

LESSON

• Lesson on Prisms and Cylinders

Our focus is on right prisms and cylinders—those in which any altitude intersects both bases.

A. Show the class a variety of prisms (both solid structures and containers) that have rectangles, regular polygons, and non-regular polygons as bases.

B. Emphasize the common properties of all the prisms:

They have two bases that are parallel, congruent polygons, and they have uniform cross-sections.

C. Explain that uniform cross-section means that if we could “slice” through the prism, with a knife held parallel to the bases, then the slice would always be congruent to the bases.

Demonstrate this with a prism made of play dough or modeling clay.

D. “Hollow” prisms (containers) also have uniform cross-section, but for them, the “slices” are polygons which are congruent to the bases.

For the prisms that you have provided as models, show the class how the bases for each of them are “connected” by rectangles.

E. Next, display a set of various kinds of cylinders, including both solids and containers.

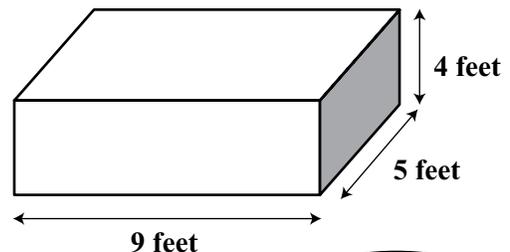
Notice that the only difference between cylinders and prisms is that the bases of the cylinders are circles or ovals (or some other kind of closed, flat figures) instead of polygons.

F. Now, review the process for finding the volume of any prism or cylinder by leading the class through these examples.

Example 1

This is a diagram of the shipping crate for a commercial freezer.

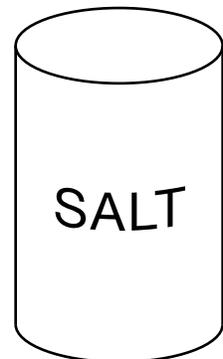
What is the volume of the crate?



Example 2

A box of salt is a cylinder whose diameter is 8 centimeters, and whose height is 18 centimeters.

- What is the area of the top of the box?
- What is the volume of the box?



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Notice that students who use 3.14 as an approximation for π , get 904.32 cubic cm as the volume of the box; whereas those who use $3\frac{1}{7}$ as the approximation for π , get 905.14285 cubic cm. So what is “the correct answer”?

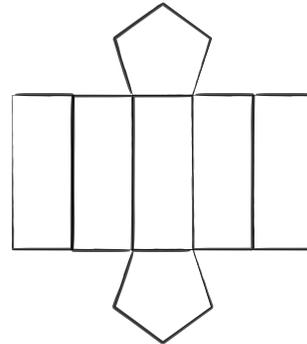
The only reasonable response is that 904 and 905 are both correct answers. Since we aren’t even certain about the whole number of cubic cm, it’s incorrect to imply that we know something about fractions of cubic cm.

Example 3

The picture shown at right is not drawn to scale. It is a sketch of the pattern for a cookie box.

The box is a prism that is 8 cm high. The top is a regular pentagon with perimeter 70 cm. The distance from the center of the box-top to each side is 10 cm.

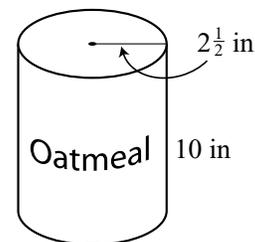
- Find the volume of the box.
- Find the surface area of the box.



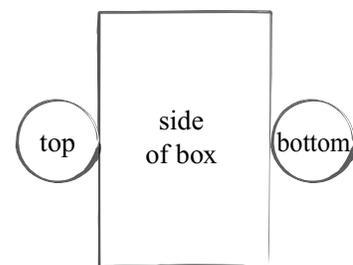
Example 4

An oatmeal box is a cylinder with measurements as shown in Picture I.

- What is the volume of the box?
- What is the area of the rectangle that forms the “side” of the box? (Notice the sketch in Picture II.)



Picture I



Picture II

Class discussion of these problems should include reasonable approximations for all answers, and consideration of when to round. If calculators are being used (which they should be for these tedious computations), then rounding at the end of all the operations is fine. But if, for some reason, the calculations are being done “by hand”, then we certainly want to round to reasonable precision “as we go”—there is no point in multiplying and dividing five- or six-digit numbers when we are going to round them to three digits at the end.