CITYTUTOR DC

Fifth Grade Math Lesson Materials

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Identification of the copyrighted work claimed to have been infringed, or, if multiple copyrighted works allegedly have been infringed, then a representative list of such copyrighted works;

Identification of the material that is claimed to be infringing and that is to be removed or access to which is to be disabled, and information reasonably sufficient to permit us to locate the allegedly infringing material, e.g., the specific web page address on the Platform;

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CITYTUTOR DC

G5 Unit 5:

Area and Volume

G5 U5 Lesson 1

Find the volume of a right rectangular prism by packing with cubic units and counting.

G5 U5 Lesson 1 - Students will find the volume of a right rectangular prism by packing with cubic units and counting

Warm Welcome (Slide 1): Tutor choice

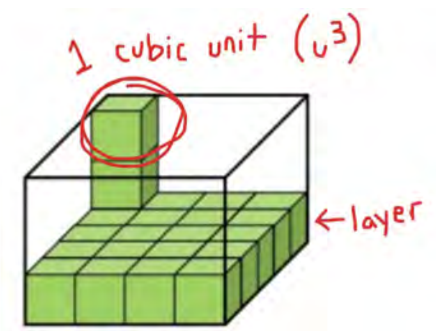
Frame the Learning/Connect to Prior Learning (Slide 2): Today is our first lesson of a new unit all about volume and area. Today, we'll focus on the concept of volume. The term volume has several meanings in everyday life. For instance, you can control the volume on your iPad or the TV. The volume we're exploring in this unit is different. When we talk about volume in math, we're talking about the amount of three-dimensional space an object takes up. For instance, a swimming pool has volume. We can think of how much water it would take to fill the swimming pool as its volume. A balloon has volume. We can think of how much air is inside the balloon as its volume. Can you think of other things that have volume? Possible Student Answers, Key Points:

- The room we're in right now has volume.
- A soda can or a water bottle has volume.

Examples of things that have volume are everywhere. Today, we're going to focus on finding the volume of right rectangular prisms by packing with cubic units and counting.

Let's Talk (Slide 3): Before we work on a few problems, take a second and look at these images. What do you notice? What do you wonder? Possible Student Answers, Key Points:

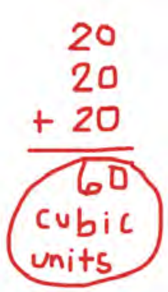
- I notice they're all box-shaped. I see they're all examples of rectangular prisms. I notice they are all objects that are 3D.
- I wonder if these are all examples of things that have volume. I wonder how much fits inside each. I wonder why the last picture isn't full of cubes.



These are all examples of rectangular prisms. Since rectangular prisms are three-dimensional, or 3D, figures, we can find their volume. We measure the volume of objects using cubic units or unit cubes. *(circle and label the top cubic unit in the rightmost figure)* This is one cubic unit, or one unit cube. We sometimes see cubic units abbreviated as u^3. *(write u^3)*

The number of cubic units it takes to completely pack a figure without any gaps is its volume. Let's think about how many cubes it would take to pack this rectangular prism. Take a look at how many cubes are already packed in just the bottom layer. *(label the bottom layer)*

I see 5 rows of 4 cubes are packed into the bottom layer. *(trace and count each row of 4 with your finger)* How many cubes are in just the bottom layer? (20) There are 20 cubes in the bottom layer. That's not the volume of the prism yet, because the stack of cubes in the back of this prism show me that we could fit two more layers of cubes.

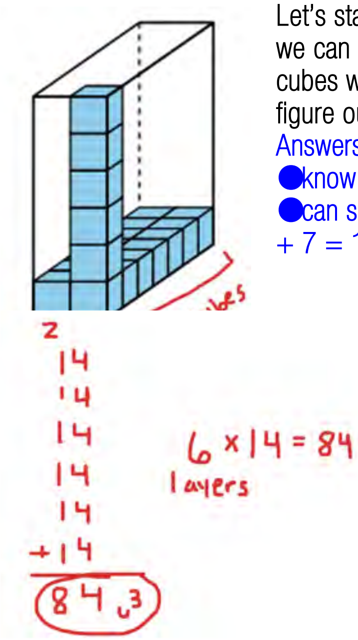


If the bottom layer has 20 cubes, I know we could back another layer of 20 cubes on top of that. Then, we could pack 20 more cubes on top of that. 20 cubes in the bottom layer, 20 cubes in the middle layer, and 20 cubes in the top layer. *(write 20 + 20 + 20 vertically to mimic the layers in the prism)* How many cubes could we pack into this rectangular prism? (60) Great, we can say the volume of this rectangular prism is 60 cubic units, because we could pack the entire figure with 60 unit cubes. We just found the volume of a rectangular prism!

Let's Think (Slide 4): Take a look at this next rectangular prism. What can we already tell about this figure based on the image? Possible Student Answers, Key Points:

- I know it has volume, because it is three-dimensional. We can pack it with cubes.
- I know the figure is 6 cubes tall, because I see the stack of 6 cubes. I know the figure is 2 cubes across. I see it goes 6 cubes back.
- I know the bottom layer is packed with cubes.

We see some unit cubes already packed into this rectangular prism. This problem shows use the bottom layer completely packed in, and it also shows us a tower of cubes so we know how tall the prism is. This helps us think about how many layers we'll need to stack to consider the volume.



Let's start by looking at just the bottom layer. The tower of cubes blocks our view of some of that layer, but we can still figure out how many cubes are packed into the bottom of our prism. I see the bottom layer is 2 cubes wide and 7 cubes long, or deep. *(label 2 cubes and 7 cubes with brackets)* Knowing this, how can I figure out the number of cubes in the bottom layer even though some are obscured? Possible Student Answers, Key Points:

- I know 7 rows of 2 is 14. I can think 7 x 2 or 2 x 7.
- I can see one column of 7 cubes, so I know the other column that is blocked by the tower is also 7 cubes. 7 + 7 = 14

7 rows of 2 cubes, means the bottom layer is packed with 14 cubes. Look at the stack of cubes from the bottom to top of the prism. How many layers will we need to fill this rectangular prism completely? (6 layers) We would need to pack this box with 6 layers of 14 cubes to fill it completely. *(write 14 + 14 + 14 + 14 + 14 + 14 vertically to mimic the layers)* If we add up 6 layers of 14 cubes, we get a volume of 84 cubic units. *(write 84 u^3)* That much repeated addition can be time-consuming. If we wanted to be more efficient, we can find 6 layers of 14 cubes using multiplication. *(write 6 layers x 14 = 84)*

We just found the volume of the rectangular prism. What thinking did we have to do to arrive at our volume? How would you describe this process to a friend? Possible Student Answers, Key Points:

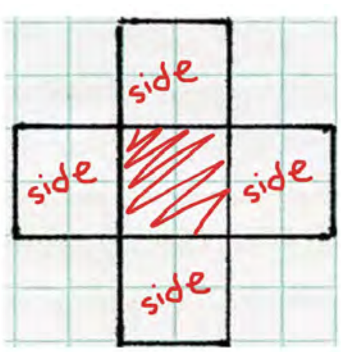
- We looked at the picture and thought about how many cubes were in the bottom layer and how many layers we need to pack the rectangular prism to the top.
- We found the number of cubes packed into the bottom. Since each layer is the same size, we could just keep adding layers or use multiplication to help us find how many cubes pack the whole box.

Excellent work. Let's look at one more example.

Let's Think (Slide 5): *(read the problem aloud)* Does this flat drawing have volume? Possible Student Answers, Key Points:

- No, you can't pack cubes into something flat.
- No, volume is the amount of 3D space an object takes up. The drawing is two-dimensional.

A flat drawing does not have volume, but Tina is going to take this flat drawing, cut it out, and fold it up so that it forms a rectangular prism. Our job is to figure out how many cubes can fit into the figure once she folds it into a box.



We can think of this middle square as being the bottom of Tina's box if she folds it. *(lightly shade the middle square so the grid lines are still visible)* The other squares will fold up to form the sides of the box. *(label the other squares as sides)*

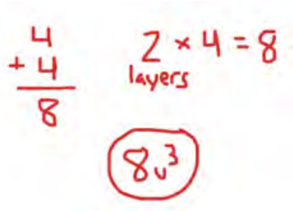
TEACHER NOTE: If possible, having a physical replica of Tina's figure to actually fold can make visualizing the rectangular prism easier.

We can imagine the bottom of the box, with the four other squares folded up to make the sides of the rectangular prism. Tina's box wouldn't have a top. Now let's think about how many cubes we could pack in the figure. How many cubes could we put into the bottom layer, and how do you know? Possible Student Answers, Key Points:

- We can pack four cubes in the bottom layer.
- The bottom layer looks like a square that has lengths of 2 units. 2 x 2 = 4

Four cubes can fit in the bottom layer. If we packed 4 cubes in the bottom layer, would the rectangular prism be full? (No.) The sides that Tina will fold up have side lengths of 2 units, which means the box she makes would be 2 units tall. We could pack in another layer of 4 cubes to fill the prism. If we packed in another layer of 4 cubes on top of the original layer, how could we find the volume of Tina's folded figure? Possible Student Answers, Key Points:

- The bottom layer is 4, and the top layer is 4. If I counted all the cubes, it would take 8 to fill the box.
- The volume is 8 cubic units. There are 2 layers of 4 cubes, so I can think of 2 x 4 = 8.



The volume of Tina's figure is 8 cubic units, or 8 u^3. A layer of 4 cubes plus a layer of 4 cubes, means it takes 8 cubes to pack the box. *(write 4 + 4 = 8 vertically to mimic the layers of the prism)* We can also think of it as 2 layers of 4, and we can multiply 2 x 4 to find the volume. *(write 2 layers x 4 = 8, then write 8 cubic units as the answer)*

Great work!

Let's Try it (Slides 6 - 7): Now let's work on finding the volume of right rectangular prisms by packing with unit cubes and counting together. To find the volume of a rectangular prism, we just need to determine how many unit cubes it takes to completely pack the figure. Thinking about the cubes in one layer and how many layers we need to completely pack the prism can help us find the volume. When can count cubes individually or we can find more efficient ways of counting by thinking of equal groups of cubes. Looking at rows, columns, and stacks of cubes can help us find efficient ways to count cubic units. Let's try out what we've been learning.

WARM WELCOME

Today we will find the volume of a right rectangular prism by packing with cubic units and counting.

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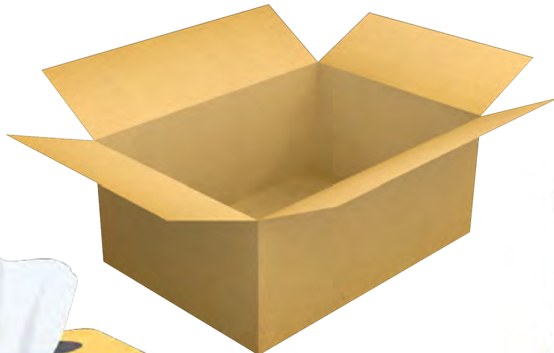
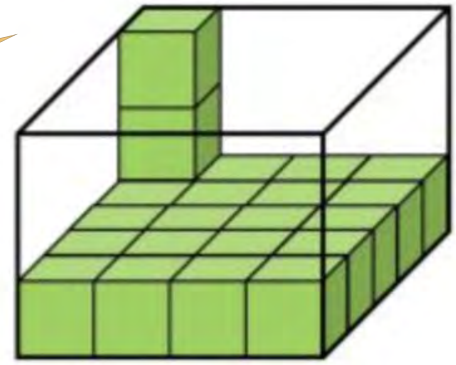
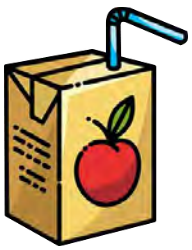
Let's Talk:

What do you notice? What do you wonder?

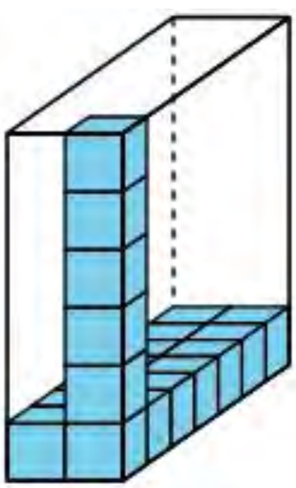






Let's Think:

How many cubes would fill the box?



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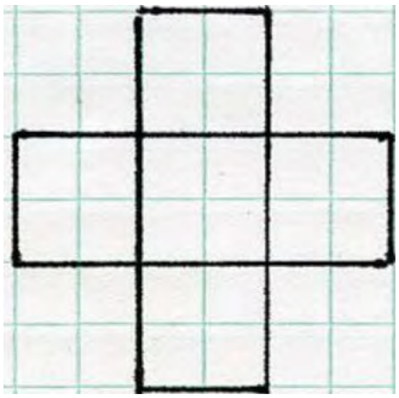
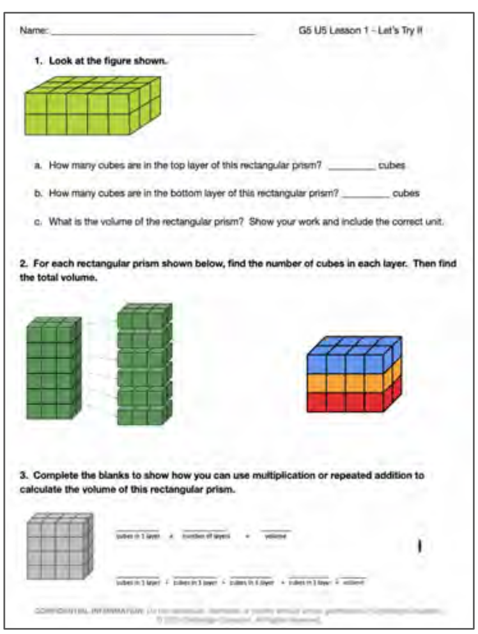
Let's Think:

Tina is going to cut out the figure and fold it to make a box. How many cubes would fit in the box? What is the volume?



Let's Try It:

Let's explore finding the volume of a right rectangular prism by packing with cubic units and counting together.



Name: ______________________ G5 U5 Lesson 1 - Let's Try It

1. **Look at the figure shown.**

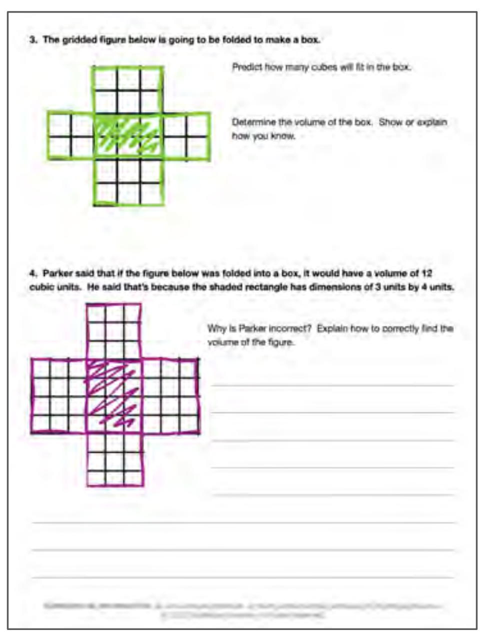
a. How many cubes are in the top layer of this rectangular prism? ________ cubes

b. How many cubes are in the bottom layer of this rectangular prism? ________ cubes

c. What is the volume of the rectangular prism? Show your work and include the correct unit.

2. **For each rectangular prism shown below, find the number of cubes in each layer. Then find the total volume.**

3. **Complete the blanks to show how you can use multiplication or repeated addition to calculate the volume of this rectangular prism.**



3. **The gridded figure below is going to be folded to make a box.**

Predict how many cubes will fit in the box.

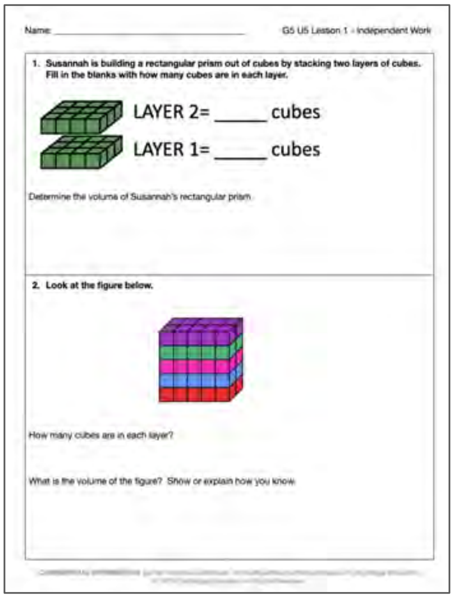
Determine the volume of the box. Show or explain how you know.

4. **Parker said that if the figure below was folded into a box, it would have a volume of 12 cubic units. He said that's because the shaded rectangle has dimensions of 3 units by 4 units.**

Why is Parker incorrect? Explain how to correctly find the volume of the figure.

On your Own:

Now it's time to find the volume of a rectangular prism by packing with cubic units and counting on your own.



Name: ______________________ G5 U5 Lesson 1 - Independent Work

1. Susannah is building a rectangular prism out of cubes by stacking two layers of cubes. Fill in the blanks with how many cubes are in each layer.

LAYER 2= _____ cubes

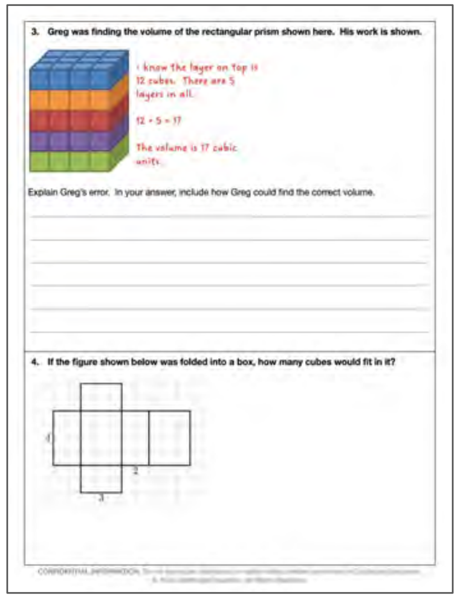
LAYER 1= _____ cubes

Determine the volume of Susannah's rectangular prism.

2. Look at the figure below.

How many cubes are in each layer?

What is the volume of the figure? Show or explain how you know.



3. Greg was finding the volume of the rectangular prism shown here. His work is shown.

I know the layer on top is 12 cubes. There are 5 layers in all.

12 + 5 = 17

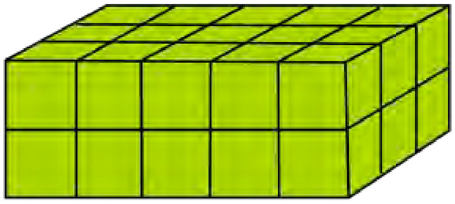
The volume is 17 cubic units.

Explain Greg's error. In your answer, include how Greg could find the correct volume.

4. If the figure shown below was folded into a box, how many cubes would fit in it?

Name: ____ G5 U5 Lesson 1 - Let's Try It

1. Look at the figure shown.

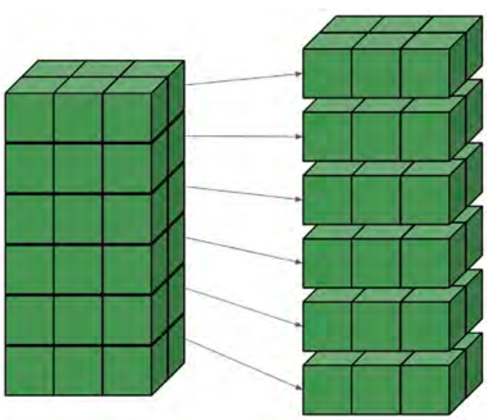


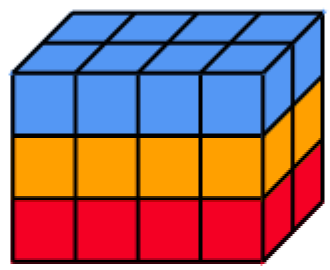
a. How many cubes are in the top layer of this rectangular prism? __________ cubes

b. How many cubes are in the bottom layer of this rectangular prism? __________ cubes

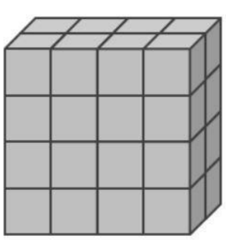
c. What is the volume of the rectangular prism? Show your work and include the correct unit.

2. For each rectangular prism shown below, find the number of cubes in each layer. Then find the total volume.





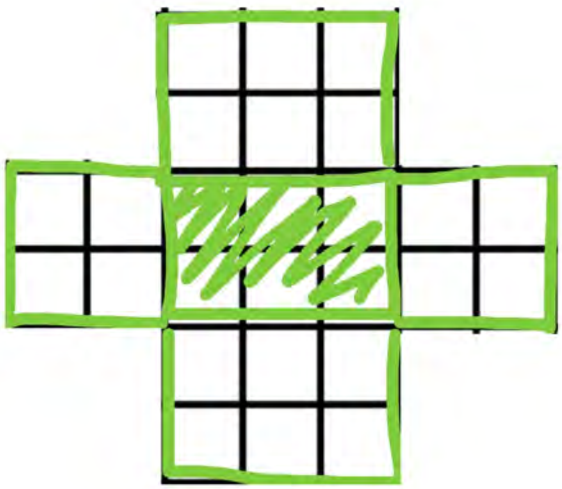
3. Complete the blanks to show how you can use multiplication or repeated addition to calculate the volume of this rectangular prism.



________ x ________ = ________
cubes in 1 layer x number of layers = volume

________ + ________ + ________ + ________ = ________
cubes in 1 layer + cubes in 1 layer + cubes in 1 layer + cubes in 1 layer = volume

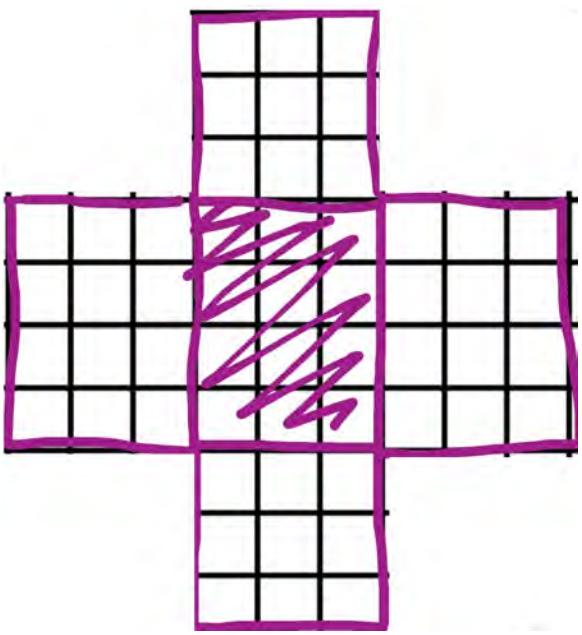
3. The gridded figure below is going to be folded to make a box.



Predict how many cubes will fit in the box.

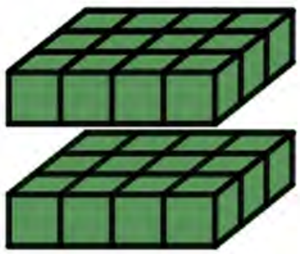
Determine the volume of the box. Show or explain how you know.

4. Parker said that if the figure below was folded into a box, it would have a volume of 12 cubic units. He said that's because the shaded rectangle has dimensions of 3 units by 4 units.



Why is Parker incorrect? Explain how to correctly find the volume of the figure.

1. Susannah is building a rectangular prism out of cubes by stacking two layers of cubes. Fill in the blanks with how many cubes are in each layer.

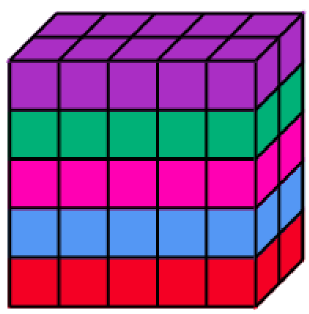


LAYER 2= ______ cubes

LAYER 1= ______ cubes

Determine the volume of Susannah's rectangular prism.

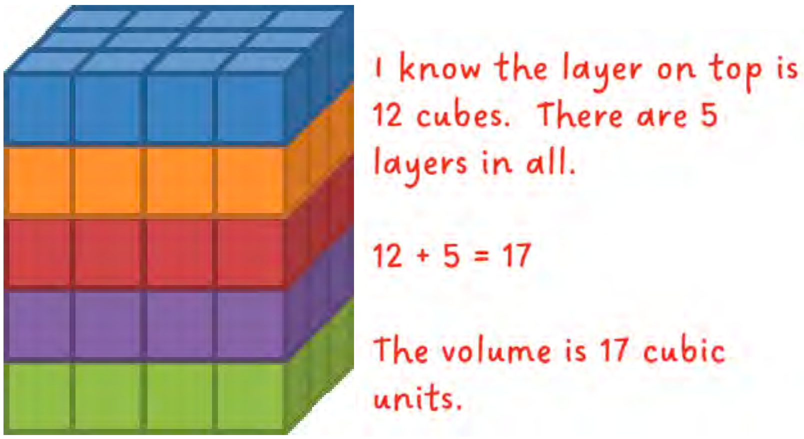
2. Look at the figure below.



How many cubes are in each layer?

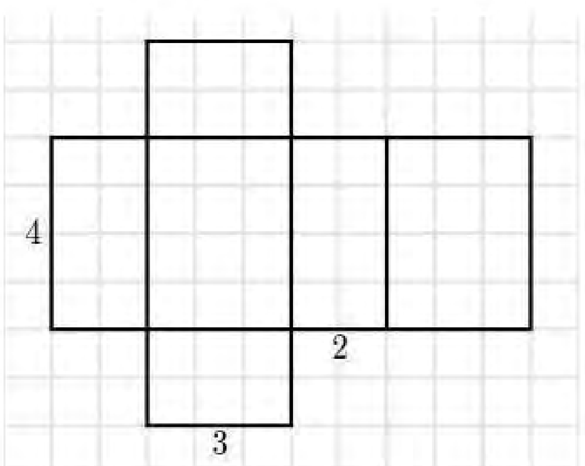
What is the volume of the figure? Show or explain how you know.

3. Greg was finding the volume of the rectangular prism shown here. His work is shown.



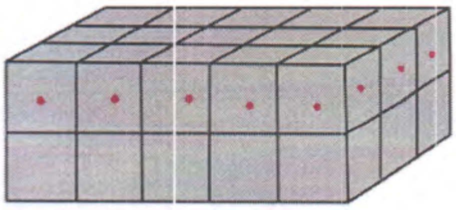
Explain Greg's error. In your answer, include how Greg could find the correct volume.

4. If the figure shown below was folded into a box, how many cubes would fit in it?



Name: KEY

1. **Look at the figure shown.**



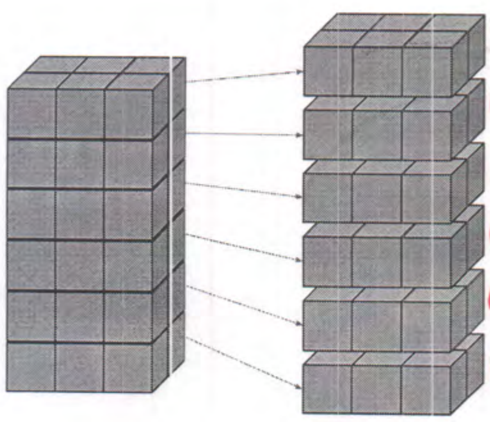
a. How many cubes are in the top layer of this rectangular prism? 15 cubes

b. How many cubes are in the bottom layer of this rectangular prism? 15 cubes

c. What is the volume of the rectangular prism? Show your work and include the correct unit.

15 + 15 = 30   30 cubic units

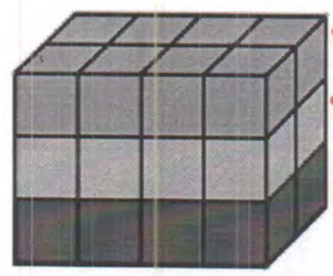
2. For each rectangular prism shown below, find the number of cubes in each layer. Then find the total volume.



6, 6, 6, 6, 6, 6

6 × 6

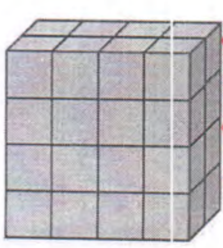
$36u^3$



8, 8, 8

$8 \times 3 = 24u^3$

3. Complete the blanks to show how you can use multiplication or repeated addition to calculate the volume of this rectangular prism.

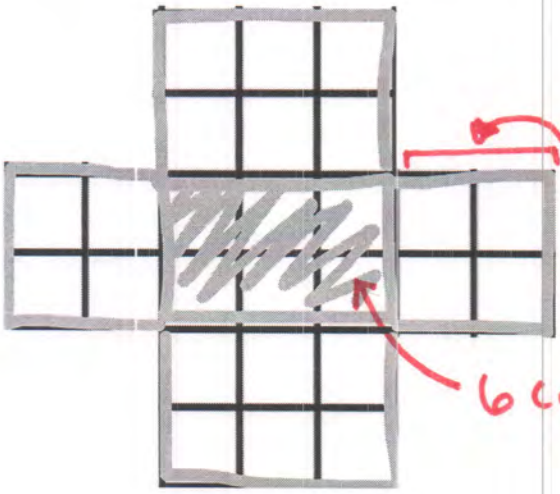


8, 8, 8, 8

8 (cubes in 1 layer) × 4 (number of layers) = $32u^3$ (volume)

8 (cubes in 1 layer) + 8 (cubes in 1 layer) + 8 +8 (cubes in 1 layer) = $32u^3$ (volume)

3. The gridded figure below is going to be folded to make a box.



Predict how many cubes will fit in the box.

I know 6 cubes fit in the bottom, so maybe 12 or 18.

