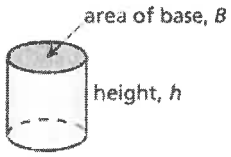
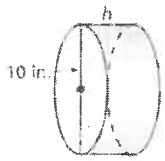
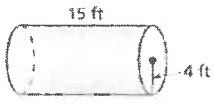
Name _____ **Period** _____

Chapter 8 Pre-Algebra	Volume and Similar Solids
Standards	MAFS.8.G.3.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
Essential Question	How can you find the volume of a cylinder?
Learning Targets	In this lesson I will: • Find the volumes of cylinders • Find the heights of cylinders given the volume • Solve real-life problems
8.1 Volumes of Cylinders	**Volume of a Cylinder** **Words** The volume V of a cylinder is the product of the area of the base and the height of the cylinder. **Algebra** $V = Bh$ (Area of base · Height of cylinder) 
Example 1	**Find the volume of the cylinder. Round your answer to the nearest tenth.** 
Example 2	**Find the height of the cylinder. Round your answer to the nearest whole number.**  Volume = 314 in.^{3}
On Your Own	**Find the volume V or height h of the cylinder. Round your answer to the nearest tenth.** **1.**  V = **2.**  Volume = 176 cm^3
Example 3 Real Life Application	**How much salsa is missing from the jar?** 

Example 4 Real Life Application

About how many gallons of water does the watercooler bottle contain? (1 $ft^3 \approx 7.5$ gal)

Ⓐ 5.3 gallons Ⓑ 10 gallons Ⓒ 17 gallons Ⓓ 40 gallons

On Your Own

3. **WHAT IF?** In Example 3, the height of the salsa in the jar is 5 centimeters. How much salsa is missing from the jar?

4. A cylindrical water tower has a diameter of 15 meters and a height of 5 meters. About how many gallons of water can the tower contain? (1 $m^3 \approx 264$ gal)

Essential Question

How can you find the volume of a cone?

Learning Targets

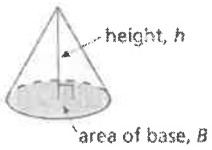
In this lesson I will:

- Find the volumes of cones
- Find the heights of cones given the volume
- Solve real-life problems

8.2 Volumes of Cones

Volume of a Cone

Words The volume V of a cone is one-third the product of the area of the base and the height of the cone.



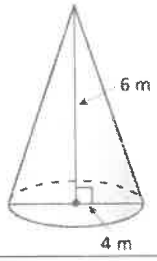
Algebra $V = \frac{1}{3}Bh$

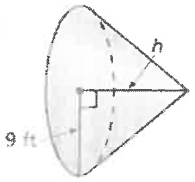
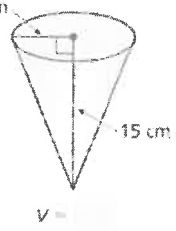
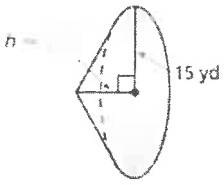
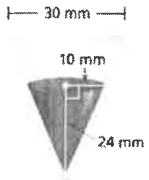
Area of base

Height of cone

Example 1

Find the volume of the cone. Round your answer to the nearest tenth.



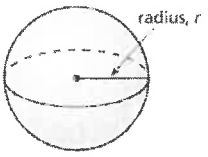
Example 2	**Find the height of the cone. Round your answer to the nearest tenth.**  Volume = 956 ft³
On Your Own	**Find the volume V or height h of the cone. Round your answer to the nearest tenth.** **1.**  **2.**  Volume = 7200 yd³
Example 3	**You must answer a trivia question before the sand in the timer falls to the bottom. The sand falls at a rate of 50 cubic millimeters per second. How much time do you have to answer the question?** 
On Your Own	**3. WHAT IF?** The sand falls at a rate of 60 cubic millimeters per second. How much time do you have to answer the question? **4. WHAT IF?** The height of the sand in the timer is 12 millimeters, and the radius is 5 millimeters. How much time do you have to answer the question?
Essential Question	How can you find the volume of a sphere?
Learning Targets	In this lesson I will: • Find the volumes of spheres • Find the radii of spheres given the volumes • Solve real-life problems

8.3 Volumes of Spheres

Volume of a Sphere

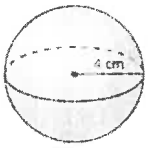
Words The volume V of a sphere is the product of $\frac{4}{3}\pi$ and the cube of the radius of the sphere.

