Homework Helpers

Grade 5
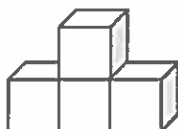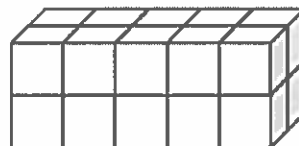# Module 5

G5-M5-Lesson 1

1. The following solids are made up of 1 cm cubes. Find the total volume of each figure, and write it in the chart below.

   a.

   b.

   > I see there are 3 cubes on the bottom and 1 cube on top. Therefore, this solid has a total of 4 cubes.

   > I see there are 2 layers of cubes like layers of a cake (top and bottom). There are 10 cubes on the top, and there must be 10 cubes on the bottom. Therefore, this solid has a total of 20 cubes.

   > Since Figure (a) is made of a total of 4 cubes, I can say that it has a volume of 4 cubic centimeters.

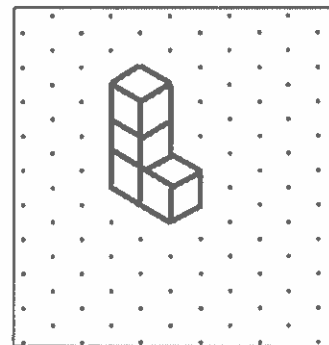 | Figure | Volume | Explanation |
   |--------|--------|-------------|
   | a | $4\ cm^3$ | *I added 3 cubes and 1 cube.* $3 + 1 = 4$ |
   | b | $20\ cm^3$ | *I counted the top layer and then multiplied by 2.* |

2. Draw a figure with the given volume on the dot paper.

   a. 2 cubic units
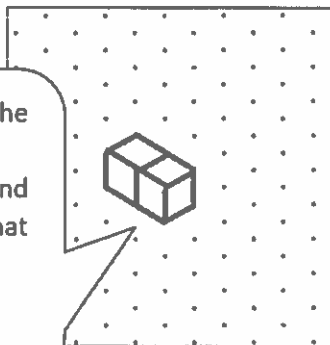
   > I can connect the dots to make straight lines and draw figures that look like centimeter cubes.

   b. 4 cubic units

3. Allison says that the figure below, made of 1 cm cubes, has a volume of 4 cubic centimeters.

    a. Explain her mistake.

    Allison is not counting the cube that is hidden. The cube that is on the
    second layer needs to be sitting on a hidden cube. The volume of this
    figure is 5 cubic centimeters.

    > I see there are 4 cubes showing, but there
    > is one hidden under the 1 cube on top.
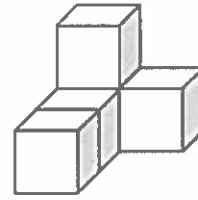
    b. Imagine if Allison adds to the second layer so the cubes completely cover the first layer in the figure above. What would be the volume of the new structure? Explain how you know.

    The volume would be 8 cm^3. *I counted the first layer, and then multiplied by* 2.
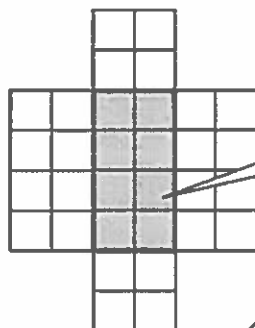
    $4 \text{ cm}^3 \times 2 = 8 \text{ cm}^3$

    > Since Allison wants to build a second layer that is the
    > same as the first layer, I can just multiply 4 cubes times 2.

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G5-M5-Lesson 2

1. Shade the following figures on centimeter grid paper. Cut and fold each to make 3 open boxes, taping them so they hold their shapes. Pack each box with cubes. Write how many cubes fill the box.

a.

> I can count the shaded area or the base. It would take 8 cubes to cover the base.

Number of cubes: _____16_____

> I can imagine folding all of the flaps up to form an open rectangular prism. There are 2 layers (top and bottom), so I can multiply $8 \times 2 = 16$.

b.
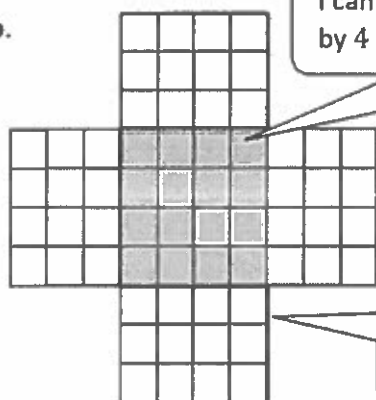
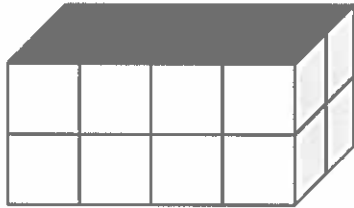> I can count the shaded area or the base. It is a 4 by 4 array, and $4 \times 4 = 16$.

Number of cubes: _____48_____

> I can imagine folding all of the flaps up to form an open rectangular prism. There are 3 layers, so I multiply $16 \times 3 = 48$.

2. How many centimeter cubes would fit in each box? Explain your answer using words and diagrams on the box. (The figures are not drawn to scale.)

a.

> My prediction was accurate. It would take 16 cm cubes to fill the box.

Prediction: __16 *centimeter cubes*__

Actual: __16 *centimeter cubes*__

> There are 2 layers like layers of a cake (top and bottom). There are 8 cubes in each layer. $8 \times 2 = 16$

There are 2 layers: top and bottom. Each layer has 8 cubes, and 8 cubes $\times$ 2 $=$ 16 cubes.

b.
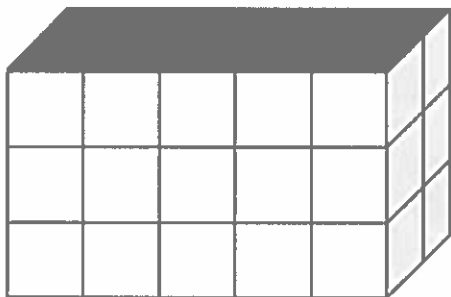
> This box looks like it might hold twice as many cubes as the first one, so my prediction is 32 cubes.

Prediction: __32 *centimeter cubes*__

Actual: __30 *centimeter cubes*__

There are 3 layers: top, middle, and bottom.