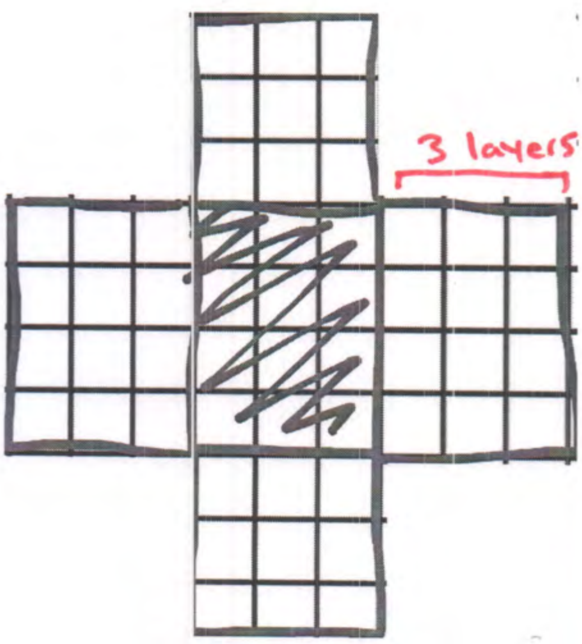
Determine the volume of the box. Show or explain how you know.

the box would be 2 layers tall

6 cubes in bottom layer

6 cubes + 6 cubes = 12 cubes $12u^3$

4. Parker said that if the figure below was folded into a box, it would have a volume of 12 cubic units. He said that's because the shaded rectangle has dimensions of 3 units by 4 units.

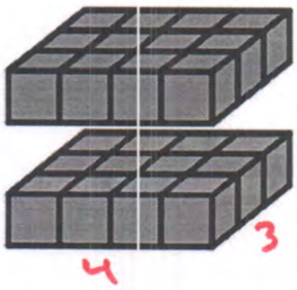


Why is Parker incorrect? Explain how to correctly find the volume of the figure.

The shaded area is just the bottom layer. The bottom layer has 12 cubes, but the prism will have 3 layers. 3 layers of 12 cubes means the volume is 36 cubic units.

Name: KEY

1. Susannah is building a rectangular prism out of cubes by stacking two layers of cubes. Fill in the blanks with how many cubes are in each layer.



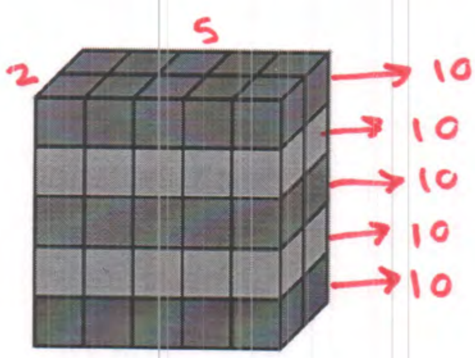
LAYER 2= 12 cubes

LAYER 1= 12 cubes

Determine the volume of Susannah's rectangular prism.

$12 + 12 = 24 u^3$

2. Look at the figure below.



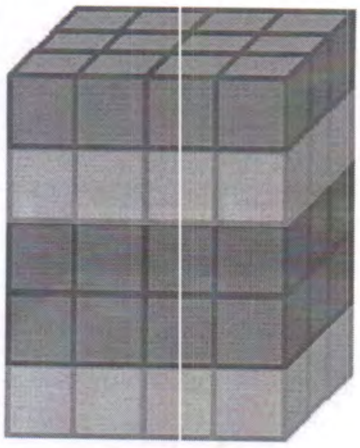
How many cubes are in each layer?

10 cubes

What is the volume of the figure? Show or explain how you know.

5 layers × 10 cubes = 50 cubic units

3. Greg was finding the volume of the rectangular prism shown here. His work is shown.



I know the layer on top is 12 cubes. There are 5 layers in all.

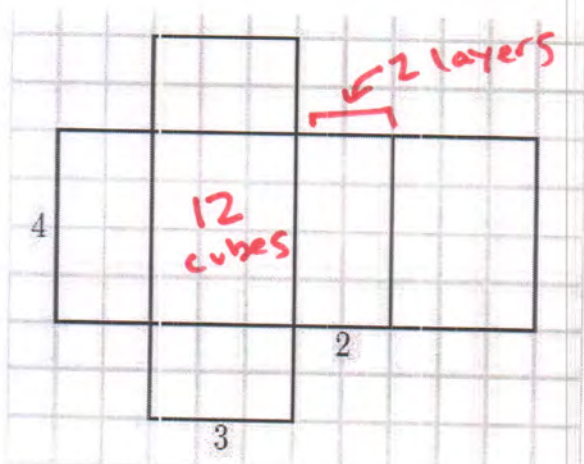
12 + 5 = 17

The volume is 17 cubic units.

Explain Greg's error. In your answer, include how Greg could find the correct volume.

Greg added the number of cubes in each layer to the number of layers. Each layer is an equal group of 12 cubes, so Greg should multiply 5 × 12 to find the volume. The volume is 60 u^3.

4. If the figure shown below was folded into a box, how many cubes would fit in it?



12 + 12

24 cubes

G5 U5 Lesson 2

Compose and decompose right rectangular prisms using layers.

CITYTUTOR DC

G5 U5 Lesson 2 - Students will compose and decompose right rectangular prisms using layers

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): In our previous lesson, we spent time thinking about the volume of right rectangular prisms. What are some things you remember about our work with volume? What is volume? What units do we use to measure it? How did we find volume? Possible Student Answers, Key Points:

- Volume is the amount of space a three-dimensional figure takes up.
- We measure volume in cubic units. We can write cubic units as u^3.
- Volume is equal to the number of cubic units you can pack in a rectangular prism without gaps.
- In our last lesson, we looked at the bottom layer of cubes to help us think about how many cubes would fill the entire figure.

Excellent thinking! Today, we'll continue exploring volume, and we'll pay extra close attention to the layers in our right rectangular prisms. Thinking about a prism in layers can help us efficiently find its volume. Let's work through some examples together, and I'll show you what I mean.

Let's Talk (Slide 3): Before we look at some problems, take a look at the two figures shown here. What do you notice is the same? What is different? Possible Student Answers, Key Points:

- They're both rectangular prisms. It looks like they're the same size. They both have sections that are shaded with colors.
- They're colors are different. The first rectangular prism is split into two layers. The second rectangular prism is cut into layers going the other way.

I noticed some of the same things! These are the same rectangular prisms. The only difference is that they are partitioned into layers differently. The one on the left is partitioned into a bottom layer, and a top layer. The one on the right is partitioned into layers going left to right. The same rectangular prism can be partitioned into layers in different ways.

$$\begin{array}{r} 15 \\ +\,15 \\ \hline \end{array}$$

If I look at the first prism, I see the bottom layer is 3 rows of 5 cubes. That means each layer has 15 cubes. I can think of the volume of this prism as being 15 cubes on the bottom and 15 cubes on the top. *(write 15 + 15 vertically to mirror the structure of the layers)*

$$6+6+6+6+6=$$

The second prism shows 5 layers. I can see from the purple layer, that each layer has 6 cubes. I can think of the volume of the prism as being *(point to each layer)* 6 cubes, 6 cubes, 6 cubes, 6 cubes, and 6 cubes. *(write 6 + 6 + 6 + 6 + 6 = horizontally to mirror the structure of the layers)*

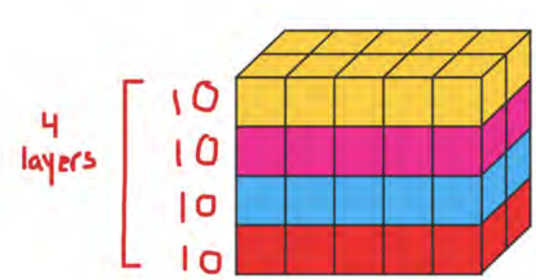
What do you notice about the two ways we can think about this prism's volume? Possible Student Answers, Key Points:

- They use different numbers. One shows two layers of 15, and the other shows 5 layers of 6.
- Both equations total 30. Both figures have the same volume, we're just thinking of it differently.

Both prisms have a volume of 30 cubic units! We know two layers of 15 will give us a total of 30 cubes. We know five layers of 6 will give us a total of 30 cubes. No matter how we decompose a rectangular prism into layers, the prism will have the same volume. Let's apply this thinking to a couple math problems.

Let's Think (Slide 4): Take a look at the rectangular prism shown here. We'll answer a few questions about this prism to think about its volume. The first question asks us to determine how many cubes are in each layer. We can look at any layer, since they're all the same size, but which layer might be easiest to look at and why? Possible Student Answers, Key Points:

- I can look at the yellow layer on top, because I can just count all the cubes.
- I can look at the bottom layer, since that's what we did in our previous lesson. I see it has a length of 5 cubes and a width of 2 cubes.



Let's look at the yellow layer on top, since in this image we can see every cube. I see the top layer is 5 cubes long and 2 cubes wide. There are 10 cubes in the top layer. Great, we've answered the first question! *(label 10 next to each layer)*

The second question asks how many layers are in the figure. What do you think? Possible Student Answers, Key Points:

- There are 4 layers, because each layer is a different color.
- There are 4 layers, because I see the prism is 4 cubes tall.

Correct, there are 4 layers in this figure. *(label the image with a bracket to show there are 4 layers)* So if each layer is 10 cubes, and there are 4 layers, we can find the volume. How could we use that information to determine how many cubes are in the entire prism?
Possible Student Answers, Key Points:

- I can think of 4 layers of 10 as 4 x 10. The volume is 40 cubic units.
- I can add 10 + 10 + 10 + 10 to get a total volume of 40 cubic units.

Whether we use repeated addition or multiplication, we can see that the volume of a prism made of 4 layers of 10 cubes is 40 cubic units.

Let's Think (Slide 5): This problem shows the same rectangular prism three times. We're going to decompose the prism into layers in different ways and record our findings in the chart.

When we first started learning about volume, we thought about stacking cubes into the bottom layer of a box and working to fill the box. Let's think of this prism as having a bottom layer first. *(shade bottom layer with one color, middle layer with another, and top layer with another)* We can think of the prism as being decomposed into *(point to each)* a bottom layer, a middle layer, and a top layer. Based on this decomposition, help me fill out the table. How many cubes are in each layer? What is our number of layers? What is the volume? *(fill answers into chart as student shares)* Possible Student Answers, Key Points:

- I see there are three layers, because we shaded them. The top layer is easiest to see, so I can count that there are 10 cubes in that layer. I know 3 layers of 10 is 30. The volume is 30 cubic units.

Now let's think of the same prism decomposed into different layers. We can think about the layers kind of like slicing a cake. In our last example, we sliced so there were layers going from bottom to top. This time, I'll slice the layers so they go from one side to the other side, like this. *(shade each layer with a different color as shown)*
The prism is still the same prism, we're just looking at it differently. What do you notice about how we decomposed it this time? Possible Student Answers, Key Points:

- Our layers look vertical instead of horizontal.
- We have more layers.
- Our last layers were 10 cubes each, but these look like less.

Let's see if we can fill out the chart now. How many cubes are in each layer? (6) I can look at any layer to answer that, but the right hand layer is the easiest to see and count. There are 6 cubes in each layer this time. *(fill answers in chart as student shares)* How many layers compose the prism? (5) We shaded 5 layers this time. If we have 5 layers, and each layer contains 6 cubes, what is the volume of the prism? (30 cubic units)

We have one last decomposition to consider. We sliced from bottom to top, from left to right, and now I'll "slice" the prism from front to back. *(shade the front one color and back another color as shown)* How can I use this decomposition to fill in the information in the chart? *(fill in answers as student shares)* Possible Student Answers, Key Points:

- I can see the green section is 15 cubic units. Each layer contains 15 cubes.
- I see two layers, the front and back.
- I know the volume of the prism is 30 cubic units, because 15 + 15 is 30.

We just decomposed the same rectangular prism into layers three different ways. Take a look at the table we filled in. What do you notice about the information? Possible Student Answers, Key Points:

- The volume is the same each time.
- The first two numbers are factors that we can multiply to get 30.

Cubes in Each Layer	Number of Layers	Volume (in cubic units)
10 ×	3 =	30
6 ×	5 =	30
15 ×	2 =	30

The volume was 30 every time. *(highlight or circle all three volumes)* This makes sense, because the prism was the same each time. No matter how we look at it, it takes up the same amount of space. We can also see patterns in the cubes in each layer and the number of layers. If we know the cubes in each layer, we can multiply that by the number of layers to find the volume. *(fill in multiplication symbol and equal sign in the table as shown)* 3 layers of 10 cubes equals 30 cubes. 5 layers of 6 cubes equals 30 cubes. 2 layers of 15 cubes equals 30 cubes.

Pretty cool! Knowing the number of layers and the number of cubes in each layer can help us quickly find the volume of any rectangular prism. It's extra cool that we can decompose a prism in several different ways and still arrive at the same volume. I think we're ready for you to help me with some more problems.

Let's Try it (Slides 6 - 7):   Now let's work on composing and decomposing right rectangular prisms using layers together. As we work through each example, we'll want to make sure we consider how many cubes are in each layer and how many layers make up the entire rectangular prism. Knowing these two pieces of information can help us efficiently find how many cubic units compose the figure without having to count each unit. We should also keep in mind that there are many ways to decompose the same figure into layers. Whether we think about horizontal or vertical layers, we can still find the volume. Let's try it out with some more examples.

WARM WELCOME

Today we will compose and decompose right rectangular prisms using layers.

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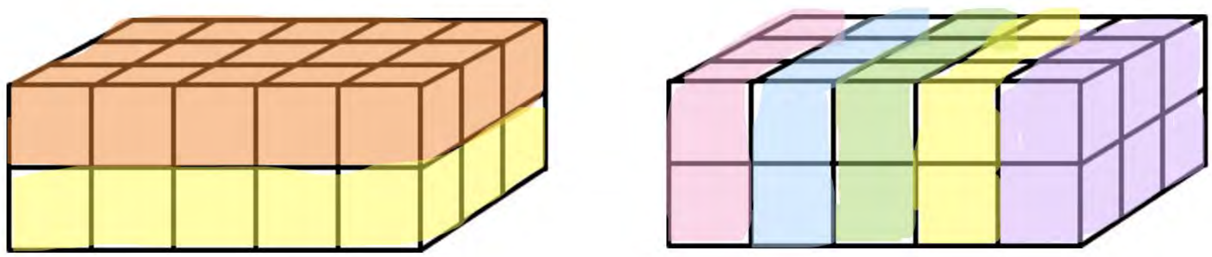
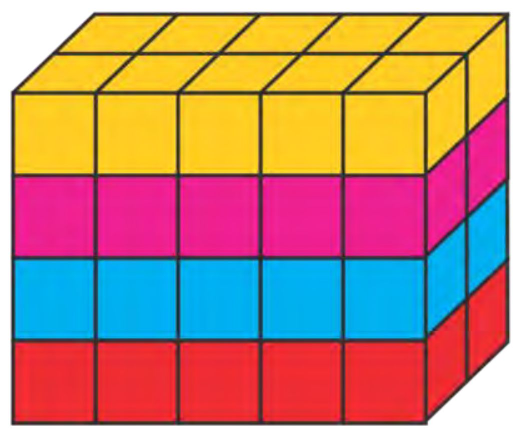
Let's Talk:

What's the same?
What's different?



Let's Think:



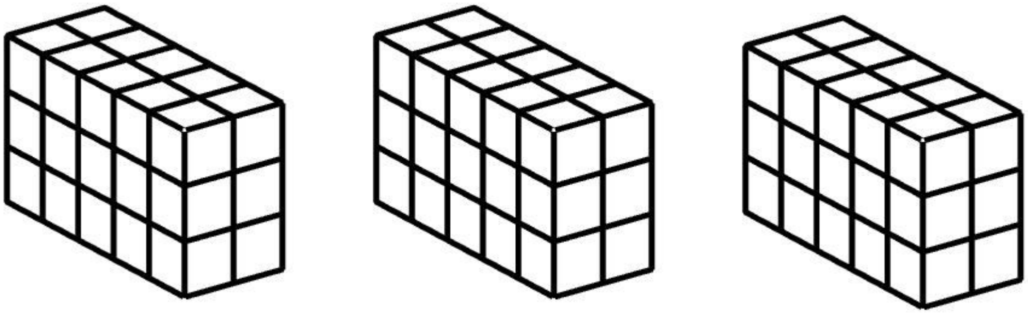
How many cubes are in each layer?

How many layers are in the figure?

What is the volume of the rectangular prism?

Let's Think:

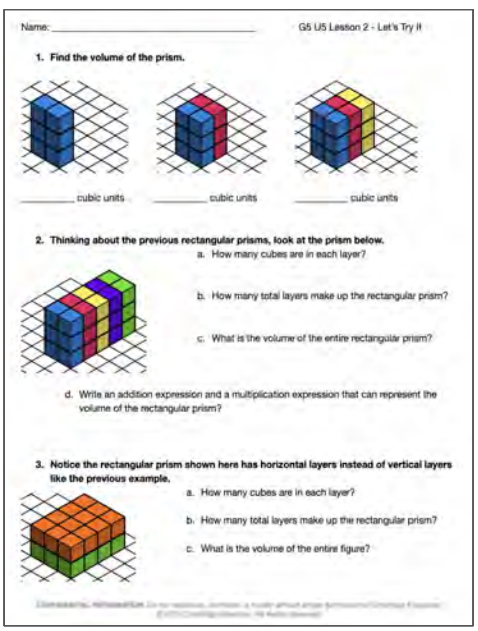
Decompose the rectangle shown here into layers 3 different ways. Record your findings in the table.



Cubes in Each Layer	Number of Layers	Volume (in cubic units)

Let's Try It:

Let's explore composing and decomposing right rectangular prisms into layers together.



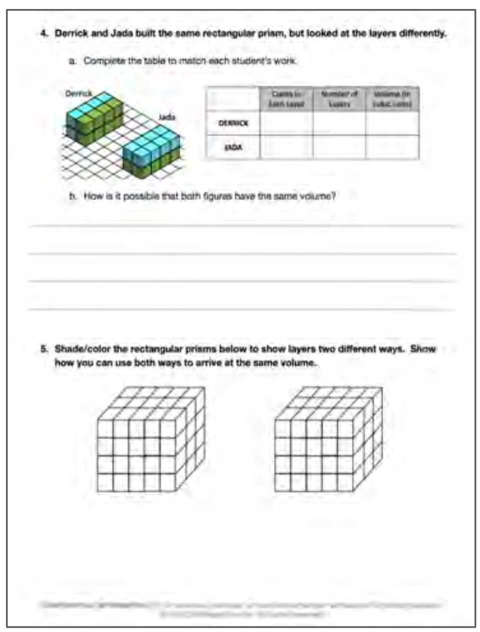
Name: ______________________ G5 U5 Lesson 2 - Let's Try It

1. **Find the volume of the prism.**

_______ cubic units _______ cubic units _______ cubic units

2. **Thinking about the previous rectangular prisms, look at the prism below.**
   a. How many cubes are in each layer?
   b. How many total layers make up the rectangular prism?
   c. What is the volume of the entire rectangular prism?
   d. Write an addition expression and a multiplication expression that can represent the volume of the rectangular prism?

3. **Notice the rectangular prism shown here has horizontal layers instead of vertical layers like the previous example.**
   a. How many cubes are in each layer?
   b. How many total layers make up the rectangular prism?
   c. What is the volume of the entire figure?



4. **Derrick and Jada built the same rectangular prism, but looked at the layers differently.**
   a. Complete the table to match each student's work.

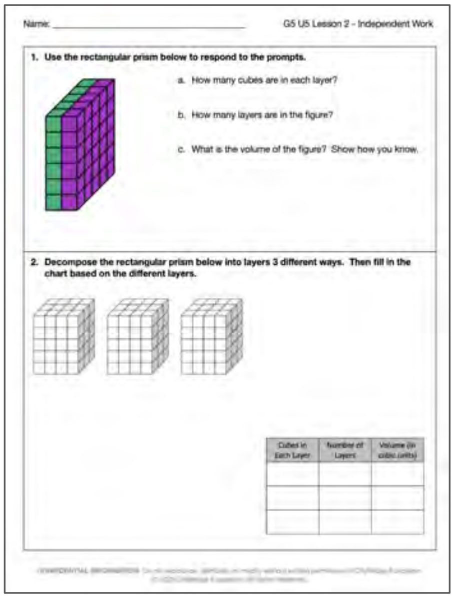
	Cubes in Each Layer	Number of Layers	Volume (in cubic units)
DERRICK			
JADA			

   b. How is it possible that both figures have the same volume?

5. **Shade/color the rectangular prisms below to show layers two different ways. Show how you can use both ways to arrive at the same volume.**

On your Own:

Now it's time to compose and decompose right rectangular prisms using layers on your own.



Name: ______________________ G5 U5 Lesson 2 - Independent Work

1. Use the rectangular prism below to respond to the prompts.

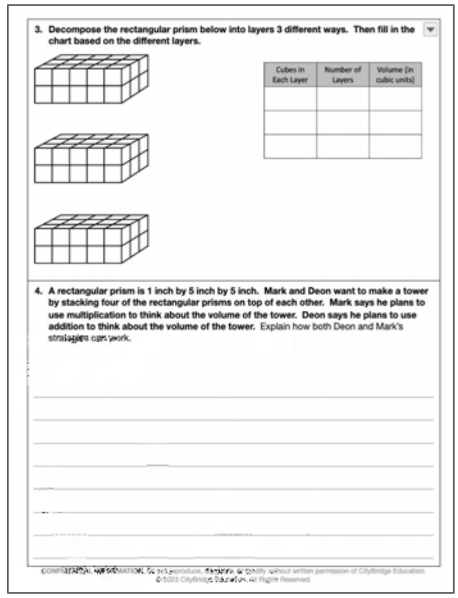
a. How many cubes are in each layer?

b. How many layers are in the figure?

c. What is the volume of the figure? Show how you know.

2. Decompose the rectangular prism below into layers 3 different ways. Then fill in the chart based on the different layers.

Cubes in Each Layer	Number of Layers	Volume (in cubic units)



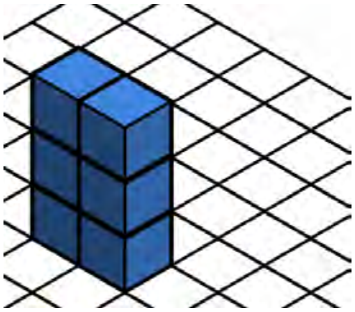
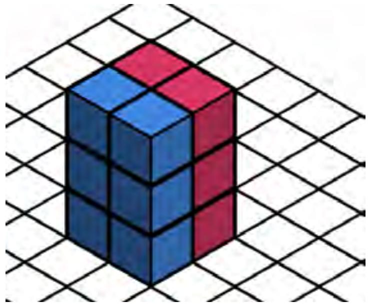
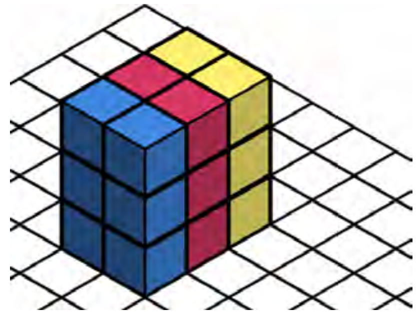
3. Decompose the rectangular prism below into layers 3 different ways. Then fill in the chart based on the different layers.

Cubes in Each Layer	Number of Layers	Volume (in cubic units)

4. A rectangular prism is 1 inch by 5 inch by 5 inch. Mark and Deon want to make a tower by stacking four of the rectangular prisms on top of each other. Mark says he plans to use multiplication to think about the volume of the tower. Deon says he plans to use addition to think about the volume of the tower. Explain how both Deon and Mark's strategies can work.

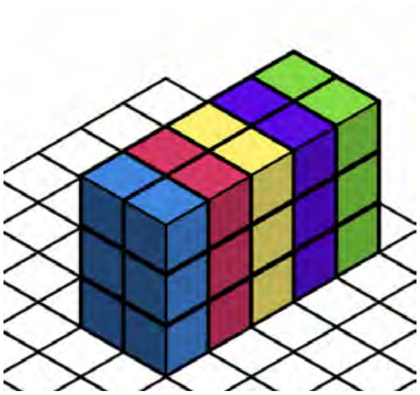
Name: ______________________________________ G5 U5 Lesson 2 - Let's Try It

1. Find the volume of the prism.

_________ cubic units _________ cubic units _________ cubic units

2. Thinking about the previous rectangular prisms, look at the prism below.



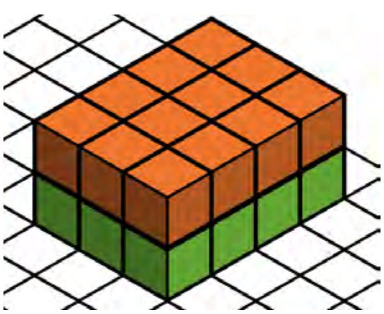
a. How many cubes are in each layer?

b. How many total layers make up the rectangular prism?

c. What is the volume of the entire rectangular prism?

d. Write an addition expression and a multiplication expression that can represent the volume of the rectangular prism?

3. Notice the rectangular prism shown here has horizontal layers instead of vertical layers like the previous example.
   a. How many cubes are in each layer?

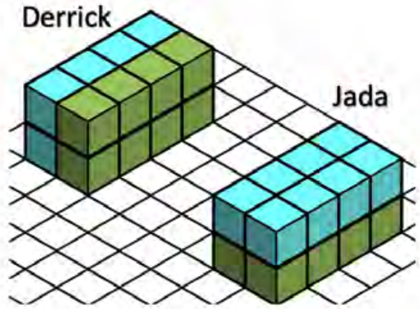


b. How many total layers make up the rectangular prism?

c. What is the volume of the entire figure?

4. Derrick and Jada built the same rectangular prism, but looked at the layers differently.

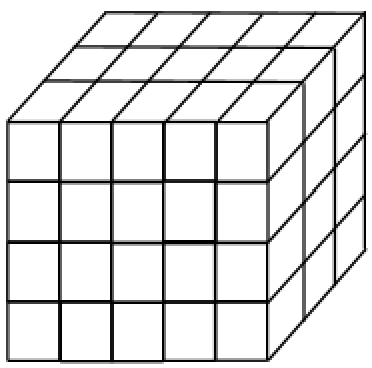
   a. Complete the table to match each student's work.

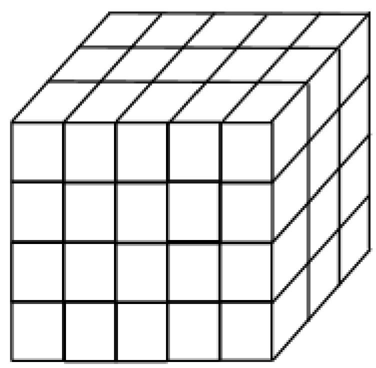


	Cubes in Each Layer	Number of Layers	Volume (in cubic units)
DERRICK			
JADA			

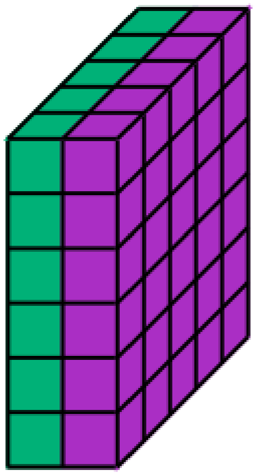
b. How is it possible that both figures have the same volume?

5. Shade or color the rectangular prisms below to show layers two different ways. Show how you can use both ways to arrive at the same volume.





1. Use the rectangular prism below to respond to the prompts.

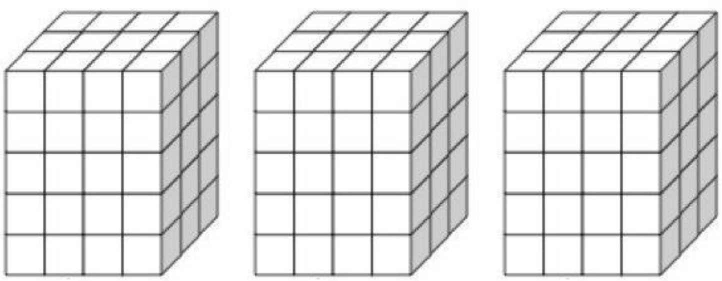


a. How many cubes are in each layer?

b. How many layers are in the figure?

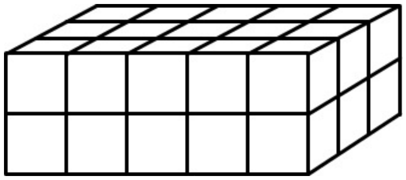
c. What is the volume of the figure? Show how you know.

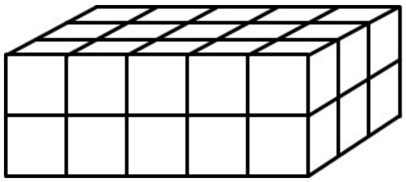
2. Decompose the rectangular prism below into layers 3 different ways. Then fill in the chart based on the different layers.

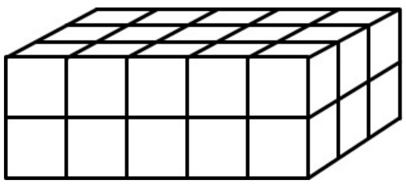


Cubes in Each Layer	Number of Layers	Volume (in cubic units)

3. Decompose the rectangular prism below into layers 3 different ways. Then fill in the chart based on the different layers.





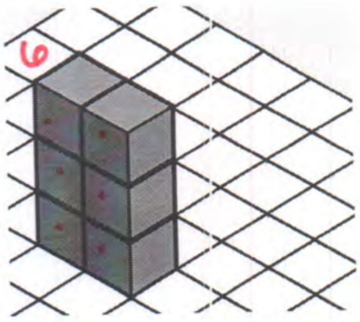


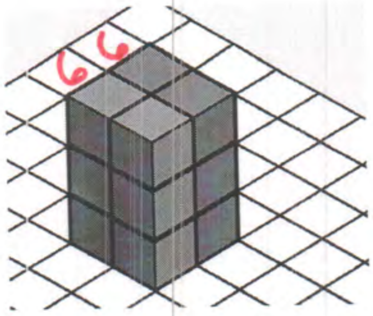
Cubes in Each Layer	Number of Layers	Volume (in cubic units)

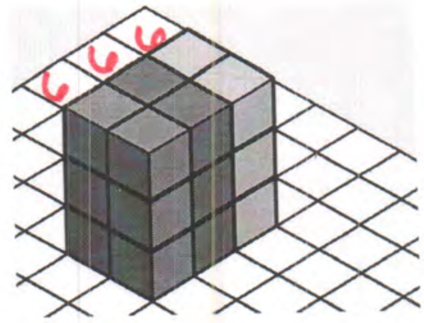
4. A rectangular prism is 1 inch by 5 inch by 5 inch. Mark and Deon want to make a tower by stacking four of the rectangular prisms on top of each other. Mark says he plans to use multiplication to think about the volume of the tower. Deon says he plans to use addition to think about the volume of the tower. Explain how both Deon and Mark's strategies can work.

