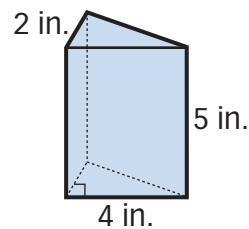


Lesson 23 Part 1: Introduction CCLS
7.G.B.6

Volume of Solids

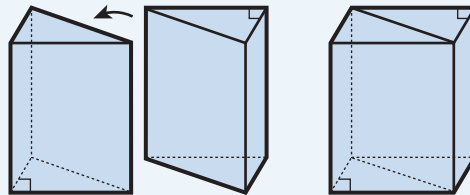
In grade 6, you learned to find the volumes of rectangular prisms and of solid figures composed of rectangular prisms. Take a look at this problem.

Find the volume of the figure shown.


 Explore It

Use the math you already know to solve the problem.

- This figure is a right triangular prism. Imagine two prisms attached together like this:



- Describe the composed figure.

- What are the dimensions of the composed figure?

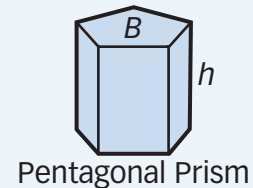
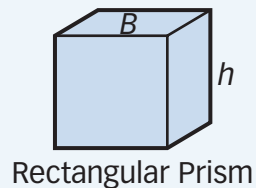
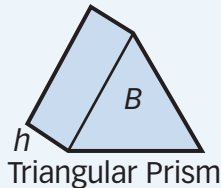
- What is the volume of the composed figure?

- How could you find the volume of the triangular prism you started with? Explain.



Find Out More

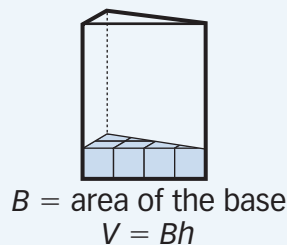
A **right prism** is a solid that has two faces (called bases) that are polygons. The bases of a right prism are the same size and shape and parallel to each other. The other faces are rectangles and are perpendicular to the bases. Prisms are named by their bases. Here are some examples of right prisms.



To find the volume of the triangular prism on the previous page, you multiplied the three dimensions of the rectangular prism and took half, or divided the product by 2.

So, the formula for the volume of a triangular prism is $\frac{1}{2}lwh$ or $(\frac{1}{2}lw)(h)$. The expression $\frac{1}{2}lw$ represents the area of the triangle, the base of the prism.

To find the volume of a right triangular prism, find the area of the triangular base, the number of cubes in one layer, and multiply by the height, the number of layers.



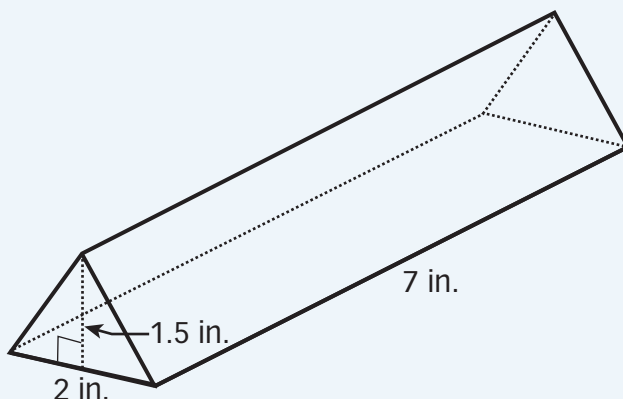
Reflect

- 1 Do you think you can use the formula $V = Bh$ to find the volume of any right prism? Explain.



Read the problem below. Then explore how to calculate volume using the formula for the volume of right prism.

A packing carton in the shape of a triangular prism is shown in the diagram below. What is the volume of this carton?

**Model It**

You can use words to describe the prism.

The base of this prism is a triangle.

The base of the triangle measures 2 inches.

The height drawn to the base of the triangle measures 1.5 inches.

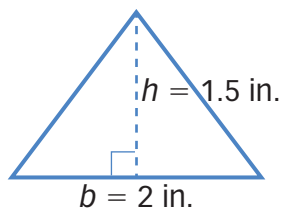
The height of the prism is 7 inches.

**Solve It**

You can use the formula $V = Bh$ to find the volume of the carton.

You know the height of the prism.

You need to find the area of the base shown below.





Connect It

Now you will solve the problem from the previous page.

- 2 Look at Model It. How do you know which faces of the carton are the bases?

- 3 Describe the shapes of the other faces.

- 4 Which of the dimensions of the other faces do you use to find the volume of the prism? Explain.

- 5 What is the area of the base of the carton? Show your work.

- 6 What is the volume of the carton? Show your work.

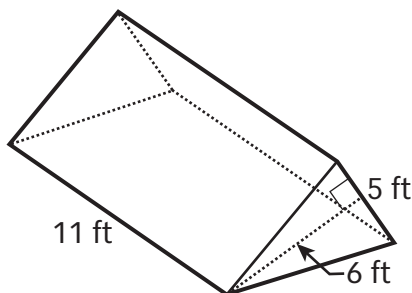
- 7 How can you find the volume of any triangular prism?