Each layer has 10 cubes, and 10 cubes $\times$ 3 $=$ 30 cubes.

Lesson 2:   Find the volume of a right rectangular prism by packing with cubic units and counting.

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G5-M5-Lesson 3

1. Use the prisms to find the volume.
    - Build the rectangular prism pictured below to the left with your cubes, if necessary.
    - Decompose it into layers in three different ways, and show your thinking on the blank prisms.
    - Complete the missing information in the table.
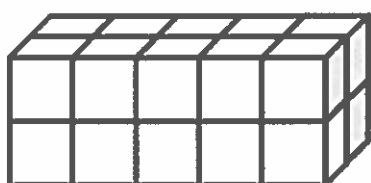
Number of Layers	Number of Cubes in Each Layer	Volume of the Prism
2	10	20 cubic cm
5	4	20 cubic cm
2	10	20 cubic cm

I can look at the rectangular prism above or the ones I cut below to help me record the information in the table.

10
10

4 4 4 4 4

10   10
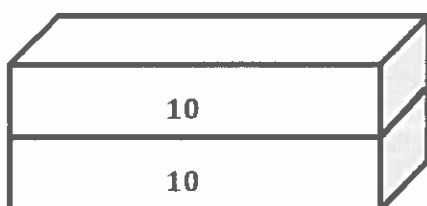
I will cut it horizontally (top and bottom like layers in a cake). I have 2 layers, and there are 10 cubes in each layer.
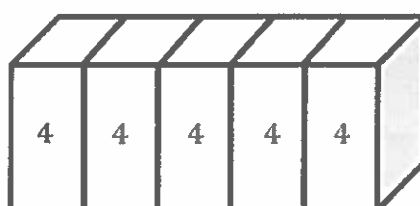
I will cut it vertically (left to right like slices of bread). I have 5 layers, and there are 4 cubes in each layer.
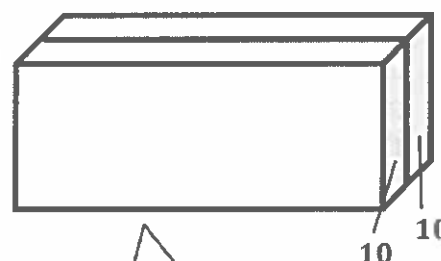
I will cut it into 2 layers, front and back. There are 10 cubes in each layer.

I can visualize a prism that is 5 in × 5 in × 1 in. When looking at the prism from the top, it would look like a square since the length and the width are equal. The prism is also just one inch tall, so it looks like the bottom layer of a cake.

2. Joseph makes a rectangular prism 5 inches by 5 inches by 1 inch. He then decides to create layers equal to his first one. Fill in the chart below, and explain how you know the volume of each new prism.

To find the volume in 3 layers, I will multiply 3 times 25 in^3. The answer is 75 in^3.

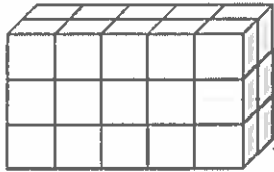| Number of Layers	Volume	Explanation
3	75 in^3	1 *layer:* 25 in^3 3 *layers:* $3 \times 25 \text{ in}^3 = 75 \text{ in}^3$
5	125 in^3	1 *layer:* 25 in^3 5 *layers:* $5 \times 25 \text{ in}^3 = 125 \text{ in}^3$

To find the volume of 5 layers, I will multiply 5 times 25 in^3. The answer is 125 in^3.

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G5-M5-Lesson 4

1. Each rectangular prism is built from centimeter cubes. State the dimensions, and find the volume.

a.

> The height of the rectangular prism is 3 cm.

> The width of the rectangular prism is 2 cm.

> The length of the rectangular prism is 5 cm.

Length: _____5_____ cm

Width: _____2_____ cm

Height: _____3_____ cm

Volume: _____30_____ cm³

> Volume is equal to length times width times height. I can multiply 5 cm by 2 cm by 3 cm, which is 30 cm³.

> The length of the rectangular prism is 4 cm.

b.
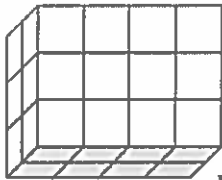
> The height of the rectangular prism is 3 cm.

> The width of the rectangular prism is 2 cm.

Length: _____4_____ cm

Width: _____2_____ cm

Height: _____3_____ cm

Volume: _____24_____ cm³

> Volume = $l \times w \times h$. I can multiply 4 cm by 2 cm by 3 cm, which is 24 cm³.

2. Write a multiplication sentence that you could use to calculate the volume for each rectangular prism in Problem 1. Include the units in your sentences.

a. $\underline{5 \text{ cm} \times 2 \text{ cm} \times 3 \text{ cm} = 30 \text{ cm}^3}$

b. $\underline{4 \text{ cm} \times 2 \text{ cm} \times 3 \text{ cm} = 24 \text{ cm}^3}$

3. Calculate the volume of each rectangular prism. Include the units in your number sentences.

> The height of the rectangular prism is 7 meters.

7 m

$V = \underline{\quad 4\ m \times 3\ m \times 7\ m = 84\ m^3 \quad}$

> I multiply the 3 dimensions together to find the volume.

3 m
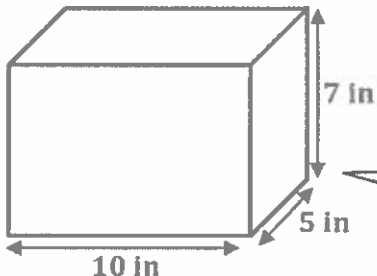
> The width of the rectangular prism is 3 meters.
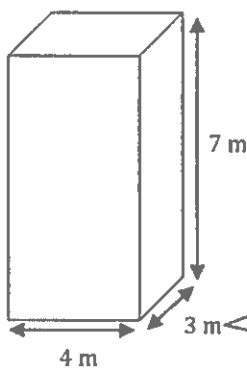
4 m

> The length of the rectangular prism is 4 meters.

4. Meilin is constructing a box in the shape of a rectangular prism to store her small toys. It has a length of 10 inches, a width of 5 inches, and a height of 7 inches. What is the volume of the box?

> The rectangular prism measures 10 inches by 5 inches by 7 inches.

7 in

> I draw a rectangular prism and label the length as 10 inches, width as 5 inches, and height as 7 inches.

