Essential Question How can you estimate the volume of a composite solid?
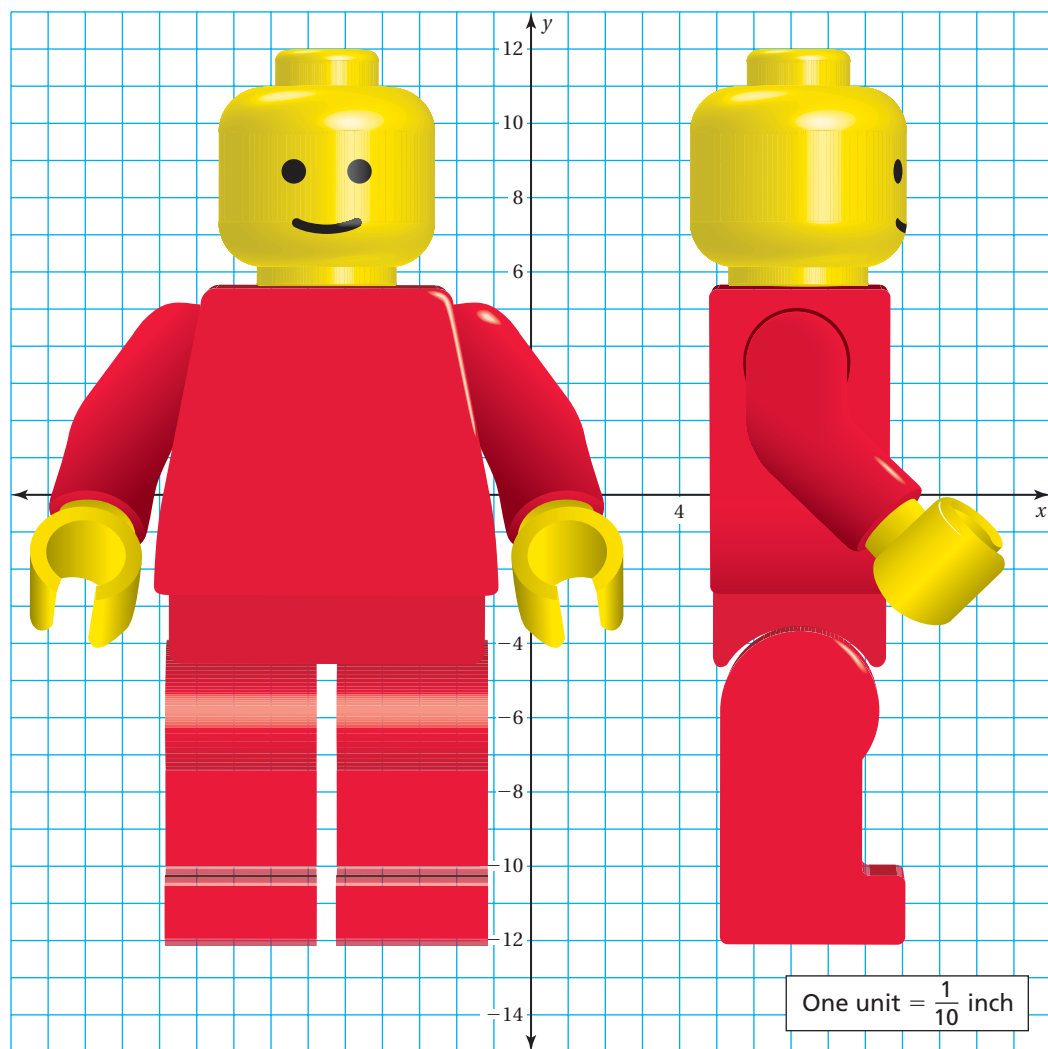
1 ACTIVITY: Estimating Volume

Work with a partner. You work for a toy company and need to estimate the volume of a Minifigure that will be molded out of plastic.
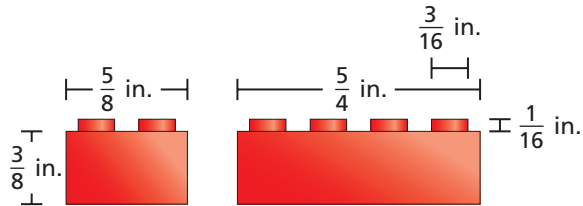
a. Estimate the number of cubic inches of plastic that is needed to mold the Minifigure's head. Show your work.