Try It

Apply what you just learned about finding volume to the following problem. Show your work on a separate sheet of paper.

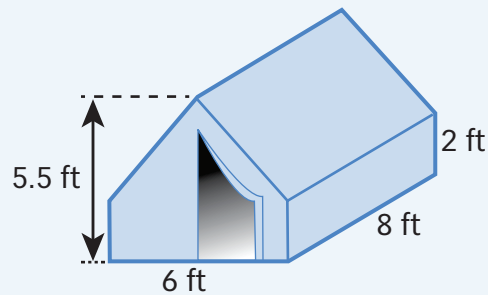
- 8 What is the volume of the right triangular prism shown below? _____





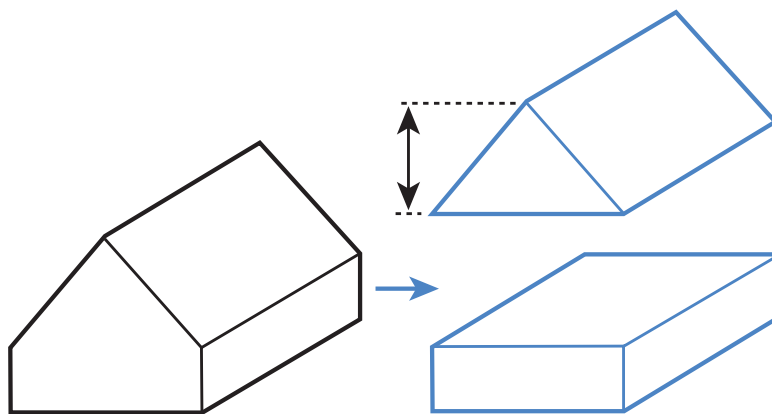
Read the problem below. Then use what you learned about calculating volumes of prisms to solve the problem.

What is the volume of the camping tent shown below?



Model It

You can think about this figure as the combination of two solids: a triangular prism on top of a rectangular prism.



Solve It

You can find the volume of the triangular prism and the volume of the rectangular prism and add the volumes together.

volume of the triangular prism = area of the triangular base \times height of the prism

volume of the rectangular prism = area of the rectangular base \times height of the prism



Connect It

Now you will solve the problem from the previous page.

- 9 Look at Model It. What are the dimensions of the rectangular prism? $___ \times ___ \times ___$
Label the figure to show the dimensions. What is its volume? Show your work.

- 10 What are the dimensions of the base of the triangular prism? Label the figure to show the dimensions.

Explain how you found the height of the triangular base.

- 11 What is the volume of the triangular prism? Show your work.

- 12 What is the volume of the tent? _____

- 13 Sam says that he can find the volume of the tent without breaking it up into two different solids. Explain how.

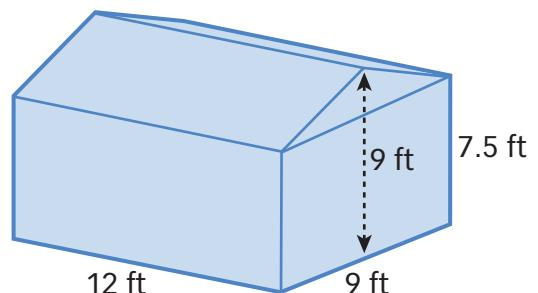
- 14 How do you find the volume of a figure made up of two or more prisms?



Try It

Use what you just learned about calculating volume to solve the problem below. Show your work on a separate sheet of paper.

- 15 Mr. Jones is building the garage shown to the right. What is the volume of the garage? _____





The student found the volume by multiplying the area of the base times the height.



Pair/Share

How could you break up this figure into three different prisms to find the volume?

Which lengths are the base and height of the triangular base?



Pair/Share

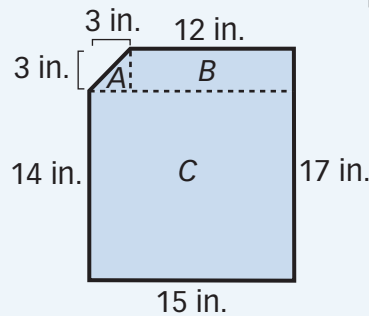
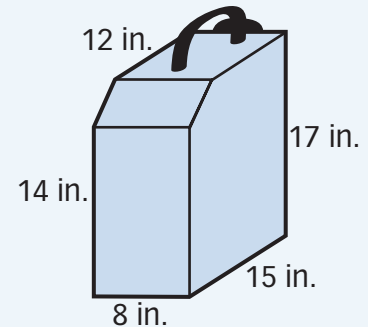
How do you decide which faces are the bases of the prism?

Study the model below. Then solve problems 16–18.

Student Model

How much gas (in cubic inches) would fill this gas can?