5 in

10 in

Volume = length × width × height

$V = 10\ in \times 5\ in \times 7\ in = 350\ in^3$

The volume of the box is 350 cubic inches.

Lesson 4:   Use multiplication to calculate volume.

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G5-M5-Lesson 5

1. Kevin filled a container with 40 centimeter cubes. Shade the beaker to show how much water the container will hold. Explain how you know.

   It will hold 40 milliliters of water. I know that $1 \text{ cm}^3 = 1 \text{ mL}$.
   Therefore, 40 cm^3 is equal to 40 mL.

   > I know $1 \text{ cm}^3 = 1 \text{ mL}$, so $40 \text{ cm}^3 = 40 \text{ mL}$.
   > I will shade the water level to 40 milliliters.

   100 mL
   80 mL
   60 mL
   40 mL
   20 mL
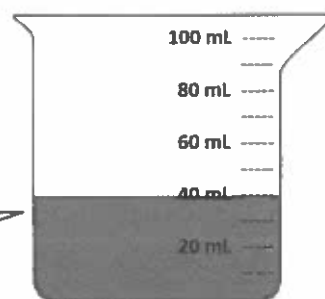
2. A beaker contains 200 mL of water. Joe wants to pour the water into a container that will hold the water. Which of the containers pictured below could he use? Explain your choices.
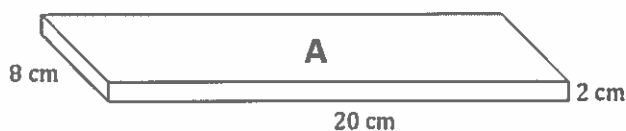
   > I will find the volume of container A. It is 320 cm^3.

   A
   8 cm
   20 cm
   2 cm

   $V_A = 20 \text{ cm} \times 8 \text{ cm} \times 2 \text{ cm}$
   $= 320 \text{ cm}^3$

   > Since $320 \text{ cm}^3 = 320 \text{ mL}$, this container can hold 200 mL of water.

   B
   3 cm
   6 cm
   7 cm
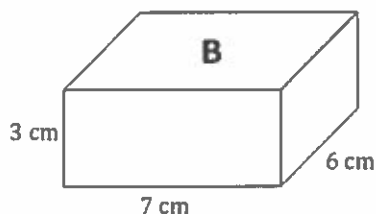
   $V_B = 7 \text{ cm} \times 6 \text{ cm} \times 3 \text{ cm}$
   $= 126 \text{ cm}^3$

   > Since $126 \text{ cm}^3 = 126 \text{ mL}$, this container cannot hold 200 mL of water.
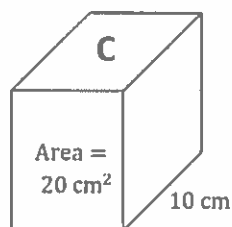
I can find the volume of container C by multiplying the area of the front face by the width.

C

Area = 20 cm²

10 cm

$V_C = 20 \text{ cm}^2 \times 10 \text{ cm}$

$= 200 \text{ cm}^3$

Since 200 cm³ = 200 mL, this container can hold 200 mL of water.
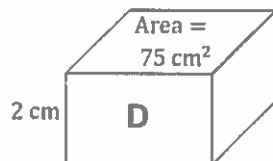
I can find the volume of container D by multiplying the area of the top face by the height.

Area = 75 cm²

2 cm   **D**

$V_D = 75 \text{ cm}^2 \times 2 \text{ cm}$

$= 150 \text{ cm}^3$

Since 150 cm³ = 150 mL, this container will not be able to hold 200 mL of water.

Joe will be able to use container A because the volume is 320 cm³. He will also be able to use container C because the volume is 200 cm³. He will not be able to use containers B and D because they are too small.

Lesson 5:   Use multiplication to connect volume as *packing* with volume as *filling*.

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G5-M5-Lesson 6

1. Find the total volume of the figures, and record your solution strategy.

   a.

The top figure has a length of 5 in and a height of 3 in.

Since the top figure is sitting directly on top of the bottom figure, without any gaps or overlaps, the width of both figures is 4 in.

I can find the volume of the top figure.
Volume = 5 in × 4 in × 3 in = 60 in³

I can find the volume of the bottom figure.
Volume = 10 in × 4 in × 7 in = 280 in³

Volume: _____340 in³_____

I will add both figures' volumes together. 60 in³ + 280 in³ = 340 in³

Solution Strategy:

I found the top figure's volume, 60 in³, and the bottom figure's volume, 280 in³. Then, I added both volumes together to get a total of 340 in³.

b.
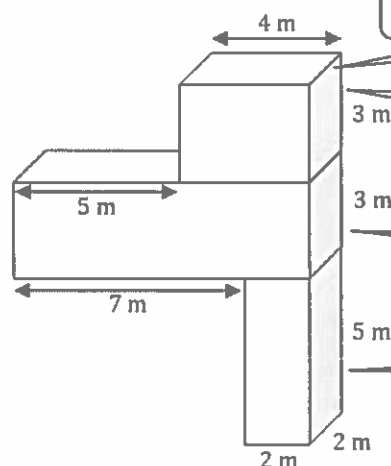
All three figures have the same width of 2 m.

I can find the volume for the top figure.
Volume = 4 m × 2 m × 3 m = 24 m³

Volume = 9 m × 2 m × 3 m = 54 m³

Volume = 2 m × 2 m × 5 m = 20 m³

4 m

3 m

3 m

5 m

5 m

7 m

2 m

2 m

I add all three figures' volumes together.
24 m³ + 54 m³ + 20 m³ = 98 m³

Volume: _____ 98 m³ _____

Solution Strategy:

I found the top figure's volume, 24 m³, the middle figure's volume, 54 m³, and the bottom figure's volume, 20 m³. Then, I added all three volumes together to get a total of 98 m³.

2. A fish tank has a base area of 65 cm² and is filled with water to a depth of 21 cm. If the height of the tank is 30 cm, how much more water will be needed to fill the tank to the brim?

30 cm

21 cm

Area = 65 cm²
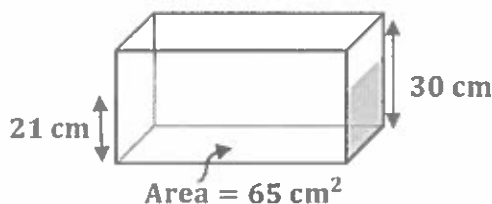
30 cm − 21 cm = 9 cm

I can find the height of the tank that is without water. It is 9 cm.

