

# Lesson 14.4:

## Volumes of Prisms

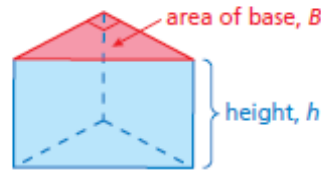
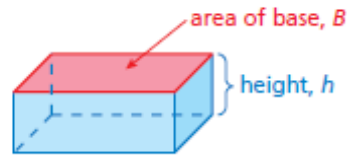
### Essential Question

How can you find the volume of a prism?

## Key Idea

### Volume of a Prism

**Words** The volume  $V$  of a prism is the product of the area of the base and the height of the prism.



**Algebra**

$$V = Bh$$

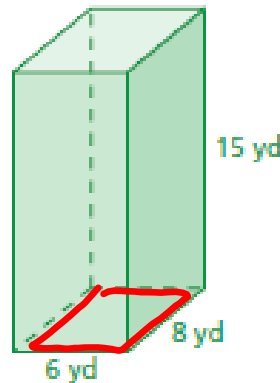
Area of base

Height of prism

✱ Rectangular:  $B$  can be any face

✱ Non-Rectangular:  $B$  cannot be a rectangle

Find the volume of the prism.



$$V = Bh$$

$$(6 \text{ yd} \cdot 8 \text{ yd}) \cdot 15 \text{ yd}$$

$$48 \text{ yd}^2 \cdot 15 \text{ yd}$$

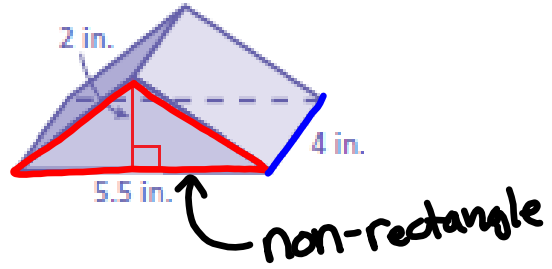
$$\boxed{720 \text{ yd}^3}$$

✱ units cubed

Find the volume of the prism.

$$B = \frac{1}{2} \cdot 5.5 \text{ in} \cdot 2 \text{ in}$$

$$= 5.5 \text{ in}^2$$

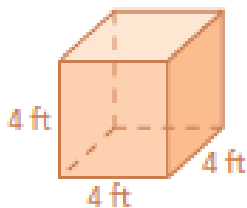


$$V = Bh = 5.5 \text{ in}^2 \cdot 4 \text{ in}$$

$$22 \text{ in}^3$$

Find the volume of the prism.

1.

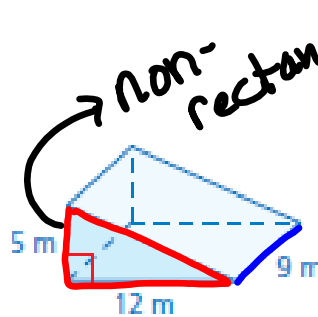


$$V = Bh$$

$$(4 \text{ ft} \cdot 4 \text{ ft}) \cdot 4 \text{ ft}$$

$$64 \text{ ft}^3$$

2.



$$V = Bh$$

$$\left(\frac{1}{2} \cdot 12 \text{ m} \cdot 5 \text{ m}\right) 9 \text{ m}$$

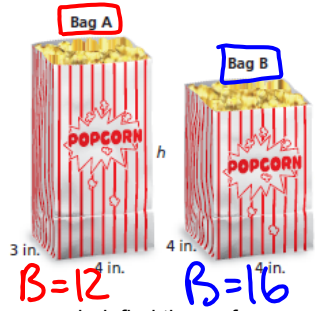
$$30 \text{ m}^2 \cdot 9 \text{ m}$$

$$270 \text{ m}^3$$

A movie theater designs two bags to hold 96 cubic inches of popcorn. (a) Find the height of each bag. (b) Which bag should the theater choose to reduce the amount of paper needed? Explain.

a. Find the height of each bag.

$$\begin{array}{r|l} 96 \div 12 & 12h \\ \hline 8 & = h \end{array} \quad \begin{array}{r|l} 96 \div 16 & 16h \\ \hline 6 & = h \end{array}$$



b. To determine the amount of paper needed, find the surface area of each bag.

$$\begin{aligned} & 2(3 \text{ in} \cdot 8 \text{ in}) + 2(4 \text{ in} \cdot 8 \text{ in}) + (3 \text{ in} \cdot 4 \text{ in}) \\ & 48 \text{ in}^2 + 64 \text{ in}^2 + 12 \text{ in}^2 \\ & 124 \text{ in}^2 \\ & 4(4 \text{ in} \cdot 6 \text{ in}) + (4 \text{ in} \cdot 4 \text{ in}) \\ & 96 \text{ in}^2 + 16 \text{ in}^2 \\ & 112 \text{ in}^2 \end{aligned}$$

Bag B

3. You design Bag C that has a volume of 96 cubic inches. Should the theater in Example 3 choose your bag? Explain.



$$\begin{array}{r|l} 96 \text{ in}^3 & 19.2 \text{ in}^2 \cdot h \\ \hline \div 19.2 \text{ in}^2 & \div 19.2 \text{ in}^2 \\ \hline 5 \text{ in} & = h \end{array}$$

$$B = 19.2 \text{ in}^2$$

$$\begin{aligned} SA &= 2(4 \cdot 5) + 2(4 \cdot 4.8 \cdot 5) + 19.2 \\ & 40 + 48 + 19.2 \\ & \boxed{107.2 \text{ in}^2} \end{aligned}$$

Bag C has the least SA between the 3 bags.