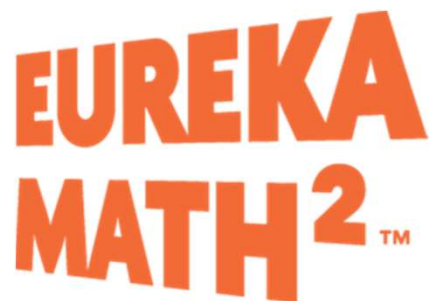




Module 5 - Lesson 17:

Find the volume of right rectangular prisms by packing with unit cubes and counting.

CCSS Standard – 5.MD.C.3.a / 5.MD.C.3.b / 5.MD.C.4

FLUENCY (10-min)

Beep Counting by 3 Tenths by 7 Tenths



Listen carefully as I count by 3 tenths or 7 tenths. I will replace one of the numbers with the word beep.
Raise your hand when you know the beep number. Ready?

0, 0.3, _____

1.5, _____, 2.1

1.5, 1.2, _____

3.0, _____, 2.4

0, 0.7, _____

3.5, _____, 4.9

3.5, 2.8, _____

7.0, _____, 5.6

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

Determine the sum then write and say an addition equation or related subtraction equation.

0.1

0.2

0.3

0.4

0.5

0.6

0.7

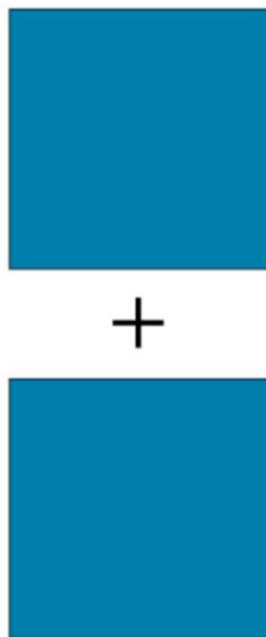
0.8

0.9

Partner A and B: "Sum is 0.8"

Partner A "0.5 + 0.3 = 0.8"

Partner B "0.8 - 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 sum.
- Partner A records an ADDITION equation on their whiteboard.
- Partner B records a SUBTRACTION equation.
- Finish when all cards have been used.

Teacher Note: Combine tenths, hundredths, whole numbers for more challenge.

LAUNCH (5-min)

Reason which container takes up more space.

SILENT THINK TIME (1-minute)

Share your thinking with a partner.
Be sure to discuss thinking about
measurement relationships and strategies.

Today, we will measure the amount of space
that right rectangular prisms take up.

Which prism takes up more space?



Right Rectangular Prism A

Right Rectangular Prism B

LEARN (35-min)

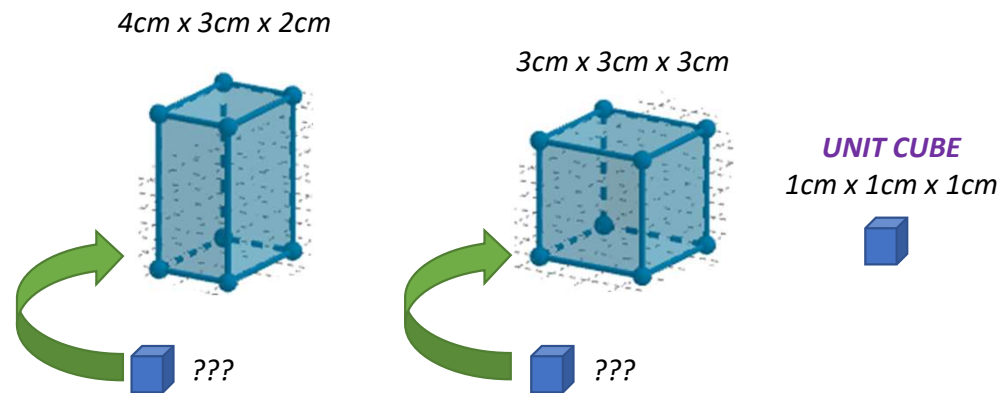
Pack Prisms

TASK:

Determine the amount of space that the right rectangular prisms take up by packing the prisms completely with unit cubes.

Materials:

- 4 cm x 3 cm x 2 cm prism
- 3 cm x 3 cm x 3 cm prism
- 40 centimeter cubes
- Ruler
- LEARN book page 165



We can use unit squares to tile two-dimensional shapes and measure the shape's area in square units. One way to measure the amount of space a three-dimensional object takes up is to pack it with cubes.