Name: KEY

1. Find the volume of the prism.

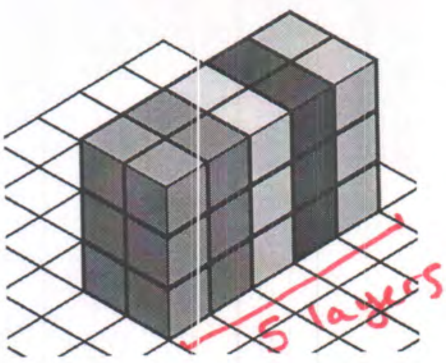






6 cubic units   12 cubic units   18 cubic units

2. Thinking about the previous rectangular prisms, look at the prism below.



a. How many cubes are in each layer?

6 cubes

b. How many total layers make up the rectangular prism?

5 layers

c. What is the volume of the entire rectangular prism?

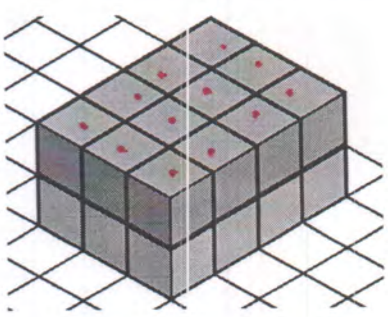
$6 \times 5 = 30\,u^3$

d. Write an addition expression and a multiplication expression that can represent the volume of the rectangular prism?

$6 \times 5 = 30\,u^3$

$6 + 6 + 6 + 6 + 6 = 30\,u^3$

3. Notice the rectangular prism shown here has horizontal layers instead of vertical layers like the previous example.



a. How many cubes are in each layer?

12 cubes

b. How many total layers make up the rectangular prism?

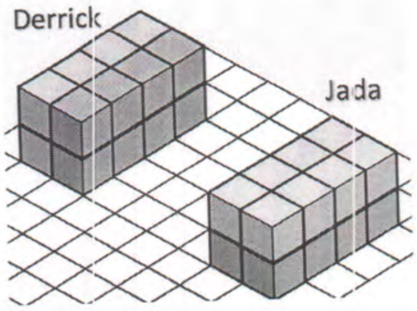
2 layers

c. What is the volume of the entire figure?

$12 + 12 = 24\,u^3$ $2 \times 12 = 24\,u^3$

4. **Derrick and Jada built the same rectangular prism, but looked at the layers differently.**

a. Complete the table to match each student's work.

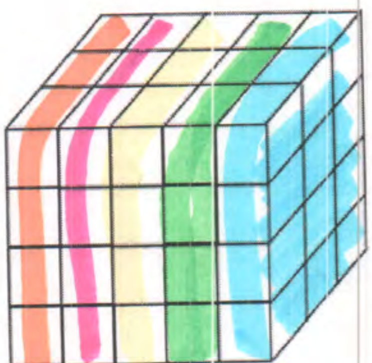


	Cubes in Each Layer	Number of Layers	Volume (in cubic units)
DERRICK	8	2	16
JADA	8	2	16

b. How is it possible that both figures have the same volume?

Derrick looked at layers with a vertical cut. Jada looked at layers with a horizontal cut. It's the same prism with the same cubes, they are just looking at the layers differently.

5. **Shade or color the rectangular prisms below to show layers two different ways. Show how you can use both ways to arrive at the same volume.**

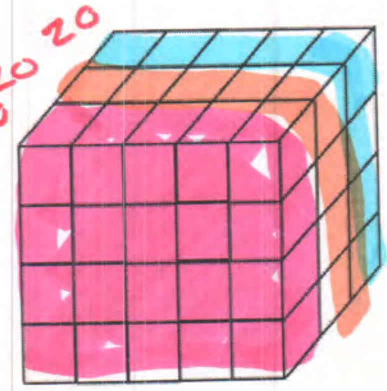


12 12 12 12 12

5×12

60 u^3

20 20 20

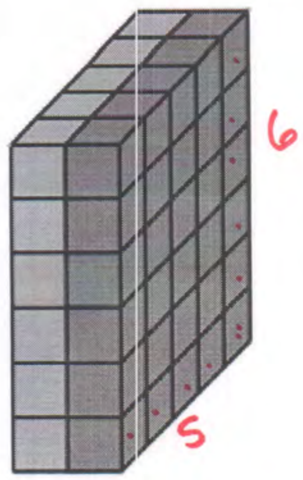


3 × 20

60 u^3

Name: KEY

1. Use the rectangular prism below to respond to the prompts.



a. How many cubes are in each layer?

30 cubes

b. How many layers are in the figure?

30 + 30 = 60 cubes

c. What is the volume of the figure? Show how you know.

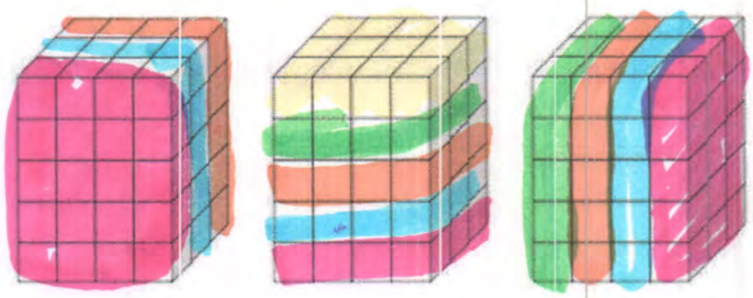
$60 u^3$

30 + 30

OR

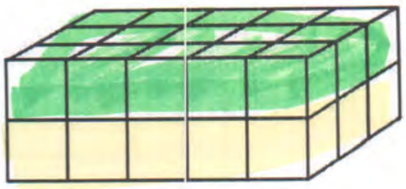
2 × 30

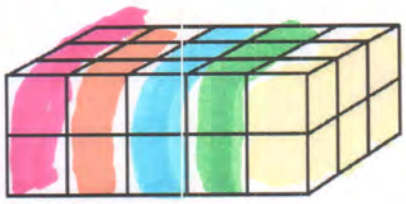
2. Decompose the rectangular prism below into layers 3 different ways. Then fill in the chart based on the different layers.

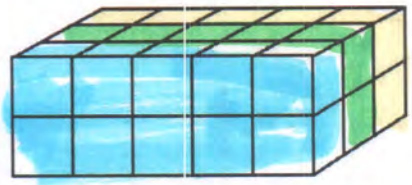


Cubes in Each Layer	Number of Layers	Volume (in cubic units)
20	3	60
12	5	60
15	4	60

3. **Decompose the rectangular prism below into layers 3 different ways. Then fill in the chart based on the different layers.**







Cubes in Each Layer	Number of Layers	Volume (in cubic units)
15	2	30
6	5	30
10	3	30

4. **A rectangular prism is 1 inch by 5 inch by 5 inch. Mark and Deon want to make a tower by stacking four of the rectangular prisms on top of each other. Mark says he plans to use multiplication to think about the volume of the tower. Deon says he plans to use addition to think about the volume of the tower.** Explain how both Deon and Mark's strategies can work.

The volume of one prism would be 25 cubic inches. Mark could use multiplication by multiplying 4 layers by 25 cubes. Deon could use repeated addition by doing 25 + 25 + 25 + 25 to show the four layers. Either way the answer is 100 cubic inches.

G5 U5 Lesson 3

Use multiplication to calculate volume.

G5 U5 Lesson 3 - Students will use multiplication to calculate volume

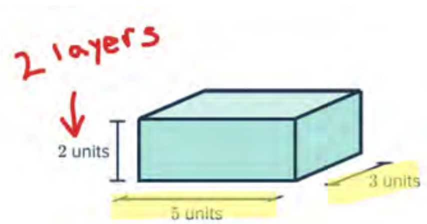
Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We've been building our understanding of volume for the past couple lessons. We've counted cubes to find the volume of rectangular prisms, and we've spent time decomposing prisms into layers to calculate the volume. Today, we're going to become even stronger as we think through even more efficient ways of calculating the volume of right rectangular prisms.

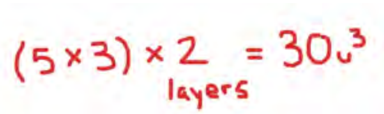
Let's Talk (Slide 3): Take a look at these images representing a rectangular prism. You probably notice that the first image doesn't show any unit cubes. Do you think it's possible to calculate the volume of the rectangular prism, even though we can't visually count the cubes that would go inside? How could we still think about the volume? Possible Student Answers, Key Points:

- We can use the measurements that are labeled to think about how many cubes could fit inside.
- We could calculate how many cubes could go into one layer and work from there.
- We could visualize the cubes, kind of like the second picture shows.

Great thinking! We can use labeled dimensions of length, width, and height to help us consider how many cubes can fit in a figure even when we don't actually *see* the cubes.



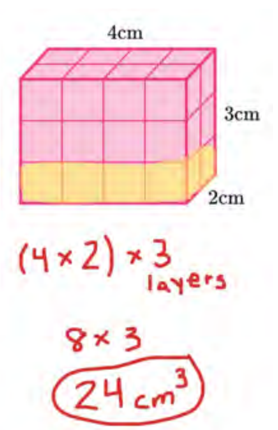
In this example, I can picture the bottom layer being 5 cubic units long and 3 cubic units wide. *(highlight those dimensions)* That means the bottom layer has a volume of 15 cubic units, because 5 x 3 = 15. The height is labeled 2 units, which I can think of as meaning there are two layers in this rectangular prism. *(label that the 2 units can be thought of as 2 layers)* Without having to physically see or count the cubes, I know this prism can be packed with 2 layers of 15 cubes.



What's the volume of this rectangular prism? (30 cubic units) Well done! We can think of 5 x 3 as representing the number of cubes in one layer, then we can multiply that quantity by the number of layers, which in this case is 2. *(write and label equation as shown)* The volume is 30 cubic units.

Today, we'll see how multiplication can be an efficient strategy to help us calculate the volume of rectangular prisms.

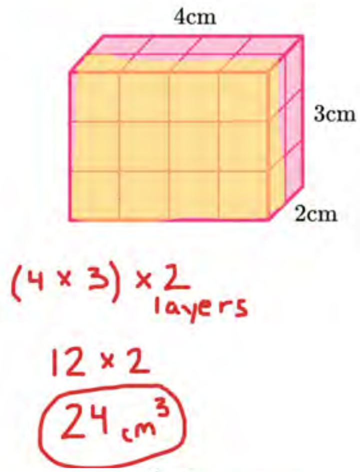
Let's Think (Slide 4): This problem wants us to find the volume of this rectangular prism using multiplication two different ways.



Let's start by thinking of it like our last problem. We'll focus on the bottom layer to start with. *(highlight or shade the bottom layer)* I see the bottom layer measures 4 cm long and 2 cm wide, so there are 8 cubes in the bottom layer. The picture and the height measurement show me we have 3 of those layers. So I can think of 3 layers of 8 cubes. I know that would be 24 cubes.

I can use multiplication to show that thinking. (*write (4 x 2) x 3)* The bottom layer can be thought of as 4 x 2. I can multiply that quantity by the 3 layers. 4 x 2 is 8. *(write 8 x 3 underneath the previous expression)* So the volume of the prism is 24 cubic centimeters. *(write answer)*

That's one way to find the volume. Let's try looking at it another way!

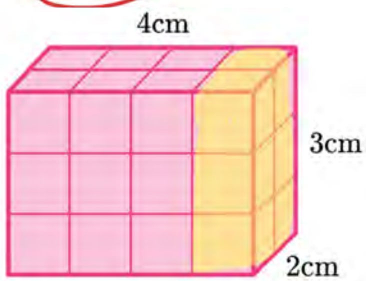


What if instead of looking at the bottom as one layer, we looked at the front as one layer? *(highlight or shade the front layer)* How many cubes are in this layer, and how many layers compose the entire rectangular prism? Possible Student Answers, Key Points:

- There are 12 cubes in the front layer. I can count them, or I can see 3 rows of 4.
- When we look at the prism this way, there are two layers. I see the front layer and one layer behind it.

We can represent this decomposition using multiplication too. *(write and evaluate the expression as you narrate)* The front layer is 3 rows of 4, so we can think of that as 4 x 3. We need two layers of that quantity, so I can multiply that quantity by 2. 4 x 3 gives us 12, and 12 x 2 layers gives us a volume of 24 cubic centimeters.

We just solved for the volume of this rectangular prism two different ways using multiplication. Both times we got the same area, we just changed how we thought about the layers.



I know this problem only asked for two ways to find the volume, but I just thought of another way somebody might decompose this rectangular prism. *(highlight or shade the right-hand layer as shown)* How could somebody use multiplication to find the volume if they looked at the right side as a layer? Possible Student Answers, Key Points:

- The layer is 6 cubes, because 3 x 2 = 6.
- There are 4 layers if we decompose the rectangular prism this way.
- I can think of (3 x 2) x 4, which is 6 x 4. The volume is 24 cubic units.

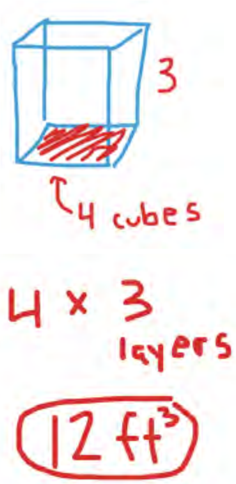
Excellent thinking. We can use multiplication to find the volume of rectangular prisms in a variety of ways depending on how we look at the dimensions and think about the layers.

Let's Think (Slide 5): *(read the problem)* This problem wants us to find the volume of Kevin's cardboard box, but I notice they didn't include a picture so we can see the box.

I'll sketch a box so we can at least picture the sides. It's okay if the box isn't the exact right dimensions for now. *(sketch a box similar to the one shown)* Whenever a problem involving 2D or 3D figures doesn't include an image, it can be helpful to make a sketch so you at least have something to refer to as you work.

What information do we know about Kevin's box? Possible Student Answers, Key Points:

- s made of cardboard.
- The area of the base is 4 square feet. The height is 3 feet.



Let's think about what we know and label our drawing. The height is 3 feet, that's important. *(label 3 feet as the height)* The area of the base is 4 square feet. If we picture 4 squares in the base, can you picture how many cubes would fit in that bottom layer? (4 cubes) If the area of the base is 4 square feet, that means we could place 1 cubic foot on top of each of those squares. So the bottom layer of this prism could hold 4 cubes. *(label that on the image)*

That's enough information to help us find the volume of Kevin's box. The bottom layer can be packed with 4 cubic units. There are 3 layers in this prism. I know 3 groups of 4 cubes can be thought of as 3 x 4 using multiplication. *(write 4 x 3 layers)* What is the volume of the rectangular prism? (12 cubic feet) Nice work. *(write the answer)*

What was the same and different about this problem compared to the one we did before this? Possible Student Answers, Key Points:

- This one didn't have a picture with it, so we had to draw our own.
- The other problem asked us to find the volume in more than one way.
- This problem gave us the area of the base and the height. It didn't tell us the exact length and width.
- We used multiplication in both problems.

Whether we have a picture or not, we can use multiplication to find the volume of a rectangular prism. Whether we know the length, width, and height or just one layer and the other dimension, we can use multiplication to find the volume of a rectangular prism. It is an efficient way to calculate how much space a rectangular prism takes up.

Let's Try it (Slides 6 - 7): Now let's try using multiplication to find the volume of rectangular prisms together. Remember, we can look at the layers of a rectangular prism in a way that makes most sense to us. We also know that we can sketch a picture of the figure if one is not provided. No matter what, multiplication can be a handy tool to help us efficiently arrive at the volume of a prism. Let's go for it. I'll be here to support you as needed.

WARM WELCOME

Today we will use multiplication to calculate volume.

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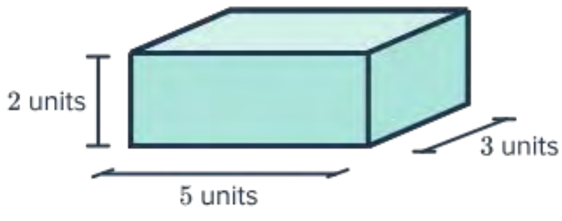
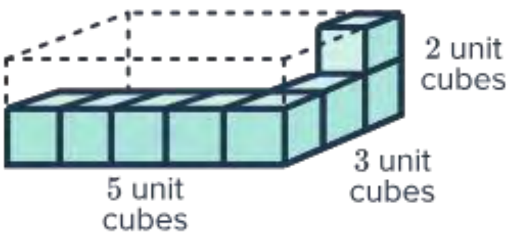
Let's Talk:

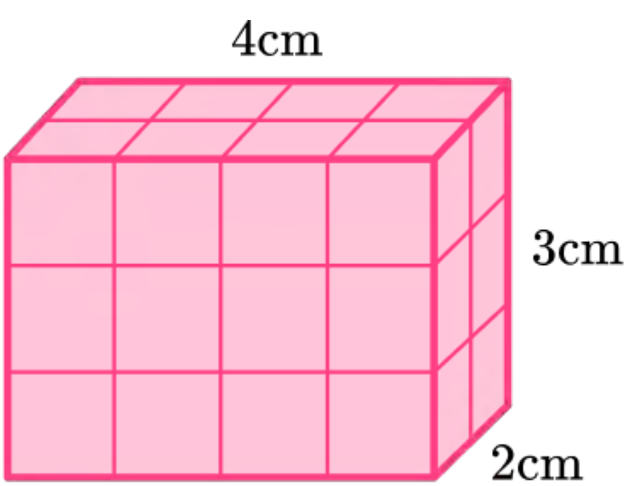
Help! The first image of the rectangular prism doesn't show any unit cubes!





Let's Think:

Use multiplication to find the volume of the rectangular prism. Show your work in two different ways.



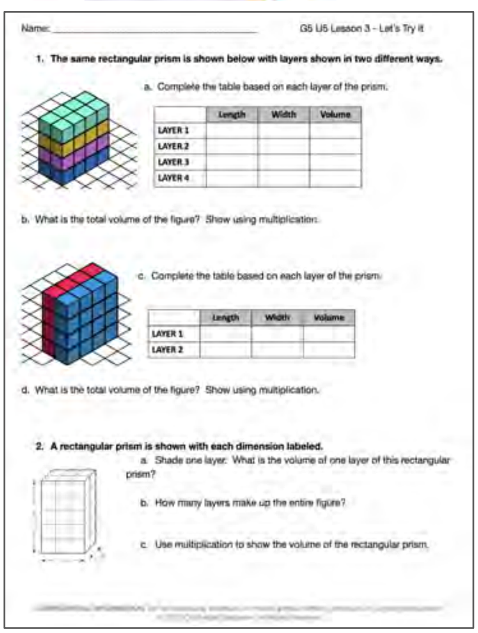
Let's Think:

Kevin is trying to find the volume of a cardboard box. The area of the base of the box is 4 square feet. The height of the box is 3 feet.

What is the volume of the cardboard box?

Let's Try It:

Let's explore using multiplication to calculate volume together.



Name: ____________________ G5 U5 Lesson 3 - Let's Try It

1. **The same rectangular prism is shown below with layers shown in two different ways.**

a. Complete the table based on each layer of the prism.

	Length	Width	Volume
LAYER 1			
LAYER 2			
LAYER 3			
LAYER 4			

b. What is the total volume of the figure? Show using multiplication.

c. Complete the table based on each layer of the prism.

	Length	Width	Volume
LAYER 1			
LAYER 2			

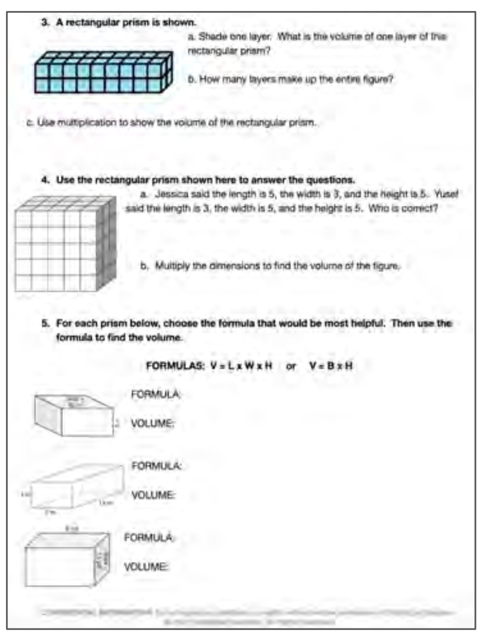
d. What is the total volume of the figure? Show using multiplication.

2. **A rectangular prism is shown with each dimension labeled.**

a. Shade one layer. What is the volume of one layer of this rectangular prism?

b. How many layers make up the entire figure?

c. Use multiplication to show the volume of the rectangular prism.



3. **A rectangular prism is shown.**

a. Shade one layer. What is the volume of one layer of the rectangular prism?

b. How many layers make up the entire figure?

c. Use multiplication to show the volume of the rectangular prism.

4. **Use the rectangular prism shown here to answer the questions.**

a. Jessica said the length is 5, the width is 3, and the height is 5. Yusef said the length is 3, the width is 5, and the height is 5. Who is correct?

b. Multiply the dimensions to find the volume of the figure.

5. **For each prism below, choose the formula that would be most helpful. Then use the formula to find the volume.**

FORMULAS: V = L x W x H or V = B x H

FORMULA:

VOLUME:

FORMULA:

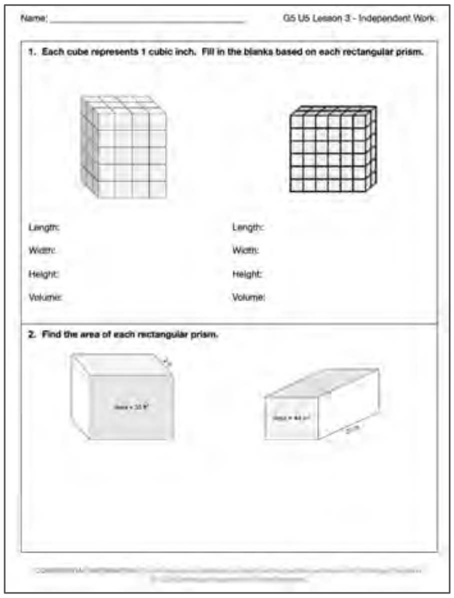
VOLUME:

FORMULA:

VOLUME:

On your Own:

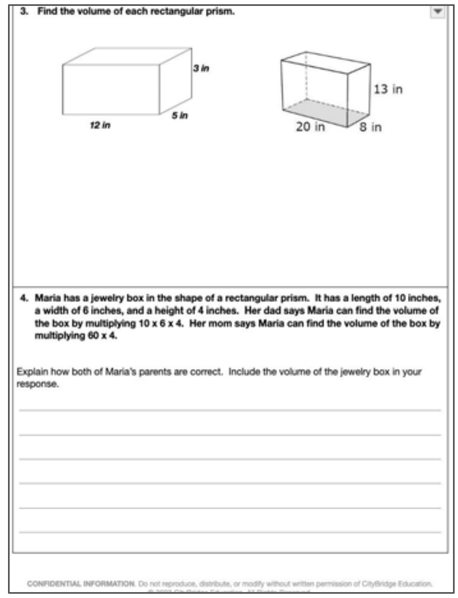
Now it's time to use multiplication to calculate volume on your own.


Name: ______________________ G5 U5 Lesson 3 - Independent Work

1. Each cube represents 1 cubic inch. Fill in the blanks based on each rectangular prism.

Length:	Length:
Width:	Width:
Height:	Height:
Volume:	Volume:

2. Find the area of each rectangular prism.


3. Find the volume of each rectangular prism.

4. Maria has a jewelry box in the shape of a rectangular prism. It has a length of 10 inches, a width of 6 inches, and a height of 4 inches. Her dad says Maria can find the volume of the box by multiplying 10 x 6 x 4. Her mom says Maria can find the volume of the box by multiplying 60 x 4.

Explain how both of Maria's parents are correct. Include the volume of the jewelry box in your response.

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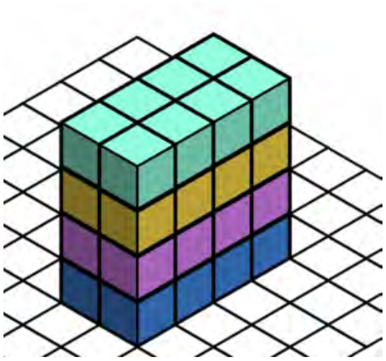
Name: ____ G5 U5 Lesson 3 - Let's Try It

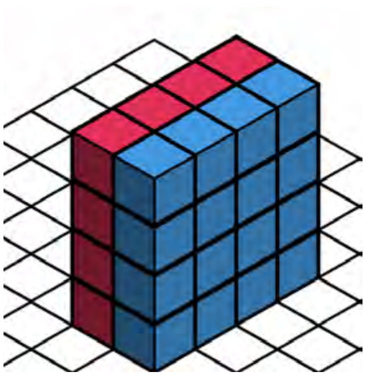
1. The same rectangular prism is shown below with layers shown in two different ways.



a. Complete the table based on each layer of the prism.

	Length	Width	Volume
LAYER 1			
LAYER 2			
LAYER 3			
LAYER 4			

b. What is the total volume of the figure? Show using multiplication.

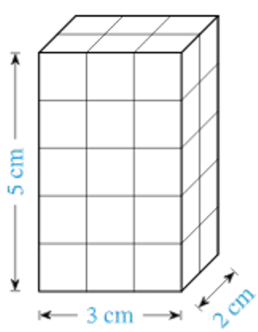


c. Complete the table based on each layer of the prism.

	Length	Width	Volume
LAYER 1			
LAYER 2			

d. What is the total volume of the figure? Show using multiplication.

2. A rectangular prism is shown with each dimension labeled.

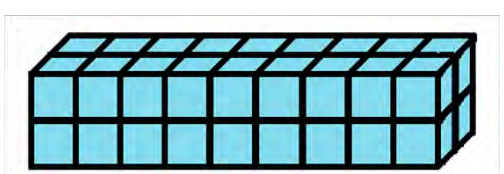


a. Shade one layer. What is the volume of one layer of this rectangular prism?

b. How many layers make up the entire figure?

c. Use multiplication to show the volume of the rectangular prism.

3. A rectangular prism is shown.

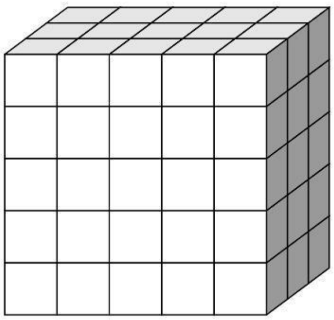


a. Shade one layer. What is the volume of one layer of this rectangular prism?

b. How many layers make up the entire figure?

c. Use multiplication to show the volume of the rectangular prism.

4. Use the rectangular prism shown here to answer the questions.

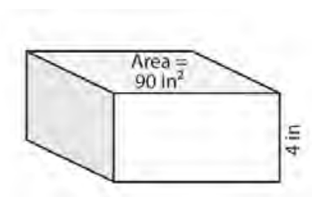


a. Jessica said the length is 5, the width is 3, and the height is 5. Yusef said the length is 3, the width is 5, and the height is 5. Who is correct?

b. Multiply the dimensions to find the volume of the figure.

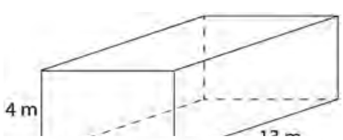
5. For each prism below, choose the formula that would be most helpful. Then use the formula to find the volume.

FORMULAS: V = L x W x H or V = B x H



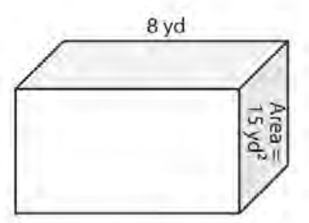
FORMULA:

VOLUME:



FORMULA:

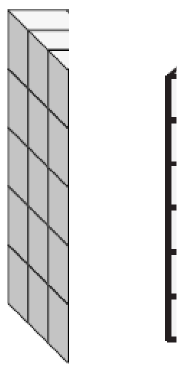
VOLUME:



FORMULA:

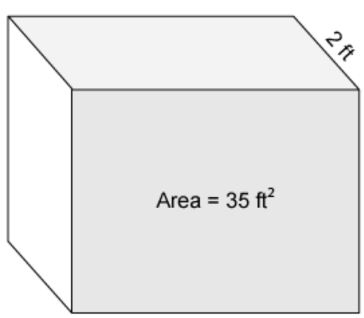
VOLUME:

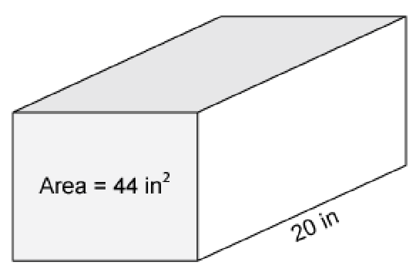
1. Each cube represents 1 cubic inch. Fill in the blanks based on each rectangular prism.



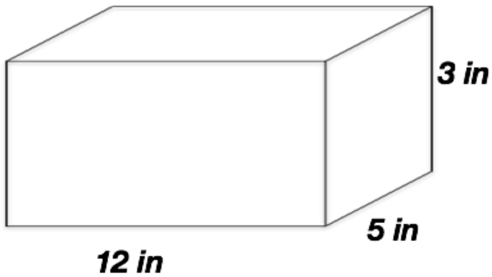
Length:	Length:
Width:	Width:
Height:	Height:
Volume:	Volume:

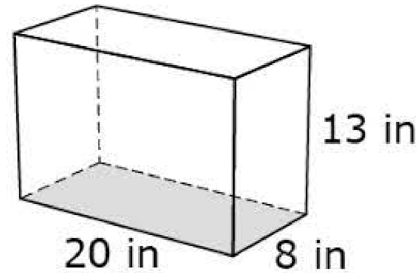
2. Find the volume of each rectangular prism.





3. Find the volume of each rectangular prism.



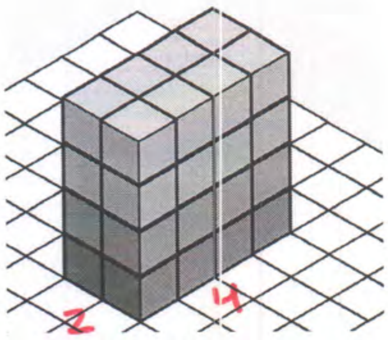


4. Maria has a jewelry box in the shape of a rectangular prism. It has a length of 10 inches, a width of 6 inches, and a height of 4 inches. Her dad says Maria can find the volume of the box by multiplying 10 x 6 x 4. Her mom says Maria can find the volume of the box by multiplying 60 x 4.