65 cm² × 9 cm = 585 cm³

I label the rectangular prism with all the given information.

$$\begin{array}{r} 6\ \ 5 \\ \times \qquad 9 \\ \hline 5\ \ 8\ \ 5 \end{array}$$

I can find the volume of the empty tank by multiplying the area of the base times the height, 9 cm.

1 cm³ = 1 mL
585 cm³ = 585 mL

585 mL of water will be needed to fill the tank to the brim.

Lesson 6:   Find the total volume of solid figures composed of two non-overlapping rectangular prisms.

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G5-M5-Lesson 7

Edwin builds rectangular planters.

1. Edwin's first planter is 6 feet long and 2 feet wide. The container is filled with soil to a height of 3 feet in the planter. What is the volume of soil in the planter? Explain your work using a diagram.

Volume = length × width × height

$$V = 6\ \text{ft} \times 2\ \text{ft} \times 3\ \text{ft} = 36\ \text{ft}^3$$

The volume of soil in the planter is 36 cubic feet.
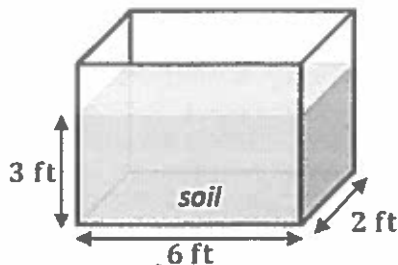
> I draw a rectangular prism and label all the given information.

> I can multiply the length, width, and height of the soil to find the volume of the soil in the planter.

> In order to have a volume of 50 cubic feet, I have to think of different factors that I can multiply to get 50. Since volume is three-dimensional, I will have to think of 3 factors.

2. Edwin wants to grow some flowers in two planters. He wants each planter to have a volume of 50 cubic feet, but he wants them to have different dimensions. Show two different ways Edwin can make these planters, and draw diagrams with the planters' measurements on them.

> I need to think of 3 factors that give a product of 50.

Volume = $l \times w \times h$

$$V = 5\ \text{ft} \times 5\ \text{ft} \times 2\ \text{ft} = 50\ \text{ft}^3$$

> I can verify my answer by finding the volume for Planter A. The answer is 50 cubic feet.
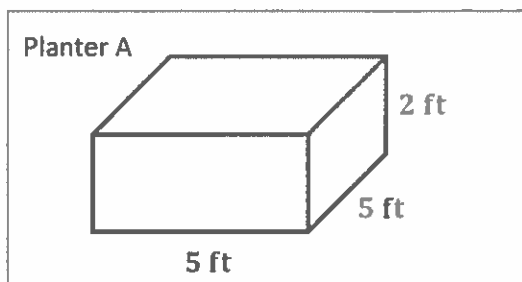
> I draw a rectangular prism and label it as 5 feet by 5 feet by 2 feet.

EUREKA MATH   Lesson 7:   Solve word problems involving the volume of rectangular prisms with whole number edge lengths.   13

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Planter B

1 ft

5 ft

10 ft

I need the 3 different factors for Planter B.
$10 \times 5 \times 1 = 50$

Volume $= l \times w \times h$
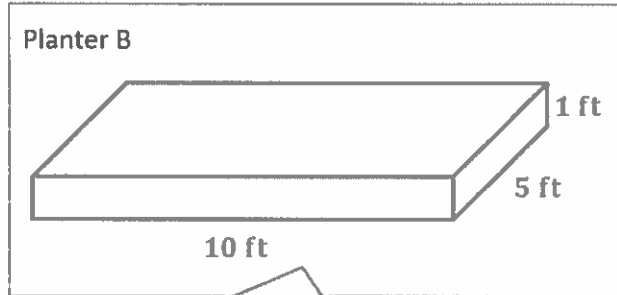
$V = 10 \text{ ft} \times 5 \text{ ft} \times 1 \text{ ft} = 50 \text{ ft}^3$

I will draw a rectangular prism and label it
as 10 feet by 5 feet by 1 foot.

In order to have a volume of 30 cubic feet, I have to think
of three factors that give a product of 30.

3. Edwin wants to make one planter that extends from the ground to just below his back window. The window starts 3 feet off the ground. If he wants the planter to hold 30 cubic feet of soil, name one way he could build the planter so it is not taller than 3 feet. Explain how you know.

3 ft

2 ft

5 ft

The volume is 30 cubic feet, and one of the dimensions must
not be more than 3 feet. So, I will keep the height as 3 feet.

I already know the volume is 30 ft^3 , and
the height is 3 ft, so I'll divide the volume
by the height to find the area of the base.
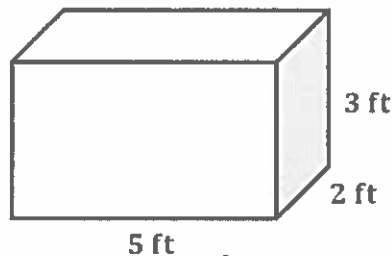
$30 \text{ ft}^3 \div 3 \text{ ft} = 10 \text{ ft}^2$

I draw a rectangular prism
and label the dimensions
5 ft by 2 ft by 3 ft.

$10 \text{ ft}^2 = 5 \text{ ft} \times 2 \text{ ft}$

Length $= 5$ ft

Width $= 2$ ft

Height $= 3$ ft

Now that I know the area of the
base of the planter is 10 ft^2, I need
to think of two factors that have a
product of 10. 5 and 2 will work!

Since Edwin wants to build a planter with a height of 3 ft and a volume of 30 ft^3, the base of the planter should have an area of 10 ft^2. I drew a planter with a length of 5 ft, width of 2 ft, and height of 3 ft.

Solve word problems involving the volume of rectangular prisms with
         whole number edge lengths.

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G5-M5-Lesson 8

1. I have a prism with the dimensions of 8 in by 12 in by 20 in. Calculate the volume of the prism, and then give the dimensions of two different prisms that each have $\frac{1}{4}$ of the volume.