Algebra $V = \frac{4}{3}\pi r^3$ (Cube of radius of sphere)



Example 1

Find the volume of the sphere. Round your answer to the nearest tenth.



Example 2

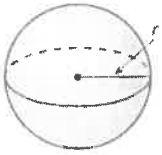
Find the radius of the sphere.

On Your Own

Find the volume V or radius r of the sphere. Round your answer to the nearest tenth, if necessary.

1.

2.



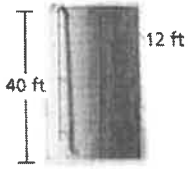
Volume = 36π m^3

Example 3 Real-Life Application

A hemisphere is one-half of a sphere. The top of the silo is a hemisphere with a radius of 12 feet. What is the volume of the silo? Round your answer to the nearest thousand.

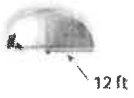
The silo is made up of a cylinder and a hemisphere. Find the volume of each solid.

Cylinder



$V = Bh$

Hemisphere

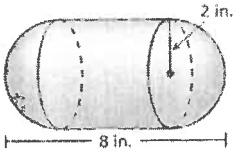


$V = \frac{1}{2} \cdot \frac{4}{3}\pi r^3$

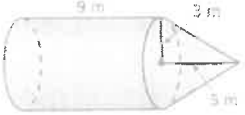
On Your Own

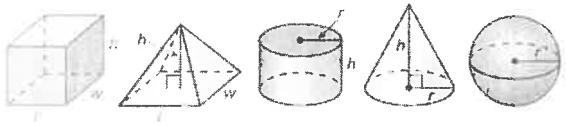
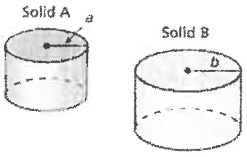
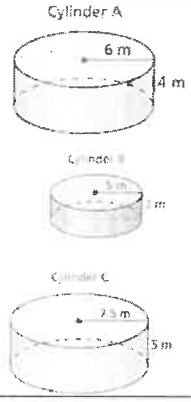
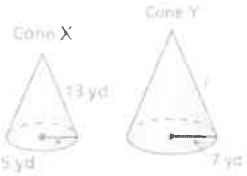
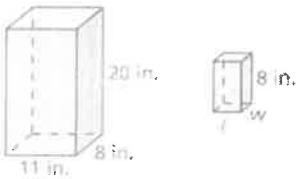
Find the volume of the composite solid. Round your answer to the nearest tenth.

3.



4.

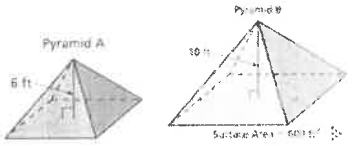


Essential Question	When the dimensions of a solid increase by a factor of k, how does the surface area change? How does the volume change?
Learning Targets	In this lesson I will: • Identify similar solids • Use properties of similar solids to find missing measures • Understand the relationship between surface areas of similar solids • Understand the relationship between volumes of similar solids • Solve real-life problems
8.4 Surface Areas and Volumes of Similar Solids	**Similar solids** are solids that have the same shape and proportional corresponding dimensions. **Linear Measures**  **Surface Areas of Similar Solids** When two solids are similar, the ratio of their surface areas is equal to the square of the ratio of their corresponding linear measures. $\frac{\text{Surface Area of A}}{\text{Surface Area of B}} = \left(\frac{a}{b}\right)^2$ 
Example 1	 **Which cylinder is similar to Cylinder A?**
Example 2	**The cones are similar. Find the missing slant height ℓ.** 
On Your Own	1. Cylinder D has a radius of 7.5 meters and a height of 4.5 meters. Which cylinder in Example 1 is similar to Cylinder D? 2. The prisms at the right are similar. Find the missing width and length. 

