

# Geometry: 11.5-11.8 Notes

NAME \_\_\_\_\_

## 11.5 Volumes of Prisms and Cylinders

Date: \_\_\_\_\_

### Define Vocabulary:

volume

Cavalieri's Principle

density

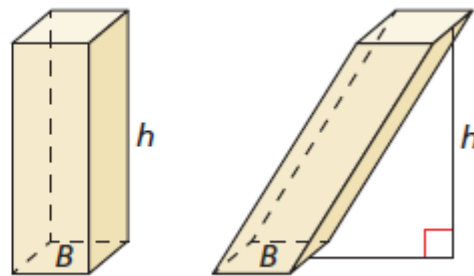
similar solids

### Volume of a Prism

The volume  $V$  of a prism is

$$V = Bh$$

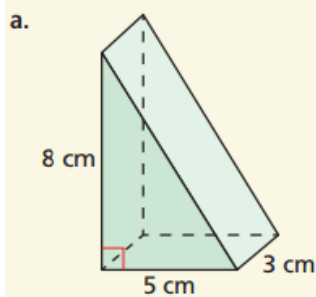
where  $B$  is the area of a base and  $h$  is the height.



### Examples: Finding Volumes of Prisms

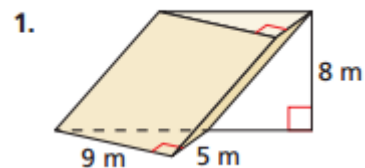
#### WE DO

Find the volume of each prism.



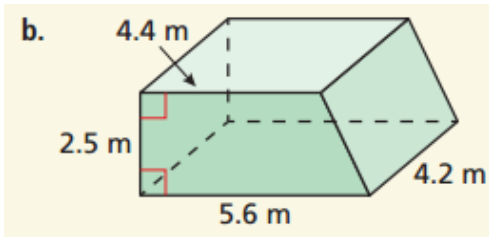
#### YOU DO

Find the volume of the solid.

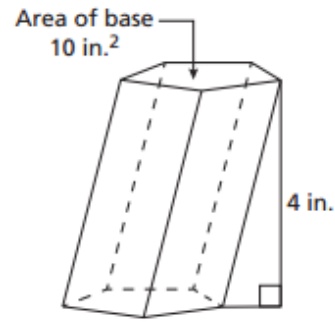


**Examples: Finding Volumes of Prisms**

**WE DO**



**YOU DO**

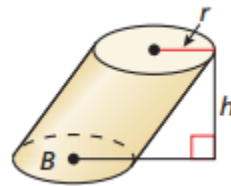
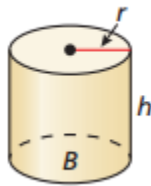


**Volume of a Cylinder**

The volume  $V$  of a cylinder is

$$V = Bh = \pi r^2 h$$

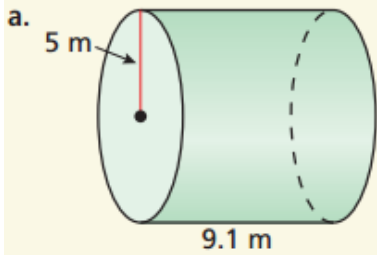
where  $B$  is the area of a base,  $h$  is the height, and  $r$  is the radius of a base.



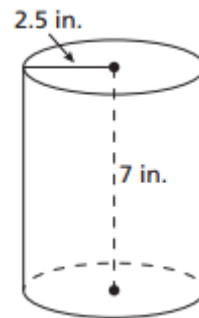
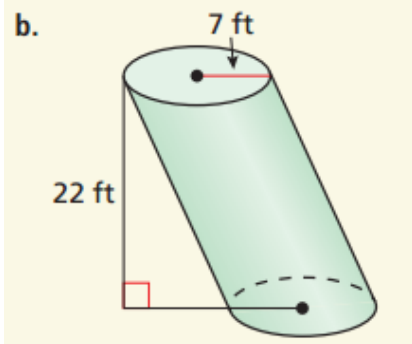
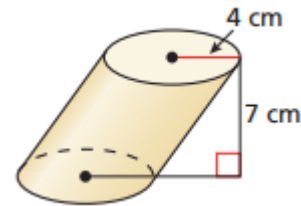
**Examples: Finding Volumes of Cylinders**

**WE DO**

Find the volume of each cylinder.



