work Time (8 minutes)

[DO] Circulate among groups.

[ASK] To a group struggling with drawing: Did you draw four triangles? Are the sides equal?

[WAIT] Expected: Students draw and cut pyramid nets.

[SAY] Good! Now fold along the edges and tape it together.

[ASK] To another group: What shapes make up the pyramid?

[WAIT] Expected: A base and triangular faces!

[SAY] Excellent! How do we find the surface area?

[WAIT] Expected: We add the base area and all triangular face areas!

[SAY] Perfect! Calculate both areas.

[DO] For struggling groups: Let us find the area of the base first. Then find the area of one triangular face. How many faces are there?

[DO] For early finishers: Can you write a general formula for any pyramid?

Class Discussion (2 minutes)

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

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

[WAIT] Expected: We add the base area and all triangular face areas!

[SAY] Excellent! Did everyone get the same formula?

[WAIT] Check for understanding.

[SAY] Today we will formalize this formula.

Phase 2: Structured Instruction (10 minutes)

Formalizing the Formula (10 minutes)

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

[WRITE] On the board: Surface Area of Pyramids

[SAY] A pyramid is a geometric solid with a polygon base and triangular faces that meet at an apex.

[DO] Draw a pyramid on the board.

[SAY] Pyramids are named after their base shape. A square base gives a square pyramid.

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

[WRITE] Surface Area = Base Area + Sum of all triangular face areas

[SAY] For a square pyramid:

[WRITE] Surface Area = Base Area + 4 times (Area of one triangular face)

[SAY] Where Base Area = side times side, and Area of triangle = $(1 / 2)$ times base times slant height.

[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 pyramid is the same as a prism. No, a pyramid has triangular faces meeting at an apex, while a prism has rectangular faces.

[SAY] Mistake 2: I only need the triangular face areas. No, you must add the base area too.

[SAY] Mistake 3: All pyramids have square bases. No, pyramids can have any polygonal base.

[SAY] Mistake 4: Height and slant height are the same. No, slant height is along the triangular face, while height is perpendicular to the base.

[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 square pyramid with height 6 cm and side length 4 cm. Given $b = 2$ by 2 and $H = 4$.

[DO] Draw the diagram on the board.

[SAY] Step 1: Find the base area.

[WRITE] Base Area = 2 times 2 = 4 cm squared

[SAY] Step 2: Find the area of one triangular face.

[WRITE] Area = $(1 / 2)$ times 2 times 4 = 4 cm squared

[SAY] Step 3: Find the area of all triangular faces.

[WRITE] Area of all triangles = 4 times 4 = 16 cm squared

[SAY] Step 4: Find the total surface area.

[WRITE] Surface area = 16 + 4 = 20 cm squared

[SAY] The surface area is 20 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 pyramid with a square base has a total surface area of 400 cm squared, and its base side measures 8 cm. Calculate the slant height.
2. A square pyramid has a base with sides of 24 cm each, and the height of the triangular face is 18 cm. Find the total surface area.
3. A miniature paper pyramid has a square base of 12 cm by 12 cm and a slant height of 20 cm. How much paper is required?

Differentiation Notes

For Struggling Learners:

- Provide pre-drawn pyramid nets.
- Use square pyramids 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 triangular pyramids using Heron's formula.
- Explore real-world applications: Egyptian pyramids, tent roofs, packaging.
- Investigate problems requiring Pythagorean theorem for slant height.
- Apply to composite solids.

Post-Lesson Reflection Prompts

- Did students successfully discover the pyramid surface area formula through the anchor activity?
- Were students able to construct pyramid nets accurately?
- What misconceptions emerged, and how were they addressed?
- Did students understand the difference between a pyramid and a prism?
- What adjustments would improve this lesson?