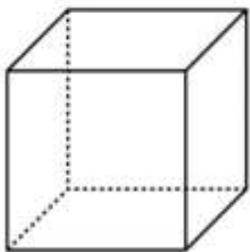Name_____

Date_____

Measurement

Volume of Prisms

Definition of a prism – A prism is a polyhedron that has two parallel bases. The other faces (sides) are parallelograms. The prism is named by the shape of the base.
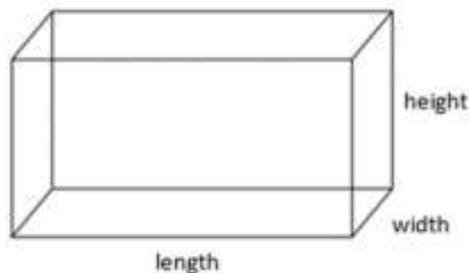
Formula – *B is the area of the base and h is the height of the prism.*
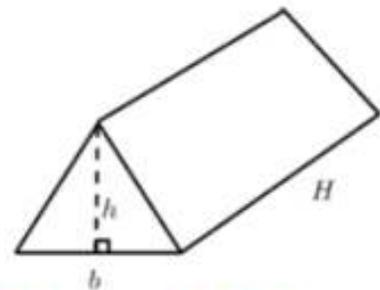
$$V = Bh$$

height

width

length

Cube -
all of the sides
are the same size

$$V = s^3$$

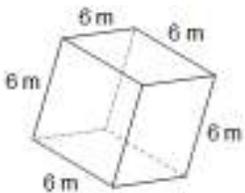**Rectangular Prism -**
the bases are rectangles

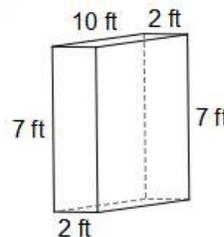$$V = lwh$$

Triangular Prism -
the bases are
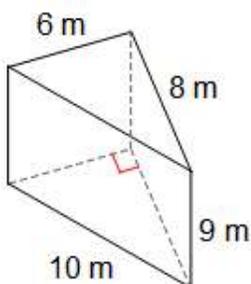triangles

$$V = (\frac{1}{2}bh)H$$

Model Problems-

1) Find the volume.

6 m
6 m
6 m
6 m
6 m

2) Find the volume.

10 ft   2 ft
7 ft   7 ft
2 ft

3) Find the volume.

6 m
8 m
9 m
10 m

4) Find the volume.

2 km

6 km

7 km

2 km

6 km
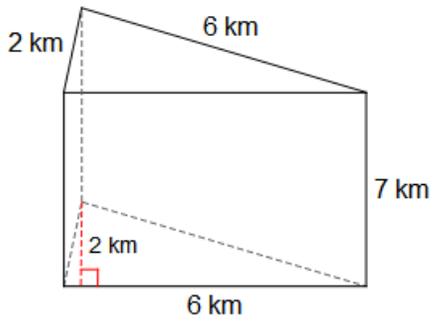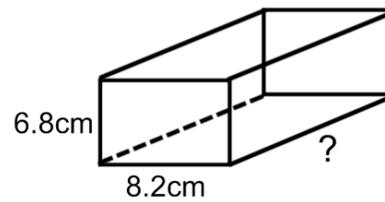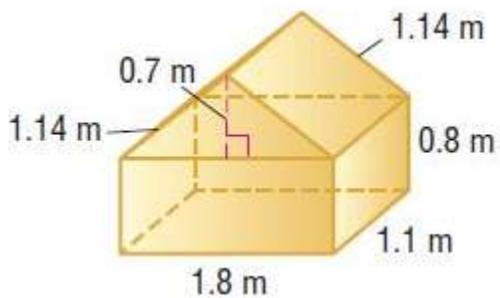
5) The volume of rectangular prism is 80 cm³ and the length is 5 cm. Find the height if the width is 2 cm.

6) Find the missing dimension if the volume is 780.64 cm³.

6.8cm

8.2cm

?

7) Calculate the total volume.

1.14 m

0.7 m

1.14 m

0.8 m

1.1 m

1.8 m

Volume of Cylinders

Volume is the measure of the space occupied by a solid. Volume is measured in cubic units. A **cylinder** is a three-dimensional figure with two parallel congruent circular bases connected by a curved surface. The area of the base of a cylinder tells the number of cubic units in one layer. The height tells how many layers there are in the cylinder.

Key Concept — **Volume of a Cylinder**

Words   The volume V of a cylinder with radius r is the area of the base B times the height h.

Symbols $V = Bh$, where $B = \pi r^2$ or $V = \pi r^2 h$

Model

h

$B = \pi r^2$
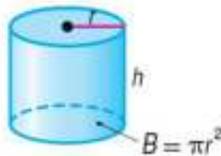
Model Problems:

1.) Find the volume of the cylinder. Use the Pi button on your calculator and round to the nearest tenths place.