Look at a side view to see how you could find the area of the base of the prism by breaking it into two rectangles and a right triangle.



The area of triangle A is $\frac{1}{2}(3)(3) = 4.5$ square inches.

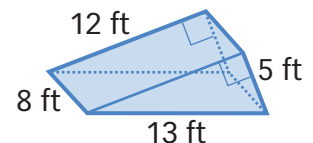
The area of rectangle B is $3(12) = 36$ square inches.

The area of rectangle C is $14(15) = 210$ square inches.

The area of the base is $4.5 + 36 + 210 = 250.5$ square inches.

Solution: $V = Bh = (250.5)(8) = 2,004$ cubic inches

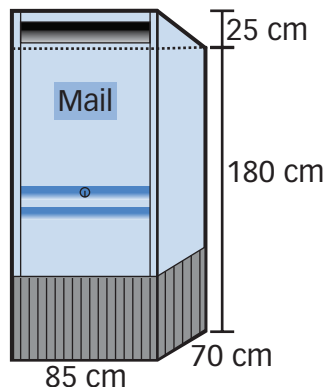
- 16 A bicycle ramp used for competitions is a triangular prism. What is the volume of the ramp?



Solution: _____

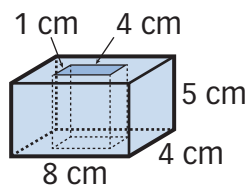


17 Find the volume of the Canada Post mailbox shown below.



Solution: _____

18 A machine part is made from a rectangular prism with a smaller rectangular prism cut out of it, as shown below. What is the volume of the part? Circle the correct answer.



- A 20 cubic centimeters
- B 140 cubic centimeters
- C 160 cubic centimeters
- D 180 cubic centimeters

Leo chose **D** as the correct answer. How did he get that answer?

What shapes make up this solid?



Pair/Share

Explain the steps you took to solve the problem.

Should I add or subtract to find the volume of the machine part?



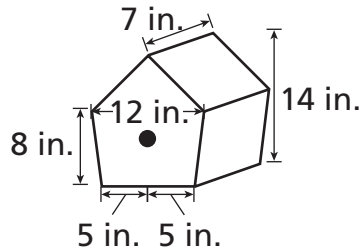
Pair/Share

Does Leo's answer make sense?



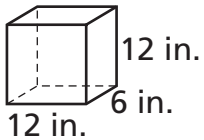
Solve the problems.

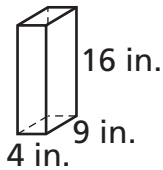
- 1 What is the volume of the bird house shown below?

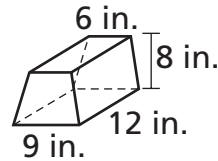


- A 1,120 cubic inches
 B 980 cubic inches
 C 892 cubic inches
 D 868 cubic inches

- 2 Janet needs to purchase one of the shipping containers below. Write the words "Large," "Medium," and "Small" under the appropriate container based on their volumes.





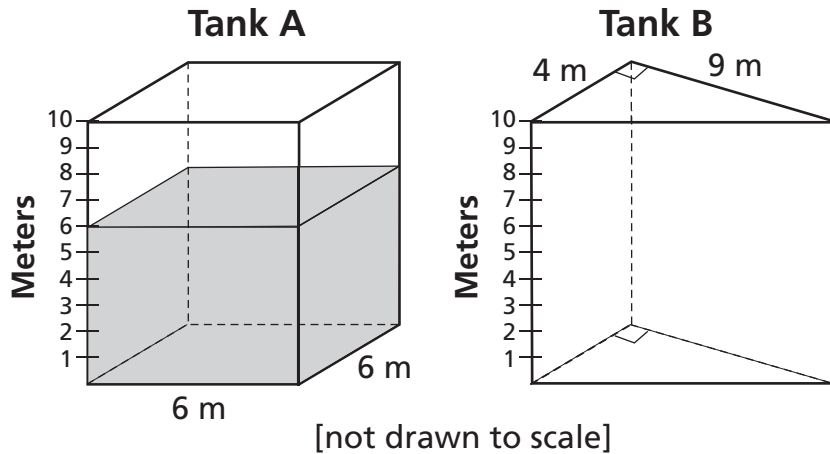


[not drawn to scale]



3

Two water tanks are shown. Tank A is a rectangular prism and Tank B is a triangular prism. Tank A is filled with water to the 6-meter mark. Some of the water from Tank A is being transferred to Tank B so that the water level in Tank A is at 2 meters. Shade the amount of water in Tank B to indicate the approximate height of the water in Tank B after the transfer. Also write the height, to the nearest whole number of meters, in the answer box provided.



In Tank B, the height of the water is approximately _____ meters.

4

The base of a right triangular prism is a right isosceles triangle whose equal sides measure 25 cm each. The volume of the prism is 0.075 cubic meter. Find the height of the prism.

Answer _____

**Self Check**

Go back and see what you can check off on the Self Check on page 169.