> To find $\frac{1}{4}$ of the volume, I can use the original prism's volume divided by 4.
> $\frac{1}{4}$ of 1,920 in^3 is equal to 480 in^3.

	Length	Width	Height	Volume
Original Prism	8 in.	12 in.	20 in.	1,920 in^3

> I multiply the three dimensions to find the original volume.
> 8 in × 12 in × 20 in = 1,920 in^3

	Length	Width	Height	Volume
Prism 1	2 in.	12 in.	20 in.	480 in^3

> In order to create a volume that is $\frac{1}{4}$ of 1,920, I can change one of the dimensions and keep the others the same.
> $\frac{1}{4}$ of 8 in = 2 in

> 2 in × 12 in × 20 in = 480 in^3

	Length	Width	Height	Volume
Prism 2	8 in.	6 in.	10 in.	480 in^3

> Another way I can create a volume that is $\frac{1}{4}$ of 1,920 is to change two of the dimensions and keep the other the same.
> $\frac{1}{2}$ of 12 in = 6 in
> $\frac{1}{2}$ of 20 in = 10 in

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Lesson 8:   Apply concepts and formulas of volume to design a sculpture using
            rectangular prisms within given parameters.

15

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Kayla's bedroom has a volume of 800 ft³.
10 ft × 8 ft × 10 ft = 800 ft³

One way to double the volume is to double one dimension and keep the others the same.

2. Kayla's bedroom has the dimensions of 10 ft by 8 ft by 10 ft. Her den has the same height (10 ft) but double the volume. Give two sets of the possible dimensions of the den and the volume of the den.

Length: 10 ft × 2 = 20 ft

I can double the length, 10 ft × 2 = 20 ft, and keep both the width and the height the same.

Width: 8 ft

Height: 10 ft

Volume = 20 ft × 8 ft × 10 ft = 1,600 ft³

1,600 ft³ is double the original volume of 800 ft³.

Length: 10 ft × 4 = 40 ft

In order to double the volume, I can also quadruple the length and cut the width in half.

Width: 8 ft × $\frac{1}{2}$ = 4 ft

Height: 10 ft

Volume = 40 ft × 4 ft × 10 ft = 1,600 ft³

1,600 ft³ is double the original volume of 800 ft³.

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G5-M5-Lesson 9

Find three rectangular prisms around your house. Describe the item you are measuring (e.g., cereal box, tissue box), and then measure each dimension to the nearest whole inch and calculate the volume.

a.   Rectangular Prism A

Item: **Cereal box**

> I will measure a cereal box, and then multiply the three dimensions to find the volume.

Height: _____ 12 _____ inches

Length: _____ 8 _____ inches

Width: _____ 3 _____ inches

Volume: _____ 288 _____ cubic inches

> Volume = length × width × height
> = 8 in × 3 in × 12 in
> = 288 in^3

b.   Rectangular Prism B

Item: Tissue box

> I will measure a tissue box, and then multiply the three dimensions to find the volume.

Height: _____ 3 _____ inches

Length: _____ 9 _____ inches

Width: _____ 5 _____ inches

Volume: _____ 135 _____ cubic inches

> Volume = length × width × height
> = 9 in × 5 in × 3 in
> = 45 in^2 × 3 in
> = 135 in^3

> The volume of the tissue box is 135 cubic inches.

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Lesson 9:   Apply concepts and formulas of volume to design a sculpture using rectangular prisms within given parameters.

17

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G5-M5-Lesson 10

1. Alex tiled some rectangles using square units. Sketch the rectangles if necessary. Fill in the missing information, and then confirm the area by multiplying.

Rectangle A:

> I look at Rectangle A's dimensions, 4 units by $2\frac{1}{2}$ units.

Rectangle A is

4 units long by $2\frac{1}{2}$ unit wide.

> I can draw a length of 4 units.

4 *units*

Area = ___10___ square units

> I can draw a rectangle and show a width of $2\frac{1}{2}$ units.

2 *units*

$\frac{1}{2}$ *unit*

> I can count the halves and see that there are 4 half square units, which is the same as 2 square units. I can multiply too.
>
> 4 units $\times \frac{1}{2}$ unit = 2 square units

> I can count the squares and see that there are 8 whole square units. I can multiply too.
>
> 4 units $\times$ 2 units = 8 square units

> 8 square units + 2 square units = 10 square units

$4 \ units \times 2\frac{1}{2} \ units$

> I can confirm the area by multiplying the length and width.

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

> The area of Rectangle A is 10 square units.

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

$= 8 + 2$

$= 10$

> I can use the rectangle I drew and the distributive property to help me multiply.
>
> 4 units $\times$ 2 units = 8 square units
>
> 4 units $\times \frac{1}{2}$ unit $= \frac{4}{2}$ square units = 2 square units

Lesson 10:   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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2. Juanita made a mosaic from different colored rectangular tiles. Two blue tiles measured $2\frac{1}{2}$ inches × 3 inches. Five white tiles measured 3 inches × $2\frac{1}{4}$ inches. What is the area of the whole mosaic in square inches?

> I can find the area of one blue tile.

> To find the area of the two blue tiles, I can multiply the area by 2.

$2\frac{1}{2}$ in × 3 in

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

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

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

$= 7\frac{1}{2}$

The area of 1 blue tile is $7\frac{1}{2}$ in².

$1 \ unit = 7\frac{1}{2} \ in^2$

$2 \ units = 2 \times 7\frac{1}{2} \ in^2$

$= (2 \times 7) + \left(2 \times \frac{1}{2}\right)$

$= 14 + \frac{2}{2}$

$= 14 + 1$

$= 15$

The area of 2 blue tiles is 15 in².

> I can find the area of one white tile.

> To find the area of five white tiles, I can multiply the area by 5.

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

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

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

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

The area of 1 white tile is $6\frac{3}{4}$ in².

$1 \ unit = 6\frac{3}{4} \ in^2$

$5 \ units = 5 \times 6\frac{3}{4} \ in^2$

$= (5 \times 6) + \left(5 \times \frac{3}{4}\right)$

$= 30 + \frac{15}{4}$

$= 30 + 3\frac{3}{4}$

$= 33\frac{3}{4}$

The area of 5 white tiles is $33\frac{3}{4}$ in².