**YOU DO**



## Using the Formula for Density

**Density** is the amount of matter that an object has in a given unit of volume. The density of an object is calculated by dividing its mass by its volume.

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

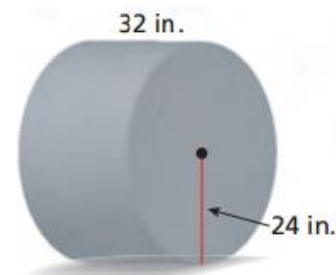
### Examples: Using the Formula for Density

#### WE DO

The density of water is 1000 kilograms per cubic meter. Find the mass of 1 cubic foot of water. Use the fact that 1 foot = 0.3048 meters.

#### YOU DO

The diagram shows the dimensions of a concrete cylinder. Concrete has a density of 2.3 grams per cubic centimeter. Find the mass of the concrete cylinder to the nearest gram.



Assignment	
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**Examples: Modeling with Mathematics****WE DO**

You are building a cylindrical packing tube. You want the length of the tube to be 30 inches and the volume to be 589 cubic inches. What should the radius of the base be?

**YOU DO**

You are building a rectangular chest. You want the length to be 5 meters, the width to be 3 meters, and the volume to be 60 cubic meters. What should the height be?

**Examples: Solving a Real-Life Problem****WE DO**

You are building a 3-foot tall dresser. You want the volume to be 42 cubic feet. What should the area of the base be? Give a possible length and width.

**YOU DO**

You are building a 5-meter-tall dresser. You want the volume to be 75 cubic meters. What should the area of the base be? Give a possible length and width.

**Similar Solids**

Two solids of the same type 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*. If two similar solids have a scale factor of  $k$ , then the ratio of their volumes is equal to  $k^3$ .

### Examples: Finding the Volume of a Similar Solid

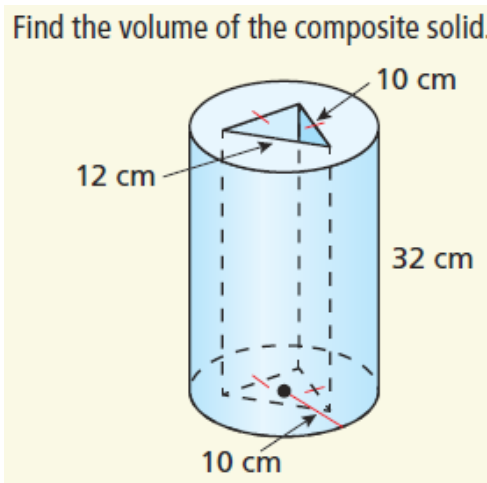
#### WE DO

Square prism A and square prism B are similar. Each base edge of prism A is 4 inches, and each base edge of prism B is 6 inches. The volume of prism B is 135 cubic inches. Find the volume of prism A.

### Examples: Finding the Volume of a Composite Solid

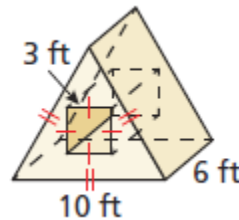
#### WE DO

Find the volume of the composite solid.



#### YOU DO

Find the volume of the composite solid.



Assignment	
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**Define Vocabulary:**

pyramid

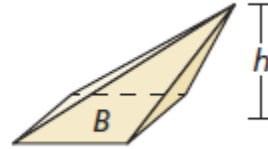
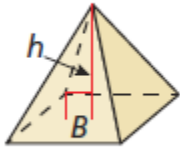
composite solid

**Volume of a Pyramid**

The volume  $V$  of a pyramid is

$$V = \frac{1}{3}Bh$$

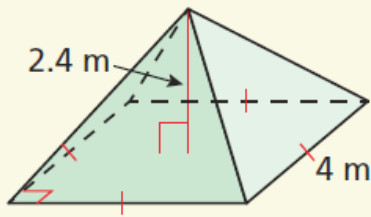
where  $B$  is the area of the base and  $h$  is the height.



