

# Volume of Triangular Prisms and Pyramids

Q: How do you find the volume of a triangular prism or triangular pyramid?

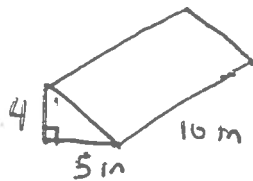
A Prism - ① Find the area of the \_\_\_\_\_.  
 ② \_\_\_\_\_ the area of the prism's base by its \_\_\_\_\_.

Pyramid ① Find the area of the \_\_\_\_\_.  
 ② \_\_\_\_\_ the area of the ~~prism~~ pyramid's base by its \_\_\_\_\_ and then by \_\_\_\_\_.

## Volume of triangular prism

①  $A = \frac{1}{2}bh$  ← area of triangular base (B)

②  $V = Bh$  ← Volume of triangular prism



What is the volume

1  $A = \frac{1}{2} ( \quad ) = B$

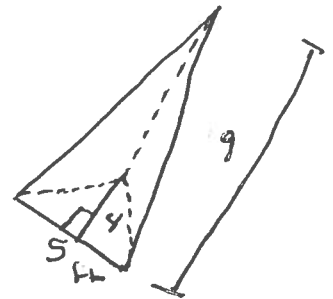
2  $V = ( \quad ) ( \quad )$

= \_\_\_\_\_

## triangular pyramid

①  $A = \frac{1}{2}bh$  ← area of triangular base

②  $V = \frac{1}{3}Bh$  ← volume



1  $A = \frac{1}{2} ( \quad ) = B$

$V = \frac{1}{3} ( \quad )$

= \_\_\_\_\_

## Volume of Triangular Prisms and Pyramids

Q: How do you find the volume of a triangular prism or triangular pyramid?

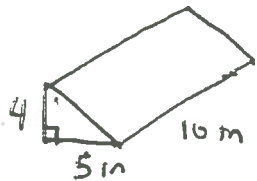
A Prism - ① Find the area of the base.  
 ② Multiply the area of the prism's base by its height.

Pyramid ① Find the area of the base.  
 ② Multiply the area of the ~~prism~~ pyramid's base by its height and then by  $\frac{1}{3}$ .

Volume of triangular prism

$$\textcircled{1} A = \frac{1}{2}bh \quad \leftarrow \begin{array}{l} \text{area of} \\ \text{triangular base (B)} \end{array}$$

$$\textcircled{2} V = Bh \quad \leftarrow \begin{array}{l} \text{Volume of} \\ \text{triangular prism} \end{array}$$



What is the volume

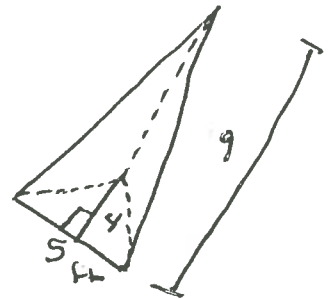
$$1 \quad A = \frac{1}{2}(4)(5) = B$$

$$2 \quad V = (10)(10) \\ = \underline{\underline{100}}$$

triangular pyramid

$$\textcircled{1} A = \frac{1}{2}bh \quad \leftarrow \begin{array}{l} \text{area of} \\ \text{triangular} \\ \text{base} \end{array}$$

$$\textcircled{2} V = \frac{1}{3}Bh \quad \leftarrow \text{volume}$$



$$1 \quad A = \frac{1}{2}(4)(5) = B$$

$$V = \frac{1}{3}(10)(9)$$

$$= \underline{\underline{30}}$$

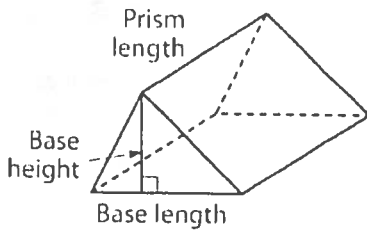
**LESSON**  
**10-2**

# Volume of Triangular Prisms and Pyramids

## Reading Strategies: Build Vocabulary

To solve volume problems with triangular prisms and pyramids, it is helpful to know and use the vocabulary words that refer to the parts of the figures. Notice that both figures have *base heights* and heights for the figure as a whole.