Example 3

The pyramids are similar. What is the surface area of Pyramid A?

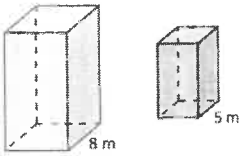
$$\frac{\text{Surface Area of A}}{\text{Surface Area of B}} = \left(\frac{\text{Height of A}}{\text{Height of B}}\right)^2$$



On Your Own

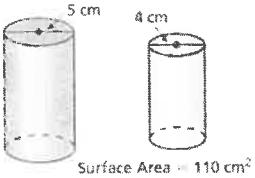
The solids are similar. Find the surface area of the red solid. Round your answer to the nearest tenth.

3.



Surface Area = 608 m²

4.

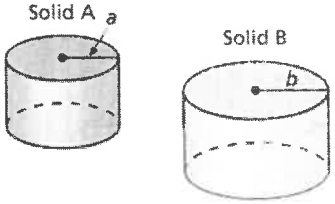


Surface Area = 110 cm²

Volumes of Similar Solids

When two solids are similar, the ratio of their volumes is equal to the cube of the ratio of their corresponding linear measures.

$$\frac{\text{Volume of A}}{\text{Volume of B}} = \left(\frac{a}{b}\right)^3$$



The dimensions of the touch tank at an aquarium are doubled. What is the volume of the new touch tank?

Ⓐ 150 ft³ Ⓑ 4000 ft³

Ⓒ 8000 ft³ Ⓓ 16,000 ft³

Original Tank

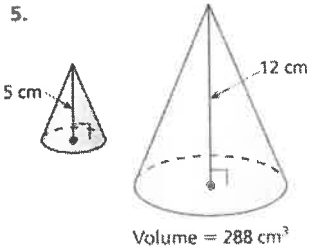
Volume = 2000 ft³

$$\frac{\text{Original volume}}{\text{New volume}} = \left(\frac{\text{Original dimension}}{\text{New dimension}}\right)^3$$

On Your Own

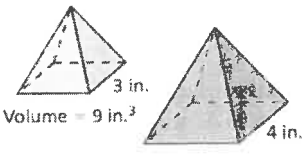
The solids are similar. Find the volume of the red solid. Round your answer to the nearest tenth.

5.



Volume = 288 cm³

6.



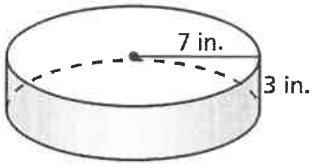
Volume = 9 in.³

Name_____ Date_____

8.1 Practice A

Find the volume of the cylinder. Round your answer to the nearest tenth.

1.



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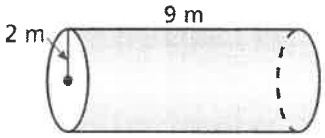

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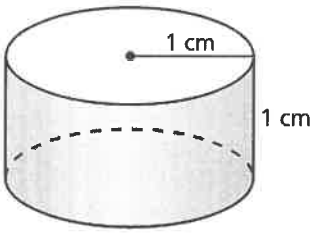
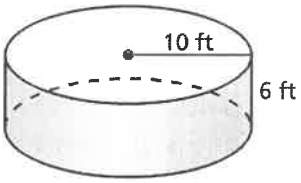
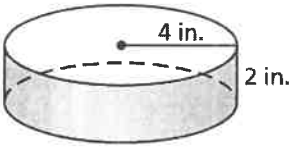


4.



5.