**Examples: Finding the Volume of a Pyramid**

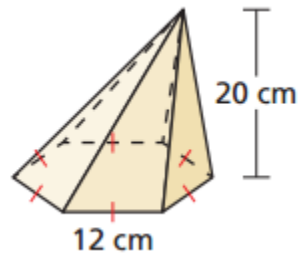
**WE DO**

Find the volume of the pyramid.



**YOU DO**

Find the volume of the pyramid.



**Examples: Using the Volume of a Pyramid**

**WE DO**

A square pyramid has a height of 12 centimeters and a volume of 64 cubic centimeters. Find the side length of the square base.

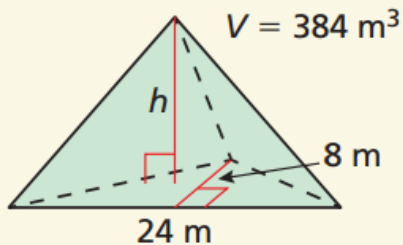
**YOU DO**

The volume of a square pyramid is 75 cubic meters and the height is 9 meters. Find the side length of the square base.

**Examples: Using the Volume of a Pyramid**

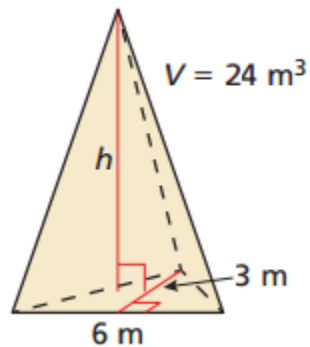
**WE DO**

Find the height of the triangular pyramid.



**YOU DO**

Find the height of the triangular pyramid.



### Examples: Finding the Volume of a Similar Solid

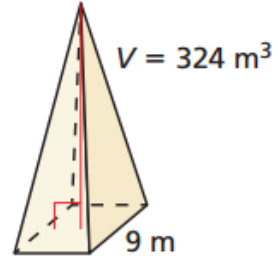
#### WE DO

Square pyramid A and square pyramid B are similar. The height of pyramid A is 6 inches and the height of pyramid B is 15 inches. The volume of pyramid B is 312.5 cubic inches. Find the volume of pyramid A.

#### YOU DO

Pyramid C and pyramid D are similar. Find the volume of pyramid D.

Pyramid C



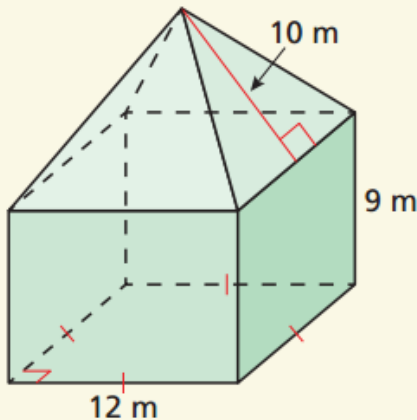
Pyramid D



### Examples: Finding the Volume of a Composite Solid

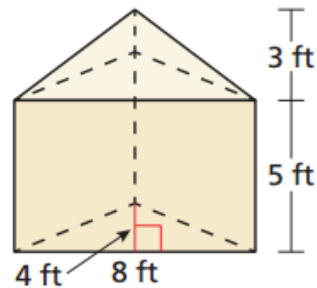
#### WE DO

Find the volume of the composite solid.



#### YOU DO

Find the volume of the composite solid.



