

## Module 5 - Lesson 22:

Find the volumes of right rectangular prisms by using the area of the base.

CCSS Standard – 5.MD.C.5 / 5.MD.C.5.b

**FLUENCY (10-min)****Hidden Addends**

Determine the product then write and say a multiplication equation or related division equation.

0.1

0.2

0.3

0.4

0.5

0.6

0.7

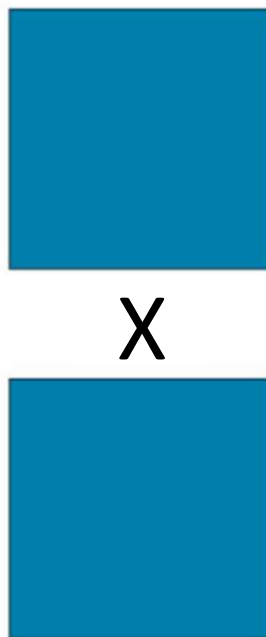
0.8

0.9

Partners A and B: “Product is 0.15”

Partner A “ $0.5 \times 0.3 = 0.15$ ”

Partner B “ $0.15 \div 0.5 = 0.3$ ”

**Task:**

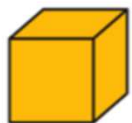
- Place deck of cards facedown.
- Flip over a card and place it on a blue square.
- Both partners say the product.
- Partner A records a MULTIPLICATION equation on their whiteboard.
- Partner B records a DIVISION equation.
- Finish when all cards have been used.

**FLUENCY** (10-min)

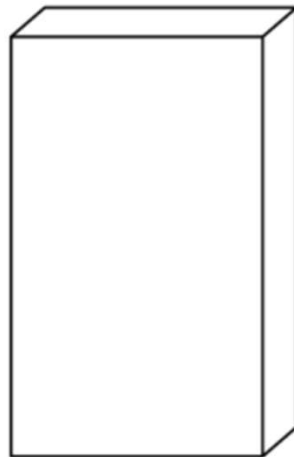
**Counting with Centimeter Cubes**

What is the volume of the layer of centimeters cubes next to the prism?

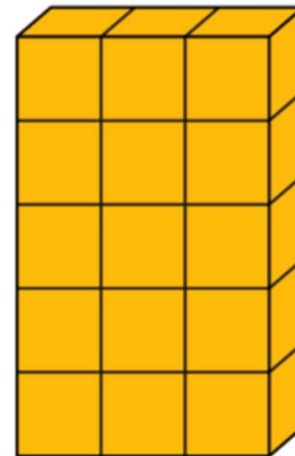
Raise your hand when you know.



= 1 cubic centimeter



*The 3 cubes  
represent one  
layer of the prism.  
How many layers  
will fit in the  
prism?*



*What is the volume of the prism?    **15 cubic centimeters***

**FLUENCY** (10-min)

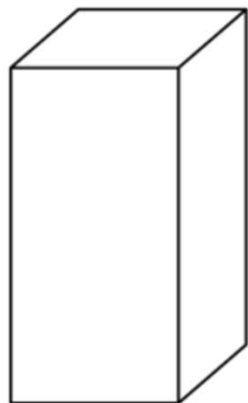
**Counting with Centimeter Cubes**

What is the volume of the layer of centimeters cubes next to the prism?

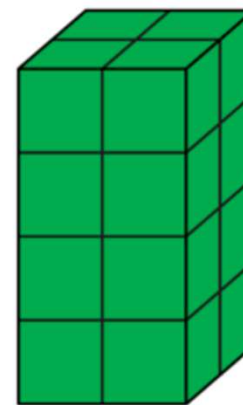
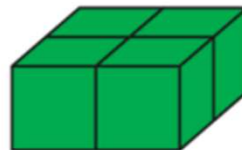
Raise your hand when you know.



= 1 cubic centimeter



*The 4 cubes  
represent one  
layer of the prism.  
How many layers  
will fit in the  
prism?*



*What is the volume of the prism?*    **16 cubic centimeters**

**FLUENCY** (10-min)

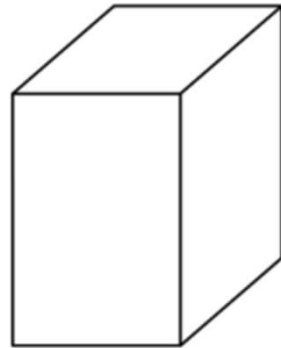
**Counting with Centimeter Cubes**

What is the volume of the layer of centimeters cubes next to the prism?

