Name: _____

Date: _____

Lesson 2-10: Composition of 3D Figures

Learning Goal: #15: How do I find volume of a composite figure??

Definition: A *composite figure* is a shape that can be made up of any of our 3-D figures **put together**!

Let's try one together!

The Miller's want to heat their house from top to bottom. The house is made up of a ⟨triangular prism⟩ and a ⟨rectangular prism.⟩ Find the <u>total volume</u> of the house that will be heated to the nearest cubic foot.

Volume of △ Prism

$$V = (\tfrac{1}{2} b \cdot h) H$$

$$V = (\tfrac{1}{2}(30)(6))(50)$$

$$V = (90)(50)$$

$$V = 4500 ft^3$$

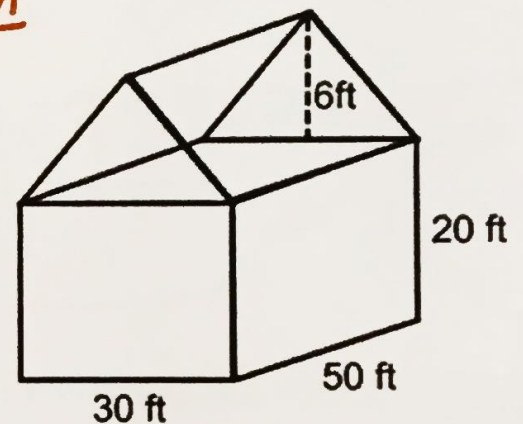**Volume of ▭ Prism**

$$V = L \cdot W \cdot H$$

$$V = (50)(30)(20)$$

$$V = 30,000 ft^3$$

Total Volume = 4500 + 30,000

Total Volume = 34,500 ft³

(Diagram of house: 6ft, 20 ft, 50 ft, 30 ft)

Turn and Talk

Summarize the steps we used to solve the composition problem?

Steps to Follow

1. Calculate the **volume** of **figure 1**
2. Calculate the **volume** of **figure 2**
3. Combine the volumes together by **adding the volumes together**

How would our approach be different if they asked us to find the total surface area? How would it be the same?

Different formulas   **Same Process**

🍅 **Watch me!**

1. Beth got a new bottle for her homemade salad dressing. How much salad dressing to the nearest hundredth of an inch can she fit in the bottle if she fills it to the top?

↳ Volume

Sketch and label the two figures that make up the composite figure to the right:

① Volume of Top:

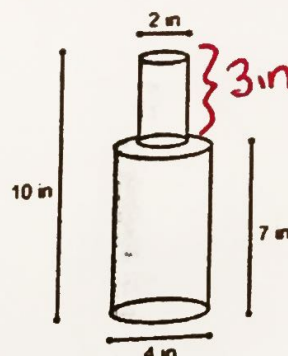$V = \pi r^2 H$

$V = \pi (1)^2 (3)$

$V = 3\pi \text{ in}^3$

② Volume of Bottom:

$V = \pi r^2 H$

$V = \pi (2)^2 (7)$

$V = 4\pi \cdot 7$

$V = 28\pi \text{ in}^3$

Total Volume: $3\pi + 28\pi = 31\pi$ in

$= 97.38937226$

$= 97.39 \text{ in}^3$

Don't Round until the end!

(figure: bottle with 2 in top width, 3 in neck, 10 in, 7 in, 4 in)

2. A top company has a new statue in front of their building. They want to paint it with a protective coat. How much paint will it take to cover the statue to the square foot?

↳ Surface Area

↳ Surface Area

Sketch and label the two figures that make up the composite figure to the right:

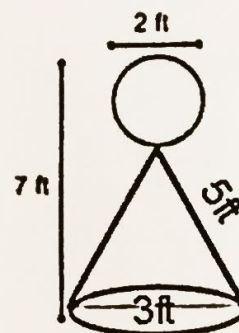① Surface Area of Sphere

$SA = 4\pi r^2$

$= 4\pi (1)^2$

$= 4\pi$

② Surface Area of Cone

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

$SA = \pi (1.5)^2 + \pi (1.5)(5)$

$SA = 2.25\pi + 7.5\pi$

$SA = 9.75\pi$

③ Total Surface Area $= 4\pi + 9.75\pi$

$= 13.75\pi$

$= 43.19689899$

$= 43 \text{ ft}^2$

(figure: sphere on cone, 2 ft, 7 ft, 5 ft, 3 ft)

✏ You Try!

