LESSON MAKER PRO

Hidden Dimensions

Find lengths a drawing needs but an outside edge cannot show.

HIGH SCHOOL · MM.D3D.A.10.c

MM.D3D.A.10.c "Determine which measurements cannot be taken directly and must be calculated based on other measurements when constructing a two-dimensional visual representation of a three-dimensional object or structure."

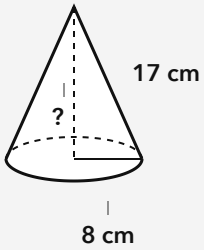
NAME _____ DATE _____

LOOK INSIDE THE SOLID

A solid's interior height or corner-to-corner diagonal cannot be measured along an outside edge. Use known lengths to form a right triangle, then apply $a^2 + b^2 = c^2$. One leg may need to be calculated first, such as half a base width or the diagonal across a box's base.

WORKED EXAMPLE

Which length is hidden inside the cone? Calculate it for a side-view drawing.

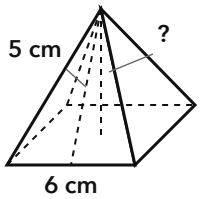


1. The radius, hidden height, and slant length form a right triangle.
2. $h^2 + 8^2 = 17^2$
3. $h^2 = 289 - 64 = 225$
4. $h = 15$

Answer: The hidden vertical height is 15 cm.

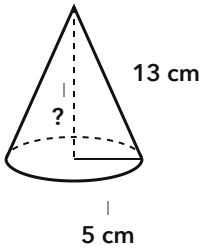
PRACTICE 6 problems

1 Find the hidden vertical height of the square pyramid shown.



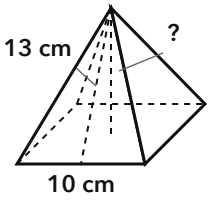
ANSWER _____

2 Find the hidden vertical height of the cone shown.



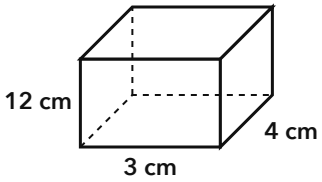
ANSWER _____

3 Find the hidden vertical height of the square pyramid shown.



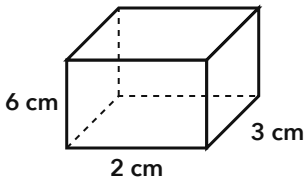
ANSWER _____

4 A straight line through the box's interior runs from one corner to the opposite corner. Find its length.



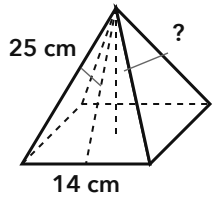
ANSWER _____

5 Find the length of a straight line through the box's interior from one corner to the opposite corner.



ANSWER _____

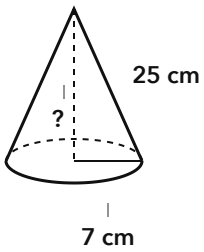
6 Find the hidden vertical height of the square pyramid shown.



ANSWER _____

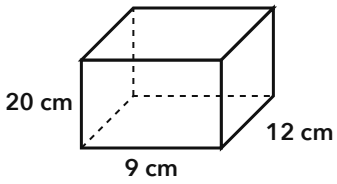
APPLY IT Show your work

1 You are making a side-view diagram for a 3D-printed cone-shaped desk lamp. What hidden vertical height should you put on the diagram?



ANSWER _____

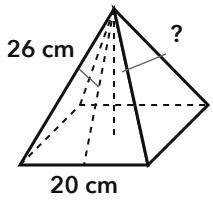
2 You are planning a straight cable route through the inside of a rectangular equipment case, from one corner to the opposite corner. How long is the route?



ANSWER _____

CHALLENGE One step up

A designer needs a side-view drawing of the square pyramid shown. Find its hidden vertical height. Then find how tall to draw it if 1 cm on the page represents 4 cm on the pyramid.



WORK SPACE AND ANSWER

ANSWER KEY

Hidden Dimensions

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the hidden vertical height of the square pyramid shown.	**4 cm**
2	Find the hidden vertical height of the cone shown.	**12 cm**
3	Find the hidden vertical height of the square pyramid shown.	**12 cm**
4	A straight line through the box's interior runs from one corner to the opposite corner. Find its length.	**13 cm**
5	Find the length of a straight line through the box's interior from one corner to the opposite corner.	**7 cm**
6	Find the hidden vertical height of the square pyramid shown.	**24 cm**

PART 2 · APPLY IT

1. **24 cm** The radius, height, and slant length form a right triangle. The height is the square root of 25^2 - 7^2, or 24 cm.
2. **25 cm** The base diagonal is the square root of 9^2 + 12^2, or 15 cm. The interior route is the square root of 15^2 + 20^2, or 25 cm.

CHALLENGE

The hidden vertical height is 24 cm. Draw it 6 cm tall.

For each square pyramid, use half the labeled base width as one leg of the right triangle. For each box, the interior diagonal can be found using the base diagonal and the box's height.