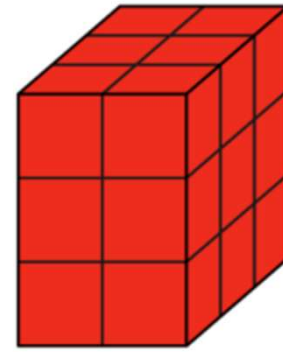
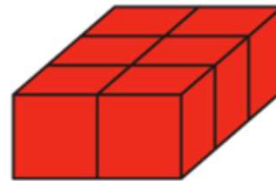
Raise your hand when you know.



= 1 cubic centimeter



*The 6 cubes  
represent one  
layer of the prism.  
How many layers  
will fit in the  
prism?*



*What is the volume of the prism?    **18 cubic centimeters***

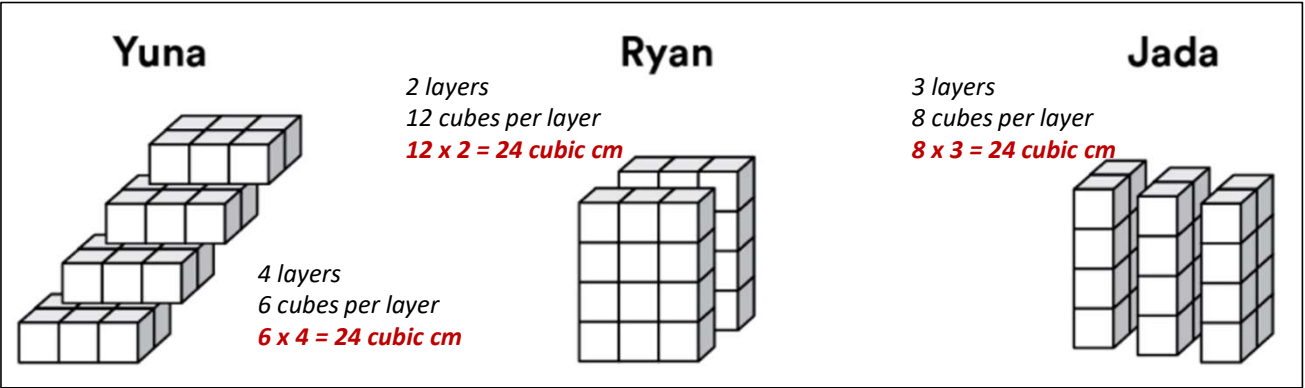
**LAUNCH** (5-min)

## Compare Methods for Finding Volume of Right Rectangular Prisms

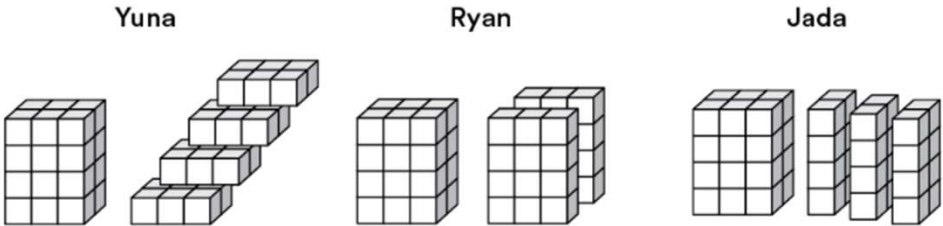
Yuna, Ryan, and Jada each use layers composed of centimeter cubes to build right rectangular prisms.

**THINK-PAIR-SHARE:**  
Do the three prisms have the same volume?

The prisms that Yuna, Ryan, and Jada composed use different layers, but have the same dimensions 3 x 2 x 4 and therefore the same volume.



Let’s record some information about the composition in the table.



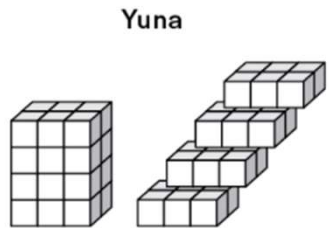
Student	Number of Cubes in Each Layer	Number of Layers	Volume (cubic centimeters)
Yuna	6	4	24
Ryan	12	2	24
Jada	8	3	24

Today, we will determine another way to find the volume of right rectangular prisms.

## LEARN (35-min)

## Write a Formula

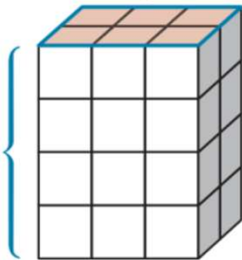
Let's take a closer look at Yuna's prism.