### Triangular Prisms



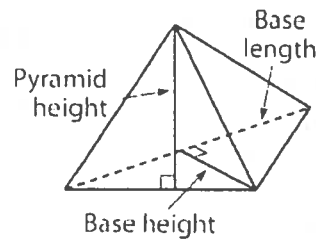
The *base length* and the *base height* are used to compute the area of the triangular base,  $B$ :

$$B = \frac{1}{2} \times \text{base height} \times \text{base length}$$

The *prism length* is used to compute the *prism volume*,  $V_{\text{prism}}$ :

$$V_{\text{prism}} = B \times \text{prism length}$$

### Triangular Pyramids



The *base length* and the *base height* are used to compute the area of the triangular base,  $B$ :

$$B = \frac{1}{2} \times \text{base height} \times \text{base length}$$

The *pyramid height* is used to compute the *pyramid volume*,  $V_{\text{pyramid}}$ :

$$V_{\text{pyramid}} = \frac{1}{3} \times B \times \text{pyramid height}$$

### Calculate the parts and compute the volume.

- The triangular base of a prism is 10 feet wide and has a height that is half of that. The length of the prism is 4 feet more than the width of its base. Include the units.

Base width: \_\_\_\_\_ Base height: \_\_\_\_\_ Base area: \_\_\_\_\_

Prism length: \_\_\_\_\_ Prism volume: \_\_\_\_\_

- The triangular base of a pyramid has a width that is half of the pyramid height. The pyramid height is four times the height of the base which is 3 meters.

Base width: \_\_\_\_\_ Base height: \_\_\_\_\_ Base area: \_\_\_\_\_

Pyramid height: \_\_\_\_\_ Pyramid volume: \_\_\_\_\_

**LESSON**  
**10-2**

# Volume of Triangular Prisms and Pyramids

## Success for English Learners

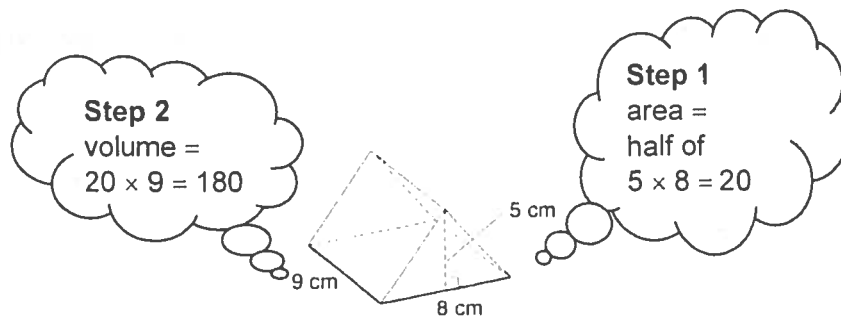
### Problem 1

Find the volume of the *triangular prism*.

**Step 1** Find the base area.

**Step 2** To find the volume, multiply the base area by the length of the prism.

**Step 3** Write the volume with the correct units: cubic centimeters



**Step 3** The volume is 180 cubic centimeters.

### Problem 2

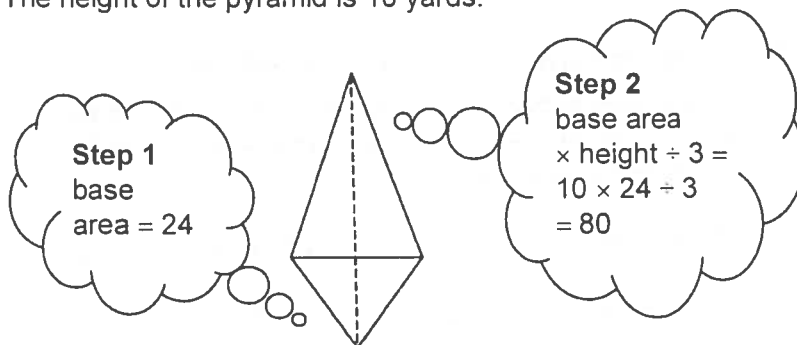
Find the volume of the *triangular pyramid*.