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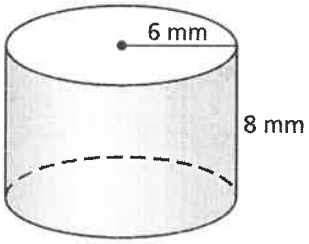


7. A water tank is in the shape of a cylinder with a diameter of 20 feet and a height of 20 feet. The tank is 70% full. About how many gallons of water are in the tank? Round your answer to the nearest whole number. $\left(1 \text{ ft}^3 \approx 7.5 \text{ gal}\right)$

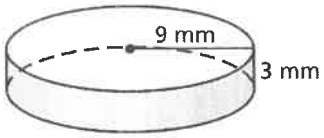
8. A cylinder has a surface area of 339 square centimeters and a radius of 6 centimeters. Estimate the volume of the cylinder to the nearest whole number.

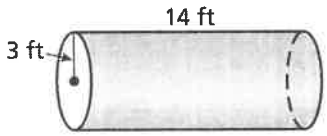
9. How does the volume of a cylinder change when its diameter is doubled? Explain.

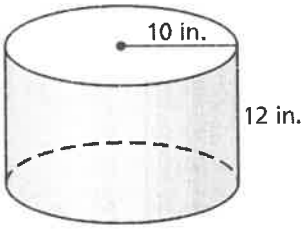
Name _____ Date _____

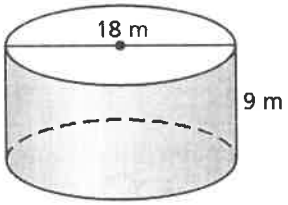
8.1 Practice B

Find the volume of the cylinder. Round your answer to the nearest tenth.

1. 

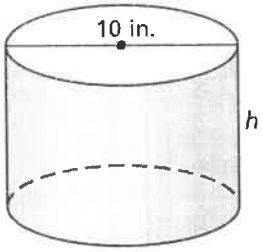
2. 

3. 

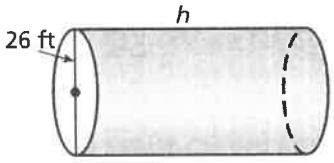
4. 

Find the missing dimension of the cylinder. Round your answer to the nearest whole number.

5. Volume = 550 $in.^3$



6. Volume = 25,000 ft^3



7. Your friend's swimming pool is in the shape of a rectangular prism, with a length of 25 feet, a width of 8 feet, and a height of 5 feet.

   a. What is the volume of your friend's swimming pool?

   b. Your swimming pool is in the shape of a cylinder with a diameter of 16 feet and has the same volume as your friend's pool. What is the height of your pool? Round your answer to the nearest whole number.

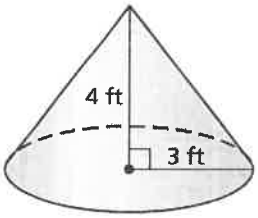
   c. While you were on vacation, 6 inches of water evaporated from your pool. About how many gallons of water evaporated from your pool? $(1\ ft^3 \approx 7.5\ gal)$ Round your answer to the nearest whole number.

Name_____ Date_____

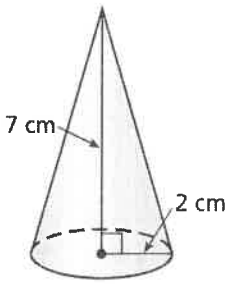
8.2 Practice A

Find the volume of the cone. Round your answer to the nearest tenth.

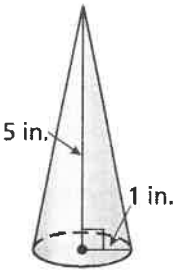
1.



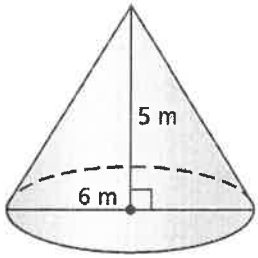
2.



3.



4.