b. Estimate the number of cubic inches of plastic that is needed to mold one of the Minifigure's legs. Show your work.
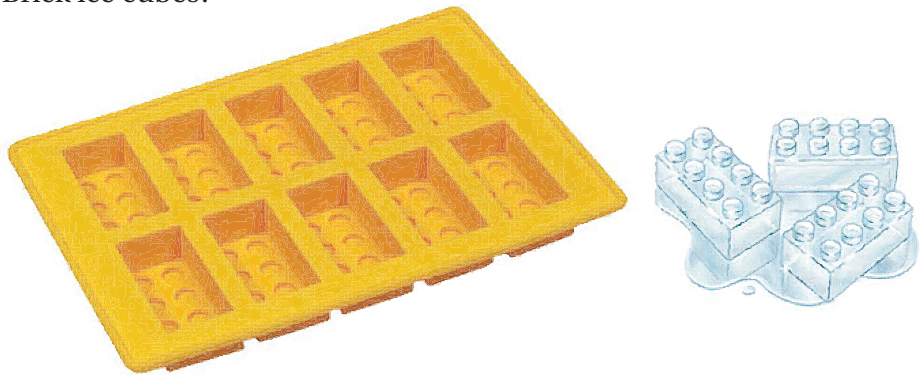

One unit = $\frac{1}{10}$ inch

ACTIVITY: Finding the Volumes of Composite Solids

Work with a partner.

a. Make a plan for estimating the amount of plastic it takes to make a standard eight-stud LEGO® Brick.

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$\frac{3}{16}$ in.

$\frac{5}{8}$ in. $\frac{5}{4}$ in. $\frac{1}{16}$ in.

$\frac{3}{8}$ in.

**b.** How much water, in cubic inches, would it take to make ten LEGO® Brick ice cubes?

What Is Your Answer?

3. IN YOUR OWN WORDS How can you estimate the volume of a composite solid? Try thinking of some alternative strategies.

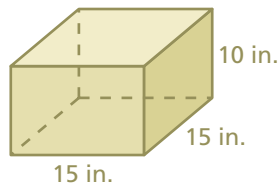*Practice* Use what you learned about the volumes of composite solids to complete Exercises 4–6 on page 328.

EXAMPLE 1 **Finding the Volume of a Composite Solid**
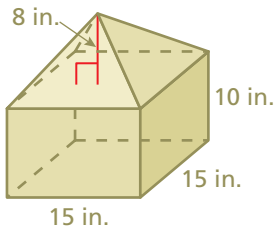
Find the volume of the composite solid.

The solid is made up of a square prism and a square pyramid. Find each volume.

Square prism

Square pyramid

$V = Bh$

$\quad = 15(15)(10)$

$\quad = 2250$

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

$\quad = \dfrac{1}{3}(15)(15)(8)$

$\quad = 600$
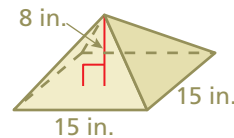
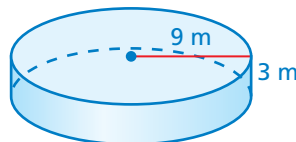Find the sum: $2250 + 600 = 2850$ in.^{3}.

∴ The volume of the composite solid is 2850 cubic inches.

EXAMPLE 2 **Finding the Volume of a Composite Solid**
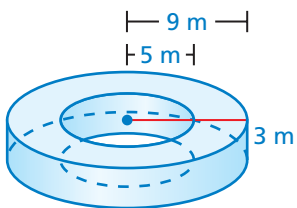
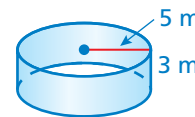**Find the volume of the composite solid. Round your answer to the nearest tenth.**

The solid is a cylinder with a cylinder-shaped hole. Find each volume.

Entire Cylinder

Cylinder-Shaped Hole

$V = Bh$

$\quad = \pi(9)^2(3)$

$\quad = 243\pi$

$V = Bh$

$\quad = \pi(5)^2(3)$

$\quad = 75\pi$

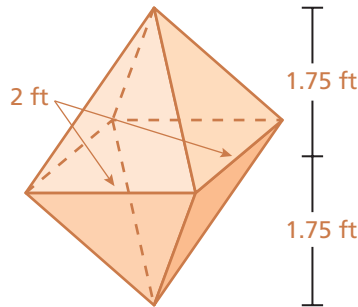Find the difference: $243\pi - 75\pi = 168\pi \approx 527.5$ m^3.