Assignment	
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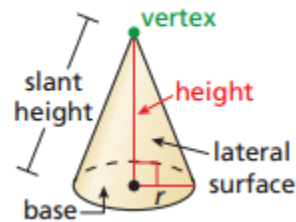


**Define Vocabulary:**

lateral surface of a cone

**Finding Surface Areas of Right Cones**

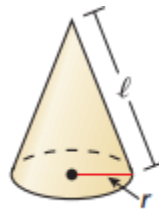
Recall that a *circular cone*, or *cone*, has a circular *base* and a *vertex* that is not in the same plane as the base. The *altitude*, or *height*, is the perpendicular distance between the vertex and the base. In a *right cone*, the height meets the base at its center and the *slant height* is the distance between the vertex and a point on the base edge.

**Surface Area of a Right Cone**

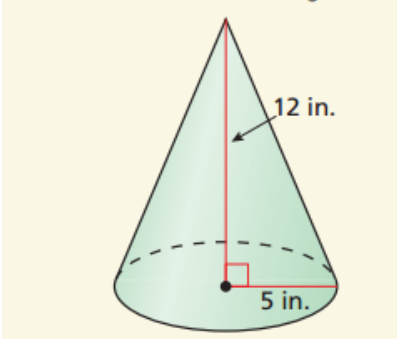
The surface area  $S$  of a right cone is

$$S = \pi r^2 + \pi r \ell$$

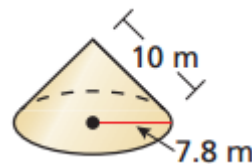
where  $r$  is the radius of the base and  $\ell$  is the slant height.

**Examples: Finding Surface Areas of Right Cones****WE DO**

Find the surface area of the right cone.

**YOU DO**

Find the surface area of the right cone.

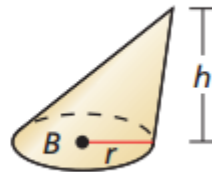


## Volume of a Cone

The volume  $V$  of a cone is

$$V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2h$$

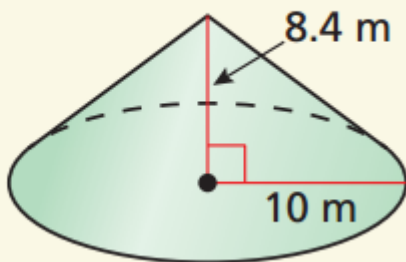
where  $B$  is the area of the base,  $h$  is the height, and  $r$  is the radius of the base.



**Examples: Finding the Volume of a Cone**

### WE DO

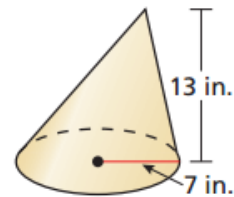
Find the volume of the cone.



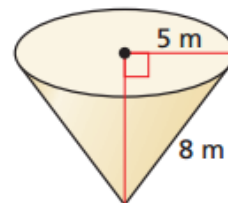
### YOU DO

Find the volume of the cone.

1.



2.



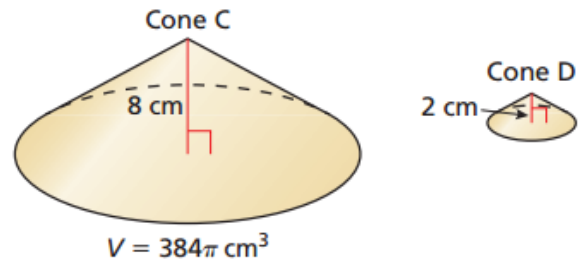
**Examples: Finding the Volume of a Similar Solid**

**WE DO**

Cone A and cone B are similar. The height of cone A is 6 inches and the height of cone B is 2 inches. The volume of cone B is  $18\pi$  cubic inches. Find the volume of cone A.

**YOU DO**

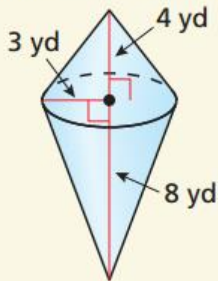
Cone C and cone D are similar. Find the volume of cone D.