$33\frac{3}{4} \ in^2 + 15 \ in^2 = 48\frac{3}{4} \ in^2$

> I can add the two areas together to find the area of the entire mosaic.

The area of the whole mosaic is $48\frac{3}{4}$ square inches.

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Lesson 10: 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.

19

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G5-M5-Lesson 11

1. Cindy tiled the following rectangles using square units. Sketch the rectangles, and find the areas. Then, confirm the area by multiplying.

   a. **Rectangle A:**

   > I look at Rectangle A's dimensions, $3\frac{1}{2}$ units by $2\frac{1}{2}$ units.

   > I can draw a length of $3\frac{1}{2}$ units.

   3 *units* $\frac{1}{2}$ *unit*

   Rectangle A is $3\frac{1}{2}$ units long by $2\frac{1}{2}$ units wide.

   2 *units*

   Area = $8\frac{3}{4}$ units²
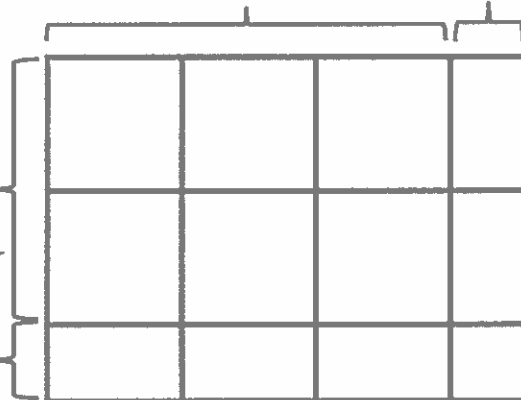
   > I draw a width of $2\frac{1}{2}$ units.

   $\frac{1}{2}$ *unit*

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

   $= (2 \times 3) + \left(2 \times \frac{1}{2}\right) + \left(\frac{1}{2} \times 3\right) + \left(\frac{1}{2} \times \frac{1}{2}\right)$

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

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

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

   $= 8\frac{3}{4}$

   > I can look at the rectangle above to help me multiply.
   > 2 units × 3 units = 6 units²
   > 2 units × $\frac{1}{2}$ unit = $\frac{2}{2}$ unit² = 1 unit²
   > $\frac{1}{2}$ unit × 3 units = $\frac{3}{2}$ units² = $1\frac{1}{2}$ units²
   > $\frac{1}{2}$ unit × $\frac{1}{2}$ unit = $\frac{1}{4}$ unit²

   > I rename $1\frac{1}{2}$ as $1\frac{2}{4}$ so I can add.

   > The area of Rectangle A is $8\frac{3}{4}$ square units.

Lesson 11: 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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b. **Rectangle B:**

Rectangle B is

$3\frac{1}{3}$ units long by $\frac{3}{4}$ unit wide.

> I draw a length of $3\frac{1}{3}$ units.

3 *units* $\frac{1}{3}$ *unit*

$\frac{3}{4}$ *unit*

Area = ___$2\frac{1}{2}$___ units²

> I draw and label the width as $\frac{3}{4}$ unit.
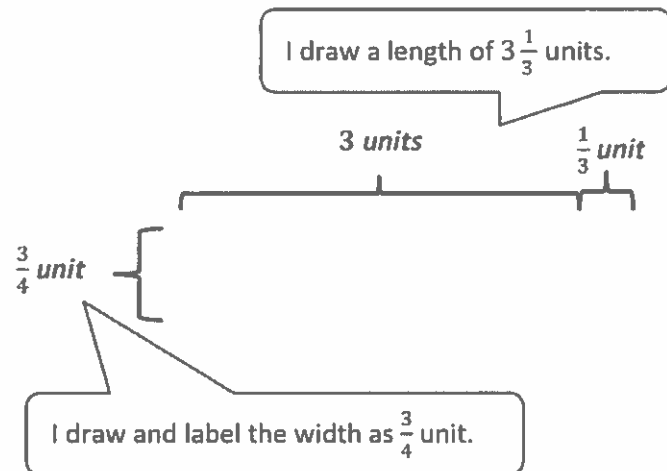
> I can multiply to find the area.

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

$= \left(\frac{3}{4} \times 3\right) + \left(\frac{3}{4} \times \frac{1}{3}\right)$

$= \frac{9}{4} + \frac{3}{12}$

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

$= 2\frac{2}{4}$

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

> I can look at the rectangle above to help me multiply.
> $\frac{3}{4}$ unit × 3 units $= \frac{9}{4}$ unit² $= 2\frac{1}{4}$ unit²
> $\frac{3}{4}$ unit × $\frac{1}{3}$ unit $= \frac{3}{12}$ unit² $= \frac{1}{4}$ unit²

> The area of Rectangle B is $2\frac{1}{2}$ square units.

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Lesson 11:   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.

21

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2. A square has a perimeter of 36 inches. What is the area of the square?

> All four sides are equal in a square.

> Since the perimeter of the square is 36 inches, I will use 36 inches divided by 4 to find the length of one side. 36 inches ÷ 4 = 9 inches

?

Area = ?

> I can draw a square and label both the area and the side length with a question mark.

Perimeter = 36 in

36 in ÷ 4 = 9 in

> Area is equal to length times width. I will multiply 9 inches times 9 inches to find an area of 81 square inches.

Area = length × width

$\quad\quad\;\; = 9\text{ in} \times 9\text{ in}$

$\quad\quad\;\; = 81\text{ in}^2$

The area of the square is 81 in^2.

G5-M5-Lesson 12

1. Measure the rectangle to the nearest $\frac{1}{4}$ inch with your ruler, and label the dimensions. Use the area model to find the area.

> I can use an inch ruler to measure this figure. The length is $2\frac{1}{4}$ inches and the width is 2 inches.

> I draw a vertical line partitioning the rectangle into whole inches and a fraction of an inch.

