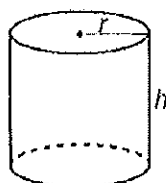


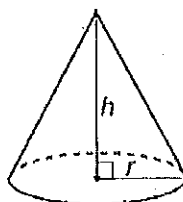
Understanding Volume of Cylinders, Cones, and Spheres

1 GETTING THE IDEA

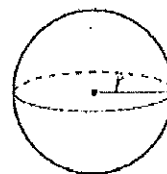
The **volume** of a solid figure is the measure of the amount of space it occupies. For solid figures like the ones shown below, you can use formulas to find each volume. The volume formulas for these solid figures are all closely related to the formula for the area of a circle, $A = \pi r^2$.



cylinder
 $V = \pi r^2 h$



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



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

The height of a cylinder is the perpendicular distance between the two bases. The height of a cone is the perpendicular distance from the vertex to the base. Remember, the **radius** of a circle is a line segment that can be drawn from any point on a circle to the center of the circle.

Example 1

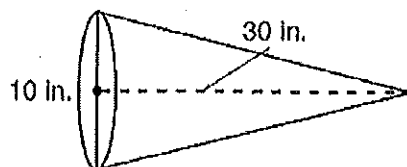
The disk shown below is a cylinder. The volume is 450 cm^3 . Find the approximate height of the disk.



Strategy Choose the formula, substitute the given information, and solve for the height. Use 3.14 for π .

Example 2

Find an exact value for the volume of the cone shown below.

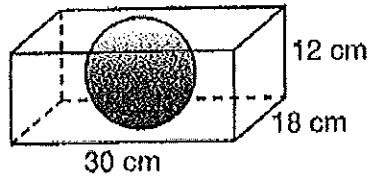


Strategy Choose the formula you need, and substitute the given information. Leave π in the answer so it will be exact.

Step 1 Choose the formula you need.

Example 3

Find the approximate volume of the largest sphere that can fit inside the box shown below.

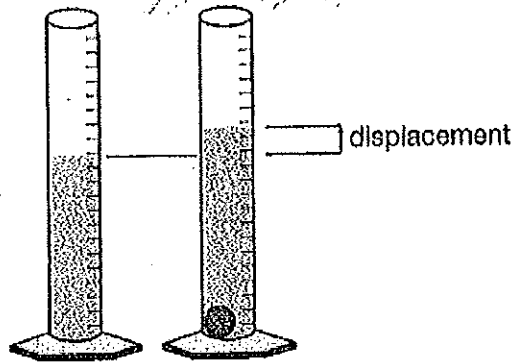


Strategy

Choose the formula you need, and substitute the given information. Use 3.14 for π to find an approximate volume.

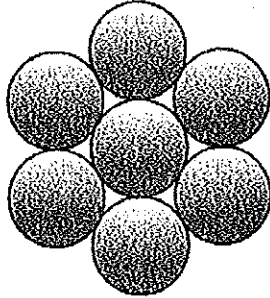
Example 4

A cylinder with a radius of 4 centimeters is partially filled with water. If you drop a solid glass ball into the cylinder, you raise the water level by 1 centimeter. Find the approximate volume of the water displaced by the glass ball. (The volume of the displaced water equals the volume of the glass ball.)



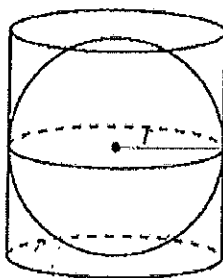
Example 6

When a solid crystallizes, the particles that form, shaped like spheres, pack together as tightly as possible. The arrangement below displays one layer of a zinc crystal.



Maria made a model of this crystal using marbles with a 2-cm diameter. Find the volume of Maria's model.

A sphere fits exactly inside a cylinder as shown below. The sphere takes up $\frac{2}{3}$ the volume of the cylinder. Find the volume of the cylinder if the radius of the sphere is 15 cm.



Find the volume of the sphere.

The formula for the volume of a sphere is _____.

So, the volume of the sphere is _____ π .

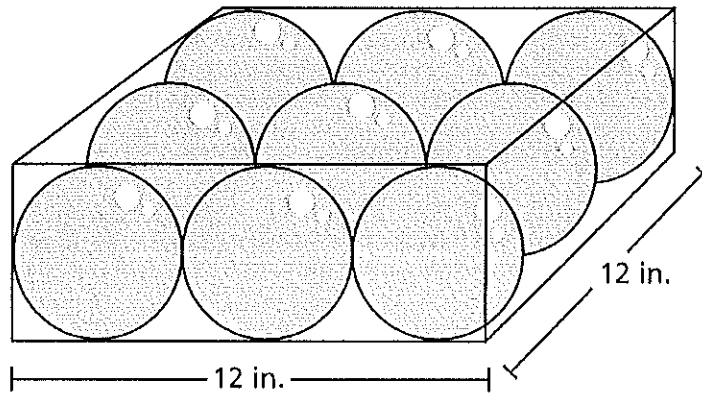
Write an equation to find the volume of the cylinder.

$$\text{_____} = \frac{2}{3} \cdot x$$

$$x = \text{_____}$$

The volume of the cylinder is _____ $\pi \text{ cm}^3$, or approximately _____.

A box contains 9 identical glass spheres that are used to make snow globes. The spheres are tightly packed, as shown below.



What is the total volume, in cubic inches, of all 9 spheres? Round your answer to the nearest tenth of a cubic inch.

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

Show your work.

Answer _____ cubic inches

Reference Sheet

A detachable reference sheet will be included in each of the three test books. For the 2015 Grade 8 Common Core Mathematics Test, the reference sheet will look as follows:

Grade 8 Mathematics Reference Sheet

CONVERSIONS

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5,280 feet	1 pound = 0.454 kilogram	1 quart = 2 pints
1 mile = 1,760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2,000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1,000 cubic centimeters

FORMULAS

Triangle	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
* Cylinder	$V = \pi r^2 h$
* Sphere	$V = \frac{4}{3}\pi r^3$
* Cone	$V = \frac{1}{3}\pi r^2 h$
Pythagorean Theorem	$a^2 + b^2 = c^2$