Explain how both of Maria's parents are correct. Include the volume of the jewelry box in your response.

Name: KEY

1. The same rectangular prism is shown below with layers shown in two different ways.

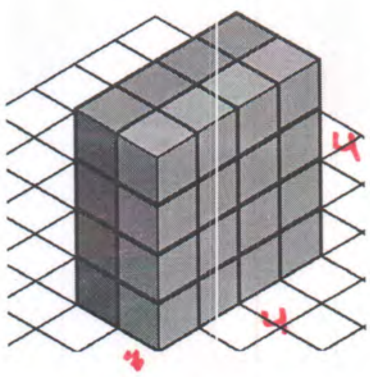


a. Complete the table based on each layer of the prism.

	Length	Width	Volume
LAYER 1	2	4	8
LAYER 2	2	4	8
LAYER 3	2	4	8
LAYER 4	2	4	8

b. What is the total volume of the figure? Show using multiplication.

8 × 4 = 32 u^3
cubes layers



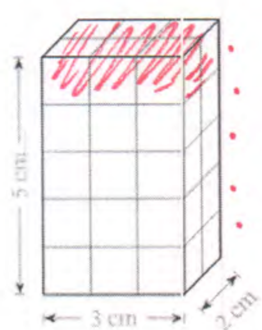
c. Complete the table based on each layer of the prism.

	Length	Width	Volume
LAYER 1	4	4	16
LAYER 2	4	4	16

d. What is the total volume of the figure? Show using multiplication.

16 × 2 = 32 u^3
cubes layers

2. A rectangular prism is shown with each dimension labeled.



a. Shade one layer. What is the volume of one layer of this rectangular prism?

6 cm^3

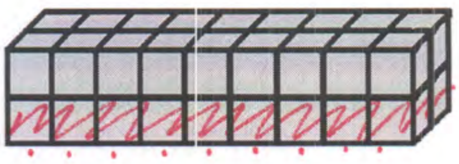
b. How many layers make up the entire figure?

5 layers

c. Use multiplication to show the volume of the rectangular prism.

5 × 6 = 30 cm^3

3. A rectangular prism is shown.



a. Shade one layer. What is the volume of one layer of this rectangular prism?

18 u^3

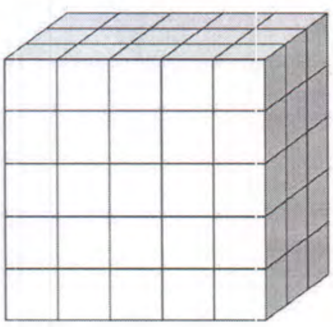
b. How many layers make up the entire figure?

2 layers

c. Use multiplication to show the volume of the rectangular prism.

$18 \times 2 = 36\ u^3$

4. Use the rectangular prism shown here to answer the questions.



a. Jessica said the length is 5, the width is 3, and the height is 5. Yusef said the length is 3, the width is 5, and the height is 5. Who is correct?

They are both correct. Length and width are interchangeable.

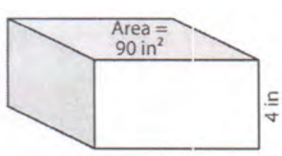
b. Multiply the dimensions to find the volume of the figure.

$5 \times 3 \times 5$

$15 \times 5 = 75\ u^3$

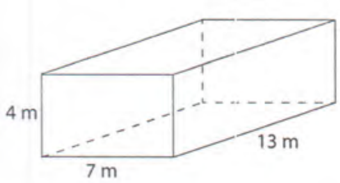
5. For each prism below, choose the formula that would be most helpful. Then use the formula to find the volume.

FORMULAS: V = L x W x H or V = B x H



FORMULA: $V = B \times H$

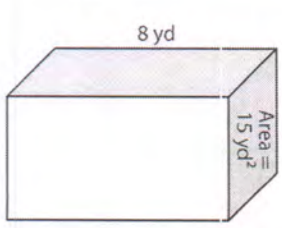
VOLUME: $V = 90 \times 4 \rightarrow 360\ in^3$



FORMULA: $V = L \times W \times H$

VOLUME: $V = 7 \times 13 \times 4$

$91 \times 4 \rightarrow 364\ m^3$

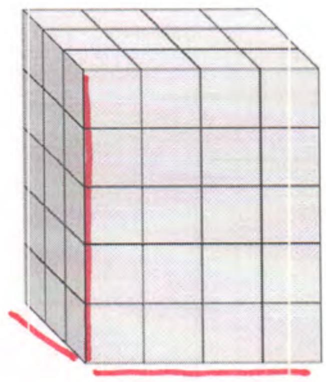


FORMULA: $V = B \times H$

VOLUME: $V = 15 \times 8 \rightarrow 120\ yd^3$

Name: KEY

1. Each cube represents 1 cubic inch. Fill in the blanks based on each rectangular prism.

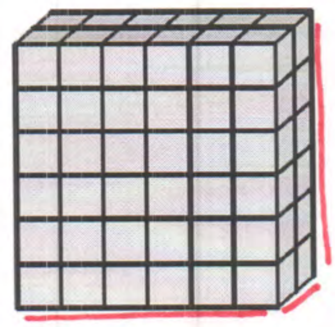


Length: 4

Width: 3

Height: 5

Volume: $4 \times 3 \times 5$
$12 \times 5 = 60 \text{ in}^3$



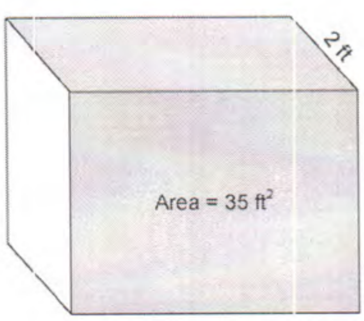
Length: 6

Width: 2

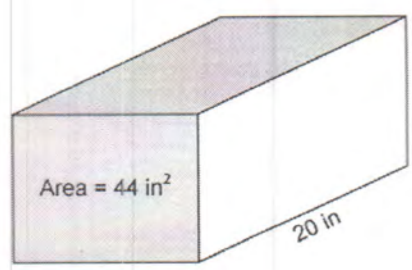
Height: 6

Volume: $6 \times 2 \times 6$
12×6
72 in^3

2. Find the volume of each rectangular prism.

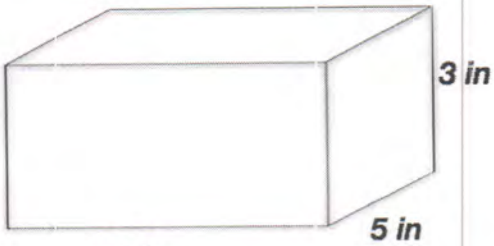


$V = B \times h$
35×2
70 ft^3



$V = B \times h$
44×20
880 in^3

3. **Find the volume of each rectangular prism.**

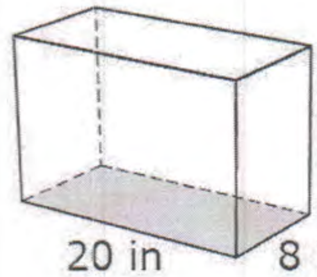


$V = L \times W \times H$

$12 \times 5 \times 3$

60×3

180 in^3



$$\begin{array}{r} 160 \\ \times 13 \\ \hline 480 \\ 1600 \\ \hline 2080 \end{array}$$

$V = L \times W \times H$

$20 \times 8 \times 13$

160×13

$2{,}080 \text{ in}^3$

4. **Maria has a jewelry box in the shape of a rectangular prism. It has a length of 10 inches, a width of 6 inches, and a height of 4 inches. Her dad says Maria can find the volume of the box by multiplying 10 x 6 x 4. Her mom says Maria can find the volume of the box by multiplying 60 x 4.**

Explain how both of Maria's parents are correct. Include the volume of the jewelry box in your response.

Maria can find the volume by multiplying length, width, and height. She can also find the volume by multiplying the area of the base (60 in^2) by the height. Either way, the volume will be 240 cubic inches.

G5 U5 Lesson 4

Find the total volume of solid figures composed of two non-overlapping rectangular prisms.

G5 U5 Lesson 4 - Students will find the volume of solid figures composed of two non-overlapping rectangular prisms

Warm Welcome (Slide 1): Tutor choice

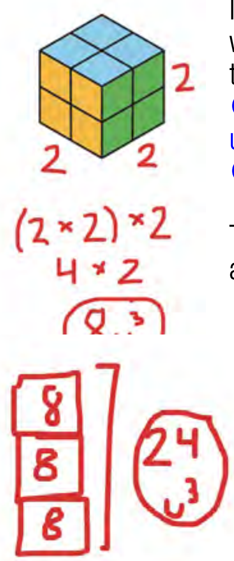
Frame the Learning/Connect to Prior Learning (Slide 2): The past several lessons have been all about volume of rectangular prisms, and we're going to continue that train of thought today. When you think about the work we've done so far with volume, what stands out to you? Possible Student Answers, Key Points:

- Volume is how much space an object takes up, or how many cubic units we can fit in a figure.
- We measure volume in cubic units.
- We can count cubes, think about layers in a figure, and/or use multiplication to help us calculate the area of rectangular prisms.

We've learned a lot about volume already! The only difference in today's work is that our figures will involve two rectangular prisms stacked or pushed side-by-side. We'll use a lot of the same thinking, but our problems will be *twice* the fun!

Let's Talk (Slide 3): Check out this rectangular prism. If I wanted to stack 3 of these together, how could I think about the volume of the entire tower I build? Possible Student Answers, Key Points:

- You could find the volume of one of the prisms, then repeatedly add or multiply to find the entire tower's volume.
- You could draw a picture of the taller tower and label it with the measurements based on what we know about the prism.



Interesting thinking. Let's see if you're right. We'll consider just the rectangular prism we see for now. The prism we're shown measures 2 units long, 2 units wide, and 2 units tall. *(label each dimension with 2)* How could I find the volume of this prism? Possible Student Answers, Key Points:

- I can count the 4 cubes on top, and I know there are 4 cubes underneath those. The volume is 8 cubic units.
- I know 2 x 2 x 2 = 8 cubic units.

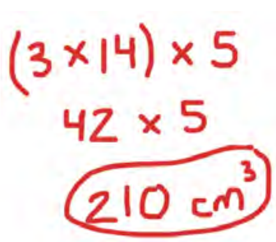
The volume is 8 cubic units. I can think of one layer as 2 x 2, and then I can multiply that value by 2 since there are 2 layers. *(write and simplify equation as shown)*

Now that we know the volume of this prism, it's not hard to picture what a stack of three of them might look like. *(draw a simple sketch showing a stack of three squares each labeled with a volume of 8)* If there were three of these stacked on top of one another, I know 8 + 8 + 8 or 8 x 3 would mean the total volume is 24 cubic units.

Some mathematicians refer to a combined figure like our tower as a composite figure or a composed figure. To find the volume of any composite figure, we can simply add the volumes of each part of the figure together. Let's try out a few more examples.

Let's Think (Slide 4): This problem wants us to find the total volume of the composite figure. Before we calculate, what do you notice about the figure? Possible Student Answers, Key Points:

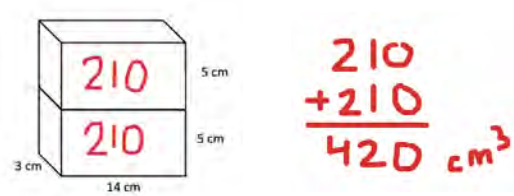
- It's made of two rectangular prisms stacked on top of each other. They both look the same size.
- The length of each prism is 14 cm, the width is 3 cm, and the height is 5 cm.



Let's start by finding the volume of just the bottom prism. I can think of the bottom prism as having a bottom layer that is equal to 3 x 14 cubes. It would take 5 layers to fill that bottom prism, so I'll use the expression (3 x 14) x 5 to represent the volume. *(write expression and show work as you narrate)* 3 x 14 = 42, and then 42 x 5 is 210. The volume of the rectangular prism on the bottom of our composed figure is 210 cubic centimeters. Is 210 cubic centimeters our final answer? How do you know? Possible Student Answers, Key Points:

- It is not our final answer. That's just the bottom prism.
- We're not done. We have to find the volume of the entire composite figure, so we need to think about the top prism too.

In this problem, both prisms are identical. The bottom is 210 cubic centimeters, so the top is too. *(label both prisms with 210)* To find the volume of the entire figure, we can combine the two volumes. *(write 210 + 210 in vertical form)* What is 210 + 210? (420) The volume of the composite figure is 420 cubic centimeters. *(write sum with units)*

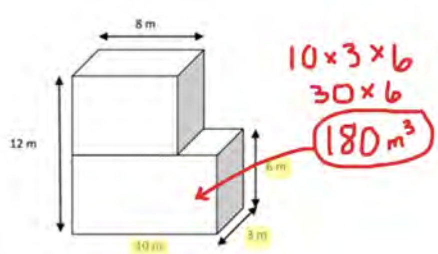


We found the volume of each rectangular prism, and then we added them together to find the volume of the entire composite figure.

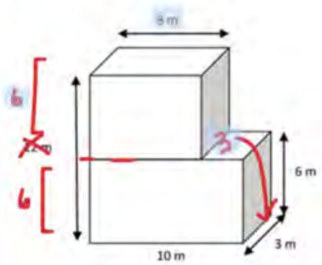
Let's Think (Slide 5): Let's try one more. You'll notice in this problem, the two rectangular prisms are not identical. That's okay, we'll still use similar thinking. Let's find the volume of each rectangular prism, then add them together.

Look at the bottom prism. *(highlight each dimension as you name it)* I see it has a length of 10 meters, a width of 3 meters, and a height of 6 meters. I also see a height measurement on the left that says 12 meters. Why is the height of the bottom prism not 12 meters? Possible Student Answers, Key Points:

- That's the height of both prisms combined.
- It's too big. The arrow with the 12 m goes past the bottom prism.

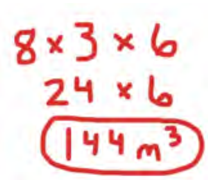


We want to be careful as we work with composite figures that we're using the measurements that pertain to the part of the figure we're looking at. If the dimensions for the bottom prism are 10 meters, 3 meters, and 6 meters, we can use multiplication to find the volume. *(write and evaluate expression as you narrate)* I can think of the volume as 10 x 3 x 6. I know 10 x 3 is 30, and 30 x 6 is 180. The volume is 180 cubic meters.

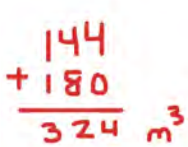


Now we'll find the volume of the top rectangular prism. I see the length is 8 meters, but the other dimensions aren't labeled as clearly. The top prism doesn't have the width labeled, but I can see from the picture it is the same width as the bottom prism. I can label the width as being 3 meters. *(label and draw an arrow to show it's the same as the 3-meter width of the bottom prism)*

The height is also not labeled clearly. I know the height of the bottom prism is 6 meters, and the height of the entire figure is 12 meters. How tall is the top prism if the bottom prism is 6 meters, and both prisms combined measure 12 meters? (6 meters, because 6 + 6 = 12 or 12 - 6 = 6) Great, now that our dimensions are clearly labeled, let's efficiently find the volume.



I know the prism has a length of 8 meters, a width of 3 meters, and a height of 6 meters. *(write and evaluate expression as you narrate)* I can think of the volume as 8 x 3 x 6. I know 8 x 3 is 24. What is 24 x 6? Take your time, and let me know when you have it. (144) 24 x 6 = 144. The volume of the top prism is 144 cubic meters.



The bottom prism is 180 cubic meters. The top prism is 144 cubic meters. If we need to find the volume of the entire composite figure, we've done all the hard work. Now we just need to add the volumes together. *(write 144 + 180 in vertical form)* I know 144 plus 180 is 324. The volume of the entire figure is 324 cubic meters. We did it!

Finding the volume of a figure composed of multiple rectangular prisms isn't harder than finding the volume of a single rectangular prism; it's just a bit more work, because you need to find both volumes. In your own words, how would you describe how to find the volume of a composite figure? Possible Student Answers, Key Points:

- To find the volume of a composite figure made of rectangular prisms, you just need to find the volume of each rectangular prism that makes up the figure. Once you have the volume of each figure, you can add them together to get the total volume.

Let's Try it (Slides 6 - 7): Now let's try finding the volume of solid figures composed of two non-overlapping rectangular prisms together. With each problem, we'll identify the unique rectangular prisms we see in the figure, calculate the volume of each figure, then combine their volumes by adding them together. We can calculate the volume of the individual prisms using any method we've learned, but remember that multiplication can be an efficient strategy to use in most cases. Let's give it a try.

WARM WELCOME

Today we will find the volume of solid figures composed of two non-overlapping rectangular prisms.

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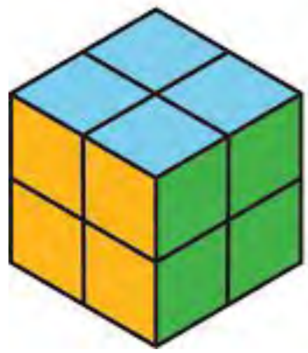
Let's Talk:

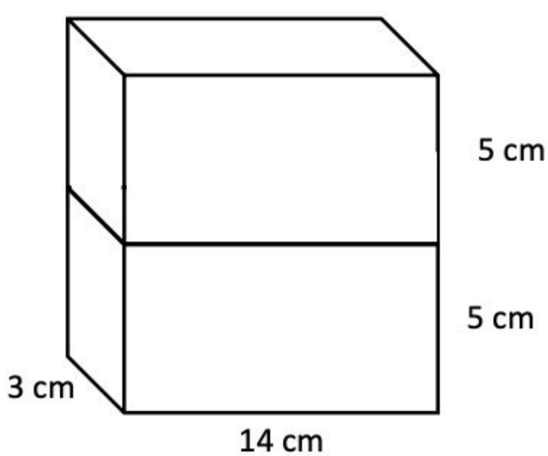


I want to stack 3 of these prisms to make a tower.

How could I find the volume of the tower?

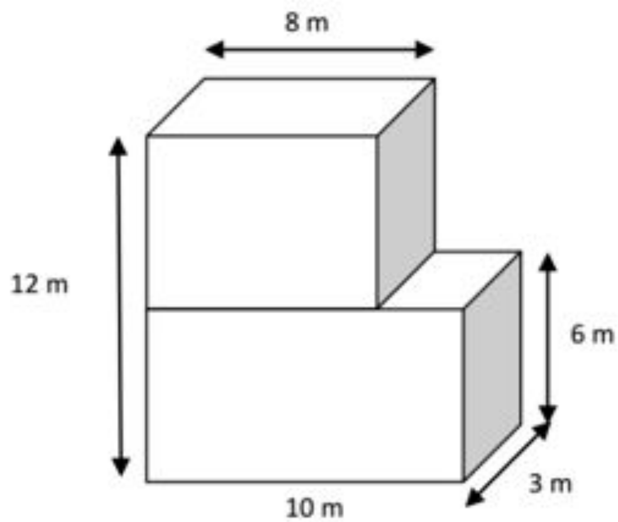
Let's Think:

What's the volume of the composite figure?



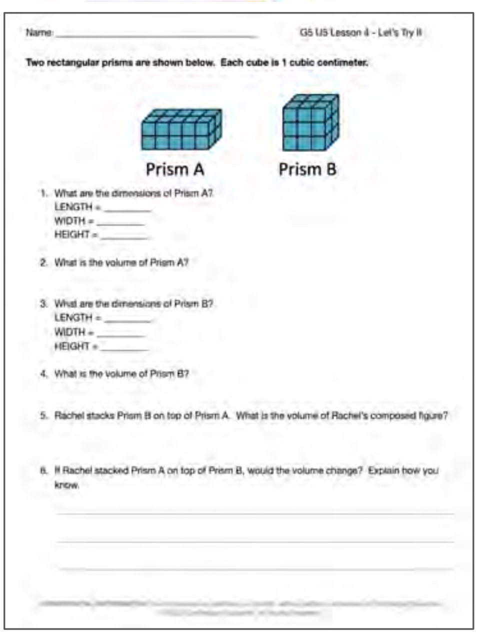
Let's Think:

Find the volume of the figure shown here.



Let's Try It:

Let's explore finding the volume of solid figures composed of two non-overlapping rectangular prisms together.

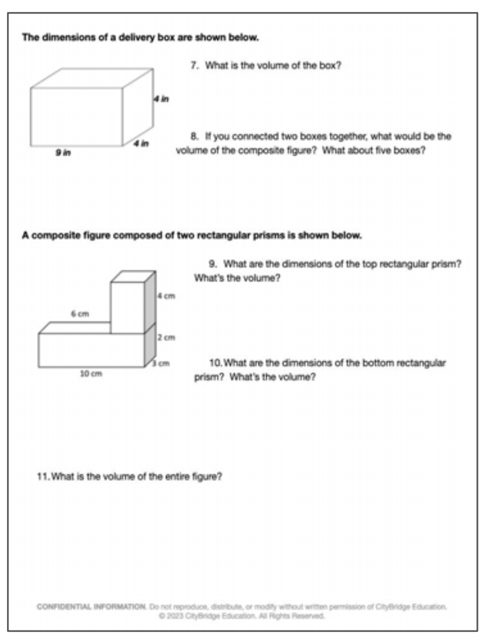


Name: ______________________ G5 U5 Lesson 4 - Let's Try It

Two rectangular prisms are shown below. Each cube is 1 cubic centimeter.

Prism A Prism B

1. What are the dimensions of Prism A?
   LENGTH = ________
   WIDTH = ________
   HEIGHT = ________
2. What is the volume of Prism A?
3. What are the dimensions of Prism B?
   LENGTH = ________
   WIDTH = ________
   HEIGHT = ________
4. What is the volume of Prism B?
5. Rachel stacks Prism B on top of Prism A. What is the volume of Rachel's composed figure?
6. If Rachel stacked Prism A on top of Prism B, would the volume change? Explain how you know.



The dimensions of a delivery box are shown below.

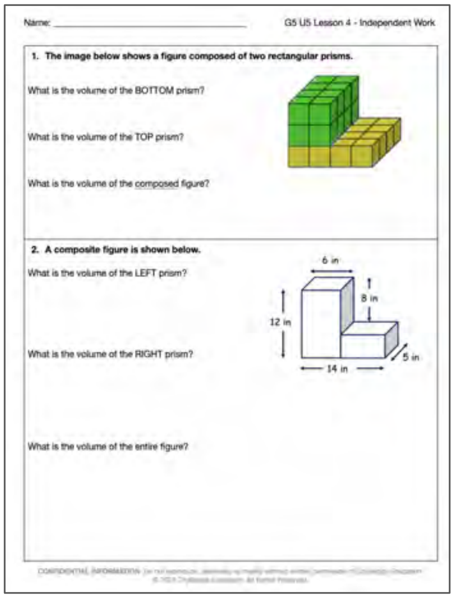
7. What is the volume of the box?
8. If you connected two boxes together, what would be the volume of the composite figure? What about five boxes?

A composite figure composed of two rectangular prisms is shown below.

9. What are the dimensions of the top rectangular prism? What's the volume?
10. What are the dimensions of the bottom rectangular prism? What's the volume?
11. What is the volume of the entire figure?

On your Own:

Now it's time to find the volume of solid figures composed of two non-overlapping rectangular prisms on your own.


Name: ______________________________ G5 U5 Lesson 4 - Independent Work

1. The image below shows a figure composed of two rectangular prisms.

What is the volume of the BOTTOM prism?

What is the volume of the TOP prism?

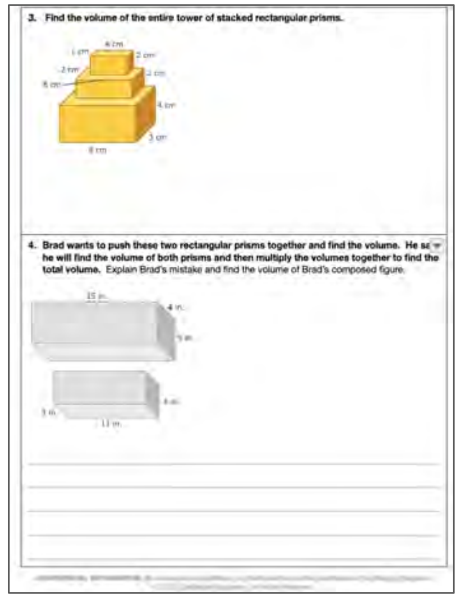
What is the volume of the composed figure?

2. A composite figure is shown below.

What is the volume of the LEFT prism?

What is the volume of the RIGHT prism?

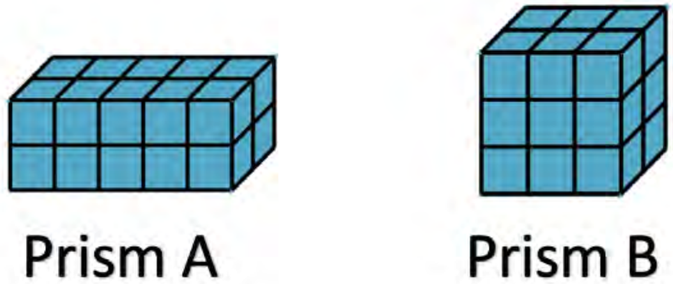
What is the volume of the entire figure?


3. Find the volume of the entire tower of stacked rectangular prisms.

4. Brad wants to push these two rectangular prisms together and find the volume. He sa[ys] he will find the volume of both prisms and then multiply the volumes together to find the total volume. Explain Brad's mistake and find the volume of Brad's composed figure.

Name: ______________________________________ G5 U5 Lesson 4 - Let's Try It

Two rectangular prisms are shown below. Each cube is 1 cubic centimeter.



1. What are the dimensions of Prism A?
   LENGTH = __________
   WIDTH = __________
   HEIGHT = __________

2. What is the volume of Prism A?

3. What are the dimensions of Prism B?
   LENGTH = __________
   WIDTH = __________
   HEIGHT = __________

4. What is the volume of Prism B?

5. Rachel stacks Prism B on top of Prism A. What is the volume of Rachel's composed figure?

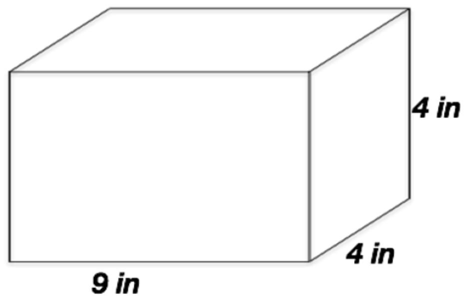
6. If Rachel stacked Prism A on top of Prism B, would the volume change? Explain how you know.

____

____

____

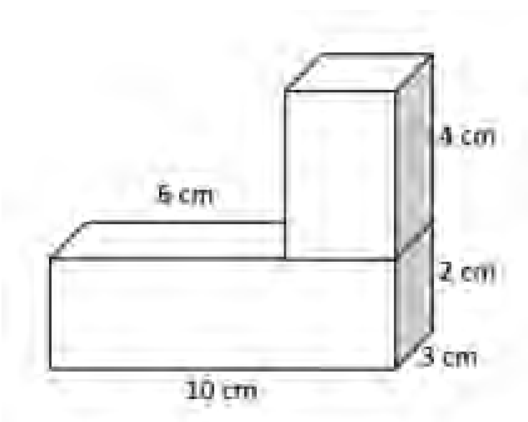
The dimensions of a delivery box are shown below.



7. What is the volume of the box?

8. If you connected two boxes together, what would be the volume of the composite figure? What about five boxes?

A composite figure composed of two rectangular prisms is shown below.

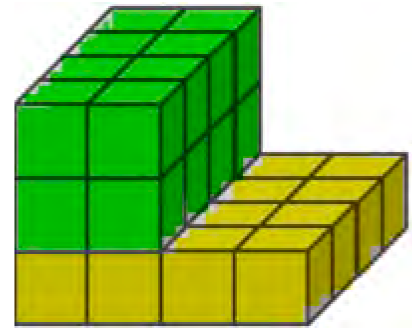


9. What are the dimensions of the top rectangular prism? What's the volume?

10. What are the dimensions of the bottom rectangular prism? What's the volume?

11. What is the volume of the entire figure?

1. The image below shows a figure composed of two rectangular prisms.

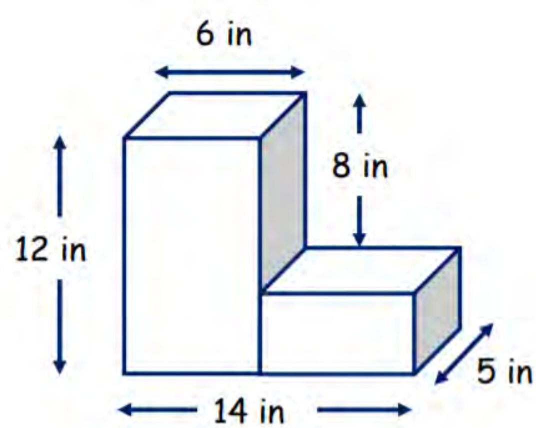


What is the volume of the BOTTOM prism?

What is the volume of the TOP prism?

What is the volume of the composed figure?

2. A composite figure is shown below.

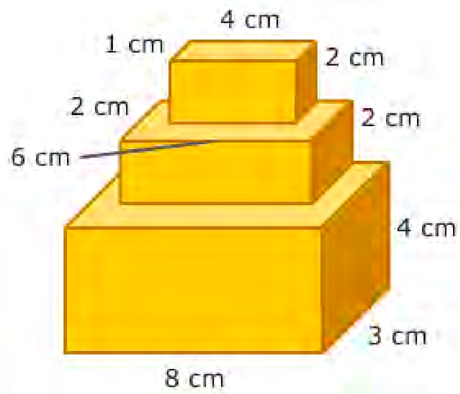


What is the volume of the LEFT prism?

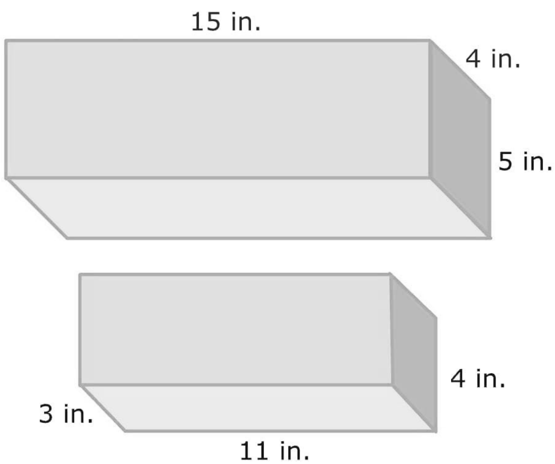
What is the volume of the RIGHT prism?