> I solve by using the area model.
> $2 \text{ in} \times 2 \text{ in} = 4 \text{ in}^2$
> $2 \text{ in} \times \frac{1}{4} \text{ in} = \frac{2}{4} \text{ in}^2$

$4 \text{ in}^2 + \frac{2}{4} \text{ in}^2$

> I add the two partial areas together to find the total area.
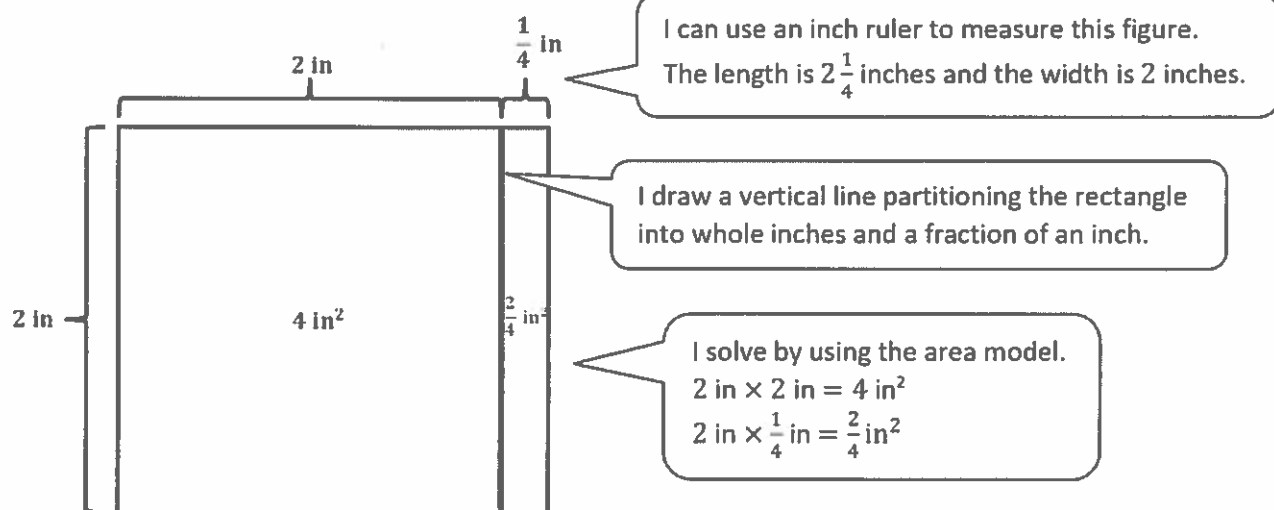
$= 4 \text{ in}^2 + \frac{1}{2} \text{ in}^2$

$= 4\frac{1}{2} \text{ in}^2$

$\text{Area} = 4\frac{1}{2} \text{ in}^2$

2. Find the area of rectangle with the following dimensions. Explain your thinking using the area model.

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

> The length is $2\frac{3}{4}$ feet, and the width is $1\frac{3}{4}$ feet.

> I partition my area model into whole foot parts and fraction of a foot parts.

> I mutliply to find the four partial areas.
>
> $1 \text{ ft} \times 2 \text{ ft} = 2 \text{ ft}^2$
>
> $1 \text{ ft} \times \frac{3}{4} \text{ ft} = \frac{3}{4} \text{ ft}^2$
>
> $\frac{3}{4} \text{ ft} \times 2 \text{ ft} = \frac{6}{4} \text{ ft}^2$
>
> $\frac{3}{4} \text{ ft} \times \frac{3}{4} \text{ ft} = \frac{9}{16} \text{ ft}^2$

$2 + \frac{3}{4} + \frac{6}{4} + \frac{9}{16}$

$= 2 + \frac{9}{4} + \frac{9}{16}$

$= 2 + 2\frac{1}{4} + \frac{9}{16}$

$= 2 + 2\frac{4}{16} + \frac{9}{16}$

$= 4\frac{13}{16}$

Area $= 4\frac{13}{16}$ ft^2

3. Zikera is putting carpet in her house. She wants to carpet her living room, which measures $12 \text{ ft} \times 10\frac{1}{2}$ ft. She also wants to carpet her bedroom, which is $10 \text{ ft} \times 7\frac{1}{2}$ ft. How many square feet of carpet will she need to cover both rooms?

Area of the living room:

$12 \text{ ft} \times 10\frac{1}{2}$ ft

$(12 \times 10) + \left(12 \times \frac{1}{2}\right)$

$= 120 + 6$

$= 126$

Area $= 126$ ft^2

> I find the area of the living room by multiplying the length and width. It is 126 square feet.

Area of the bedroom:

$10 \text{ ft} \times 7\frac{1}{2}$ ft

$10 \times \frac{15}{2}$

$= \frac{150}{2}$

$= 75$

Area $= 75$ ft^2

> I find the area of the bedroom by multiplying the length and width. It is 75 square feet.

$126 \text{ ft}^2 + 75 \text{ ft}^2 = 201 \text{ ft}^2$

She will need 201 square feet of carpet to cover both rooms.

> I combine both the area of both rooms to find the total area. The total is 201 square feet.

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G5-M5-Lesson 13

1. Find the area of the following rectangles. Draw an area model if it helps you.

   a. $\frac{35}{4}$ ft × $2\frac{3}{7}$ ft

   > I can use multiplication to find the area.

   $\frac{35}{4} × \frac{17}{7}$

   > I can rename $2\frac{3}{7}$ as a fraction greater than one, $\frac{17}{7}$.

   $= \frac{{}^{5}\cancel{35} × 17}{4 × \cancel{7}^{1}}$

   $= \frac{5 × 17}{4 × 1}$

   > 35 and 7 have a common factor of 7. $35 ÷ 7 = 5$, and $7 ÷ 7 = 1$. The new numerator is $5 × 17$, and the denominator is $4 × 1$.

   $= \frac{85}{4}$

   $= 21\frac{1}{4}$

   > I can use division to convert from a fraction to a mixed number. 85 divided by 4 is equal to $21\frac{1}{4}$.

   $\text{Area} = 21\frac{1}{4} \text{ft}^2$

   b. $4\frac{2}{3}$ m × $2\frac{3}{5}$ m

   > I use the area model to solve this problem.

