

Chapter 11

Circumference, Area, and Volume

11.1 Circumference and Arc Length

11.2 Areas of Circles and Sectors

11.3 Areas of Polygons

11.4 Three-Dimensional Figures

11.5 Volumes of Prisms and Cylinders

11.6 Volumes of Pyramids

11.7 Surface Areas and Volumes of Cones

11.8 Surface Areas and Volumes of Spheres



11.5 Volumes of Prisms and Cylinders

Volume of a Prism

- **Volume:** The # of non-overlapping cubes that will fit inside a given interior.

Volume of a Prism

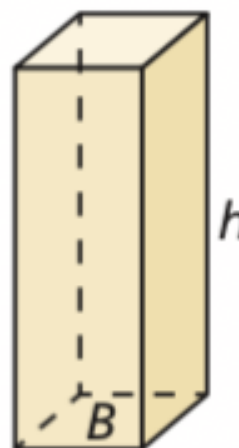
$$V = Bh$$

- **Cavalieri's Principle**

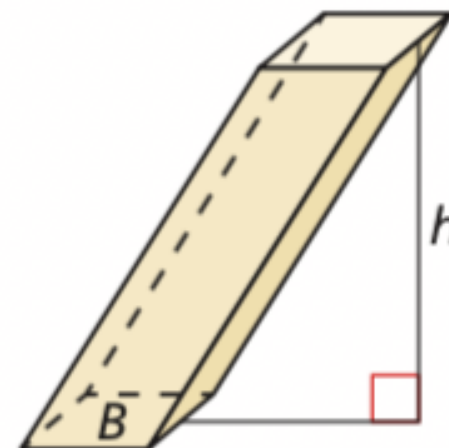
If two solids have the same height and the same cross-sectional area at every level, then they have the same volume.

$$V_{Right} = V_{Oblique}$$

Right
Prism



Oblique
Prism



11.5 Volumes of Prisms and Cylinders

Volume of a Prism and a Cylinder

- **Volume:** The # of non-overlapping cubes that will fit inside a given interior.

Volume of a Prism

$$V = Bh$$

Volume of a Cylinder

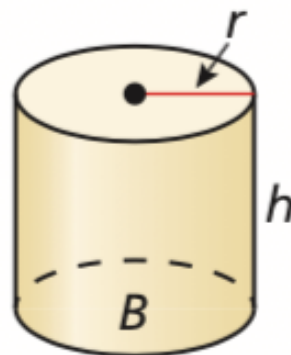
$$V = Bh$$

- **Cavalieri's Principle**

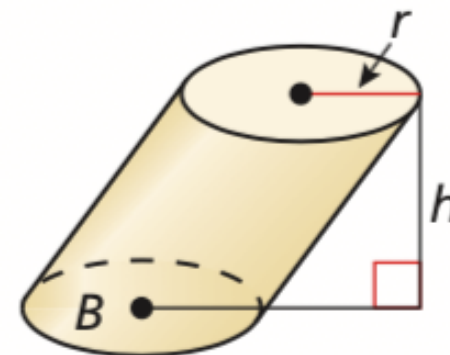
If two solids have the same height and the same cross-sectional area at every level, then they have the same volume.