Student	Number of Cubes in Each Layer	Number of Layers	Volume (cubic centimeters)
Yuna	6	4	24

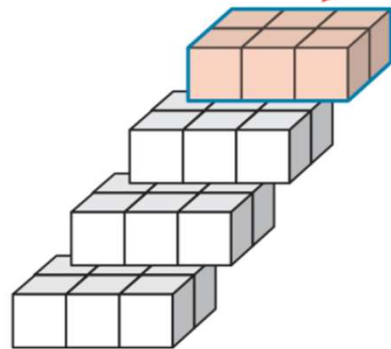
Area of the top face:  
6 square centimeters

Height:  
4 centimeters



$$V = 6 \times 4$$

Volume of the top layer:  
6 cubic centimeters



4 layers

$$V = 6 \times 4$$

We can calculate the volume of a prism by multiplying the number of cubic centimeters in **ONE LAYER**, 6, by the **NUMBER OF LAYERS**, 4.

We can also calculate the volume by multiplying the number of **SQUARE CENTIMETERS IN THE TOP FACE**, 6 by the number of **CENTIMETERS IN THE HEIGHT** of the prism, 4.

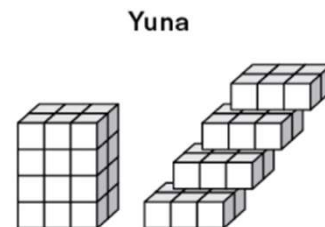
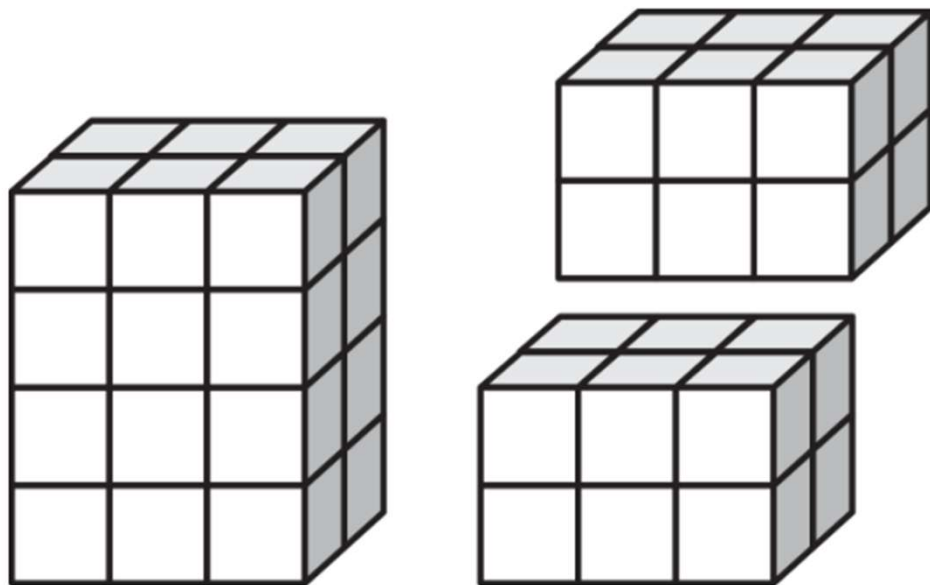
$$V = B \times h$$

Volume                  Base                  Height

**LEARN** (35-min)

**Write a Formula**

Kelly composes the same prism as Yuna, also by using horizontal layers, but he uses two layers instead of four.



What is the volume of each layer?

12 cubic centimeters

What is the area of the base Kelly's prism?

The base is still 6 cubic centimeters

Can Kelly calculate the total volume of his prism by multiplying the area of the base by the number of layers?

No!  $6 \times 2$  would only give half of the volume, 12 not 24.

When we calculate volume, we multiply the **area of the base** by the **height of the prism**, not by the number of layers because the number of layers is not always equal to the height.

## LEARN (35-min)

### Use the Area of a Base to Find Volume

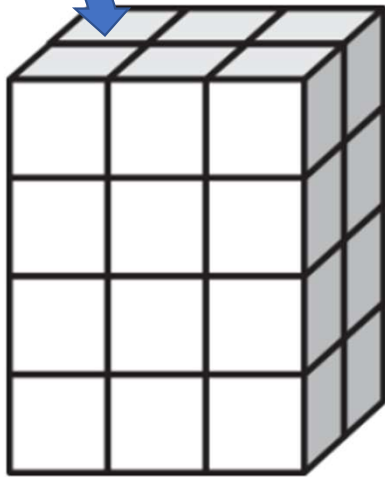
Imagine that we laid the prism we have been working with on a different side.  
Do the prisms have the same volume? How do you know?