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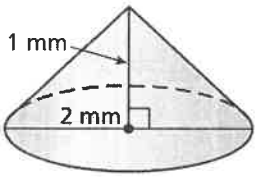

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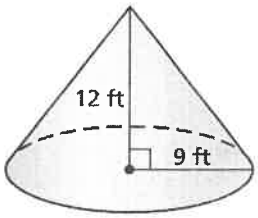


7. The volume of a cylinder is 24π cubic feet. What is the volume of a cone having the same base and same height?

8. A funnel is in the shape of a cone with a radius of 4 inches and a height of 10 inches.

a. Find the volume of the funnel. Round your answer to the nearest tenth.

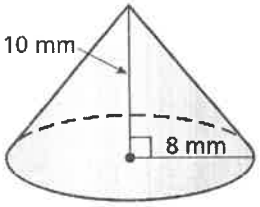
b. The funnel is filled with oil. How many quarts of oil are in the funnel? $\left(1 \text{ qt} \approx 58 \text{ in.}^3\right)$ Round your answer to the nearest tenth.

Name _____ Date _____

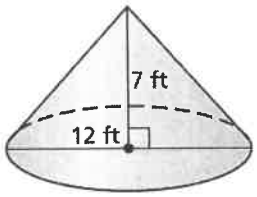
8.2 Practice B

Find the volume of the cone. Round your answer to the nearest tenth.

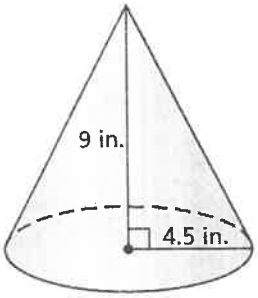
1.



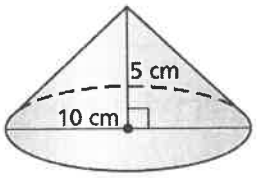
2.



3.

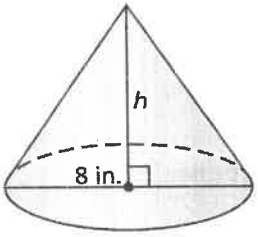


4.

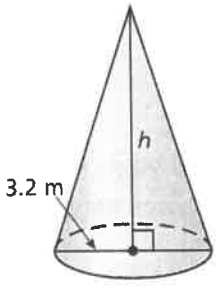


Find the missing dimension of the cone. Round your answer to the nearest tenth.

5. Volume $= 100$ in.^{3}



6. Volume $= 13.4$ m^3



7. A paper cup is in the shape of a cone, with a diameter of 2 centimeters and a height of 5 centimeters.

a. What is the volume of the paper cup?

b. Water is running into the cup at a rate of 1.5 cubic centimeters per second. How long does it take for the cup to fill with water? Round your answer to the nearest tenth.

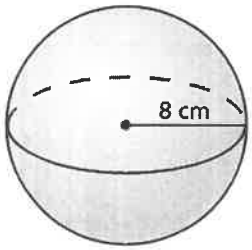
8. Cone A has the same radius but half the height of Cone B. What is the ratio of the volume of Cone A to the volume of Cone B?

Name_____ Date_____

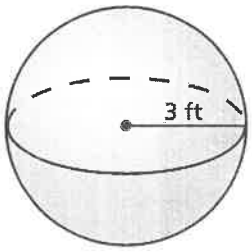
8.3 Practice A

Find the volume of the sphere. Round your answer to the nearest tenth.

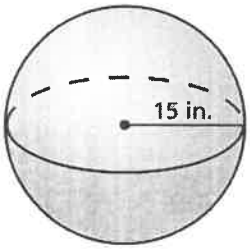
1.



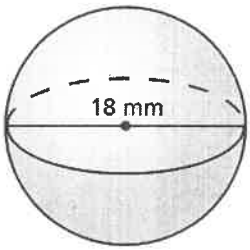
2.



3.



4.



Find the radius of the sphere with the given volume.