$$V_{Right} = V_{Oblique}$$

Right
Cylinder



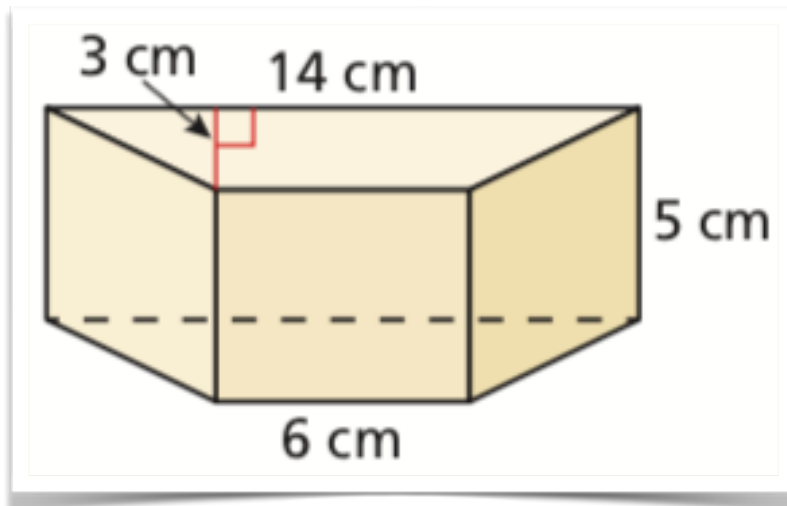
Oblique
Cylinder



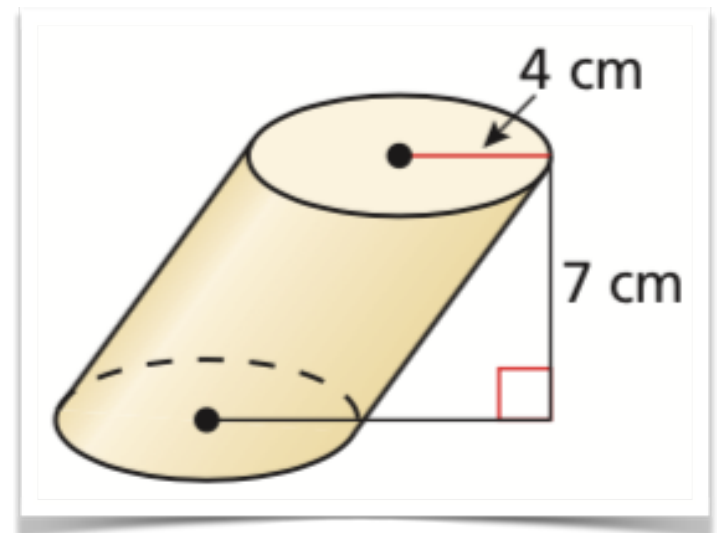
11.5 Volumes of Prisms and Cylinders

Calculate the volume of each solid

a)



b)



11.5 Volumes of Prisms and Cylinders

Density

- Density is the amount of matter that an object has in a given unit of volume.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

- Different materials have different densities, so it makes it easier to distinguish look-a-likes.

Salt
2.16 grams
per
cubic centimeter



Sugar
1.58 grams
per
cubic centimeter



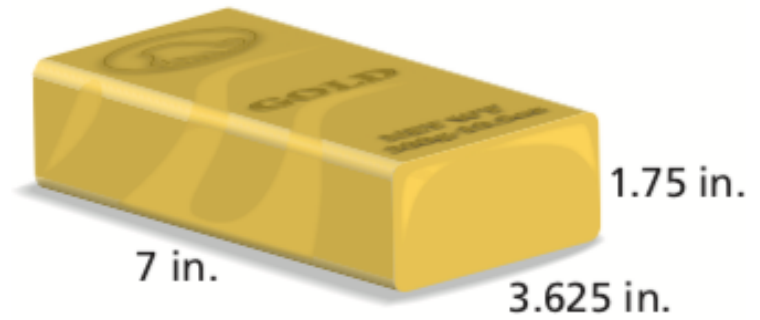
11.5 Volumes of Prisms and Cylinders

Density

Example

The diagram shows the dimensions of a standard gold bar at Fort Knox. Gold has a density of 19.3 grams per cubic centimeter. Find the mass of a standard gold bar to the nearest gram.
(1 inch = 2.54 centimeters)

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$



11.5 Volumes of Prisms and Cylinders

Volume

Example

You are building a rectangular chest. You want the length to be 6 feet, the width to be 4 feet, and the volume to be 72 cubic feet. What should the height be?



11.5 Volumes of Prisms and Cylinders

Similar Solids

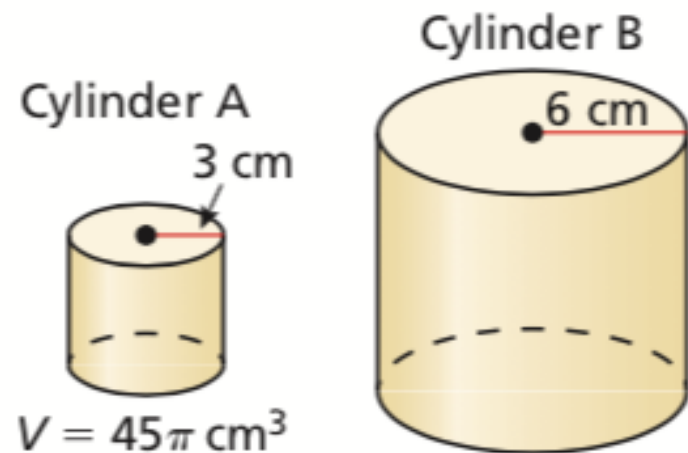
- Two solids of the same type, like cylinders, with equal ratios of corresponding linear measures, such as heights or radii, are called similar solids.
- The ratio of the corresponding linear measures of two similar solids is called the **scale factor**.

Example

Cylinders A and B are similar.

a) What is the scale factor?

b) What is the volume of cylinder B?



11.5 Volumes of Prisms and Cylinders

Volume of Composite Solid

Example

Compute the volume of the concrete block.
The two holes go all the way through.