#### TAKE-AWAY:

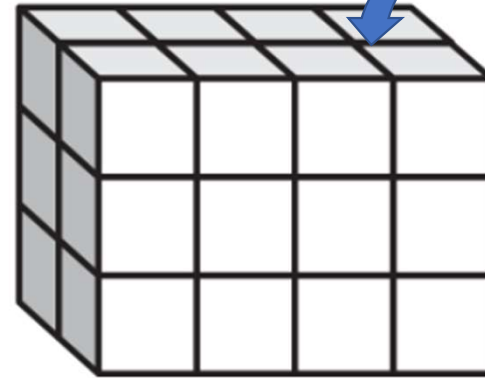
We determined that, no matter which face is on the bottom of the prism, its volume is 24 cubic cm.

We can choose ANY face of the prism to be the base! Once you choose a base, you need to know edge that shows the height.

When we first calculated the volume of this prism, we used the face with side lengths of 2 cm and 3 cm as the base. ( $2 \times 3 = 6$ ) We used the edge that measures 4 cm as the height.



$$\begin{array}{r} V = B \times h \\ 6 \times 4 \\ \hline 24 \text{ cubic cm} \end{array}$$



When we calculated the volume of this prism, we used the face with side lengths of 2 cm and 4 cm as the base. ( $2 \times 4 = 8$ ) We used the edge that measures 3 cm as the height.

$$\begin{array}{r} V = B \times h \\ 8 \times 3 \\ \hline 24 \text{ cubic cm} \end{array}$$

**LEARN** (35-min)

**Use the Area of a Base to Find Volume**

LEARN book page 225.

1. The area of the base of a right rectangular prism is 28 square inches and the height is 6 inches.  
What is the volume of the right rectangular prism?

$$\begin{array}{r} V = B \times h \\ 28 \times 6 \\ 168 \text{ cubic in} \end{array}$$

Using a formula is more efficient than decomposing a prism into layers or drawing the prism.

**Formulas make our work easier.**

As an example of this, how would doubling the height of this prism from 6 to 12 affect the volume?

What are possible lengths and widths for the base of 28 square inches?

$$7 \times 4 = 28$$

$$14 \times 2 = 28$$

$$28 \times 1 = 28$$

$$\begin{array}{r} V = B \times h \\ 28 \times 12 \\ 336 \text{ cubic in} \end{array}$$

Doubling the height would double the volume.

**LEARN** (35-min)

**Find Unknown Height or Area of a Base**

The volumes of the right rectangular prisms are shown.



**THINK-PAIR-SHARE:**

What other information can you determine about each prism?

This is the **BASE** of Prism A.  
Area =  $L \times W$   
 $3 \times 2 = 6$

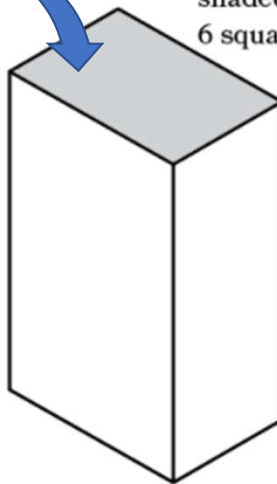
The volume of the prism is given to us as **30 cubic cm.**

So,  **$V = B \times H$**   
 $30 = 6 \times ?$

The height has to be **5 cm.**

**Prism A**

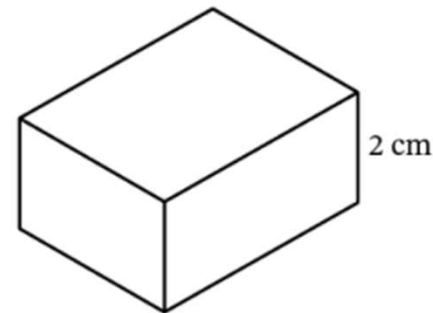
The area of the shaded face is 6 square centimeters.



Volume: 30 cubic centimeters

Prism B has a height of 2 cm and a volume of 24 cubic cm.

So,  **$V = B \times H$**   
 $24 = ? \times 2$



The base has to be **12 cm.**

Volume: 24 cubic centimeters

**Prism B**

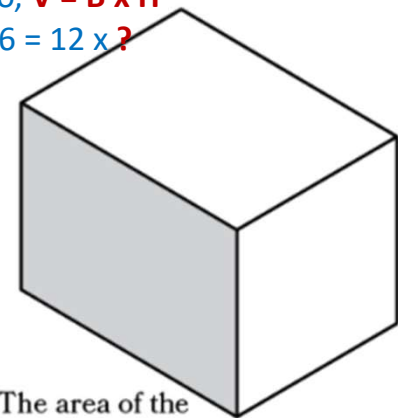
The shaded part is the **BASE** of Prism C.