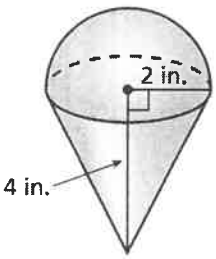
5. Volume $= 288\pi$ in.^{3}

6. Volume $= 562.5\pi$ cm^3

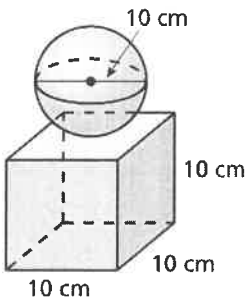
7. A fishing bobber has a radius of 0.5 inch. Find the volume of the fishing bobber. Round your answer to the nearest tenth.

Find the volume of the composite solid. Round your answer to the nearest tenth.

8.



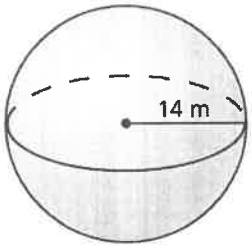
9.

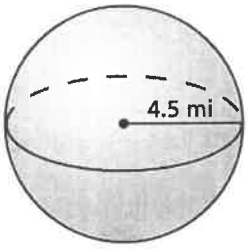


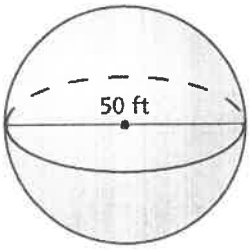
Name _____ Date _____

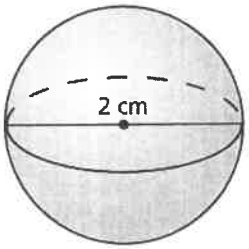
8.3 Practice B

Find the volume of the sphere. Round your answer to the nearest tenth.

1. 

2. 

3. 

4. 

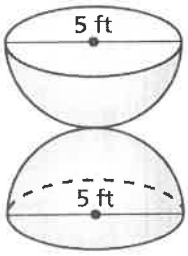
Find the radius of the sphere with the given volume.

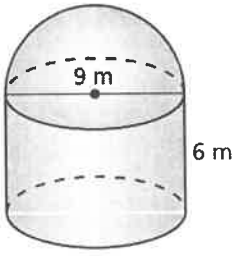
5. Volume = 2304π yd^3

6. Volume = 1543.5π mm^3

7. A spherical cabinet knob has a radius of 1.5 inches. Find the volume of the cabinet knob. Round your answer to the nearest tenth.

Find the volume of the composite solid. Round your answer to the nearest tenth.

8. 

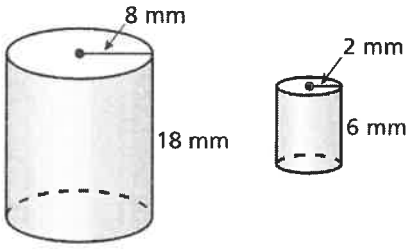
9. 

Name _____ Date _____

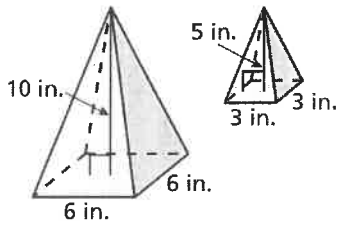
8.4 Practice A

Determine whether the solids are similar.

1.

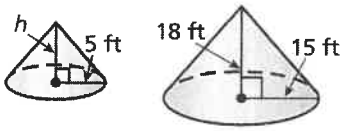


2.

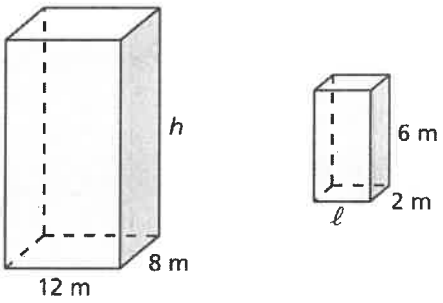


The solids are similar. Find the missing dimension(s).

3.