**Examples: Finding the Volume of a Composite Solid**

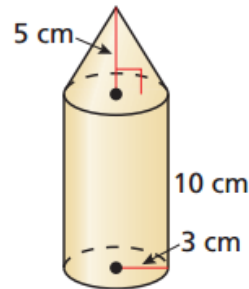
**WE DO**

Find the volume of the composite solid.



**YOU DO**

Find the volume of the composite solid.



Assignment	
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**Define Vocabulary:**

chord of a sphere

great circle

**Surface Area of a Sphere**

The surface area  $S$  of a sphere is

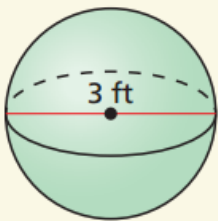
$$S = 4\pi r^2$$

where  $r$  is the radius of the sphere.

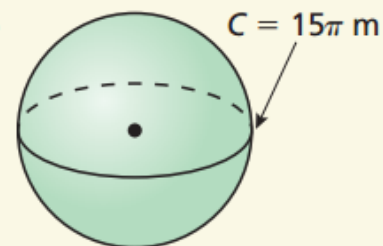
**Examples: Finding the Surface Areas of Spheres****WE DO**

Find the surface area of each sphere.

a.

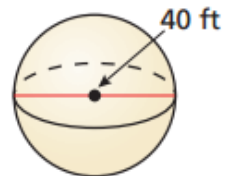


b.

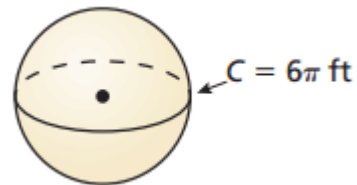
**YOU DO**

Find the surface area of the sphere.

1.



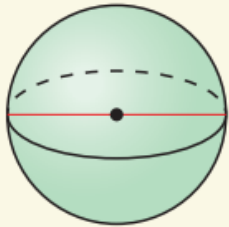
2.



## Examples: Finding the Diameter of a Sphere

### WE DO

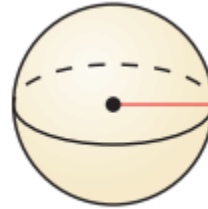
Find the diameter of the sphere.



$$S = 144\pi \text{ cm}^2$$

### YOU DO

Find the radius of the sphere.



$$S = 30\pi \text{ m}^2$$

### **Volume of a Sphere**

The volume  $V$  of a sphere is

$$V = \frac{4}{3}\pi r^3$$

where  $r$  is the radius of the sphere.

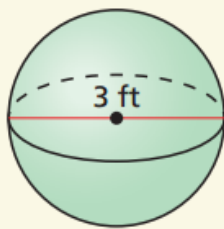


$$V = \frac{4}{3}\pi r^3$$

## Examples: Finding the Volume of a Sphere

### WE DO

Find the volume of the sphere.



### YOU DO

1. The radius of a sphere is 5 yards. Find the volume of the sphere.

2. The diameter of a sphere is 36 inches. Find the volume of the sphere.

### Examples: Finding the Volume of a Sphere

#### WE DO

The surface area of a sphere is  $676\pi$  square inches. Find the volume of the sphere.

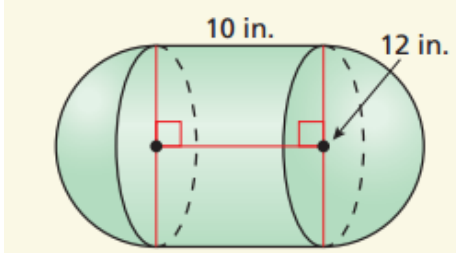
#### YOU DO

The surface area of a sphere is  $576\pi$  square centimeters. Find the volume of the sphere.

### Examples: Finding the Volume of a Composite Solid

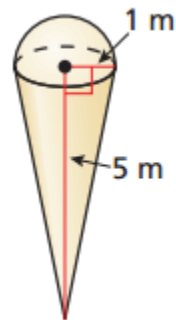
#### WE DO

Find the volume of the composite solid.



#### YOU DO

Find the volume of the composite solid.



Assignment		
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