**Step 1** Find the base area.

**Step 2** To find the volume, multiply *one third* times the base area times the height of the pyramid.

**Step 3** Write the volume with the correct units: cubic centimeters

- The area of the pyramid's base is 24 square yards.
- The height of the pyramid is 10 yards.



**Step 3** The volume is 80 cubic yards.

1. In Problem 1, why is the area of the base *one half* of 5 times 8?

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2. In Problem 2, why is " $10 \times 24 \div 3$ " the same as *one third* of the area of the base times the pyramid's height?

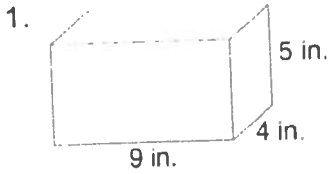
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**LESSON**  
**10-2**

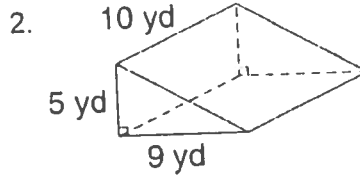
**Volume of Triangular Prisms and Pyramids**

*Practice and Problem Solving: D*

Find the volume. Be sure to include the units. The first one is done for you.

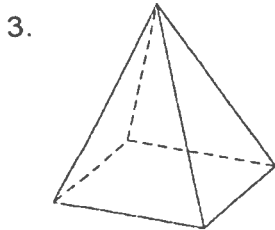


$$\begin{aligned} \text{Volume} &= \text{base area} \times \text{height} \\ &= \text{length} \times \text{width} \times \text{height} \\ &= \underline{9 \text{ in.}} \times \underline{4 \text{ in.}} \times \underline{5 \text{ in.}} \\ &= \underline{180 \text{ cubic inches}} \end{aligned}$$

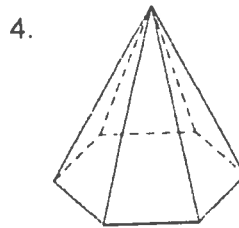


$$\begin{aligned} \text{Volume} &= \text{base area} \times \text{height} \\ &= \frac{1}{2} \times \text{length} \times \text{width} \times \text{height} \\ &= \frac{1}{2} \times \underline{\quad} \times \underline{\quad} \times \underline{\quad} \\ &= \underline{\hspace{2cm}} \end{aligned}$$

Find the volume. Be sure to include the units. The first one is done for you.



$$\begin{aligned} \text{Base area: } &6 \text{ feet} \times 6 \text{ feet} = \\ &\underline{36 \text{ square feet}} \\ \text{Height: } &9 \text{ feet} \\ \text{Volume} &= \frac{1}{3} \times \text{base area} \times \text{height} \\ &= \frac{1}{3} \times \underline{36 \text{ feet}} \times \underline{9 \text{ feet}} \\ &= \underline{108 \text{ cubic feet}} \end{aligned}$$



$$\begin{aligned} \text{Base area: } &24 \text{ square meters} \\ \text{Height: } &8 \text{ meters} \\ \text{Volume} &= \frac{1}{3} \times \text{base area} \times \text{height} \\ &= \frac{1}{3} \times \underline{\quad} \times \underline{\quad} \\ &= \underline{\hspace{2cm}} \end{aligned}$$

Find the missing measurement.

5. Volume of a pyramid: 75 cubic feet.  
Base Area: 15 square feet  
Height: \_\_\_\_\_

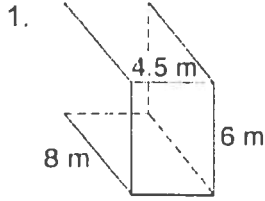
6. Volume of a prism: 120 cubic meters  
Height: 20 meters  
Base Area: \_\_\_\_\_

**LESSON**  
**10-2**

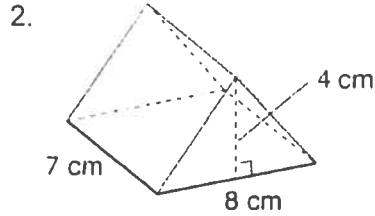
**Volume of Triangular Prisms and Pyramids**

*Practice and Problem Solving: A/B*

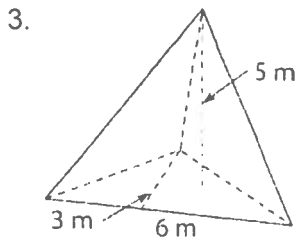
Find the volume.