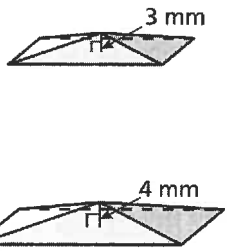


4.

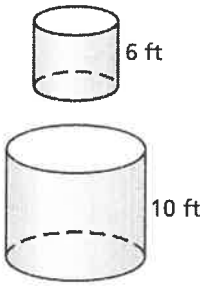


The solids are similar. Find the surface area *S* or the volume *V* of the larger solid. Round your answer to the nearest tenth.

5. Volume = 250 mm^3



6. Surface Area = 130 ft^2



7. The ratio of the corresponding linear measures of two similar cans of cat food is 4 : 3.

a. The larger can has a surface area of 100 square inches. Find the surface area of the smaller can. Round your answer to the nearest tenth.

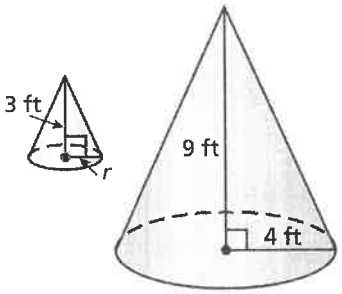
b. The larger can has a volume of 150 cubic inches. Find the volume of the smaller can. Round your answer to the nearest tenth.

Name _____ Date _____

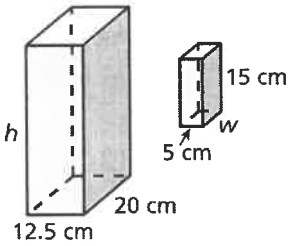
8.4 Practice B

The solids are similar. Find the missing dimension(s).

1.

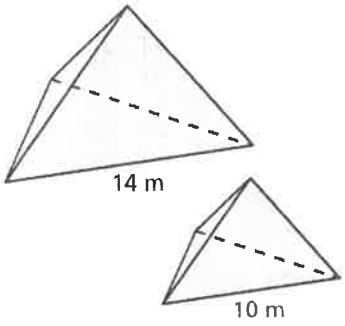


2.

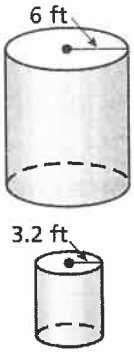


The solids are similar. Find the surface area *S* or the volume *V* of the smaller solid. Round your answers to the nearest tenth.

3. Surface Area = 294.7 m^2



4. Volume = 1500 ft^3



5. The ratio of the corresponding linear measures of two similar buckets of popcorn is 2 to 5. The larger bucket has a volume of 390 cubic inches. Find the volume of the smaller bucket. Round your answer to the nearest tenth.

6. A box of 60 tissues has a length of 11 centimeters, a width of 10.5 centimeters, and a height of 13.5 centimeters.

a. Find the volume of the box of tissues. Round your answer to the nearest tenth.

b. A similar box contains 100 tissues. The ratio of the corresponding linear measures of the two boxes is 3 : 5. Find the volume of the larger box. Round your answer to the nearest tenth.

c. Find the dimensions of the larger box. Round your answers to the nearest tenth.

Name _____ Date _____

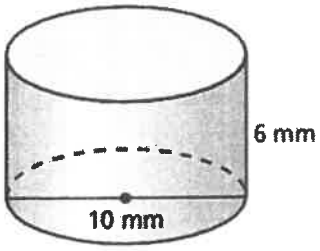
Chapter 8

Take Home Quiz #1

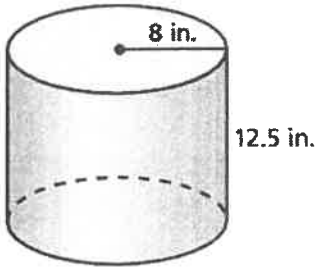
For use after Section 8.2

Find the volume of the solid. Round your answer to the nearest tenth.

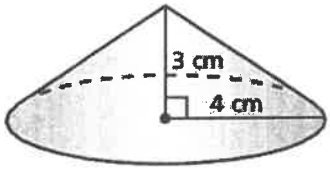
1.