What is the volume of the entire figure?

3. Find the volume of the entire tower of stacked rectangular prisms.

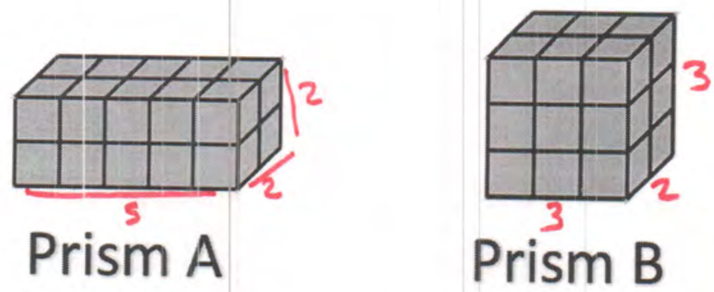


4. Brad wants to push these two rectangular prisms together and find the volume. He says he will find the volume of both prisms and then multiply the volumes together to find the total volume. Explain Brad's mistake and find the volume of Brad's composed figure.



Name: KEY

Two rectangular prisms are shown below. Each cube is 1 cubic centimeter.



1. What are the dimensions of Prism A?
   LENGTH = 5
   WIDTH = 2
   HEIGHT = 2

2. What is the volume of Prism A?
   $5 \times 2 \times 2$
   10×2
   $20 u^3$

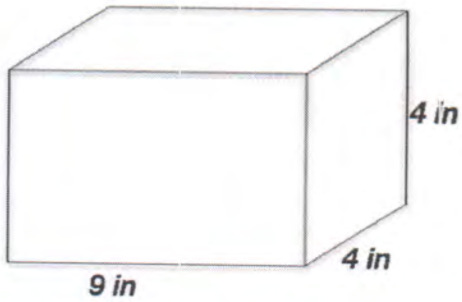
3. What are the dimensions of Prism B?
   LENGTH = 3
   WIDTH = 2
   HEIGHT = 3

4. What is the volume of Prism B?
   $3 \times 2 \times 3$
   6×3
   $18 u^3$

5. Rachel stacks Prism B on top of Prism A. What is the volume of Rachel's composed figure?
   B 18, A 20 > $20 + 18 = 38 u^3$

6. If Rachel stacked Prism A on top of Prism B, would the volume change? Explain how you know.
   No. The figure might look different, but it would still be composed of 38 total cubes.

The dimensions of a delivery box are shown below.



7. What is the volume of the box?

9 × 4 × 4
36 × 4
144 in³

36 × 4 = 144

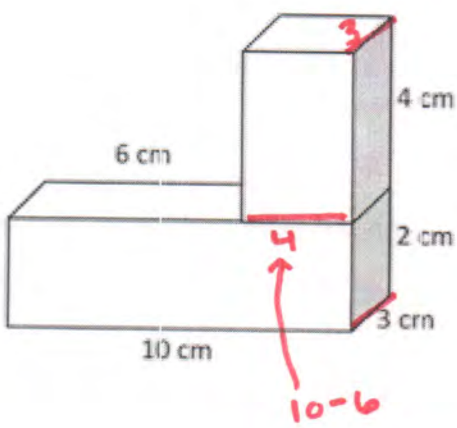
8. If you connected two boxes together, what would be the volume of the composite figure? What about five boxes?

2 boxes
2 × 144 = 288 u³
boxes

5 boxes
5 × 144
720 u³

144 × 5 = 720

A composite figure composed of two rectangular prisms is shown below.



9. What are the dimensions of the top rectangular prism? What's the volume?

length = 4 cm
width = 3 cm
height = 4 cm

4 × 3 × 4
12 × 4
48 cm³

10. What are the dimensions of the bottom rectangular prism? What's the volume?

length = 10 cm
width = 3 cm
height = 2 cm

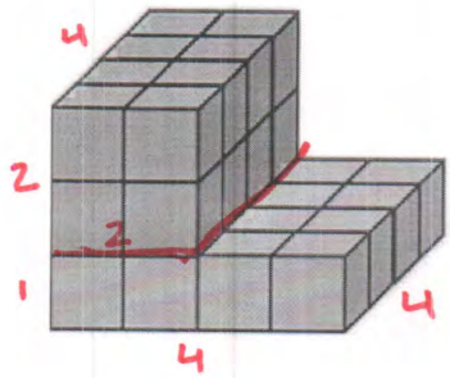
10 × 3 × 2
30 × 2
60 cm³

11. What is the volume of the entire figure?

48 + 60 = 108 cm³

Name: KEY

1. The image below shows a figure composed of two rectangular prisms.



What is the volume of the BOTTOM prism?

1 × 4 × 4
4 × 4
16 u^3

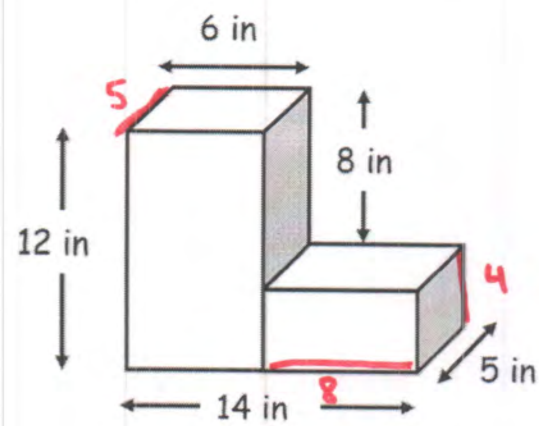
What is the volume of the TOP prism?

2 × 4 × 2
8 × 2
16 u^3

What is the volume of the composed figure?

16 + 16 = 32 u^3

2. A composite figure is shown below.



What is the volume of the LEFT prism?

5 × 6 × 12
30 × 12
360 in^3

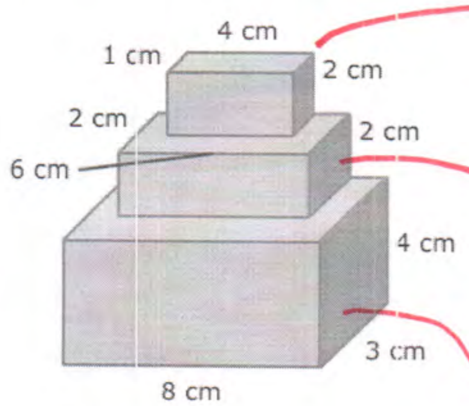
What is the volume of the RIGHT prism?

8 × 5 × 4
40 × 4
160 in^3

What is the volume of the entire figure?

360 + 160 = 520 in^3

3. **Find the volume of the entire tower of stacked rectangular prisms.**



$1 \times 4 \times 2$
4×2
$8 u^3$

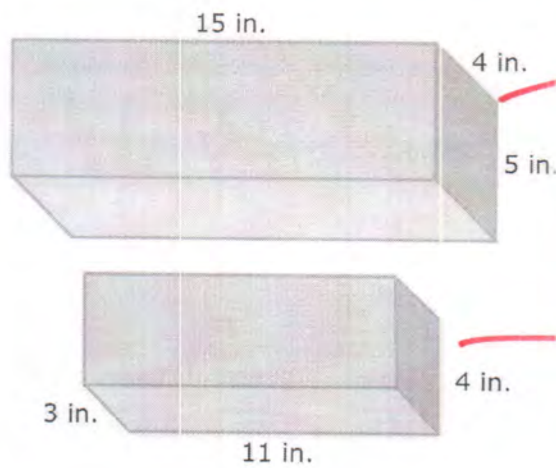
$6 \times 2 \times 2$
12×2
$24 u^3$

$8 \times 3 \times 4$
24×4
$96 u^3$

$96 + 24 + 8 = 128$

$128 u^3$
TOTAL

4. **Brad wants to push these two rectangular prisms together and find the volume. He says he will find the volume of both prisms and then multiply the volumes together to find the total volume.** Explain Brad's mistake and find the volume of Brad's composed figure.



$15 \times 4 \times 5$
60×5
$300 in^3$

$11 \times 3 \times 4$
33×4
$132 in^3$

$300 + 132$
$432 in^3$

Brad needs to add the two volumes together, not multiply. The first volume is 300 in^3 and the second volume is 132 in^3. The total combined volume is 432 in^3. 300 × 132 would be way too big!

G5 U5 Lesson 5

Find the area of rectangles with whole-by-mixed and whole-by-fractional number side lengths by tiling, record by drawing, and relate to fraction multiplication.

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G5 U5 Lesson 5 - Students will find the area of rectangles with whole-by-mixed and whole-by-fractional number side lengths by tiling, record by drawing, and relate to fraction multiplication

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We've been working so hard on finding the volume of rectangular prisms. For our lesson today, we're switching gears! For the next few lessons, we'll focus on finding the *area* of rectangles. You've likely worked with area in math class since around third grade. What are some things you already know about area? Possible Student Answers, Key Points:

- Area is the amount of space a 2D figure takes up.
- We measure area in square units.
- To find the area of a rectangle, I can multiply the length by the width.

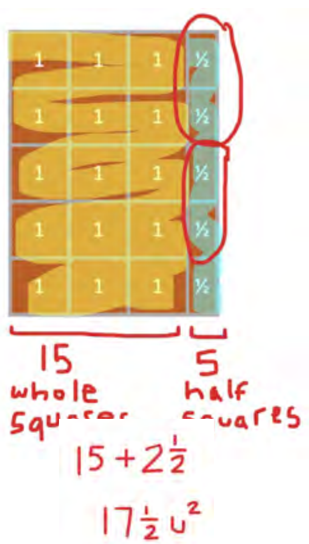
Great! You already know some important things about finding the area of rectangles, but let's quickly recap. Area is the amount of space a two-dimensional figure takes up. When your first learned about area, you probably tiled using squares to cover figures without gaps or overlaps. Similar to how we measure volume using cubic units, we measure area using square units. Let's lean on what we already know to help us find the area of rectangles with fractional side lengths.

Let's Talk (Slide 3): Take a look at the rectangles shown here. What do you notice about them? What do you wonder? Possible Student Answers, Key Points:

- I notice they get bigger each time. I notice the area of the first one is 5 square units. I notice the last one has half-squares in it.
- I wonder what they represent. I wonder why the last one includes fractions. I wonder how to find the area if some of the pieces are fractions.

The area of the first three rectangles is pretty simple to calculate, because each of the rectangles only includes whole unit squares. I can count or multiply the length by the width to find the first area is 5 square units, the second area is 10 square units, and the third area is 15 square units. The last rectangle is where we'll focus our attention today. With your help, I'll show you how to find the area of a rectangles with fractional dimensions.

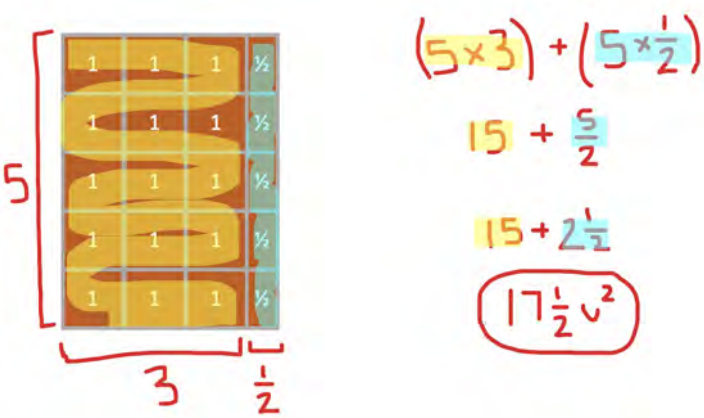
Let's Think (Slide 4): We'll find the area of this rectangle two ways.



Let's start by simply counting. How many whole unit squares do you see in this rectangle, and how many half unit squares to you see? (There are 15 whole squares and 5 half squares) *(highlight the wholes in one color and the halves in another, then label the sections as 15 whole squares and 5 half squares)*

We know that two halves make a whole, so 5 half squares would be 2 ½ squares. *(circle pairs of half square units)*

The area of the whole squares is 15 square units. The area of the half squares is 2 ½ square units. *(write 15 + 2 ½)* So, 15 plus 2 ½ means the area of the entire rectangle is 17 ½ square units. We just counted the whole square units and added them to the half square units to find the area of the figure.



We can also use multiplication to help us find the area of rectangles with fractional units. I know this rectangle has a length of 5. *(label length)* The width is 3 ½, but let's break that up to make it easier to think about. *(label width as 3 and ½ separately as shown)*

We can think of the rectangle as being decomposed into two smaller rectangles. The larger section has a length of 5 and a width of 3. *(write 5 x 3 +)* The smaller section has a length of 5 and a width of ½. *(write 5 x ½)* Let's multiply to find the area of each section. *(show work as you narrate, color-coding it if that's helpful)* 5 times 3 is 15. 5 times ½ is 5/2. We know 5/2 is equivalent to 2 ½. When we add those two areas together, we end up with 17 ½ square units.

In your own words, how would you describe the work we just did to calculate the area of a rectangle with fractional side lengths? Possible Student Answers, Key Points:

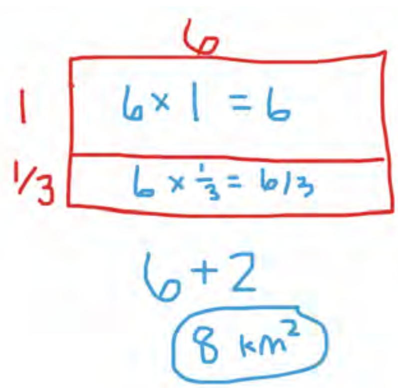
- We counted up the whole squares and the half squares and put them together.
- We multiplied length and width to find the area of one part of the rectangle. We multiplied length and width again to find the area of the other part of the rectangle. Then, we added those areas together.

We can count whole units and fractional units to find the area of a rectangle, or we can break apart the rectangle and use multiplication to find the area of each section. Let's try another example.

Let's Think (Slide 5): *(read problem)* What do you notice is the same and different about this problem compared to the previous one? Possible Student Answers, Key Points:

- It's an area problem about a rectangle. One of the side lengths has a fraction in it.
- It's different because it's a story problem. It's different because the rectangle is not tiled. We can't see the units.

We can help the architects find the area of this rectangle even though we can't see the units. We won't be able to use our counting strategy, so let's use multiplication. I know to find the area of a rectangle, I can multiply the length by the width. In this case, I'm going to decompose 1 ⅓ into a whole number and a fraction, so I can multiply in easy pieces. I'll draw an area model to help me keep track of my work. *(draw a partitioned rectangular area model as shown, labeling one side as 6 and the other side as 1 and ⅓)*



I can multiply 6 x 1 to find the area of the top rectangle. *(write 6 x 1 = 6 inside the area model)* How can I find the area of the bottom rectangle? (multiply 6 x ⅓) I know 6 times ⅓ is 6/3. *(write 6 x ⅓ = 6/3 inside the area model)* 6/3 is the same as 2 wholes.

The area of the top section of our area model is 6 square kilometers. The area of the bottom section of our area model is 2 square kilometers. That means the area of the entire plot of land is 8 square kilometers, since 6 plus 2 equals 8.

Even though we didn't have squares to count, we were still able to find the area of the rectangle by decomposing the fractional side length and multiplying using an area model.

Let's Try it (Slides 6 - 7): Now it's our turn to practice finding the area of rectangles with fractional side lengths a little more. If the problems involve unit squares, we can count them to find the area of the figure. If the problems don't involve unit squares we can count, or if we just want to be a bit more efficient, we can use multiplication to calculate the area of sections of each rectangle. Once we know the area of each section, we'll add them together to find the area of the composed rectangle. I think you're ready!

WARM WELCOME

Today we will find the area of rectangles with whole-by-mixed and whole-by-fractional number side lengths by tiling, record by drawing, and relate to fraction multiplication.

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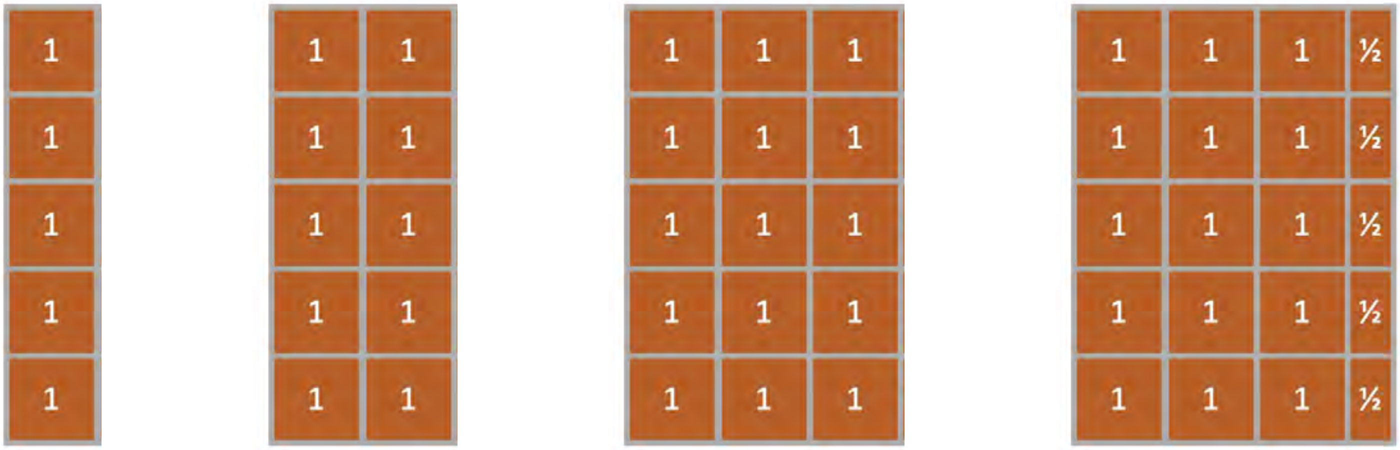
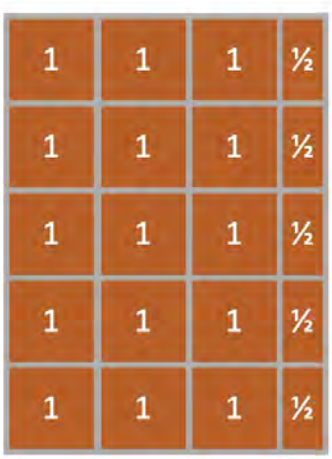
Let's Talk:



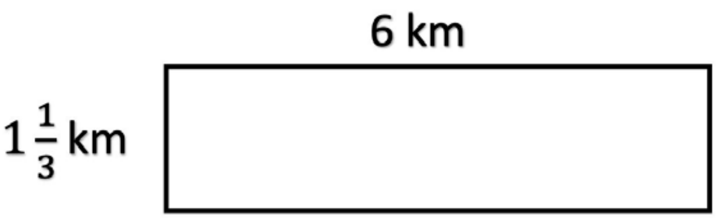
Let's Think:

What is the area of the rectangle?



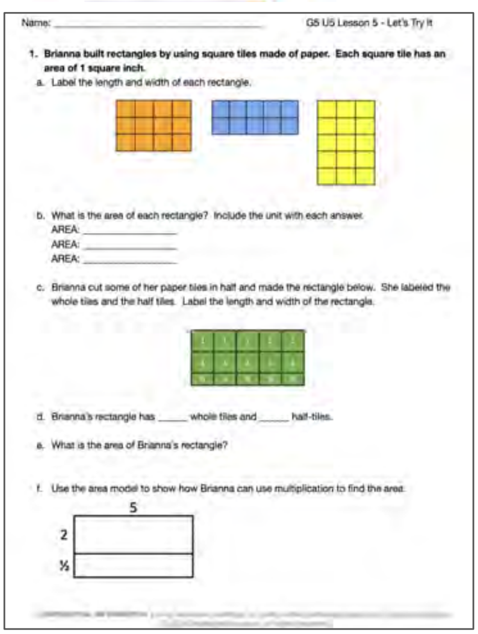
Let's Think:

A museum is being built on a large plot of land. The architects drew a model of the land to start thinking of designs for the museum. What is the area of the plot of land?



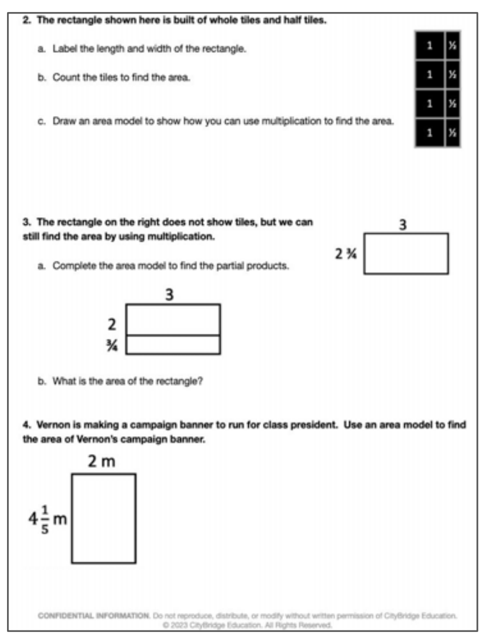
Let's Try It:

Let's explore finding the area of rectangles with whole-by-mixed and whole-by-fractional number side lengths together.



Name: ______________________ G5 U5 Lesson 5 - Let's Try It

1. **Brianna built rectangles by using square tiles made of paper. Each square tile has an area of 1 square inch.**
   a. Label the length and width of each rectangle.
   b. What is the area of each rectangle? Include the unit with each answer.
   AREA: ______________
   AREA: ______________
   AREA: ______________
   c. Brianna cut some of her paper tiles in half and made the rectangle below. She labeled the whole tiles and the half tiles. Label the length and width of the rectangle.
   d. Brianna's rectangle has _____ whole tiles and _____ half-tiles.
   e. What is the area of Brianna's rectangle?
   f. Use the area model to show how Brianna can use multiplication to find the area.



2. **The rectangle shown here is built of whole tiles and half tiles.**
   a. Label the length and width of the rectangle.
   b. Count the tiles to find the area.
   c. Draw an area model to show how you can use multiplication to find the area.

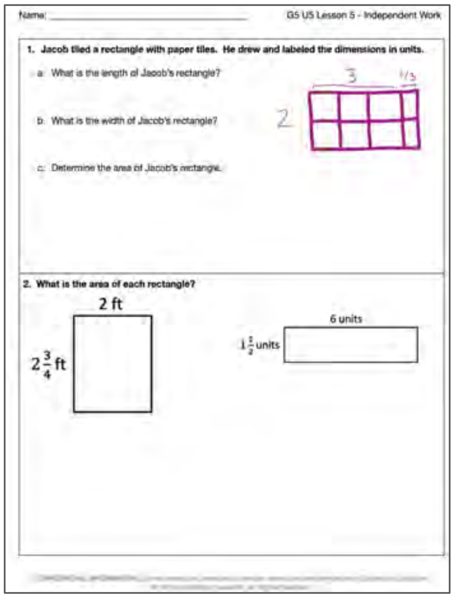
3. **The rectangle on the right does not show tiles, but we can still find the area by using multiplication.**
   a. Complete the area model to find the partial products.

   b. What is the area of the rectangle?

4. **Vernon is making a campaign banner to run for class president. Use an area model to find the area of Vernon's campaign banner.**

On your Own:

Now it's time to find the area of rectangles with whole-by-mixed and whole-by-fractional number side lengths on your own.


Name: ______________________ G5 U5 Lesson 5 - Independent Work

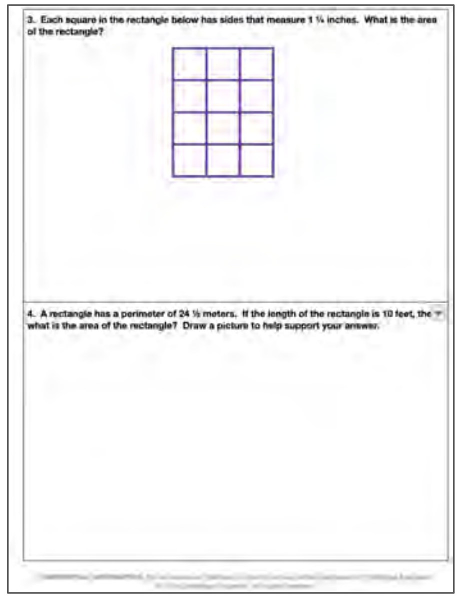
1. Jacob tiled a rectangle with paper tiles. He drew and labeled the dimensions in units.

a. What is the length of Jacob's rectangle?

b. What is the width of Jacob's rectangle?

c. Determine the area of Jacob's rectangle.

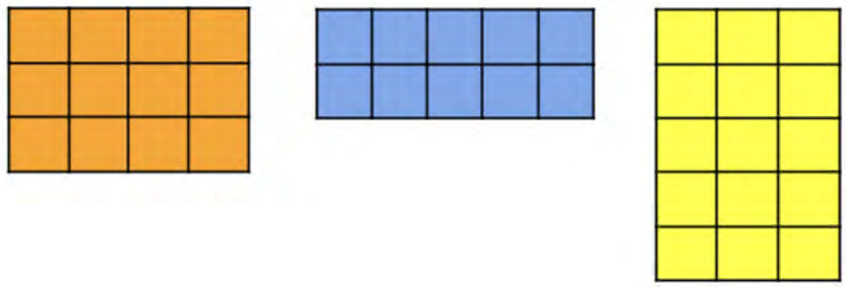
2. What is the area of each rectangle?


3. Each square in the rectangle below has sides that measure 1 ¼ inches. What is the area of the rectangle?

4. A rectangle has a perimeter of 24 ½ meters. If the length of the rectangle is 10 feet, the what is the area of the rectangle? Draw a picture to help support your answer.

1. Brianna built rectangles by using square tiles made of paper. Each square tile has an area of 1 square inch.

a. Label the length and width of each rectangle.



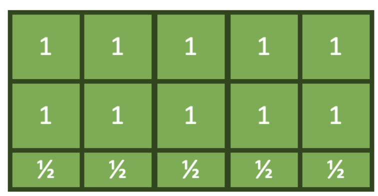
b. What is the area of each rectangle? Include the unit with each answer.

AREA: ____________________

AREA: ____________________

AREA: ____________________

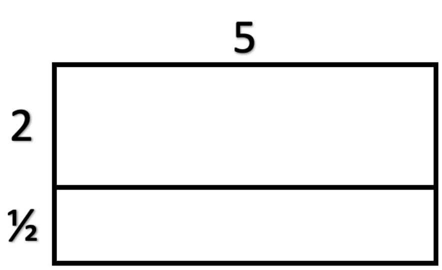
c. Brianna cut some of her paper tiles in half and made the rectangle below. She labeled the whole tiles and the half tiles. Label the length and width of the rectangle.



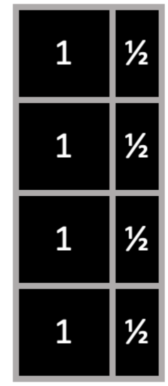
d. Brianna's rectangle has ______ whole tiles and ______ half-tiles.

e. What is the area of Brianna's rectangle?

f. Use the area model to show how Brianna can use multiplication to find the area.



2. The rectangle shown here is built of whole tiles and half tiles.

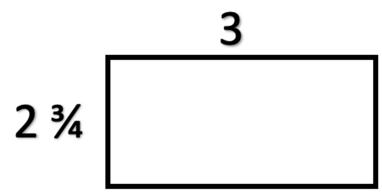


a. Label the length and width of the rectangle.

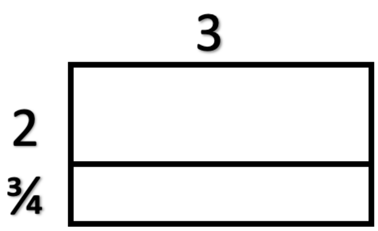
b. Count the tiles to find the area.

c. Draw an area model to show how you can use multiplication to find the area.

3. The rectangle on the right does not show tiles, but we can still find the area by using multiplication.

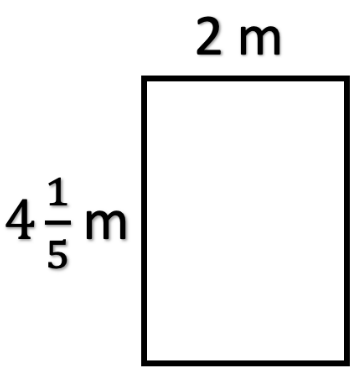


a. Complete the area model to find the partial products.



b. What is the area of the rectangle?

4. Vernon is making a campaign banner to run for class president. Use an area model to find the area of Vernon's campaign banner.

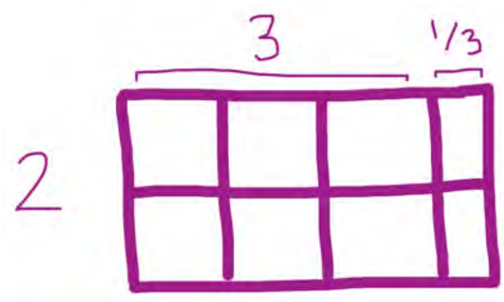


1. Jacob tiled a rectangle with paper tiles. He drew and labeled the dimensions in units.

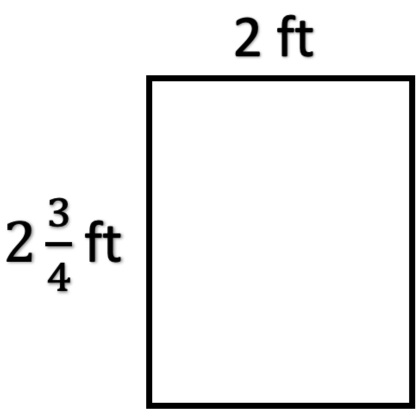
a. What is the length of Jacob's rectangle?

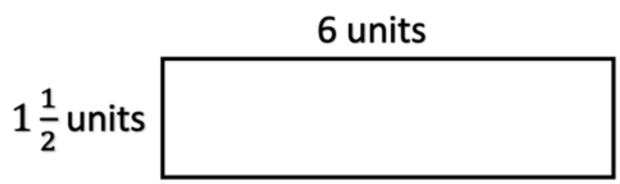
b. What is the width of Jacob's rectangle?

c. Determine the area of Jacob's rectangle.