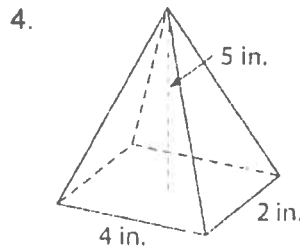
\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_

Solve.

5. A triangular prism has a base area of 20 square feet and a height of 4 feet. Find the volume.

\_\_\_\_\_

6. The volume of a triangular pyramid is 300 cubic meters. What is the area of the pyramid's base if the pyramid height is 3 meters?

\_\_\_\_\_

7. A triangular prism has a volume of 2,500 cubic feet. What is the length of the prism if its triangular bases are right triangles, each with perpendicular sides of 10 and 20 feet?

\_\_\_\_\_

8. The height of a pyramid is 15 inches. The pyramid's base is a square with a side of 5 inches. What is the pyramid's volume?

\_\_\_\_\_

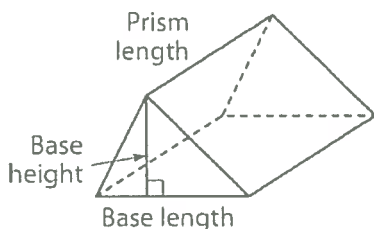
**LESSON**  
**10-2**

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## Reading Strategies: Build Vocabulary

To solve volume problems with triangular prisms and pyramids, it is helpful to know and use the vocabulary words that refer to the parts of the figures. Notice that both figures have *base heights* and heights for the figure as a whole.

### Triangular Prisms



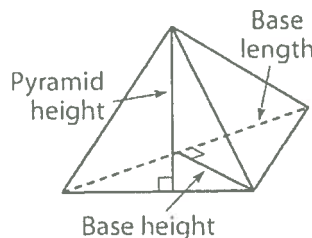
The *base length* and the *base height* are used to compute the area of the triangular base,  $B$ :

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### Triangular Pyramids

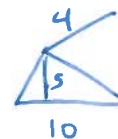


The *base length* and the *base height* are used to compute the area of the triangular base,  $B$ :

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$$V_{\text{pyramid}} = \frac{1}{3} \times B \times \text{pyramid height}$$



### Calculate the parts and compute the volume.

- The triangular base of a prism is 10 feet wide and has a height that is half of that. The length of the prism is 4 feet more than the width of its base. Include the units.

Base width: 10      Base height: 5      Base area: 25  $\frac{1}{2} Bh$   
 Prism length: 14      Prism volume: 350 ft<sup>3</sup>

- The triangular base of a pyramid has a width that is half of the pyramid height. The pyramid height is four times the height of the base which is 3 meters.

Base width: 6  $\frac{1}{2} h \left( \frac{12}{2} \right)$       Base height: 3      Base area: 9m<sup>2</sup>  $\frac{1}{2} Bh = 9$   
 Pyramid height: 12 (4h)      Pyramid volume: 36m<sup>3</sup>

**LESSON**  
**10-2**

**Volume of Triangular Prisms and Pyramids**

*Success for English Learners*

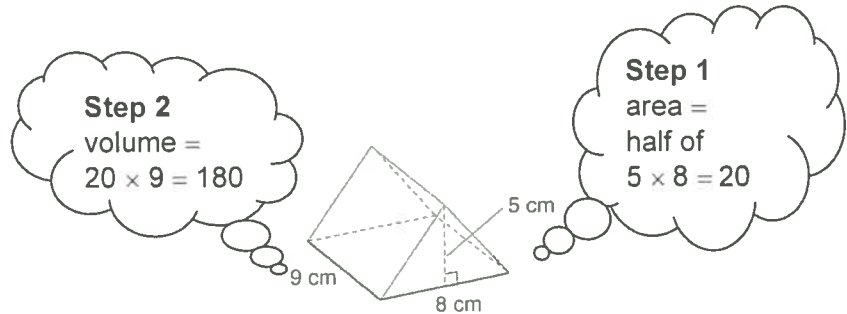
**Problem 1**

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**Step 1** Find the base area.