3. How much ice cream is in this cone to the ~~nearest tenth?~~ Assuming the ice cream fills the entire cone and a scoop on top. The scoop has the same radius as the cone.
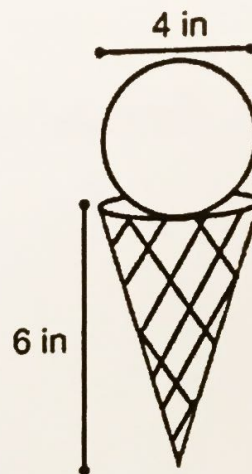
↳ volume

Sketch and label the figures that make up the composite figure to the right:

① <u>Volume Sphere:</u>

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

$$= \frac{4}{3}\pi (2)^3$$

$$= \frac{4}{3}\pi (8)$$

$$= \frac{32}{3}\pi \ in^3$$

② <u>Volume of Cone:</u>

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

$$V = \frac{1}{3}\pi (2)^2 (6)$$

$$V = \frac{1}{3}\pi (24)$$

$$V = 8\pi \ in^3$$

4 in

6 in

Total Volume $= \frac{32\pi}{3} + 8\pi = \frac{56}{3}\pi = 58.64306287$

$$\boxed{58.6 in^3}$$

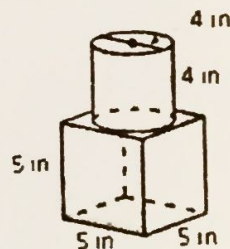**4.** Find the volume of the composite solid. Round all answers to the <u>nearest tenth of a cubic unit.</u>

① <u>Volume of top</u>

$$V = \pi r^2 \cdot H$$

$$V = \pi (2)^2 (4)$$

$$V = 16\pi \ in^3$$

② <u>Volume of Bottom</u>

$$V = l \cdot w \cdot h$$

$$V = (5)(5)(5)$$

$$V = 125 in^3$$

4 in
4 in
5 in
5 in   5 in

Total Volume $= 16\pi + 125$

$$= 175.2654825$$

$$= \boxed{175.3 in^3}$$

Lesson 2-10: Homework

1. Find the volume of the composite solid. Round all answers to the nearest tenth of a cubic unit, when necessary.

   (Sketch and label the two figures that make up the composite figure to help!)

   8in

   15

   15   15

   10in

   15in   15in
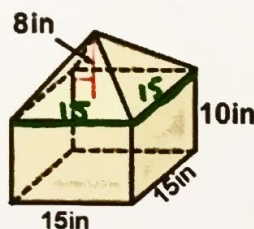
   ① <u>Volume top (pyramid)</u>

   $V = \frac{1}{3}(b \cdot h)H$

   $V = \frac{1}{3}(15)(15)(8)$

   $V = 600 in^3$

   ② <u>Volume of Bottom (☐ Prism):</u>

   $V = L \cdot W \cdot H$

   $V = (15)(15)(10)$

   $V = 2250 in^3$

   ③ Total Volume = 2250 + 600

   Total Volume = $\boxed{2850 in^3}$

2. Reynaldo builds a pool in his backyard. The pool measures 55 feet long, 28 feet wide, and 9 feet deep. How much water will fit in the pool?

   Volume → Rectangular Prism

   $V = L \cdot W \cdot H$

   $V = (55)(28)(9)$

   $\boxed{V = 13,860 ft^3}$

   L = 55
   W = 28
   H = 9

3. Mr. Gino ate an ice cream cone filed with ice cream, and a hemisphere of ice cream on top modeled on the right. The cone has a height of 10 cm and a radius of 4 cm. Calculate the amount of ice cream that Mr. Gino ate rounded to the nearest cubic centimeter.

   ① <u>Volume of Hemisphere:</u>

   r = 4

   because only half of sphere

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

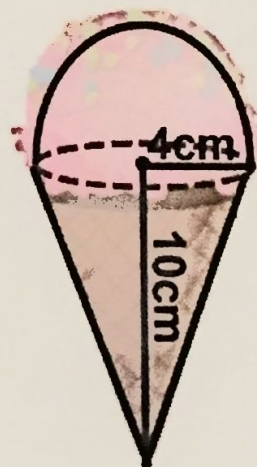 $V = \frac{1}{2} \cdot \frac{4}{3}\pi (4)^3$

   $V = 134.0412866 cm^3$

   ② <u>Volume of Cone:</u>

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

   $V = \frac{1}{3}\pi (4)^2(10)$

   $V = 167.5516082 cm^3$

   r = 4
   H = 10

   4cm

   10cm

   Total Volume = 134.0412866 + 167.5516082

   $\boxed{Total\ Volume = 301.5928948 cm^3}$