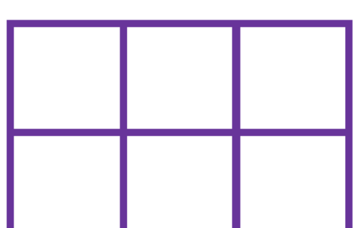


2. What is the area of each rectangle?





3. Each square in the rectangle below has sides that measure 1 ¼ inches. What is the area of the rectangle?

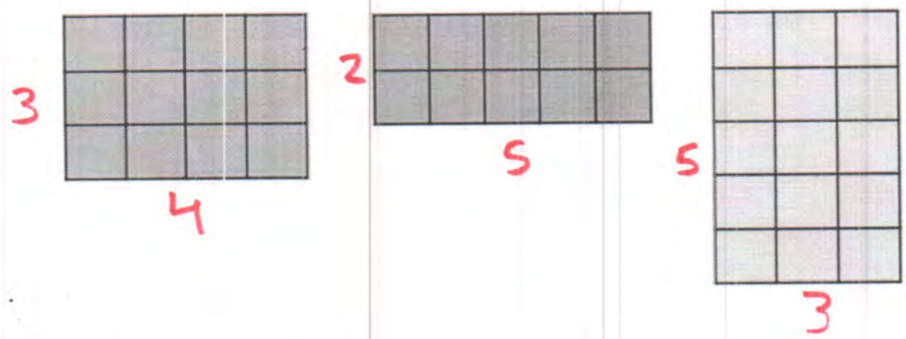


4. A rectangle has a perimeter of 24 ½ meters. If the length of the rectangle is 10 feet, then what is the area of the rectangle? Draw a picture to help support your answer.

Name: KEY

1. **Brianna built rectangles by using square tiles made of paper. Each square tile has an area of 1 square inch.**

a. Label the length and width of each rectangle.



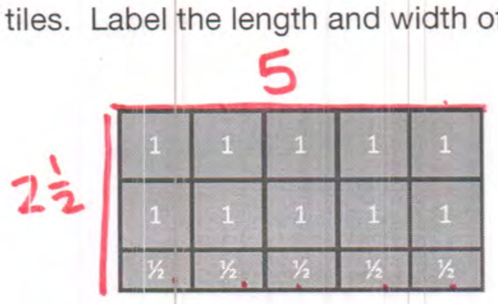
b. What is the area of each rectangle? Include the unit with each answer.

AREA: $12\ in^2$

AREA: $10\ in^2$

AREA: $15\ in^2$

c. Brianna cut some of her paper tiles in half and made the rectangle below. She labeled the whole tiles and the half tiles. Label the length and width of the rectangle.

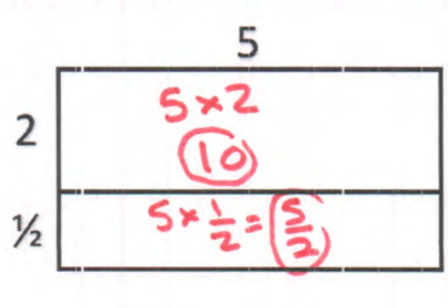


d. Brianna's rectangle has 10 whole tiles and 5 half-tiles.

e. What is the area of Brianna's rectangle?

$10 + \frac{5}{2} \longrightarrow 10 + 2\frac{1}{2} = 12\frac{1}{2}\ u^2$

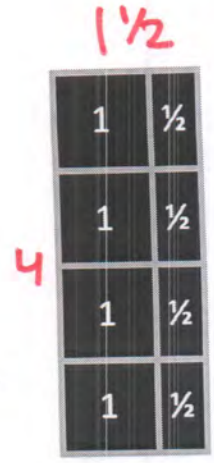
f. Use the area model to show how Brianna can use multiplication to find the area.



$10 + \frac{5}{2}$

$10 + 2\frac{1}{2}$

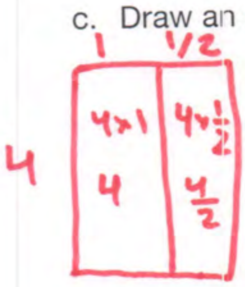
$12\frac{1}{2}\ u^2$

2. **The rectangle shown here is built of whole tiles and half tiles.**

a. Label the length and width of the rectangle. ✓

b. Count the tiles to find the area.

4 wholes + 4 halves   4+2 = 6 u²

c. Draw an area model to show how you can use multiplication to find the area.

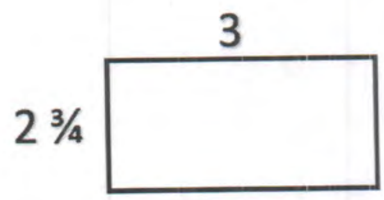


$(4\times1)+(4\times\frac{1}{2})$

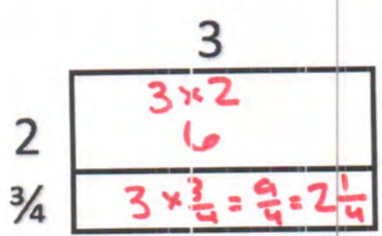
4 + 2

6 u²

3. **The rectangle on the right does not show tiles, but we can still find the area by using multiplication.**



a. Complete the area model to find the partial products.

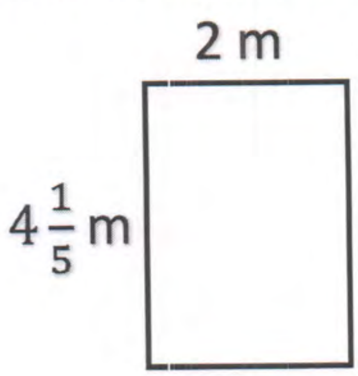


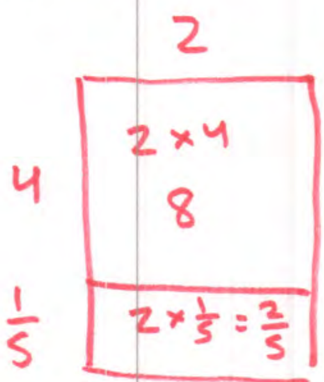
6 + 2¼

b. What is the area of the rectangle?

8¼ u²

4. **Vernon is making a campaign banner to run for class president. Use an area model to find the area of Vernon's campaign banner.**



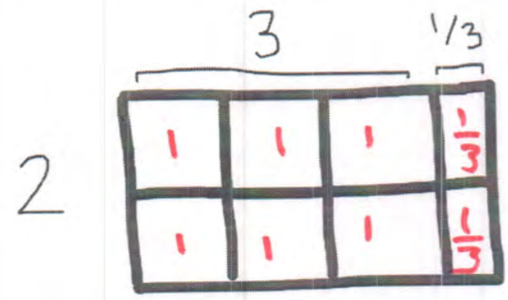


$8+\frac{2}{5}$

$8\frac{2}{5}$ m²

Name: KEY

1. Jacob tiled a rectangle with paper tiles. He drew and labeled the dimensions in units.



a. What is the length of Jacob's rectangle?

$3\frac{1}{3}$

b. What is the width of Jacob's rectangle?

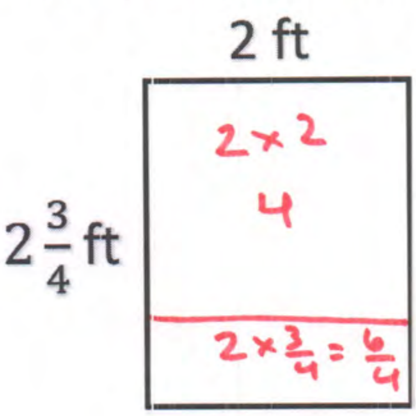
2

c. Determine the area of Jacob's rectangle.

$6 + \frac{2}{3}$

$6\frac{2}{3}\ u^2$

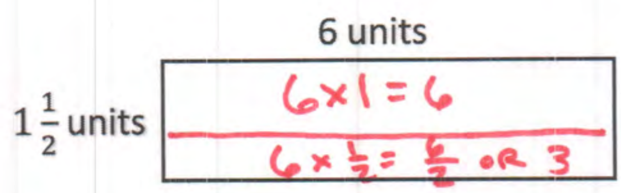
2. What is the area of each rectangle?



$4 + \frac{6}{4}$

$4 + 1\frac{2}{4}$

$5\frac{2}{4}$ or $5\frac{1}{2}\ ft^2$

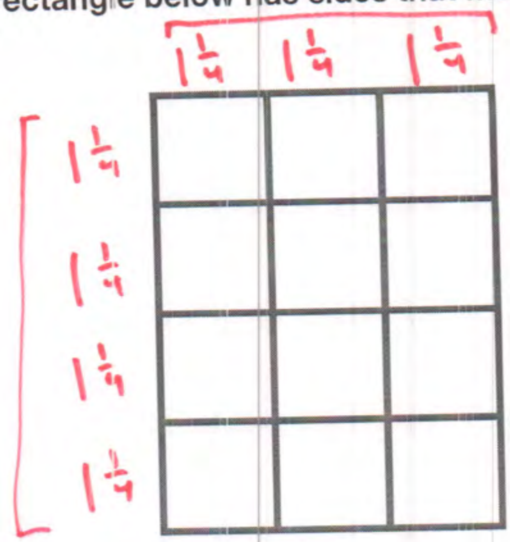


$6 + 3$

$9\ u^2$

3. Each square in the rectangle below has sides that measure 1 ¼ inches. What is the area of the rectangle?

$3\frac{3}{4}$



	3	3/4
5	5×3 15	$5 \times \frac{3}{4}$ $\frac{15}{4}$ or $3\frac{3}{4}$

$15 + 3\frac{3}{4}$

$18\frac{3}{4}\ in^2$

4. A rectangle has a perimeter of 24 ½ meters. If the length of the rectangle is 10 feet, then what is the area of the rectangle? Draw a picture to help support your answer.

	10	
$2\frac{1}{4}$		$2\frac{1}{4}$
	10	

$10 + 10 + ? + ? = 24\frac{1}{2}$

$20 + ? + ? = 24\frac{1}{2}$

$? + ? = 4\frac{1}{2}$

$2 \quad 2 \quad \frac{1}{4} \quad \frac{1}{4}$

	10
2	10×2 20
$\frac{1}{4}$	$10 \times \frac{1}{4} = \frac{10}{4}$

$20 + \frac{10}{4}$

$20 + 2\frac{2}{4}$

$22\frac{2}{4}$ or $22\frac{1}{2}\ ft^2$

G5 U5 Lesson 6

Find the area of rectangles with mixed-by-mixed and fraction-by-fraction side lengths by tiling, record by drawing, and relate to fraction multiplication.

CITYTUTOR DC

G5 U5 Lesson 6 - Students will find the area of rectangles with mixed-by-mixed and fraction-by-fraction side lengths by tiling, record by drawing, and relate to fraction multiplication

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Last time we met, we worked on calculating the area of a rectangle when one of the sides was a fraction or a mixed number. Today, we'll keep thinking about the area of rectangles, but we'll see examples where both dimensions are fractions or mixed numbers. You'll see that we'll use a lot of the same thinking!

Let's Talk (Slide 3): Let's begin by looking at these two rectangles. What is the same about them? What is different about them? Possible Student Answers, Key Points:

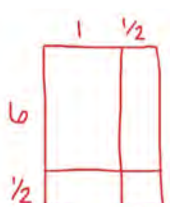
- They have the same dimensions. They're each 6 ½ units long and 1 ½ units wide.
- They look a little different in size. The second rectangle looks like an area model; it's partitioned into sections and the dimensions are decomposed.

These figures both show rectangles that measure 6 ½ units long and 1 ½ units wide. The second figure is made like an area model. Which figure do you think makes it easier to find the area of the rectangle? Possible Student Answers, Key Points:

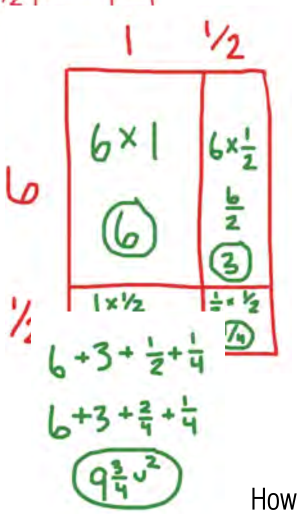
- Maybe the first one is easier, because it involves fewer values.
- Maybe the second one is easier, because it's broken into parts that I can solve in my head.

Today, we'll use area models to help us find the area of rectangles with fraction and mixed number side lengths.

Let's Think (Slide 4): Our first problem wants us to find the area of the rectangle we were just looking at.



Rather than have to think about multiplying a 6 ½ by 1 ½ all at once, let's draw an area model so we can think of this rectangle as smaller, simpler rectangles. We know that when we draw an area model, it doesn't have to be the exact dimensions of the actual rectangle. *(draw an area model with 1 and ½ labeled along the top and 6 and ½ labeled along the left)* We'll work to find the area of each rectangle, then we can combine those areas to find the final answer.



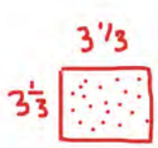
Help me find each partial product. *(write each expression and product in the corresponding portion of the area model as you narrate)* What is 6 x 1? (6) The area of this section is 6 units squared. What is 6 x ½? (6/2 or 3) 6 times ½ is 6/2. I know 6/2 is the same as 3 wholes. The area of this section is 3 square units. What is 1 x ½? (½) The area of this section is ½ square unit. Lastly, what is ½ times ½? (¼) The area of this final section is ¼ square unit. Because we used an area model, each partial product was pretty easy to do in our heads. Nice work.

Now let's combine each area to find the area of the entire rectangle. *(write 6 + 3 + ½ + ¼)* The two fractional addends don't have like units, so I'll think of ½ as 2/4 to make it simpler to combine. 6 plus 3 plus 2/4 plus ¼ results in an area of 9 ¾ square units. The area of the full rectangle is 9 ¾ square units.

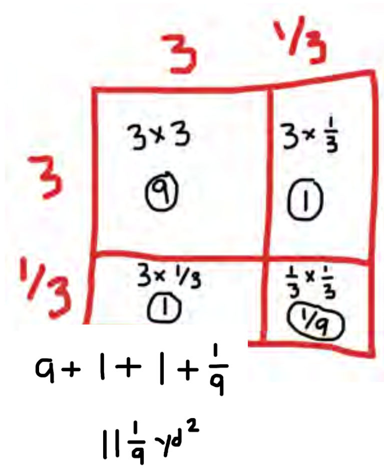
How did using an area model help us find the area of the rectangle? Possible Student Answers, Key Points:

- Decomposing the length and width, meant that we could think about more bite-size problems that we can do in our heads.
- We broke up the dimensions into whole numbers and fractions. This made it easy to find the partial products we could combine to find the area of the entire figure

Let's Think (Slide 5): *(read problem)* Right away, you probably notice that this problem doesn't include a picture. What should we do? (sketch our own picture)



(sketch a simple drawing as you narrate) I know squares have equal sides, so I'm picturing a square sandbox that measures 3 ⅓ on each side. The problem wants us to find the area, so I'm picturing the area inside the sandbox as what we're trying to determine. An area model will help us break this problem into more manageable pieces.



(sketch an area model and label each side as 3 and 1/3 as shown) We'll find the area of each part, then add them together to find the total area. How would you find the area of each part? *(write expression and product in each box as student explains)* Possible Student Answers, Key Points:

- 3 times 3 is 9. 3 times 1/3 is 3/3, which is the same as 1 whole. 3 times 1/3 is 3/3 or 1 whole again. 1/3 times 1/3 is 1/9.

|

The area of one section is 9 square units, another is 1 square unit, another is 1 square unit, and the smallest part has an area of 1/9 square unit. *(write 9 + 1 + 1 + 1/9)* If we add the areas together, we can see that the square has an area of 11 1/9 square yards.

Let's Try it (Slides 6 - 7): Now it's time to practice finding the area of rectangles with fractional side lengths. With each example, we'll use an area model to help us break the problem into easier pieces. By decomposing the mixed number side lengths, we create several simpler area problems that we can combine to get our final answer. Let's try a few more, and I'll be ready to support as needed.

WARM WELCOME

Today we will find the area of rectangles with mixed-by-mixed and fraction-by-fraction side lengths by tiling, record by drawing, and relate to fraction multiplication.

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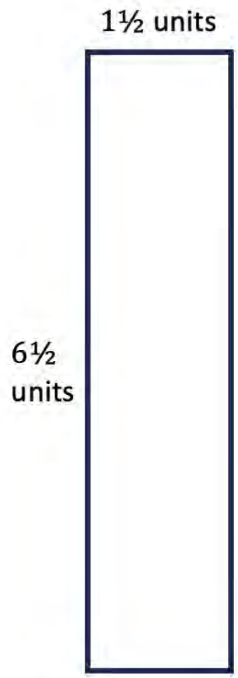
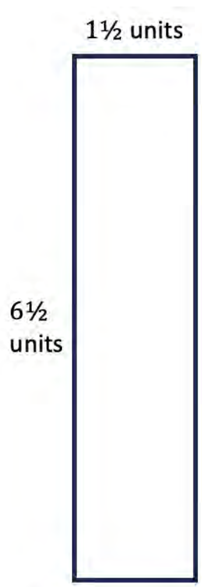
Let's Talk:

What's the same?
What's different?



Let's Think:

What is the area of the rectangle?



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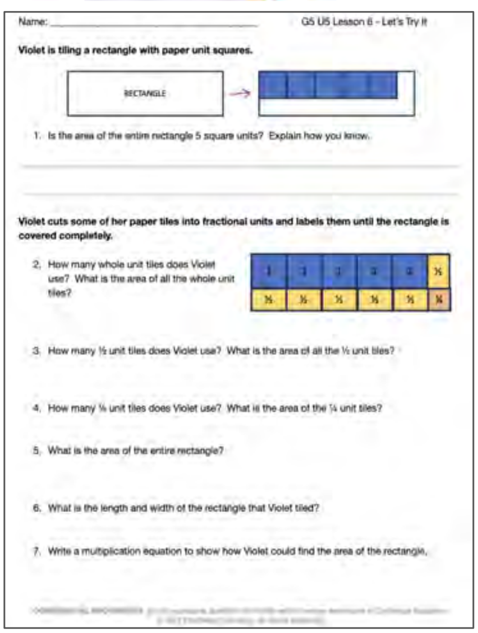
Let's Think:

A square sandbox has side lengths that measure 3 ⅓ yards. What is the area of the square sandbox?

Let's Try It:

Let's explore finding the area of rectangles with mixed-by-mixed and fraction-by-fraction side lengths together.



Name: ______________________ G5 U5 Lesson 6 - Let's Try It

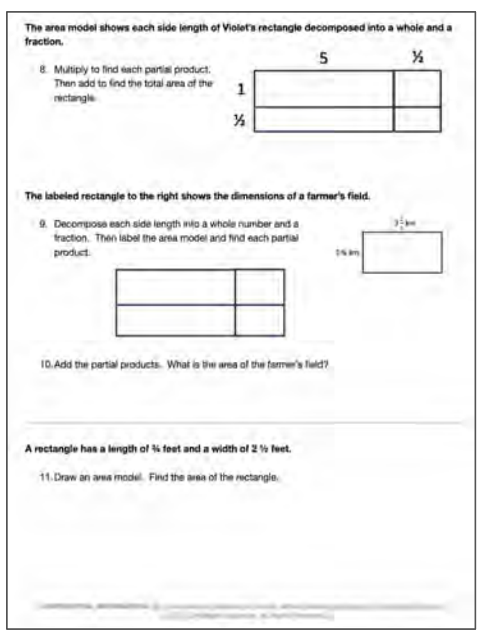
Violet is tiling a rectangle with paper unit squares.

RECTANGLE

1. Is the area of the entire rectangle 5 square units? Explain how you know.

Violet cuts some of her paper tiles into fractional units and labels them until the rectangle is covered completely.

2. How many whole unit tiles does Violet use? What is the area of all the whole unit tiles?
3. How many ½ unit tiles does Violet use? What is the area of all the ½ unit tiles?
4. How many ¼ unit tiles does Violet use? What is the area of the ¼ unit tiles?
5. What is the area of the entire rectangle?
6. What is the length and width of the rectangle that Violet tiled?
7. Write a multiplication equation to show how Violet could find the area of the rectangle.



The area model shows each side length of Violet's rectangle decomposed into a whole and a fraction.

8. Multiply to find each partial product. Then add to find the total area of the rectangle.

5 ½
1
½

The labeled rectangle to the right shows the dimensions of a farmer's field.

9. Decompose each side length into a whole number and a fraction. Then label the area model and find each partial product.

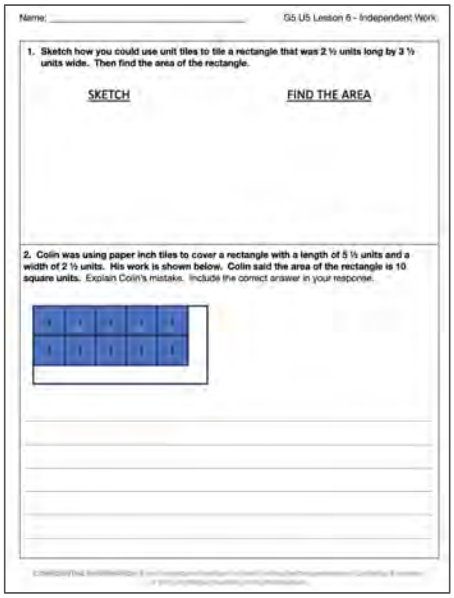
10. Add the partial products. What is the area of the farmer's field?

A rectangle has a length of ¾ feet and a width of 2 ½ feet.

11. Draw an area model. Find the area of the rectangle.

On your Own:

Now it's time to find the area of rectangles with mixed-by-mixed and fraction-by-fraction side lengths **on your own.**

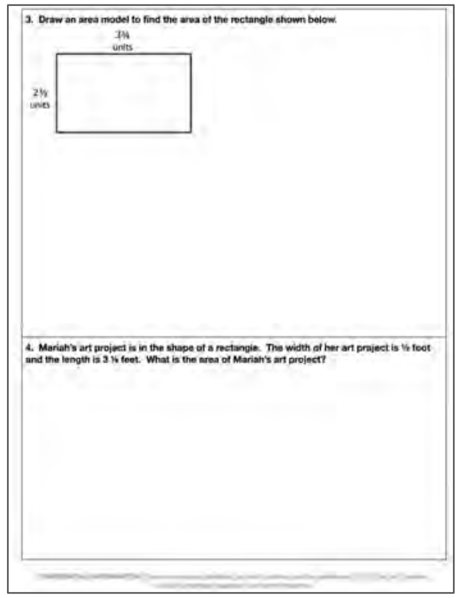


Name: ______________________ G5 U5 Lesson 6 - Independent Work

1. Sketch how you could use unit tiles to tile a rectangle that was $2\frac{1}{2}$ units long by $3\frac{1}{2}$ units wide. Then find the area of the rectangle.

SKETCH FIND THE AREA

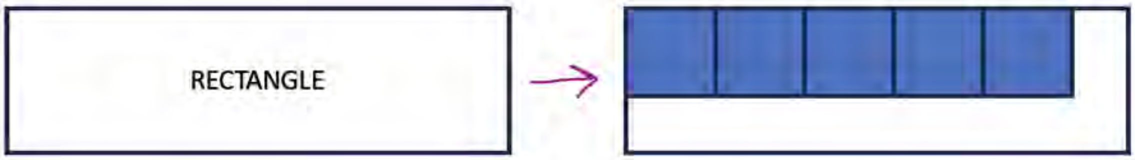
2. Colin was using paper inch tiles to cover a rectangle with a length of $5\frac{1}{2}$ units and a width of $2\frac{1}{2}$ units. His work is shown below. Colin said the area of the rectangle is 10 square units. Explain Colin's mistake. Include the correct answer in your response.



3. Draw an area model to find the area of the rectangle shown below.

4. Mariah's art project is in the shape of a rectangle. The width of her art project is $\frac{1}{2}$ foot and the length is $3\frac{1}{2}$ feet. What is the area of Mariah's art project?

Violet is tiling a rectangle with paper unit squares.

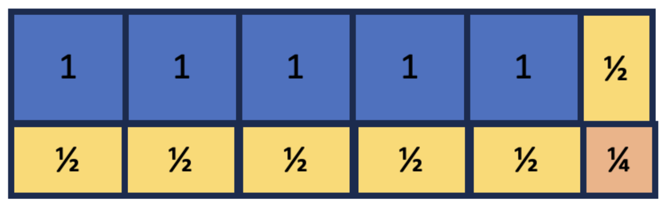


1. Is the area of the entire rectangle 5 square units? Explain how you know.

____

____

Violet cuts some of her paper tiles into fractional units and labels them until the rectangle is covered completely.



2. How many whole unit tiles does Violet use? What is the area of all the whole unit tiles?

3. How many ½ unit tiles does Violet use? What is the area of all the ½ unit tiles?

4. How many ¼ unit tiles does Violet use? What is the area of the ¼ unit tiles?

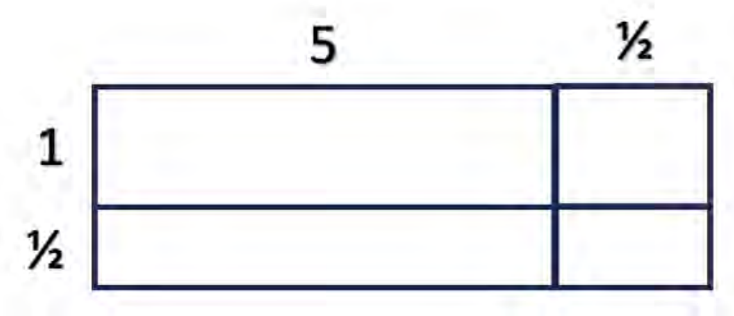
5. What is the area of the entire rectangle?

6. What is the length and width of the rectangle that Violet tiled?

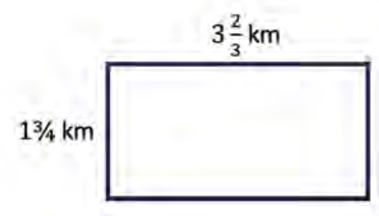
7. Write a multiplication equation to show how Violet could find the area of the rectangle.

The area model shows each side length of Violet's rectangle decomposed into a whole and a fraction.

8. Multiply to find each partial product. Then add to find the total area of the rectangle.



The labeled rectangle to the right shows the dimensions of a farmer's field.



9. Decompose each side length into a whole number and a fraction. Then label the area model and find each partial product.

10. Add the partial

A rectangle has a length of ¾ feet and a width of 2 ½ feet.

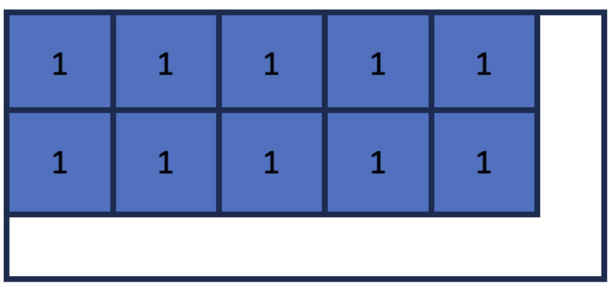
11. Draw an area model. Find the area of the rectangle.

1. Sketch how you could use unit tiles to tile a rectangle that was 2 ½ units long by 3 ½ units wide. Then find the area of the rectangle.

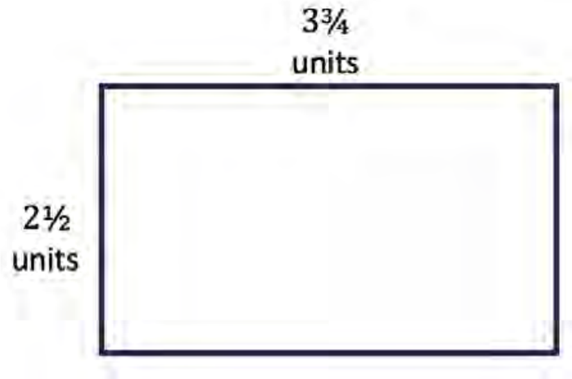
SKETCH

FIND THE AREA

2. Colin was using paper inch tiles to cover a rectangle with a length of 5 ½ units and a width of 2 ½ units. His work is shown below. Colin said the area of the rectangle is 10 square units. Explain Colin's mistake. Include the correct answer in your response.



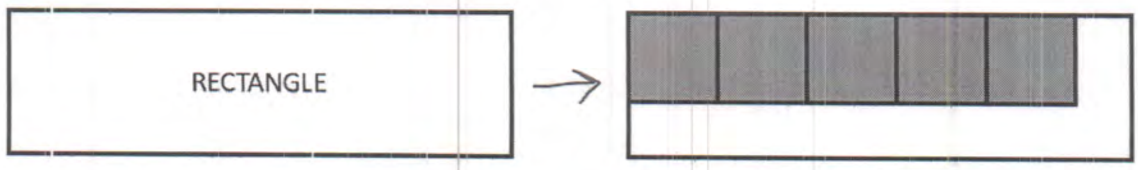
3. Draw an area model to find the area of the rectangle shown below.



4. Mariah's art project is in the shape of a rectangle. The width of her art project is ½ foot and the length is 3 ⅛ feet. What is the area of Mariah's art project?

Name: KEY

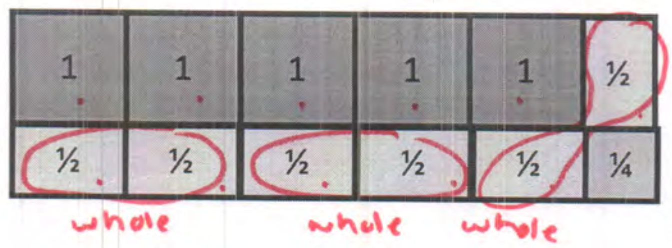
Violet is tiling a rectangle with paper unit squares.



1. Is the area of the entire rectangle 5 square units? Explain how you know.

No, the area is not 5 square units. She didn't tile the entire space

Violet cuts some of her paper tiles into fractional units and labels them until the rectangle is covered completely.



2. How many whole unit tiles does Violet use? What is the area of all the whole unit tiles?

5 whole tiles $= 5u^2$

3. How many ½ unit tiles does Violet use? What is the area of all the ½ unit tiles?

6 half tiles $= 3u^2$

4. How many ¼ unit tiles does Violet use? What is the area of the ¼ unit tiles?

1 quarter tile $= \frac{1}{4}u^2$

5. What is the area of the entire rectangle?

$5 + 3 + \frac{1}{4} = 8\frac{1}{4}u^2$

6. What is the length and width of the rectangle that Violet tiled?

length $= 5\frac{1}{2}$ width $= 1\frac{1}{2}$

7. Write a multiplication equation to show how Violet could find the area of the rectangle.

$5\frac{1}{2} \times 1\frac{1}{2} = ?$

The area model shows each side length of Violet's rectangle decomposed into a whole and a fraction.