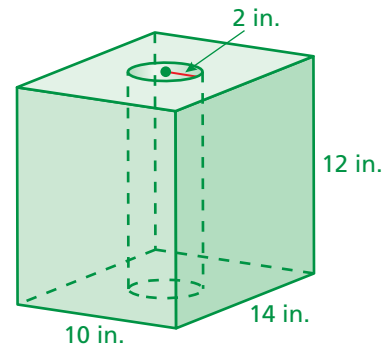∴ The volume of the composite solid is about 527.5 cubic meters.

Now You're Ready
Exercises 4–11

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

1.

2 ft

1.75 ft

1.75 ft

2.

2 in.

12 in.

14 in.

10 in.

EXAMPLE 3   Real-Life Application

What is the volume of the silver ring in an Argentine peso? Round your answer to the nearest tenth.

8.5 mm

11.5 mm

2.2 mm

The coin is a cylinder. The silver ring is the portion remaining when the inner cylinder is removed. Find the volume of each cylinder.

Entire cylinder

11.5 mm

2.2 mm

Inner cylinder

8.5 mm

2.2 mm

$$V = Bh$$

$$= \pi(11.5)^2(2.2)$$

$$= 290.95\pi$$

$$V = Bh$$

$$= \pi(8.5)^2(2.2)$$

$$= 158.95\pi$$

Subtract the volume of the inner cylinder from the volume of the entire cylinder: $290.95\pi - 158.95\pi = 132\pi \approx 414.5 \text{ mm}^3$.

⋰ The volume of the silver ring is about 414.5 cubic millimeters.

⬤ On Your Own

3. **WHAT IF?** In Example 3, how would the volume of the silver ring change if the coin were only half as thick?

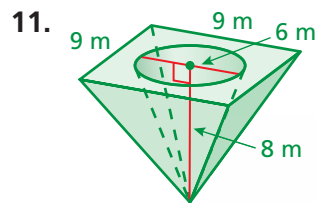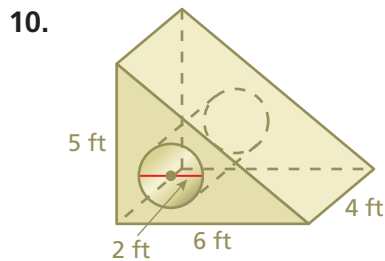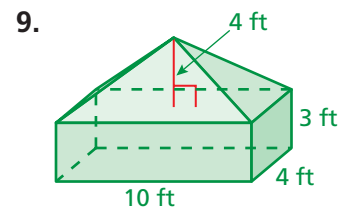4. Find the volume of the composite solid. Round your answer to the nearest tenth.

3 ft

4 ft
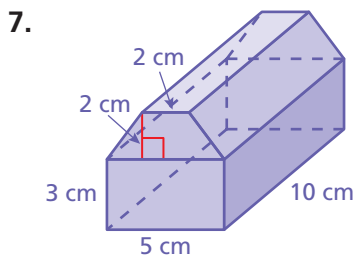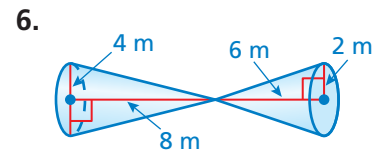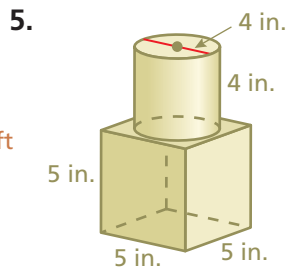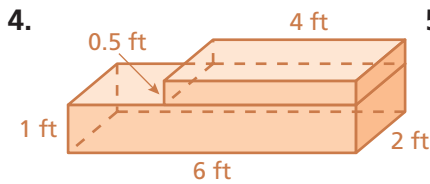
5 ft
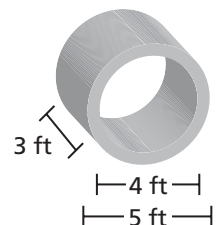
✓ Vocabulary and Concept Check

1. **VOCABULARY** What is a composite solid?

2. **WRITING** Explain how to find the volume of the composite solid.

3. **CRITICAL THINKING** Explain how finding the volume in Example 2 is different from finding the volume in Example 1.

7 in.
4 in.
3 in.
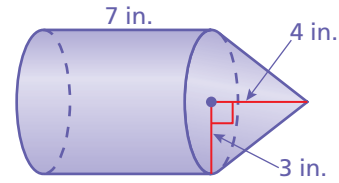
Practice and Problem Solving

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

① ② **4.**
0.5 ft
4 ft
1 ft
6 ft
2 ft

5.
4 in.
4 in.
5 in.
5 in.
5 in.

