LESSON MAKER PRO

Solid Shape Lab

Find surface area and volume in three dimensions.

GRADE 8 · 8.MG.2

8.MG.2 "The student will investigate and determine the surface area of square-based pyramids and the volume of cones and square-based pyramids. Determine the surface area of square-based pyramids by using concrete objects, nets, diagrams..."

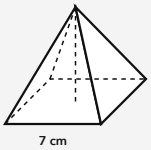
NAME _____ DATE _____

SQUARE PYRAMIDS AND CONES

For a square-based pyramid, surface area = $b^2 + 2bs$, where b is the base edge and s is the slant height. Its volume = $b^2h/3$. A cone's volume = pi $r^2h/3$, so a cone or pyramid has 1/3 the volume of a matching cylinder or prism.

WORKED EXAMPLE

Find the total surface area of the square-based pyramid shown.

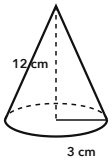


1. Use surface area = $b^2 + 2bs$.
2. Substitute: $7^2 + 2(7)(8)$.
3. Calculate: 49 + 112 = 161.

Answer: 161 cm^2

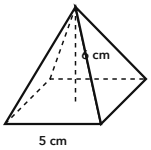
PRACTICE 6 problems

1 Find the volume of the cone shown. Leave your answer in terms of pi.



ANSWER _____

2 Find the volume of the square-based pyramid shown.



ANSWER _____

3 A square-based pyramid has a base edge of 4 cm and a slant height of 10 cm. Find its total surface area.

ANSWER _____

4 A cone has a radius of 2 cm and a height of 15 cm. Find its volume in terms of pi.

ANSWER _____

5 A cone and a cylinder have the same base radius and height. The cylinder's volume is 96pi cm^3. Find the cone's volume. State the volume relationship.

ANSWER _____

6 A square-based pyramid has a volume of 192 cm^3 and a base edge of 12 cm. Find its vertical height.

ANSWER _____

APPLY IT Show your work

1 For a school esports event, a team makes a square-pyramid cardboard display. Its base edge is 10 cm, and its slant height is 13 cm. Cardboard covers all five outside faces. What is the total surface area of the display?

WORK SPACE

ANSWER _____

2 A snack stand at a skate park fills a cone-shaped cup with shaved ice. The cup has a radius of 6 cm and a height of 12 cm. What volume of shaved ice can the cup hold? Leave your answer in terms of pi.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A square-based pyramid and a rectangular prism have the same square base edge of 12 cm and the same height of 15 cm. A student says the pyramid's volume is 2,160 cm^3. Is the student correct? Find the pyramid's volume and explain the error.

WORK SPACE AND ANSWER

ANSWER KEY

Solid Shape Lab

GRADE 8 · 8.MG.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the volume of the cone shown. Leave your answer in terms of pi.	**36pi cm^3**
2	Find the volume of the square-based pyramid shown.	**50 cm^3**
3	A square-based pyramid has a base edge of 4 cm and a slant height of 10 cm. Find its total surface area.	**96 cm^2**
4	A cone has a radius of 2 cm and a height of 15 cm. Find its volume in terms of pi.	**20pi cm^3**
5	A cone and a cylinder have the same base radius and height. The cylinder's volume is 96pi cm^3. Find the cone's volume. State the volume relationship.	**32pi cm^3; the cone has 1/3 the volume of the matching cylinder.**
6	A square-based pyramid has a volume of 192 cm^3 and a base edge of 12 cm. Find its vertical height.	**4 cm**

PART 2 · APPLY IT

1. **360 cm^2** Find the base area, $10^2 = 100$, and the four triangular faces, $2(10)(13) = 260$. Add the areas.
2. **144pi cm^3** Use $V = \pi r^2 h/3$. Substitute the radius and height, then simplify.

CHALLENGE

No. The pyramid's volume is 720 cm^3. The prism's volume is 2,160 cm^3, but the pyramid has 1/3 of the volume of a prism with the same base and height.

Accept pi notation using either pi or the pi symbol. Accept equivalent correctly labeled unit forms for surface area and volume.