8. Multiply to find each partial product. Then add to find the total area of the rectangle.

	5	½
1	$5 \times 1 = 5$	$\frac{1}{2} \times 1 = \frac{1}{2}$
½	$5 \times \frac{1}{2} = \frac{5}{2}$ or $2\frac{1}{2}$	$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$5 + \frac{1}{2} + 2\frac{1}{2} + \frac{1}{4}$

$5 + 3 + \frac{1}{4}$

$8\frac{1}{4}$ u^2

The labeled rectangle to the right shows the dimensions of a farmer's field.

9. Decompose each side length into a whole number and a fraction. Then label the area model and find each partial product.

	$3\frac{2}{3}$ km
1¾ km	

	3	2/3
1	$3 \times 1 = 3$	$\frac{2}{3} \times 1 = \frac{2}{3}$
$\frac{3}{4}$	$3 \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$	$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$

10. Add the partial products. What is the area of the farmer's field?

$3 + \frac{2}{3} + 2\frac{1}{4} + \frac{6}{12}$

$3 + \frac{8}{12} + 2\frac{3}{12} + \frac{6}{12} = 5\frac{17}{12} = 6\frac{5}{12}$ km^2

A rectangle has a length of ¾ feet and a width of 2 ½ feet.

11. Draw an area model. Find the area of the rectangle.

	2	1/2
$\frac{3}{4}$	$2 \times \frac{3}{4}$	$\frac{3}{4} \times \frac{1}{2}$

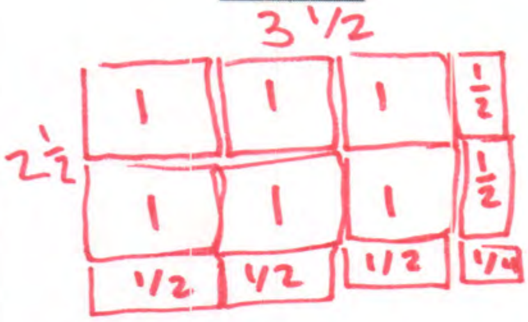
$\frac{6}{4} + \frac{3}{8}$

$\frac{12}{8} + \frac{3}{8} = \frac{15}{8} = 1\frac{7}{8}$ ft^2

Name: KEY

1. Sketch how you could use unit tiles to tile a rectangle that was 2 ½ units long by 3 ½ units wide. Then find the area of the rectangle.

SKETCH



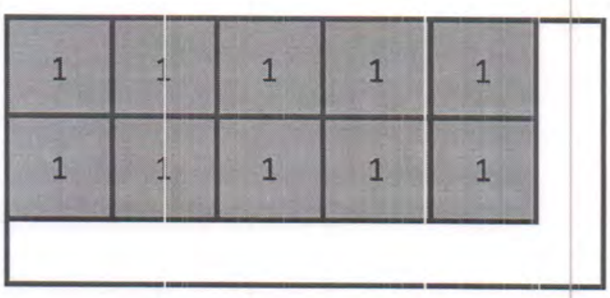
FIND THE AREA

	3	1/2
2	2 × 3 6	$2 \times \frac{1}{2} =$ 1
$\frac{1}{2}$	$3 \times \frac{1}{2} = \frac{3}{2}$	$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$6 + 1 + 1\frac{1}{2} + \frac{1}{4}$

$6 + 1 + 1\frac{2}{4} + \frac{1}{4} = 8\frac{3}{4}\ u^2$

2. Colin was using paper inch tiles to cover a rectangle with a length of 5 ½ units and a width of 2 ½ units. His work is shown below. Colin said the area of the rectangle is 10 square units. Explain Colin's mistake. Include the correct answer in your response.

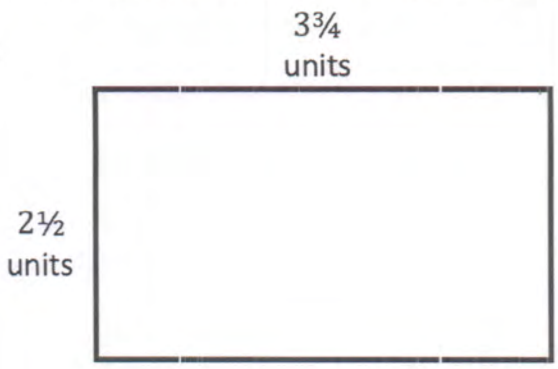


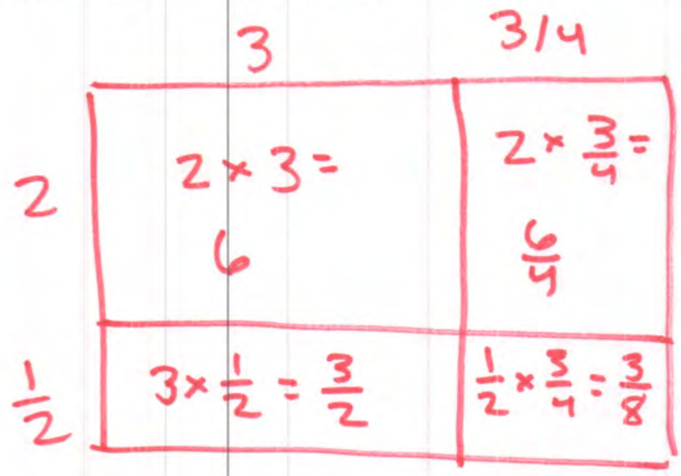
	5	1/2
2	5 × 2 10	$2 \times \frac{1}{2}$ 1
$\frac{1}{2}$	$5 \times \frac{1}{2} = \frac{5}{2}$	$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$10 + 1 + 2\frac{2}{4} + \frac{1}{4} = 13\frac{3}{4}\ u^2$

Colin's wrong, because he didn't tile the whole figure. I made an area model and found partial products of 10, 1, $2\frac{1}{2}$, and $\frac{1}{4}$. I added those together for a total area of $13\frac{3}{4}\ u^2$.

3. **Draw an area model to find the area of the rectangle shown below.**





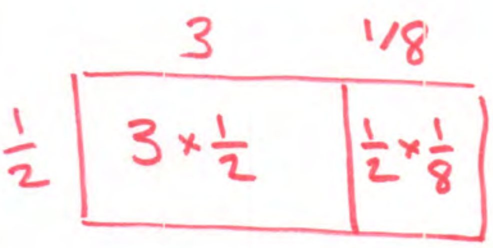
$6 + 1\frac{2}{4} + 1\frac{1}{2} + \frac{3}{8}$

3

$6 + 3 + \frac{3}{8}$

$9\frac{3}{8}u^2$

4. **Mariah's art project is in the shape of a rectangle. The width of her art project is ½ foot and the length is 3 ⅛ feet. What is the area of Mariah's art project?**



$3 \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{8}$

$\frac{3}{2} + \frac{1}{16}$

$1\frac{1}{2} + \frac{1}{16}$

$1\frac{8}{16} + \frac{1}{16}$

$1\frac{9}{16}\ ft^2$

G5 U5 Lesson 7

Multiply mixed number factors, and relate to the distributive property and the area model.

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G5 U5 Lesson 7 - Students will multiply mixed number factors, and relate to the distributive property and area model

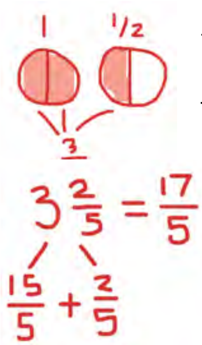
Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): We've been getting better at finding the area of rectangles with fractional side lengths. So far we've explored how we can find the area of rectangles by counting unit squares and by using an area model to decompose a rectangle into more manageable pieces. Today, we'll use what we've done previously and introduce a new strategy that doesn't require us to decompose at all. Before I show you what I mean, let's refresh on an important skill that will help us today.

Let's Talk (Slide 3): Look at the mixed numbers and fractions shown here. What do you notice? What do you wonder? Possible Student Answers, Key Points:

- I notice each equation shows a mixed number and a fraction greater than 1. I notice the mixed numbers are equivalent to the fractions greater than 1. I notice the last equation is missing a number.
- I wonder if these are all true statements. I wonder what these have to do with finding area. I wonder what the missing number is.

Each of these is an example of a mixed number and its equivalent fraction greater than 1. Sometimes we call these fractions greater than 1 "improper fractions."



Let's think about 1 ½, for example. *(draw two circles partitioned into halves and shade/label 1 ½)* If I'm picturing 1 ½ pizzas, I can think of that as 1 pizza and an extra half of a pizza like this. If I think about that amount as just halves, I can see it's equivalent to *(point and count)* 1 half, 2 halves, 3 halves. 1 ½ is equivalent to 3/2. 3/2 is the fraction greater than 1, or improper fraction, that is equivalent to the mixed number 1 ½.

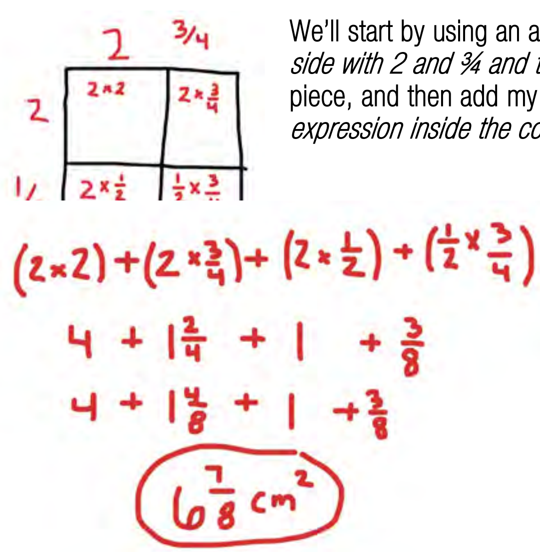
We don't have to draw a picture to know these are equivalent. We can think about it numerically. Let's look at 3 ⅖ I can think of 3 wholes as being the same as 15/5. So, I can decompose 3 ⅖ into 15/5 and ⅖ 15/5 plus ⅖ is equal to 17/5. The mixed number 3 ⅖ is equivalent to the improper fraction 17/5. *(if necessary, talk through a similar representation for 4 1/10)*

Let's look at the last example with the missing number. How can you use what we just looked at to find the missing value? Possible Student Answers, Key Points:

- I know 2 wholes would be the same as 14/7. I can decompose 2 5/7 into 14/7 + 5/7. So, I know 2 5/7 is equivalent to 19/7. The missing number is 19.

This skill is going to come in handy for our lesson. We know we can multiply the length and width of a rectangle to determine its area. Rather than decompose and multiply in parts, today we'll see how if we write mixed number dimensions as improper fractions, we can multiply quickly without an area model. Let's try this out.

Let's Think (Slide 4): This problem wants us to find the area of the rectangle using two different strategies.

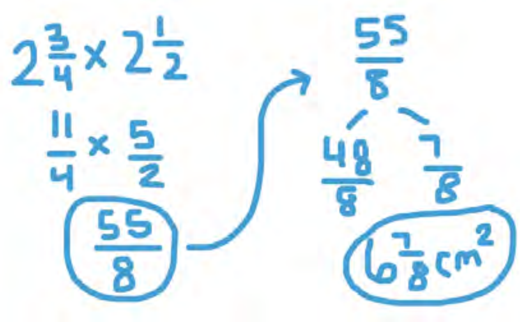


We'll start by using an area model, since that's what we're used to. *(draw a 2 x 2 area model and label one side with 2 and ¾ and the other side with 2 and ½)* I know I can multiply to find the area of each smaller piece, and then add my partial products together to find the entire area. *(write each multiplication expression inside the corresponding box)*

Let's write the partial products as one expression outside of the area model. *(write expression and evaluate as you narrate)* We know 2 x 2 is what? (4) We know 2 x ¾ is what? (6/4) I can write that as 1 and 2/4, since 4/4 is a whole. What is 2 x ½? (2/2 or 1 whole) We'll write that as 1, since it's simpler to think about. Lastly, what is ½ x ¾? (⅜

Before adding, I notice the fractions have different units. Let's rewrite 1 2/4 as 1 4/8 so that we can easily add it to the other fraction with units of eighths. If I add up each area, I can see that the rectangle's total area is 6 ⅜square centimeters.

Great! We solved for the area of this rectangle using an area model. Now let's try another strategy using those improper fractions from the beginning of the lesson.



To find the area of this rectangle, we need to multiply 2 ¾ x 2 ½. *(write 2 ¾ x 2 ½)* If we rewrite both of these mixed numbers as improper fractions, or fractions greater than 1, we can simply multiply across the fractions to arrive at the area of the rectangle. I know 2 ¾ is 2 wholes and ¾, so I can think of that as 8/4 and ¾. 2 ¾ is equivalent to 11/4. What is 2 ½ as an improper fraction? Possible Student Answers, Key Points:

- 2 ½ is equivalent to 5/2.
- 2 wholes is 4/2. 4/2 plus the ½, means the improper fraction equivalent to 2 ½ is 5/2.

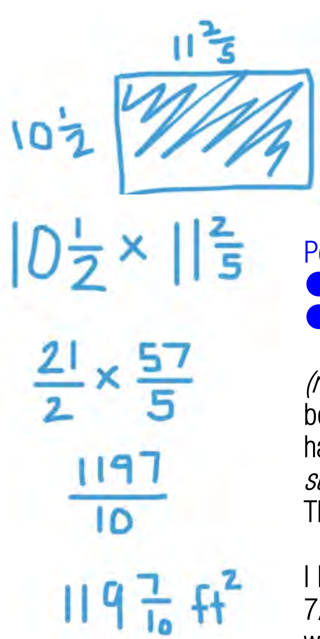
(write 11/4 x 5/2 underneath original expression) Now I can just multiply across the improper fractions. That's pretty efficient. 11/4 times 5/2 is 55/8. *(write 55/8)* I could leave my answer like that, but it might make more sense to rewrite it as a mixed number. 55/8 is between 6 wholes and 7 wholes, because 6 wholes would be 48/8 and 7 wholes would be 56/8. I can decompose 55/8 into 48/8 and 7/8 *(show using a number bond)*, so the mixed number equivalent to 55/8 is 6 7/8. Our answer is 6 7/8 square units, just like the answer we got with an area model.

We found the area using an area model first. Then, we found the area by multiplying our side lengths as improper fractions. Which strategy do you find most efficient, and why? Possible Student Answers, Key Points:

- I like the area model, because the numbers are easy to calculate in my head.
- I like the improper fraction strategy, because it feels like less steps.

Both strategies are useful, and you might run into certain problems that are easier to use with one strategy over the other. We'll keep trying the strategies out so we get more confident with them.

Let's Think (Slide 5): *(read problem)* This problem wants us to pick a strategy to find the area of the playground.



They don't include a picture, so it can be helpful to quickly sketch our own. *(sketch a rectangle labeled with the dimensions from the story problem)* We can use an area model or the strategy we just learned. Since it says we can choose, let's try the one we just learned. We'll change the mixed number dimensions into improper fractions and multiply them.

(write 10 ½ x 11 2/5) Let's first think about these two mixed numbers as improper fractions, or fractions greater than 1. What would the dimensions be as improper fractions, and how do you know? Possible Student Answers, Key Points:

- I know 10 wholes would be 20/2, so 20/2 plus ½ is 21/2.
- I know 11 wholes would be 55/5, so 55/5 plus 2/5 is 57/5.

(rewrite the expression as 21/2 x 57/5) Hm, these numbers feel like they're getting kind of big. I'm beginning to wonder if this strategy was the right one to choose. Let's keep going, because I know we can handle it. Take a moment, feel free to use pencil and paper, and find the product of 21 x 57. *(wait and support as needed)* 21 times 57 means our numerator is 1197. 2 times 5 means our denominator is 10. The area is 1197/10 square feet.

I know 10 tenths is one whole. So, 119 wholes would be 1190 tenths. I can think of 1197/10 as 119 7/10 square feet. That problem didn't have as friendly of numbers as the previous problem. Do you think we picked the best strategy for this problem? Possible Student Answers, Key Points:

- I think we did. The multiplication was a little tricky, and rewriting the answer as a mixed number took time, but I can do it. I like not having to draw an area model.
- I think we should have done an area model. It would have broken the math into pieces that are easier to think about.

Either strategy will work on our problems today, and it's always nice to have options when tackling math problems. Consider the numbers in the problem before choosing a strategy. The easier you can make your process, the less likely you are to make small mistakes.

Let's Try it (Slides 6 - 7): As you work through the next few problems, we'll get a chance to try out area models and today's new strategy where we convert the mixed number measurements into improper fractions. Using both strategies can be a great way to check your work. If we're given a choice of strategy, we'll want to think carefully and predict what either strategy would mean with the numbers at hand. Let's go for it!

WARM WELCOME

Today we will multiply mixed number factors, and relate to the distributive property and area model.

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Let's Talk:

What do you notice?
What do you wonder?

$$1\frac{1}{2} = \frac{3}{2}$$

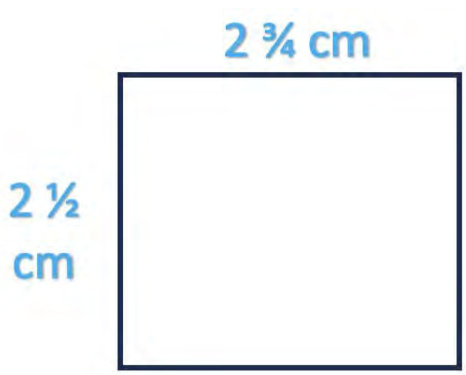
$$4\frac{1}{10} = \frac{41}{10}$$

$$3\frac{2}{5} = \frac{17}{5}$$

$$2\frac{5}{7} = \frac{\square}{7}$$

Let's Think:

Find the area of the rectangle using two different strategies.



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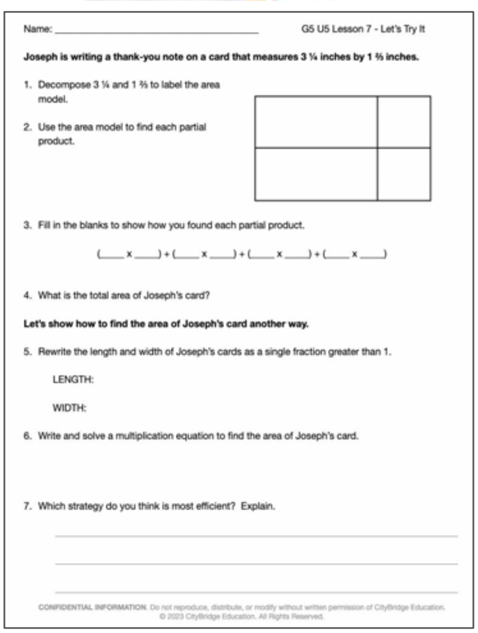
Let's Think:

A rectangular playground is 10 ½ feet long and 11 ⅖ feet wide. Choose a strategy to find the area of the playground.

Let's Try It:

Let's explore multiplying mixed number factors together.



Name: ____________________ G5 U5 Lesson 7 - Let's Try It

Joseph is writing a thank-you note on a card that measures 3 ¼ inches by 1 ⅗ inches.

1. Decompose 3 ¼ and 1 ⅗ to label the area model.
2. Use the area model to find each partial product.
3. Fill in the blanks to show how you found each partial product.

   (___ x ___) + (___ x ___) + (___ x ___) + (___ x ___)

4. What is the total area of Joseph's card?

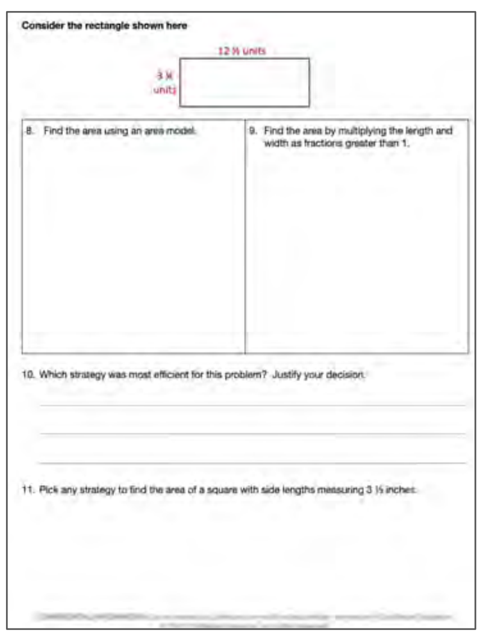
Let's show how to find the area of Joseph's card another way.

5. Rewrite the length and width of Joseph's cards as a single fraction greater than 1.

   LENGTH:

   WIDTH:

6. Write and solve a multiplication equation to find the area of Joseph's card.
7. Which strategy do you think is most efficient? Explain.

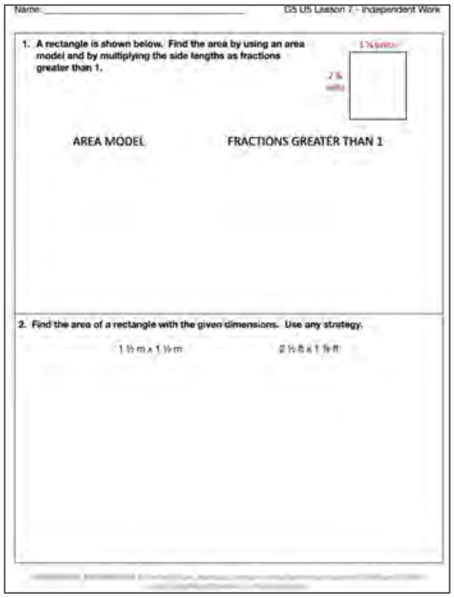


Consider the rectangle shown here

8. Find the area using an area model.
9. Find the area by multiplying the length and width as fractions greater than 1.
10. Which strategy was most efficient for this problem? Justify your decision.
11. Pick any strategy to find the area of a square with side lengths measuring 3 ⅕ inches.

On your Own:

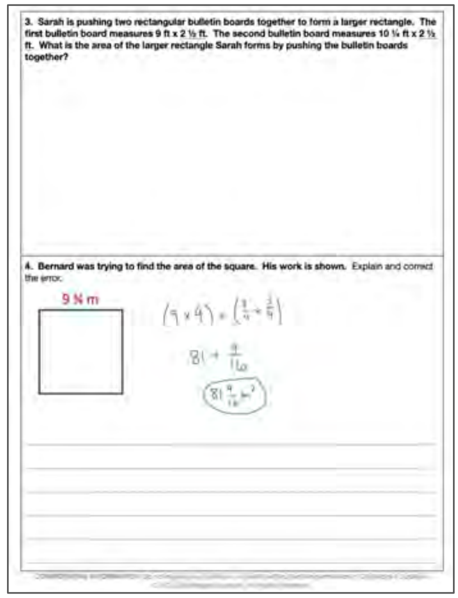
Now it's time to multiply mixed number factors on your own.


Name: ______________________ G5 U5 Lesson 7 - Independent Work

1. A rectangle is shown below. Find the area by using an area model and by multiplying the side lengths as fractions greater than 1.

AREA MODEL FRACTIONS GREATER THAN 1

2. Find the area of a rectangle with the given dimensions. Use any strategy.


3. Sarah is pushing two rectangular bulletin boards together to form a larger rectangle. The first bulletin board measures 9 ft x 2 ½ ft. The second bulletin board measures 10 ¼ ft x 2 ½ ft. What is the area of the larger rectangle Sarah forms by pushing the bulletin boards together?

4. Bernard was trying to find the area of the square. His work is shown. Explain and correct the error.

Name: ____ G5 U5 Lesson 7 - Let's Try It

Joseph is writing a thank-you note on a card that measures 3 ¼ inches by 1 ⅔ inches.

1. Decompose 3 ¼ and 1 ⅔ to label the area model.

2. Use the area model to find each partial product.

3. Fill in the blanks to show how you found each partial product.

(_____ x _____) + (_____ x _____) + (_____ x _____) + (_____ x _____)

4. What is the total area of Joseph's card?

Let's show how to find the area of Joseph's card another way.

5. Rewrite the length and width of Joseph's cards as a single fraction greater than 1.

   LENGTH:

   WIDTH:

6. Write and solve a multiplication equation to find the area of Joseph's card.

7. Which strategy do you think is most efficient? Explain.

   ____

   ____

   ____

Consider the rectangle shown here

8. Find the area using an area model.	9. Find the area by multiplying the length and width as fractions greater than 1.

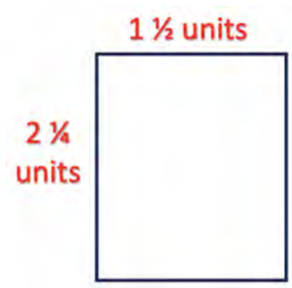
10. Which strategy was most efficient for this problem? Justify your decision.

____

____

____

11. Pick any strategy to find the area of a square with side lengths measuring 3 $\frac{2}{3}$ inches.



1. A rectangle is shown below. Find the area by using an area model and by multiplying the side lengths as fractions greater than 1.

AREA MODEL | **FRACTIONS GREATER THAN 1**

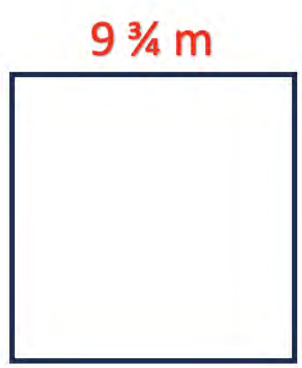
2. Find the area of a rectangle with the given dimensions. Use any strategy.

1 ½ m x 1 ½ m

2 ½ ft x 1 ⅞ ft

3. Sarah is pushing two rectangular bulletin boards together to form a larger rectangle. The first bulletin board measures 9 ft x 2 ½ ft. The second bulletin board measures 10 ¼ ft x 2 ½ ft. What is the area of the larger rectangle Sarah forms by pushing the bulletin boards together?

4. Bernard was trying to find the area of the square. His work is shown. Explain and correct the error.



$$(9 \times 9) + \left(\frac{3}{4} \times \frac{3}{4}\right)$$

$$81 + \frac{9}{16}$$

$$81\frac{9}{16}\ m^2$$

Name: KEY

Joseph is writing a thank-you note on a card that measures 3 ¼ inches by 1 ⅔ inches.

1. Decompose 3 ¼ and 1 ⅔ to label the area model.

2. Use the area model to find each partial product.

	3	1/4
1	$3 \times 1 = 3$	$1 \times \frac{1}{4} = \frac{1}{4}$
$\frac{2}{3}$	$3 \times \frac{2}{3} = \frac{6}{3} = 2$	$\frac{2}{3} \times \frac{1}{4} = \frac{2}{12}$

3. Fill in the blanks to show how you found each partial product.

$(3 \times 1) + (\frac{1}{4} \times 1) + (3 \times \frac{2}{3}) + (\frac{1}{4} \times \frac{2}{3})$

$3 + \frac{1}{4} \rightarrow \frac{3}{12} + 2 + \frac{2}{12}$

4. What is the total area of Joseph's card?

$5\frac{5}{12}$ in²

Let's show how to find the area of Joseph's card another way.

5. Rewrite the length and width of Joseph's cards as a single fraction greater than 1.

LENGTH: $3\frac{1}{4} = \frac{13}{4}$

WIDTH: $1\frac{2}{3} = \frac{5}{3}$

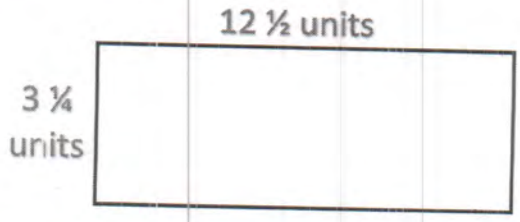
6. Write and solve a multiplication equation to find the area of Joseph's card.

$\frac{13}{4} \times \frac{5}{3} = \frac{65}{12} = 5\frac{5}{12}$ in²

7. Which strategy do you think is most efficient? Explain.

They are both efficient, but in different ways. The area model makes the math easier, but involves lots of steps. The second way has less steps but trickier numbers.

Consider the rectangle shown here



25×13: $75 + 250 = 325$

8. Find the area using an area model.

	12	$\frac{1}{2}$
3	36	$\frac{3}{2} = 1\frac{1}{2}$
$\frac{1}{4}$	$\frac{12}{4} = 3$	$\frac{1}{8}$

$36 + 1\frac{1}{2} + 3 + \frac{1}{8}$

$36 + 1\frac{4}{8} + 3 + \frac{1}{8}$

$40\frac{5}{8}\,u^2$

9. Find the area by multiplying the length and width as fractions greater than 1.

$12\frac{1}{2} = \frac{25}{2}$ $\quad 3\frac{1}{4} = \frac{13}{4}$

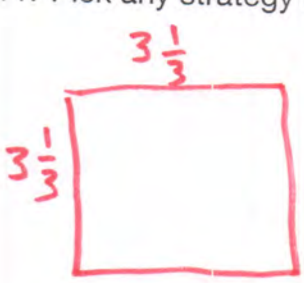
$\frac{25}{2} \times \frac{13}{4} = \frac{325}{8} = \frac{320}{8} + \frac{5}{8}$

$40\frac{5}{8}\,u^2$

10. Which strategy was most efficient for this problem? Justify your decision.

I liked the area model, because this problem had improper fractions that ~~were~~ were hard to multiply and simplify.

11. Pick any strategy to find the area of a square with side lengths measuring 3 ⅓ inches.



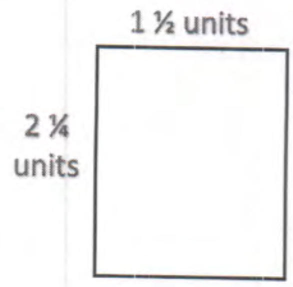
$\frac{10}{3} \times \frac{10}{3} = \frac{100}{9} = 11\frac{1}{9}\,in^2$

$\frac{99}{9}$ $\frac{1}{9}$

11 $\frac{1}{9}$

Name: KEY

1. A rectangle is shown below. Find the area by using an area model and by multiplying the side lengths as fractions greater than 1.