Area =  $L \times W$

It could be  $4 \times 3 = 12$

The volume of the prism is given to us as **36 cubic cm.**

So,  **$V = B \times H$**   
 $36 = 12 \times ?$



The area of the shaded face is 12 square centimeters.

The height has to be **3 cm.**

Volume: 36 cubic centimeters

**Prism C**

**LEARN** (35-min)

Use the Area of a Base to Find Volume

$$V = B \times h$$

$$= 8 \times 4$$

$$32$$

$$V = B \times h$$

$$32 = 8 \times ?$$

$$V = B \times h$$

$$32 = ? \times 4$$

**We can use these formulas to solve many types of problems.**

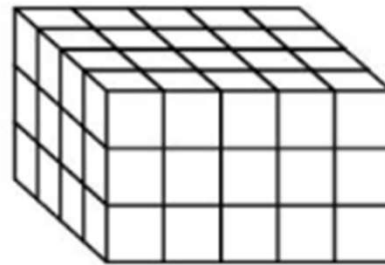
- If we know the height and the area of the base of a right rectangular prism, we can find the volume.
- If we know the area of the base and the volume of a right rectangular prism, we can find the height.
- If we know the height and the volume of a right rectangular prism, we can find the area of the base.

**LEARN** (35-min)

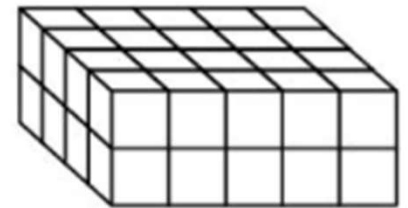
## Problem Set

1. The right rectangular prisms shown are made of centimeter cubes. Circle the two right rectangular prisms that have the same volume.

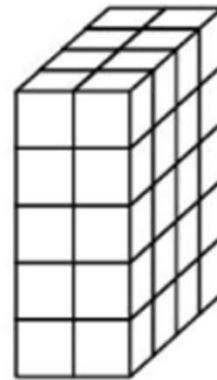
LEARN book page 227.



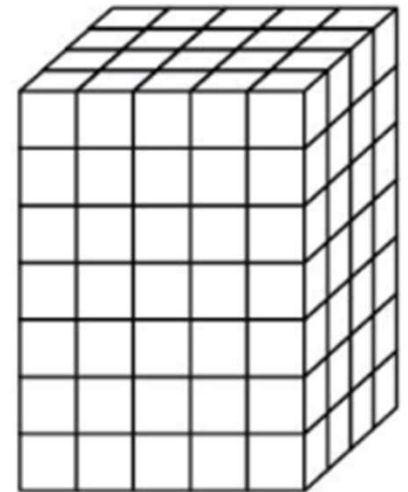
$$\begin{aligned} V &= B \times H \\ &= 20 \times 3 \\ &= 60 \text{ cubic units} \end{aligned}$$



$$\begin{aligned} V &= B \times H \\ &= 20 \times 2 \\ &= 40 \text{ cubic units} \end{aligned}$$



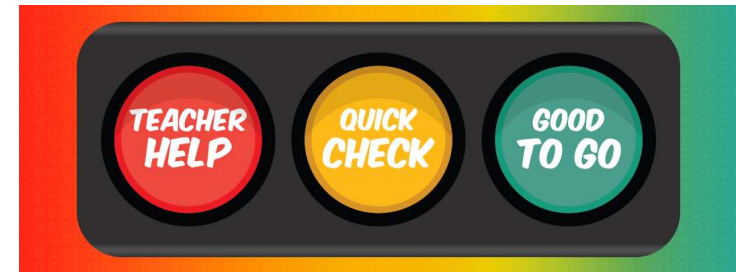
$$\begin{aligned} V &= B \times H \\ &= 8 \times 5 \\ &= 40 \text{ cubic units} \end{aligned}$$



$$\begin{aligned} V &= B \times H \\ &= 20 \times 7 \\ &= 140 \text{ cubic units} \end{aligned}$$

**LAND** (10-min)

## Exit Ticket



\_\_\_\_\_  
Name

\_\_\_\_\_  
Date



**22**

Calculate the volume of each right rectangular prism.

1. The area of the base is 18 square centimeters and the height is 2 centimeters.
2. The area of the base is 18 square centimeters and the height is 4 centimeters.

Exit Ticket – PAGE 231

### Small Group Time:

Problem Set Pages 227 - 230

### Homework:

Page 141 APPLY BOOK