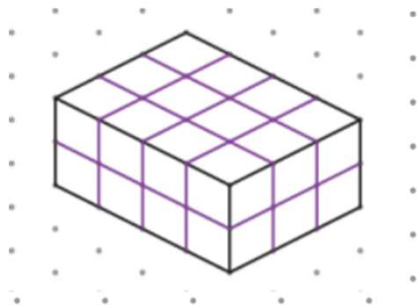
Because a cube's faces are squares and the sides of a square are the same length, the edges of a cube are the same length. When the edges of a cube each measure 1 unit, we call the cube a **unit cube**.

LEARN (35-min)

Pack Prisms

1. Sketch to show the number of unit cubes visible on the faces of the right rectangular prism. In the blank, write the total number of unit cubes it takes to pack the prism.

4cm x 3cm x 2cm



Number of unit cubes: **24**

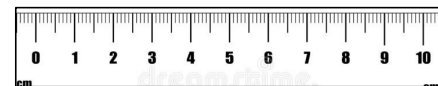
LEARN book 165.

How many **cubic units** of space does the right rectangular prism measuring 4 cm x 3 cm x 2 cm take up?

Because there are 24 unit cubes packed in the prism, we can say the prism's **volume is 24 cubic units**. The volume of a 3-dimensional shape is the **amount of space it takes up**.

If someone packed this prism with only 20 cubes, can we say the prism's volume is 20 cubic units?

No! The prism was not packed all the way. The prism must have no gaps or overlaps.



UNIT CUBE
1cm x 1cm x 1cm

This cube is called a **centimeter cube** because its edges each measure 1 centimeter. A centimeter cube takes up **1 cubic centimeter of space**.

This rectangular prism measures 4 cm by 3 cm by 2 cm.

Volume = Length x Width x Height or

Volume = AREA x Height

LEARN (35-min)

Pack Prisms



UNIT CUBE

1cm x 1cm x 1cm



*Does a paper clip
take up space?*

*Yes. So, although we can't pack
a paper clip with unit cubes, the
paper clip does have volume.*

*Do you think a paper clip's
volume is **greater than or less
than** 24 cubic centimeters?*

*A paper clip's volume is **LESS THAN**
24 cubic centimeters because it
takes up less space.*



Does a person take up space?

*Yes. So, although we can't pack a person with unit cubes, a
person has volume.*

*Do you think a person's volume is **greater than or less than**
24 cubic centimeters?*

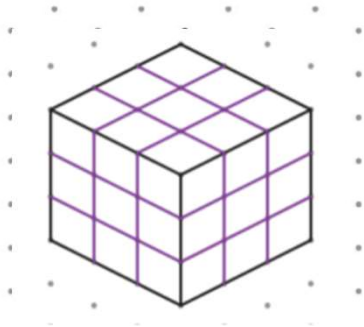
*A person's volume is **GREATER THAN** 24 cubic centimeters
because a person takes up more space.*

LEARN (35-min)

Pack Prisms

2. Sketch to show the number of centimeter cubes visible on the faces of the right rectangular prism. Then complete the table.

$3\text{cm} \times 3\text{cm} \times 3\text{cm}$



Length (centimeters)	Width (centimeters)	Height (centimeters)	Volume (cubic centimeters)
3	3	3	27

LEARN book 165.

What do you notice about this prism?

How can we measure this prism's **VOLUME** - the amount of space it takes up?

Before you pack this prism with unit cubes, estimate the prism's volume.

Because there are 27 unit cubes packed in the prism, we can say the prism's **volume is 27 cubic units**. The volume of a 3-dimensional shape is the **amount of space it takes up**.

This rectangular prism measures 3 cm by 3 cm by 3 cm.

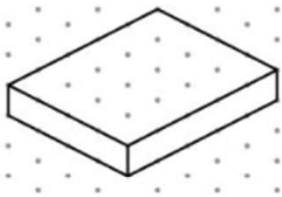
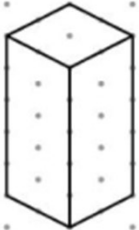
Volume = Length x Width x Height or

Volume = AREA x Height

LEARN (35-min)**Compare Volumes**

LEARN book page 166.

3. Complete the table for each right rectangular prism.

Right Rectangular Prism	Length (centimeters)	Width (centimeters)	Height (centimeters)	Volume (cubic centimeters)
	5	4	1	20
	10	4	1	40
	2	2	5	20
	2	4	5	40

PREDICT: Which of these new prisms do you think has a greater volume?

TASK: Pack both prisms with centimeter cubes and complete the table.

Although the prisms have different dimensions, the volume is the same.

THINK: If we double ONE of the dimensions of the prisms, what do you think happens?

The volume doubled!

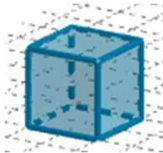
Each time we double a dimension of a right rectangular prism, the volume is doubled.