5 cm

8.3 cm
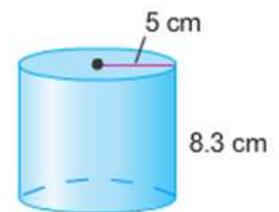
2.) Find the volume of a cylinder with a diameter of 12 inches and a height of 18 inches. Write your answer in terms of π. **(WRITING AN ANSWER IN TERMS OF PI MEANS YOU LEAVE THE π SYMBOL IN THE ANSWER. TREAT IT LIKE A VARIABLE. THIS IS CONSIDERED <u>EXACT</u> SINCE YOU DO NOT ROUND)**

3.) A cylinder with a diameter of 10 meters and a height of 15 meters has been sliced in half. Calculate the volume and round your answer to the nearest tenths place.

10m

15m
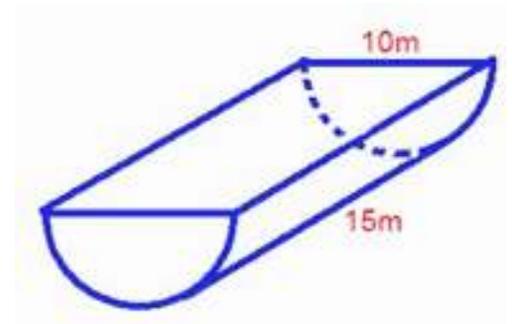
Volume of a Composite Solid

Objects made up of more than one type of solid are called **composite solids.** To find the volume of a composite solid, decompose the figure into solids whose volumes you know how to find.

4.) Mrs. Zigrossi uses cube-shaped beads when she makes jewelry. Each bead has a cylindrical hole through the middle. Find the volume of the bead. Round to the nearest tenths place.

2 mm

12 mm

12 mm

5.) The following image shows the plans for building a toy chest. Find the EXACT volume of this chest. (Leave your answer in terms of π)

30 cm

50 cm

25 cm
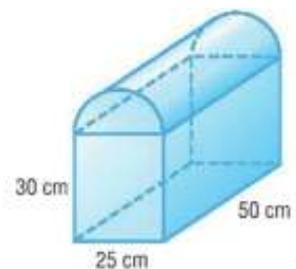
Volume of Cones

Key Concept Volume of a Cone

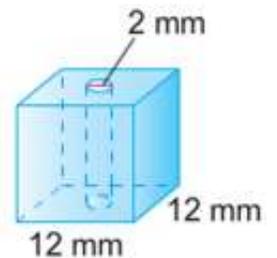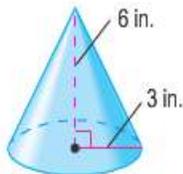|	
Words	The volume *V* of a cone with radius *r* is one third the area of the base *B* times the height *h*.
Symbol	$V = \frac{1}{3}Bh$ or $V = \frac{1}{3}\pi r^2 h$
Model	
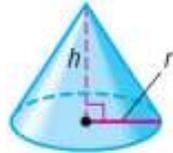
Model Problems:

1) Find the volume of the cone. Round to the nearest tenths place.

    6 in.

    3 in.

2) A cone-shaped paper cup is filled with water. The height of the cup is 10 centimeters and the diameter is 8 centimeters. What is the exact volume of the paper cup? (write your answer in terms of Pi)

3) Find the volume of the composite shape. Round your answer to the nearest tenths place.

    8 ft

    4 ft

    5 ft
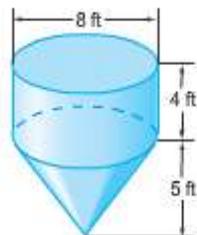
4) Find the exact volume of the shape. (write your answer in terms of Pi)

    8 cm   8 cm

    6 cm

Volume of Spheres

Key Concept — Volume of a Sphere

Words The volume V of a sphere is four thirds the product of π and the cube of the radius r.
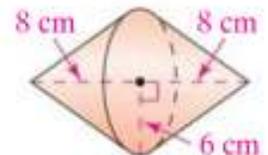
Symbols $V = \frac{4}{3}\pi r^3$

Model

Model Problems

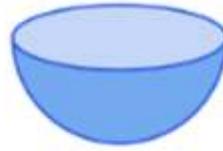1) Find the volume of the sphere. Round your answer to the nearest tenths place.

6 mm

2) The National Museum of Costa Rica has a large spherical stone in the courtyard. The diameter of the stone is about 8 feet. Find the volume of the spherical stone and round your answer to the nearest tenths place.

Hemisphere – a circle separates a sphere into two congruent halves.

$$V = \frac{1}{2}\left(\frac{4\pi r^3}{3}\right)$$

3) Find the volume of the hemisphere with a diameter of 15 km. Write your answer in terms of Pi.