6.
4 m
6 m
2 m
8 m

7.
2 cm
2 cm
3 cm
5 cm
10 cm

8.
6 in.
10 in.
6 in.
8 in.

9.
4 ft
3 ft
4 ft
10 ft

10.
5 ft
4 ft
2 ft
6 ft

11.
9 m
9 m
6 m
8 m
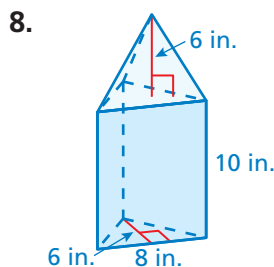
12. **BIRD FEEDER** The cedar waxwing measures about 6 inches from head to tail. The green hexagonal part of the birdfeeder has a base area of 18 square inches. Estimate how much bird seed the bird feeder will hold. Explain how you found your estimate.

13. CAKE The raspberry layer cake has a diameter of 10 inches and a height of 5 inches.

    a. About what percent of the cake is remaining?

    b. Estimate the volume of the remaining cake.

14. KICKBOARD A foam kickboard used for swimming has two identical hand grips.

    a. Find the volume of the kickboard.

    b. One cubic inch of foam weighs about 0.007 pound. How much does the kickboard weigh?

5.5 in.
0.6 in.
2 in.
0.6 in.
12 in.
1.25 in.
11 in.
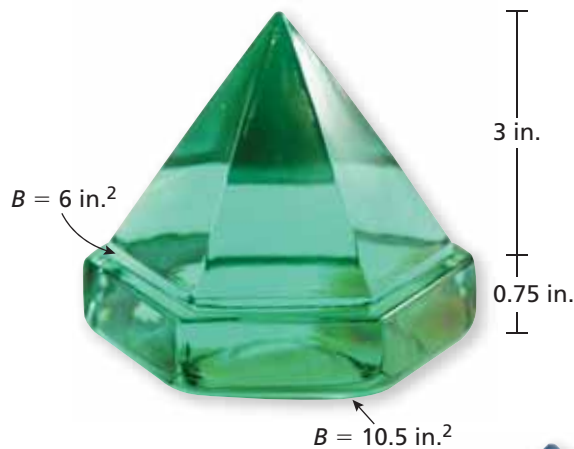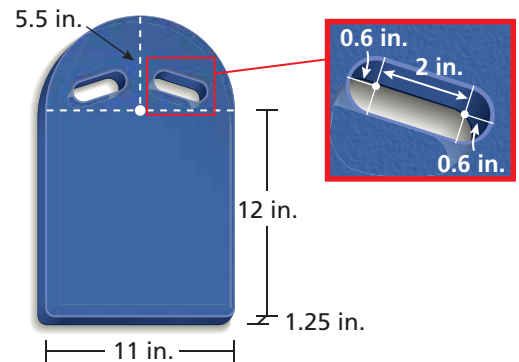
15. PAPERWEIGHT Estimate the amount of glass in the paperweight. Explain how you found your estimate.

3 in.

$B = 6$ in.^{2}

0.75 in.

$B = 10.5$ in.^{2}

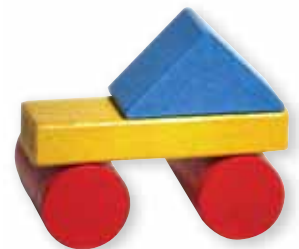**16.** **Puzzle** The volume of each group of solids is given. Find the volume of each of the four types of blocks.

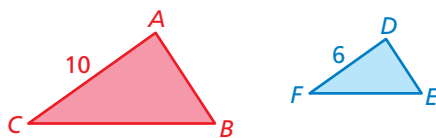$V = 8\pi + 8$ $V = 8\pi + 28$ $V = 8\pi + 20$

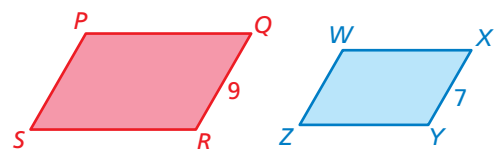## Fair Game Review   What you learned in previous grades & lessons

The two figures are similar. Find the ratio (red to blue) of the areas.

17.
A
D
10
6
F   E
C   B

18.
P   Q
W   X
9
7
S   R
Z   Y

19. MULTIPLE CHOICE A fire hydrant releases 1200 gallons of water in 4 minutes. What is the rate of release in gallons per second?

  Ⓐ 3 gal/sec   **Ⓑ** 5 gal/sec   **Ⓒ** 30 gal/sec   **Ⓓ** 300 gal/sec