LEARN (35-min)

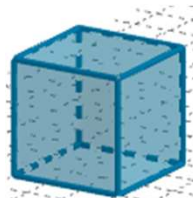
Compare Cubic Units



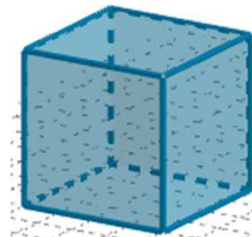
Volume
 $1\text{ cm} \times 1\text{ cm} \times 1\text{ cm}$
1 cubic cm



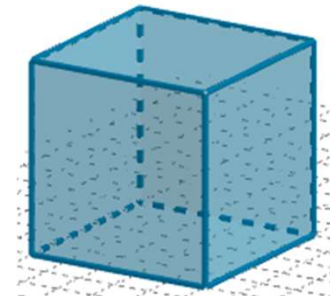
Volume
 $2\text{ cm} \times 2\text{ cm} \times 2\text{ cm}$
8 cubic cm



Volume
 $3\text{ cm} \times 3\text{ cm} \times 3\text{ cm}$
27 cubic cm

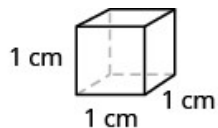


Volume
 $4\text{ cm} \times 4\text{ cm} \times 4\text{ cm}$
64 cubic cm

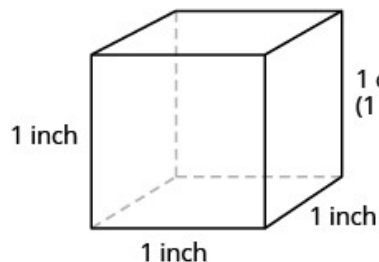


Volume
 $5\text{ cm} \times 5\text{ cm} \times 5\text{ cm}$
125 cubic cm

A prism built with inch cubes takes up more space and has greater volume than a prism built with the same number of centimeter cubes. A cubic inch is the volume of an inch cube and is greater than a cubic centimeter.



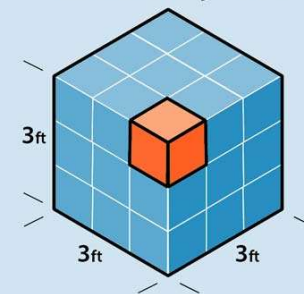
1 cubic centimeter
(1 cu. cm or 1 cm^3)



1 cubic inch
(1 cu. in. or 1 in^3)

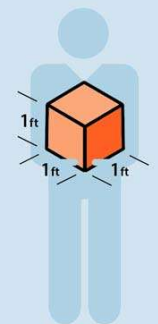
We can measure volume in other cubic units, such as cubic feet, cubic yards, or even cubic miles!

1 cubic yard



1 cubic yard = 27 cubic feet

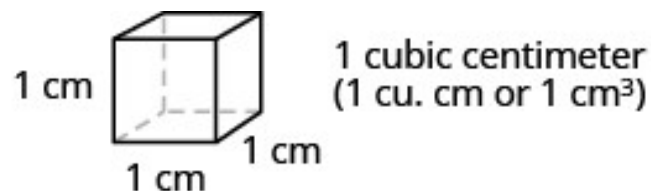
1 cubic ft



LEARN (35-min)

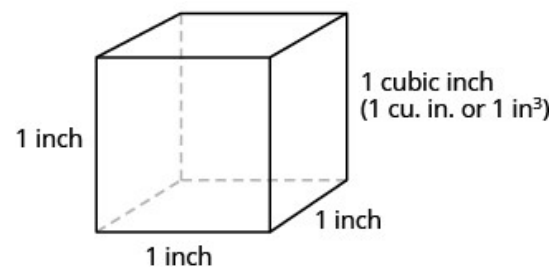
Problem Set

LEARN book page 167.



For problems 1–3, fill in the blanks.

1. A unit cube takes up 1 cubic unit of space.
2. A centimeter cube takes up 1 cubic centimeter of space.
3. An inch cube takes up 1 cubic inch of space.



LEARN book page 167.

For problems 4–7, circle the measurement with the greater volume.

4. 1 cubic foot or 1 cubic inch

5. 1 cubic inch or 1 cubic centimeter

6. 1 cubic centimeter or 1 cubic foot

7. 1 cubic foot or 13 cubic inches



Exit Ticket – PAGE 171

Small Group Time:
Problem Set Pages 167 - 169

Homework:
Page 109 APPLY BOOK

17

Name _____ Date _____

Tara draws to represent a right rectangular prism packed with centimeter cubes. Use the prism to complete parts (a)–(c).

a. How many centimeter cubes are packed in the right rectangular prism?

b. Complete the table.

Length (centimeters)	Width (centimeters)	Height (centimeters)	Volume (cubic centimeters)

c. Blake's right rectangular prism has the dimensions shown.