4) Find the volume of the following figure if the diameter is 4.5 in and the height of the cylinder is 2.5 in.
Round to the nearest tenth

5) Find the remaining volume of the cylinder if the height of the cylinder is 6m, the radius of the cylinder is 3m, and the ball has a radius of 3m. Write your answer in terms of Pi.
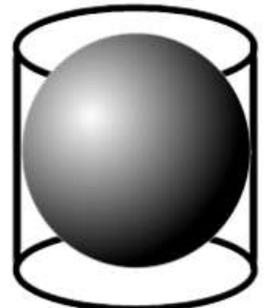
[not drawn to scale]
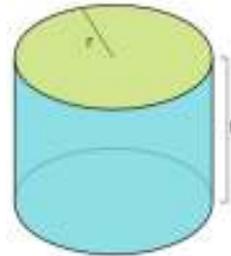
Name_____

Date_____

Solving for Height of Cylinders and Cones

To solve for height, use ESA to substitute and solve for *h.*

Model Problems:

1) Find the height of a cylinder that has a volume of 1,357.17 cm^3 and a radius of 6cm. (round to the nearest tenth of a centimeter)

Formulas

Rectangular Prism:
$$V=lwh$$
Cylinder:
$$V=\pi\, r^2\, h$$
Cone:
$$V=\tfrac{1}{3}\pi\, r^2\, h$$
Sphere:
$$V=\frac{4}{3}\,\pi\, r^3$$

2) Reese would like to purchase snow cone containers that hold approximately 12.8 in^3. If the diameter of the containers should be 3.5 inches, how tall will they be? (round to the nearest tenth of an inch)

3) In Disney's *Cars* movie, the Cozy Cone motel has cone shaped rooms. What is the approximate height if the diameter of each cone is 20 feet and a volume of 5,864 ft^3? (round to the nearest tenth of a foot)

4) If the volume of a cone is 528π cm^3 and the radius is 12 cm, what is the height of the cone?

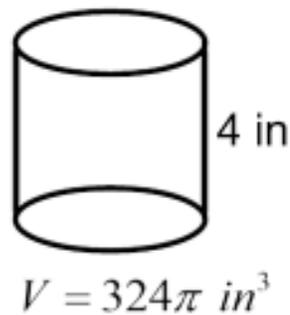5) A cylinder has a diameter of 12 inches and a volume of 180π. What is the height?

Solving for Radius of Cylinders and Cones

To solve for radius, use ESA to substitute and solve for *r*. You will need to first isolate r^2, then take the square root of both sides. $\sqrt{}$

1) The height of a cylinder is 4 inches and the volume is 324π in³, what is the radius of the cylinder?

4 in

$V = 324\pi \ in^3$

Formulas

Rectangular Prism:
  V=lwh
Cylinder:
  V=π r²h
Cone:
  V=⅓π r²h
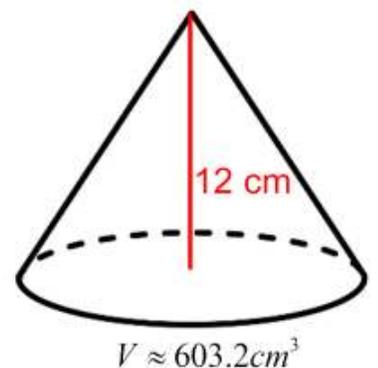Sphere:
  V=⁴⁄₃ π r³

2) The volume of a cylinder is 197.9 cm³ and the height is 7 cm. What is the radius rounded to the nearest whole centimeter?

7 cm

$V \approx 197.9 \ cm^3$
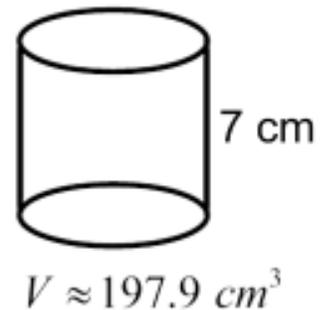
3) What is the radius of a cone that has volume of 603.2 cm³ and height of 12 cm? (round to the nearest tenth of a centimeter)

12 cm

$V \approx 603.2 cm^3$

4) The volume of a cylinder is 471.2 mm³ and the height is 6mm. What is the radius rounded to the nearest tenths place?

6 cm

$$V \approx 471.2 \, mm^3$$
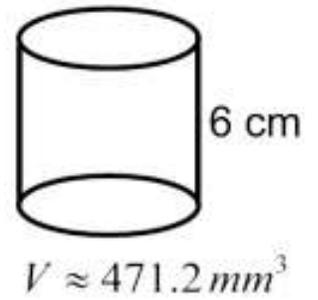
5) The volume of a cone is 600π mm³ and the height is 18mm. What is the radius?

6) The volume of a cone is 58.9 cm³ and the height is 9 cm. What is the radius rounded to the nearest tenths place?

Name_____

Date_____

Solving for Radius of Spheres

To solve for radius, use ESA to substitute and solve for r. You will need to first isolate r^3, then take cube root of both sides. $\sqrt[3]{}$

1) What is the radius of a sphere with a volume of 288π in^3?

2) What is the radius of a sphere with a volume of $2{,}304\pi$ cm^3?

3) What is the radius of a sphere with a volume of $2{,}144.66$ yd^3? Round your answer to the nearest tenths place.

4) What is the underlined diameter of a sphere with a volume of 91.95 mm³? Round your answer to the nearest tenths place?

5) What is the approximate diameter of Disney World's Spaceship Earth if it encompasses approximately 2,200,000 cubic feet? (round to the nearest foot)