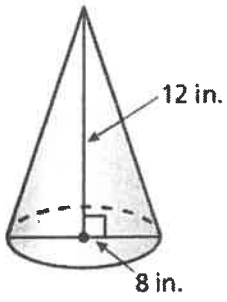
2.



3.

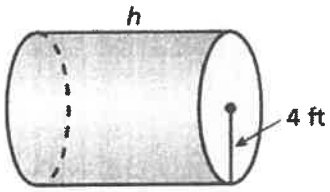


4.

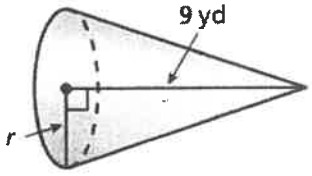


Find the missing dimension of the solid. Round your answer to the nearest tenth.

5. Volume = 502 ft^3

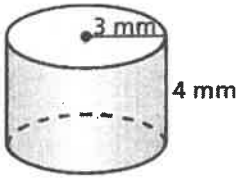


6. Volume = 85 yd^3



7. A cylindrical tank can hold 2279.64 cubic feet of water. The radius of the tank is 11 feet. What is the height of the tank?

8. Double both dimensions of the cylinder. How many times greater is the volume of the new cylinder than the volume of the original cylinder?



Answers

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

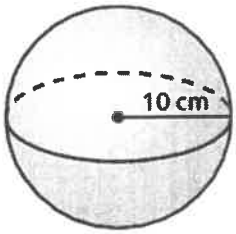
Name _____ Date _____

Chapter 8 Take Home Quiz #2

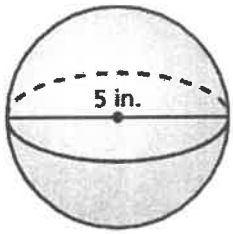
For use after Section 8.4

Find the volume of the sphere. Round your answer to the nearest tenth.

1.



2.

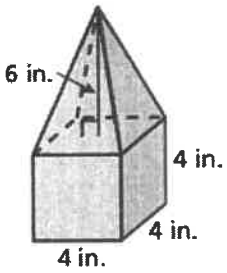


Find the radius of the sphere with the given volume.

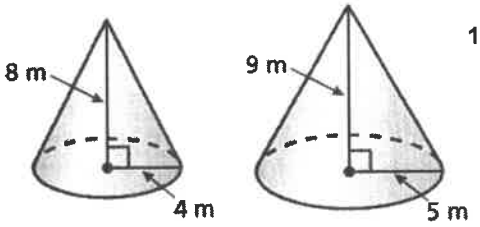
3. Volume $= 36\pi$ in.^{3}

4. Volume $= \frac{9}{16}\pi$ ft^3

5. Find the volume of the composite solid. Round your answer to the nearest tenth.

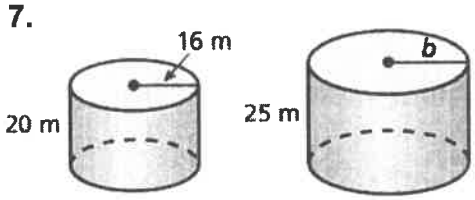


6. Determine whether the solids are similar.

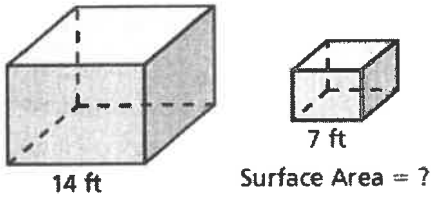


The solids are similar. Find the missing dimension or surface area.

7.



8.



Surface Area = 1240 ft^2

Surface Area = ?

9. Find the volume of the inflatable crayon.

10. The ratio of the corresponding linear measures of two similar triangular prisms is 2 to 5. The larger triangular prism has a volume of 150 cubic centimeters. Find the volume of the smaller triangular prism.

Answers

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____