AREA MODEL

	2	1/4
1	2×1	$\frac{1}{4} \times 1$
$\frac{1}{2}$	$2 \times \frac{1}{2}$	$\frac{1}{2} \times \frac{1}{4}$

$2 + \frac{1}{4} + 1 + \frac{1}{8}$

$2 + \frac{2}{8} + 1 + \frac{1}{8} = 3\frac{3}{8}\,u^2$

FRACTIONS GREATER THAN 1

$2\frac{1}{4} = \frac{9}{4}$ $1\frac{1}{2} = \frac{3}{2}$

$\frac{9}{4} \times \frac{3}{2} = \frac{27}{8} = 3\frac{3}{8}\,u^2$

$\frac{27}{8}$: $\frac{24}{8}$ $\frac{3}{8}$

2. Find the area of a rectangle with the given dimensions. Use any strategy.

1 ½ m x 1 ½ m

$\frac{3}{2} \times \frac{3}{2}$

$\frac{9}{4}$

$\frac{8}{4}$ $\frac{1}{4}$

$2\frac{1}{4}\,m^2$

2 ½ ft x 1 ⅞ ft

	2	1/2
1	2	$\frac{1}{2}$
$\frac{7}{8}$	$\frac{14}{8} = 1\frac{6}{8}$	$\frac{7}{16}$

$2 + \frac{1}{2} + 1\frac{6}{8} + \frac{7}{16}$

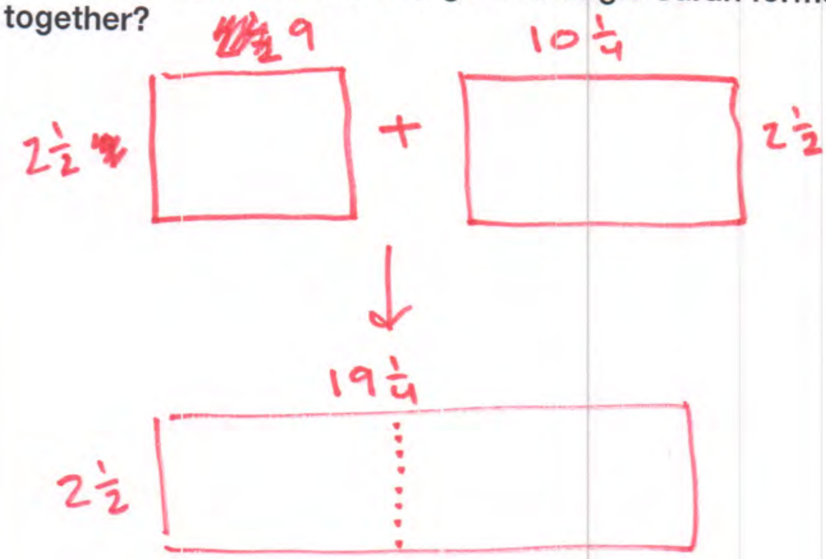
$2 + \frac{8}{16} + 1\frac{12}{16} + \frac{7}{16}$

$3\frac{27}{16}$

$\frac{16}{16}$ $\frac{11}{16}$

$4\frac{11}{16}\,ft^2$

3. **Sarah is pushing two rectangular bulletin boards together to form a larger rectangle. The first bulletin board measures 9 ft x 2 ½ ft. The second bulletin board measures 10 ¼ ft x 2 ½ ft. What is the area of the larger rectangle Sarah forms by pushing the bulletin boards together?**



$(2 \times 19) + (2 \times \frac{1}{4}) + (19 \times \frac{1}{2}) + (\frac{1}{2} \times \frac{1}{4})$

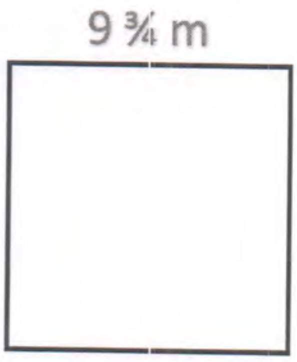
$38 + \frac{1}{2} + \frac{19}{2} + \frac{1}{8}$

$38 + \frac{20}{2} + \frac{1}{8}$

$38 + 10 + \frac{1}{8}$

$48\frac{1}{8}\ ft^2$

4. **Bernard was trying to find the area of the square. His work is shown.** Explain and correct the error.



$(9 \times 9) + (\frac{3}{4} \times \frac{3}{4}) + (9 \times \frac{3}{4}) + (9 \times \frac{3}{4})$

$81 + \frac{9}{16} + \frac{27}{4} + \frac{27}{4}$

$+ 6\frac{3}{4} + 6\frac{3}{4}$

$81\frac{9}{16}\ m^2 + 13\frac{1}{2}$

$13\frac{8}{16} = 94\frac{17}{16}$ OR $95\frac{1}{16}\ m^2$

He didn't multiply $9\frac{3}{4} \times 9\frac{3}{4}$. He only multiplied parts of his factors together. He needed to also multiply $9 \times \frac{3}{4}$ and $9 \times \frac{3}{4}$ to find the total area. The total area of the square is $95\frac{1}{16}\ m^2$.

G5 U5 Lesson 8

Solve real-world problems involving area of figures with fractional side lengths using visual models and/or equations.

G5 U5 Lesson 8 - Students will solve real-world problems involving area of figures with fractional side lengths using visual models and/or equations

Warm Welcome (Slide 1): Tutor choice

Frame the Learning/Connect to Prior Learning (Slide 2): Today is our last lesson in this unit. We spent the first half of the unit digging deep into volume concepts. More recently, we've been tackling problems that involve area with fractional side lengths. Today we'll use everything we've learned about area to solve real-world problems. What have you learned so far about calculating the area of rectangles with fractional dimensions that you predict might come in handy today? Possible Student Answers, Key Points:

- I know area is the amount of space a two-dimensional figure takes up, and we measure area in square units.
- We've found the area of rectangles with fractional side by using an area model. We also learned how you can multiply the side lengths as improper fractions to quickly find the area.

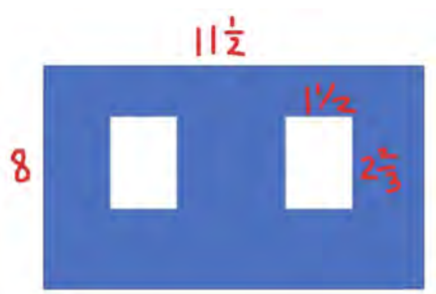
You've learned a lot. Let's put all that to use!

Let's Talk (Slide 3): *(read the information)* Based on the information provided, what math questions could we ask about this wall with the two windows? Possible Student Answers, Key Points:

- What is the area of a window? Both windows?
- What is the area of the wall?
- What is the perimeter of one of the windows or the wall?
- How much paint or wallpaper do we need to cover the wall?

Since the information involves the measurements of rectangular figures, there is a lot we could ask! This is the perfect context for a problem about area. Let's solve one.

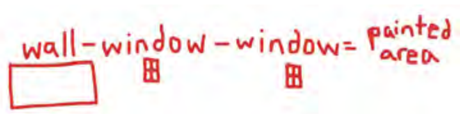
Let's Think (Slide 4): Here is one math question that we could ask and answer based on the information about the windows and the wall. *(read the problem)*



What information do we know from the problem, and what information are we trying to find out? *(label the image with dimensions as the student shares)* Possible Student Answers, Key Points:

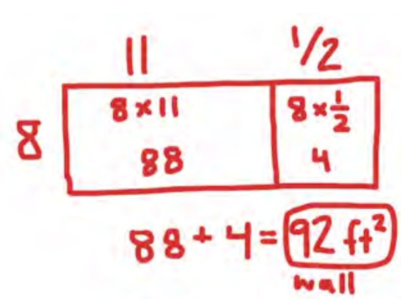
- We know the wall measures 11 ½ feet long and 8 feet tall.
- We know there are two identical windows. They each measure 1 ½ feet long and 2 ⅔ feet tall.
- We are trying to figure out how much paint we need for the wall. We are trying to find the area of the wall, not including the two windows.

This problem is asking us to find the area of the wall, since they want to know how much paint would cover the entire wall. We obviously don't want to paint the windows, so it will be important that we don't include the windows when we calculate the area of the wall. If I'm planning out my solution pathway, I can think of the painted area like the wall minus the two windows will equal the area that I paint. *(write equation with words/pictures as shown)* Let's do some math!



We'll start by finding the area of the entire wall. Since we know the length is 11 ½ and the width is 8, we can multiply them together. I can use an area model or rewrite 11 ½ as an improper fraction. Which strategy would you choose, and why? Possible Student Answers, Key Points:

- I'd choose an area model since 11 ½ seems like it will give me big numbers in the improper fraction.
- I'd choose writing 11 ½ as an improper fraction, so I don't have to draw an entire area model.



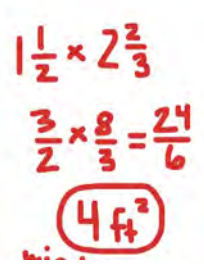
I'm going to use an area model to multiply 8 x 11 ½, because when I thought about changing 11 ½ into an improper fraction, the numbers didn't seem entirely friendly. *(draw a 2 x 1 area model, labeling the side lengths as 8 and 11 and ½)* I know 8 x 11 is 88. I know 8 x ½ is 8/2, which is just 4. *(fill in area model with the expressions and products)* 88 + 4, means the area of the entire wall is 92 square feet. *(write answer)*

Is 92 square feet the answer to our problem? How do you know? Possible Student Answers, Key Points:

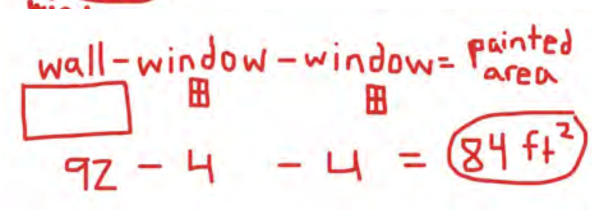
- It's not. That's just the area of the wall. We haven't taken out the windows.
- We're not done yet. If we said 92 square feet was how much paint we needed, we'd be painting over the windows.

Let's keep going. Now we have to consider the windows. Let's find the area of one window. If the dimensions are 1 ½ and 2 ⅔ feet, which strategy would you want to use to multiply these values? Possible Student Answers, Key Points:

- I might use an area model, because that's what we used on the last part of the problem.
- I might change them into improper fractions since the numbers in each mixed number are pretty accessible.



Since the numbers in each mixed number are small and pretty "friendly", how about we try converting them to improper fractions. An area model would definitely work too, if that's what you had wanted to do on your own. *(write 1 ½ x 2 ⅔ then write improper fractions underneath as student shares out)* What is 1 ½ as a fraction greater than 1? (3/2) What is 2 ⅔ as a fraction greater than 1? (8/3) When we multiply 3/2 by 8/3, we end up with 24/6. So, I know the area of each window is 4 square feet. The windows are the same size.



We have all the information we need to determine the amount of paint we'll use. The entire wall is 92 square feet. If we subtract out the windows, we can think of our problem as being 92 - 4 - 4, or 92 - 8 square feet. What is the area of the wall that we will need to paint? (84 square feet) We will need 84 square feet of paint to cover the wall. Nice work!

We just solved a real-world story problem involving area with fractional side lengths.

Let's Try it (Slides 5 - 6): Now we'll work to solve some other, similar story problems. Once we read each problem, we'll pause to think about what we know and what we're trying to find out. From there, we can develop a plan to solve. Since some of the problems today will include multiple steps, it will be crucial for us to think about the story and plan before jumping straight into the math. You've worked so hard the past several lessons, so I know we have the skills we need to succeed when solving today's story problems.

WARM WELCOME

Today we will solve real-world problems involving area of figures with fractional side lengths using visual models and/or equations.

Let's Talk:

A rectangular wall measures 11 ½ feet by 8 feet. There are two windows in the wall that each measure 1 ½ feet by 2 ⅔ feet.

What math questions could we create with the given information?

Let's Think:

A rectangular wall measures 11 ½ feet by 8 feet. There are two windows in the wall that each measure 1 ½ feet by 2 ⅔ feet. How many square feet of paint are needed to cover the wall?

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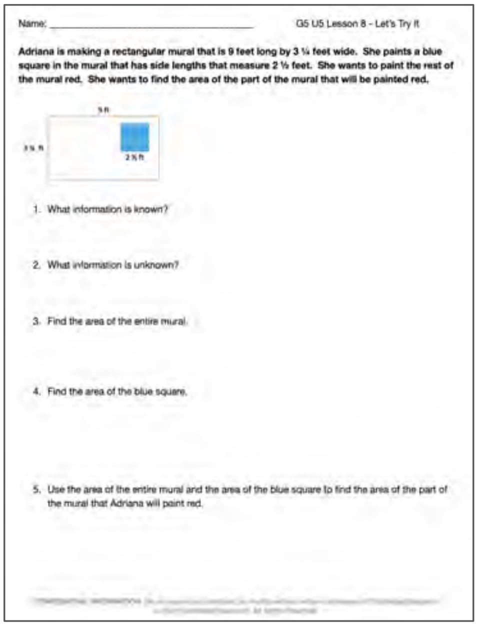
Let's Try It:

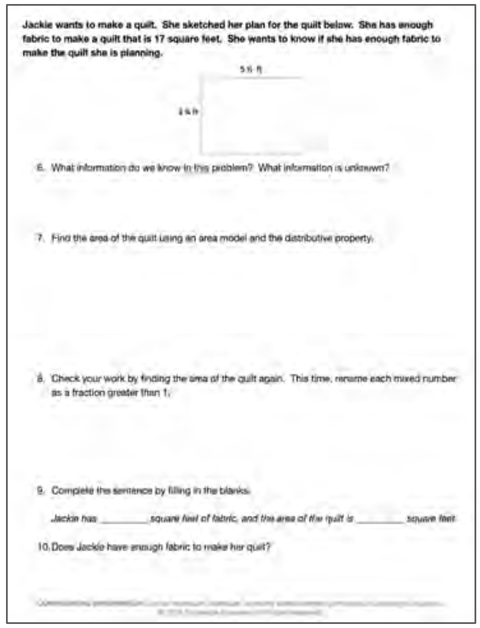
Let's explore solving real-world problems involving area of figures with fractional side lengths together.



Name: ______________________ G5 U5 Lesson 8 - Let's Try It

Adriana is making a rectangular mural that is 9 feet long by 3 ¼ feet wide. She paints a blue square in the mural that has side lengths that measure 2 ½ feet. She wants to paint the rest of the mural red. She wants to find the area of the part of the mural that will be painted red.

1. What information is known?
2. What information is unknown?
3. Find the area of the entire mural.
4. Find the area of the blue square.
5. Use the area of the entire mural and the area of the blue square to find the area of the part of the mural that Adriana will paint red.



Jackie wants to make a quilt. She sketched her plan for the quilt below. She has enough fabric to make a quilt that is 17 square feet. She wants to know if she has enough fabric to make the quilt she is planning.

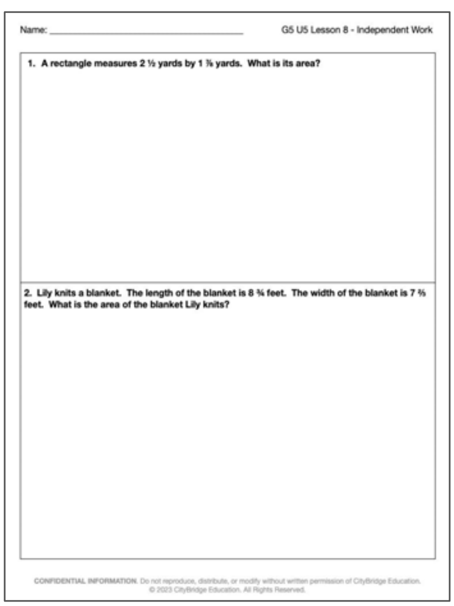
6. What information do we know in this problem? What information is unknown?
7. Find the area of the quilt using an area model and the distributive property.
8. Check your work by finding the area of the quilt again. This time, rename each mixed number as a fraction greater than 1.
9. Complete the sentence by filling in the blanks.

   Jackie has ________ square feet of fabric, and the area of the quilt is ________ square feet.

10. Does Jackie have enough fabric to make her quilt?

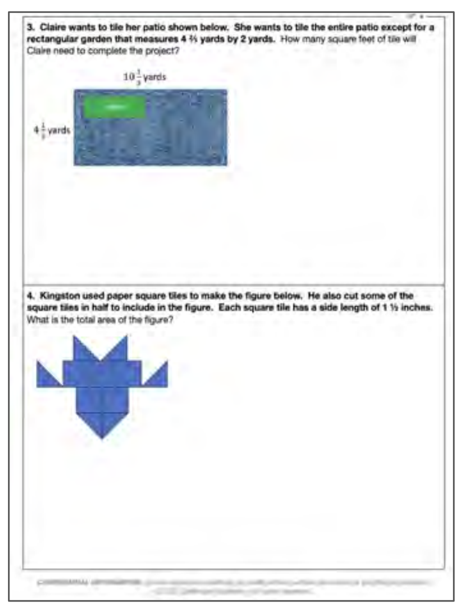
On your Own:

Now it's time to solve real-world problems involving area of figures with fractional side lengths on your own.



Name: ______________________ G5 U5 Lesson 8 - Independent Work

1. **A rectangle measures 2 ½ yards by 1 ⅞ yards. What is its area?**
2. **Lily knits a blanket. The length of the blanket is 8 ¾ feet. The width of the blanket is 7 ⅔ feet. What is the area of the blanket Lily knits?**



3. **Claire wants to tile her patio shown below. She wants to tile the entire patio except for a rectangular garden that measures 4 ⅔ yards by 2 yards.** How many square feet of tile will Claire need to complete the project?

4. **Kingston used paper square tiles to make the figure below. He also cut some of the square tiles in half to include in the figure. Each square tile has a side length of 1 ½ inches.** What is the total area of the figure?

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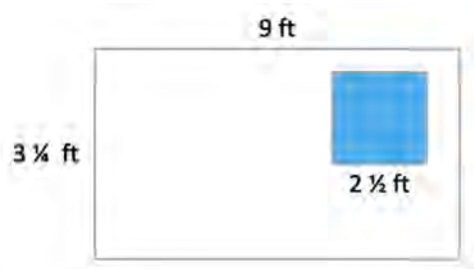
Adriana is making a rectangular mural that is 9 feet long by 3 ¼ feet wide. She paints a blue square in the mural that has side lengths that measure 2 ½ feet. She wants to paint the rest of the mural red. She wants to find the area of the part of the mural that will be painted red.



1. What information is known?

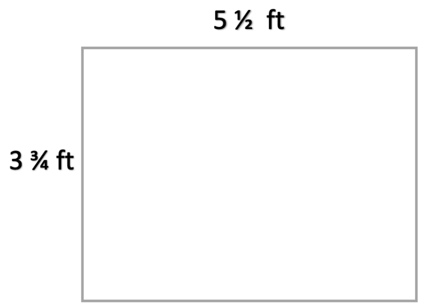
2. What information is unknown?

3. Find the area of the entire mural.

4. Find the area of the blue square.

5. Use the area of the entire mural and the area of the blue square to find the area of the part of the mural that Adriana will paint red.

Jackie wants to make a quilt. She sketched her plan for the quilt below. She has enough fabric to make a quilt that is 17 square feet. She wants to know if she has enough fabric to make the quilt she is planning.



6. What information do we know in this problem? What information is unknown?

7. Find the area of the quilt using an area model and the distributive property.

8. Check your work by finding the area of the quilt again. This time, rename each mixed number as a fraction greater than 1.

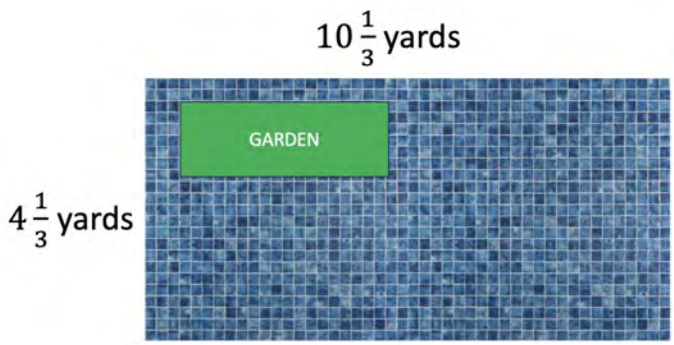
9. Complete the sentence by filling in the blanks.

   Jackie has __________ square feet of fabric, and the area of the quilt is __________ square feet.

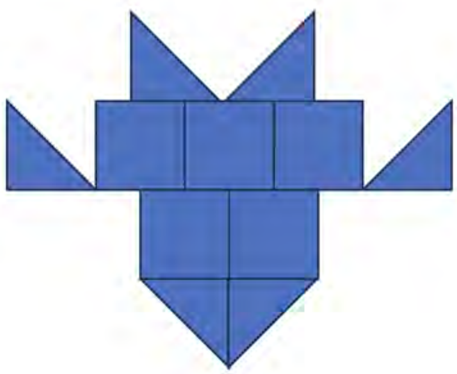
10. Does Jackie have enough fabric to make her quilt?

Name: ______________________________ G5 U5 Lesson 8 - Independent Work

1. A rectangle measures 2 ½ yards by 1 ⅞ yards. What is its area?
2. Lily knits a blanket. The length of the blanket is 8 ¾ feet. The width of the blanket is 7 ⅞ feet. What is the area of the blanket Lily knits?
3. Claire wants to tile her patio shown below. She wants to tile the entire patio except for a rectangular garden that measures 4 ⅖ yards by 2 yards. How many square feet of tile will Claire need to complete the project?

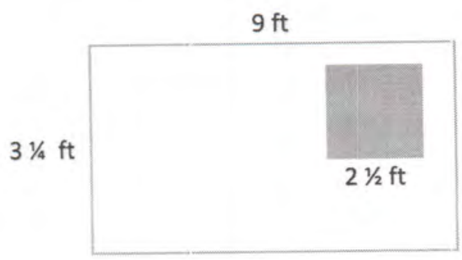


4. Kingston used paper square tiles to make the figure below. He also cut some of the square tiles in half to include in the figure. Each square tile has a side length of 1 ½ inches. What is the total area of the figure?



Name: KEY

Adriana is making a rectangular mural that is 9 feet long by 3 ¼ feet wide. She paints a blue square in the mural that has side lengths that measure 2 ½ feet. She wants to paint the rest of the mural red. She wants to find the area of the part of the mural that will be painted red.



1. What information is known?

   • I know the length and width of the mural.

   • I know the blue part is a square that is $2\frac{1}{2}$ by $2\frac{1}{2}$ ft.

2. What information is unknown?

   • I don't know the area of the blue square.

   • I don't know the area of the mural.

3. Find the area of the entire mural.

	3	1/4
9	9×3	$9 \times \frac{1}{4}$

$27 + \frac{9}{4}$

$27 + 2\frac{1}{4} = 29\frac{1}{4}\ ft^2$

4. Find the area of the blue square.

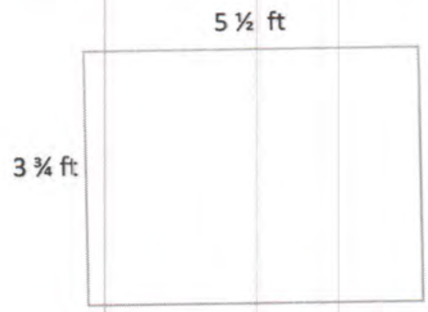
$2\frac{1}{2} \times 2\frac{1}{2}$

$\frac{5}{2} \times \frac{5}{2} = \frac{25}{4} = 6\frac{1}{4}\ ft^2$

5. Use the area of the entire mural and the area of the blue square to find the area of the part of the mural that Adriana will paint red.

$29\frac{1}{4} - 6\frac{1}{4} = 23\ ft^2$

Jackie wants to make a quilt. She sketched her plan for the quilt below. She has enough fabric to make a quilt that is 17 square feet. She wants to know if she has enough fabric to make the quilt she is planning.

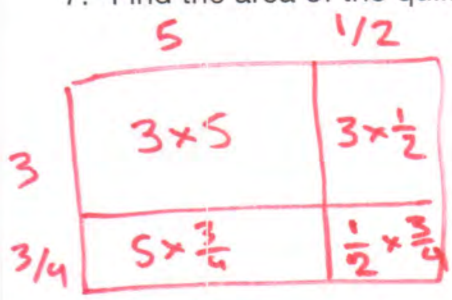


6. What information do we know in this problem? What information is unknown?

- She has 17 square feet.
- I know the length & width of the quilt.

- I don't know the area of the quilt.
- I don't know if she has enough fabric.

7. Find the area of the quilt using an area model and the distributive property.



$(3\times5)+(3\times\frac{1}{2})+(5\times\frac{3}{4})+(\frac{1}{2}\times\frac{3}{4})$

$15+\frac{3}{2}+\frac{15}{4}+\frac{3}{8}$

$15+1\frac{1}{2}+3\frac{3}{4}+\frac{3}{8}$

$15+1\frac{4}{8}+3\frac{6}{8}+\frac{3}{8}$

$19\frac{13}{8}=20\frac{5}{8}\ ft^2$

8. Check your work by finding the area of the quilt again. This time, rename each mixed number as a fraction greater than 1.

$3\frac{3}{4}=\frac{15}{4}$

$5\frac{1}{2}=\frac{11}{2}$

$\frac{15}{4}\times\frac{11}{2}=\frac{165}{8}=20\frac{5}{8}\ ft^2$

15×11: 15, 150, 165

9. Complete the sentence by filling in the blanks.

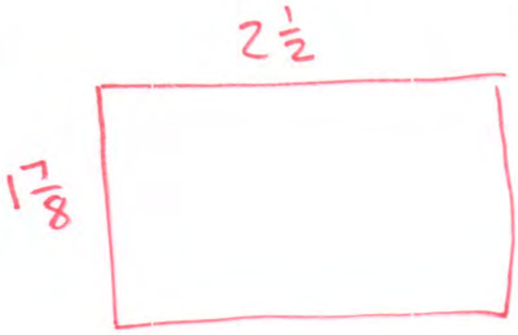
Jackie has 17 *square feet of fabric, and the area of the quilt is* $20\frac{5}{8}$ *square feet.*

10. Does Jackie have enough fabric to make her quilt?

She does not have enough.

Name: KEY

1. A rectangle measures 2 ½ yards by 1 ⅞ yards. What is its area?



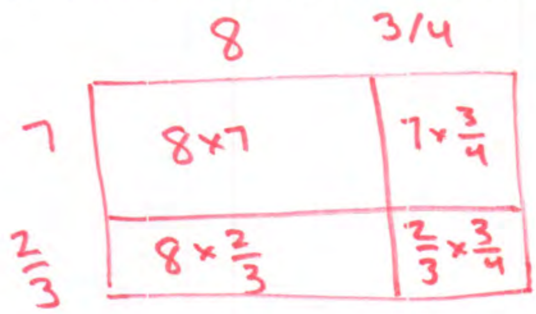
$2\frac{1}{2} \times 1\frac{7}{8} = ?$

$\frac{5}{2} \times \frac{15}{8} = \frac{75}{16}$

$\frac{64}{16}$ $\frac{11}{16}$

$4\frac{11}{16}\ yd^2$

2. Lily knits a blanket. The length of the blanket is 8 ¾ feet. The width of the blanket is 7 ⅔ feet. What is the area of the blanket Lily knits?



$(7 \times 8) + (7 \times \frac{3}{4}) + (8 \times \frac{2}{3}) + (\frac{2}{3} \times \frac{3}{4})$

$56 + \frac{21}{4} + \frac{16}{3} + \frac{6}{12}$

$56 + 5\frac{1}{4} + 5\frac{1}{3} + \frac{6}{12}$

$56 + 5\frac{3}{12} + 5\frac{4}{12} + \frac{6}{12}$

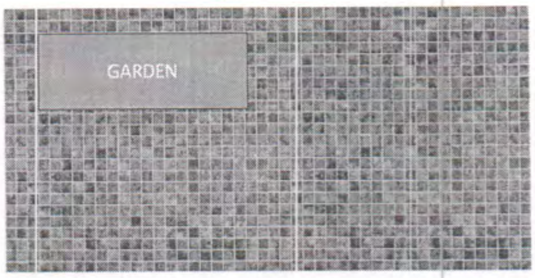
$66\frac{13}{12}$

$67\frac{1}{12}\ ft^2$

3. Claire wants to tile her patio shown below. She wants to tile the entire patio except for a rectangular garden that measures 4 ⅖ yards by 2 yards. How many square feet of tile will Claire need to complete the project?

$10\frac{1}{3}$ yards

$4\frac{1}{3}$ yards



PATIO

$(4\times10)+(4\times\frac{1}{3})+(10\times\frac{1}{3})+(\frac{1}{3}\times\frac{1}{3})$

$40 + \frac{4}{3} + \frac{10}{3} + \frac{1}{9}$

$40 + \frac{14}{3} + \frac{1}{9}$

$40 + 4\frac{2}{3} + \frac{1}{9} \rightarrow 40 + 4\frac{6}{9} + \frac{1}{9} = 44\frac{7}{9}\ yd^2$

GARDEN

$(4\times2)+(\frac{2}{5}\times2)$

$8 + \frac{4}{5}$

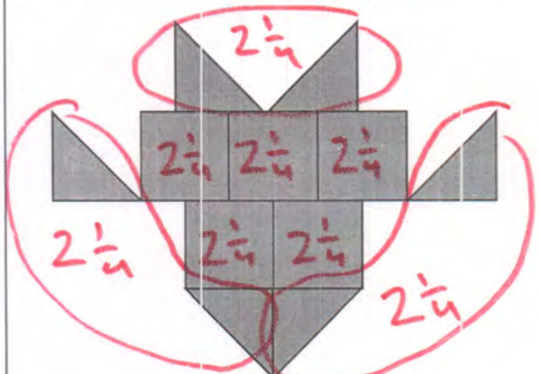
$8\frac{4}{5}\ yd^2$

$44\frac{7}{9} - 8\frac{4}{5} = ?$

$44\frac{35}{45} - 8\frac{36}{45} = ?$

$43\frac{80}{45} - 8\frac{36}{45} = 35\frac{44}{45}\ yd^2$

4. Kingston used paper square tiles to make the figure below. He also cut some of the square tiles in half to include in the figure. Each square tile has a side length of 1 ½ inches. What is the total area of the figure?



$\square = \frac{3}{2}\times\frac{3}{2} = \frac{9}{4} = 2\frac{1}{4}$

$8 \times 2\frac{1}{4}$

squares

$(8\times2)+(8\times\frac{1}{4})$

$16 + 2$

$18\ in^2$