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**Step 3** Write the volume with the correct units: cubic centimeters



**Step 3** The volume is 180 cubic centimeters.

**Problem 2**

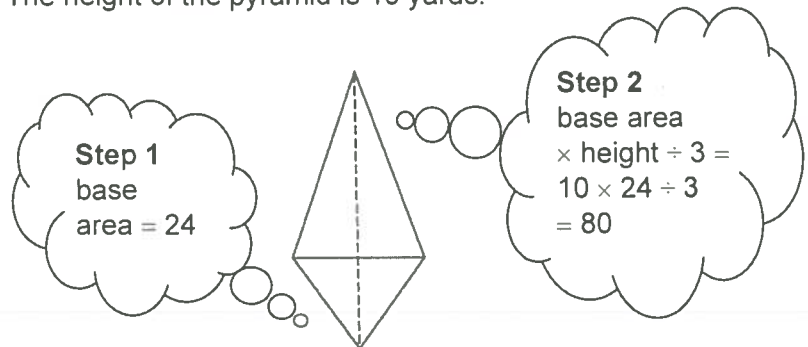
Find the volume of the *triangular pyramid*.

**Step 1** Find the base area.

**Step 2** To find the volume, multiply *one* third times the base area times the height of the pyramid.

**Step 3** Write the volume with the correct units: cubic centimeters

- The area of the pyramid's base is 24 square yards.
- The height of the pyramid is 10 yards.



**Step 3** The volume is 80 cubic yards.

1. In Problem 1, why is the area of the base *one half* of 5 times 8?

the area of a triangle is  $\frac{1}{2} b \times h$ .

2. In Problem 2, why is " $10 \times 24 \div 3$ " the same as *one third* of the area of the base times the pyramid's height?

dividing a product by 3 is the same as taking  $\frac{1}{3}$  of the product.

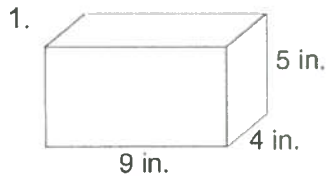


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**10-2**

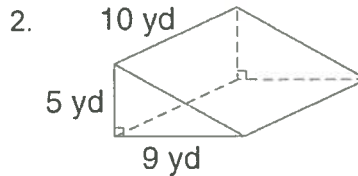
**Volume of Triangular Prisms and Pyramids**

*Practice and Problem Solving: D*

Find the volume. Be sure to include the units. The first one is done for you.

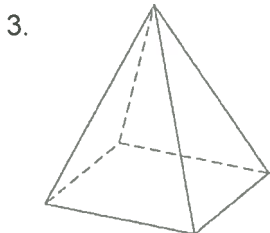


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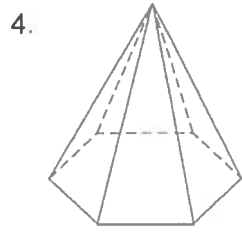


$$\begin{aligned} \text{Volume} &= \text{base area} \times \text{height} \\ &= \frac{1}{2} \times \text{length} \times \text{width} \times \text{height} \\ &= \frac{1}{2} \times \underline{5} \times \underline{9} \times \underline{10} \\ &= \underline{225 \text{ yd}^3} \end{aligned}$$

Find the volume. Be sure to include the units. The first one is done for you.



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$$\begin{aligned} \text{Base area: } &24 \text{ square meters} \\ \text{Height: } &8 \text{ meters} \\ \text{Volume} &= \frac{1}{3} \times \text{base area} \times \text{height} \\ &= \frac{1}{3} \times \underline{24} \times \underline{8} \\ &= \underline{64 \text{ m}^3} \end{aligned}$$

Find the missing measurement.

5. Volume of a pyramid: 75 cubic feet.  
Base Area: 15 square feet  
Height:  $\underline{75 \div 15 = 5 \times 3}$   
15

6. Volume of a prism: 120 cubic meters  
Height: 20 meters  
Base Area:  $\underline{120 \div 20 = 6 \text{ m}^2}$