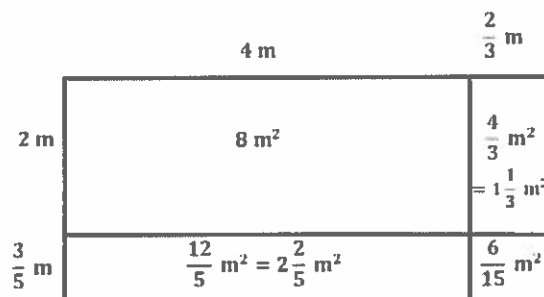 | | 4 m | $\frac{2}{3}$ m |
   |---|---|---|
   | 2 m | 8 m² | $\frac{4}{3}$ m² $= 1\frac{1}{3}$ m² |
   | $\frac{3}{5}$ m | $\frac{12}{5}$ m² $= 2\frac{2}{5}$ m² | $\frac{6}{15}$ m² |

   > I can multiply to find all four partial products.
   > $2 \text{ m} × 4 \text{ m} = 8 \text{ m}^2$
   > $2 \text{ m} × \frac{2}{3} \text{ m} = \frac{4}{3} \text{ m}^2 = 1\frac{1}{3} \text{ m}^2$
   > $\frac{3}{5} \text{ m} × 4 \text{ m} = \frac{12}{5} \text{ m}^2 = 2\frac{2}{5} \text{ m}^2$
   > $\frac{3}{5} \text{ m} × \frac{2}{3} \text{ m} = \frac{6}{15} \text{ m}^2$

   $8 \text{ m}^2 + 1\frac{1}{3} \text{ m}^2 + 2\frac{2}{5} \text{ m}^2 + \frac{6}{15} \text{ m}^2$

   $= 11 \text{ m}^2 + \frac{1}{3} \text{ m}^2 + \frac{2}{5} \text{ m}^2 + \frac{6}{15} \text{ m}^2$

   > I can add all four partial products to find the area.

   $= 11 \text{ m}^2 + \frac{5}{15} \text{ m}^2 + \frac{6}{15} \text{ m}^2 + \frac{6}{15} \text{ m}^2$

   $= 11 \text{ m}^2 + \frac{17}{15} \text{ m}^2$

   $= 11 \text{ m}^2 + 1\frac{2}{15} \text{ m}^2$

   $= 12\frac{2}{15} \text{ m}^2$

   $\text{Area} = 12\frac{2}{15} \text{m}^2$

EUREKA MATH   Lesson 13:   Multiply mixed number factors, and relate to the distributive property and the area model.   25

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2. Meigan is cutting rectangles out of fabric to make a quilt. If the rectangles are $4\frac{3}{4}$ inches long and $2\frac{1}{2}$ inches wide, what is the area of five such rectangles?

	4 in	$\frac{3}{4}$ in
2 in	8 in²	$\frac{6}{4}$ in²
$\frac{1}{2}$ in	$\frac{4}{2}$ in²	$\frac{3}{8}$ in²
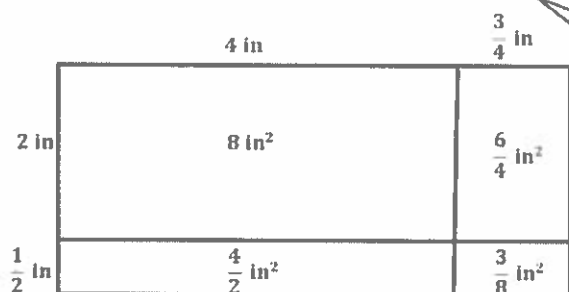
> I can find the area of 1 rectangle, and then multiply by 5 to find the total area of 5 rectangles.

> I draw an area model to help solve for the area of 1 rectangle.

> I can add up the four partial products. The area of 1 rectangle is $11\frac{7}{8}$ square inches.

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

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

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

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

$$= 11 + \frac{4}{8} + \frac{3}{8}$$

$$= 11\frac{7}{8}$$

$$1 \; unit = 11\frac{7}{8} \; in^2$$

$$5 \; units = 5 \times 11\frac{7}{8} \; in^2$$

> The area of 1 rectangle or 1 unit is equal to $11\frac{7}{8}$ square inches. I can multiply by 5 to find the area of 5 rectangles or 5 units.

$$(5 \times 11) + \left(5 \times \frac{7}{8}\right)$$

$$= 55 + \frac{35}{8}$$

$$= 55 + 4\frac{3}{8}$$

$$= 59\frac{3}{8}$$

The area of five rectangles is $59\frac{3}{8}$ square inches.

Lesson 13:   Multiply mixed number factors, and relate to the distributive property and the area model.

EUREKA MATH

G5-M5-Lesson 14

1. Sam decided to paint a wall with two windows. The gray areas below show where the windows are. The windows will not be painted. Both windows are $2\frac{1}{2}$ ft by $4\frac{1}{2}$ ft rectangles. Find the area the paint needs to cover.

> I can subtract the area of the two windows from the area of the wall to find the area that the paint needs to cover.

$13\frac{1}{2}$ ft

9 ft
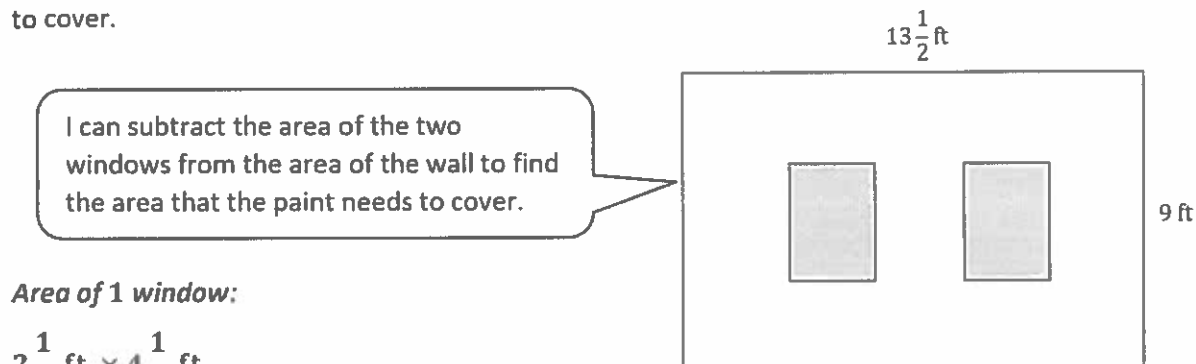
Area of 1 window:

$2\frac{1}{2}$ ft $\times 4\frac{1}{2}$ ft

$\dfrac{5}{2} \times \dfrac{9}{2}$

$= \dfrac{45}{4}$

$= 11\dfrac{1}{4}$

> The area of 1 window is $11\frac{1}{4}$ ft².

Area $= 11\dfrac{1}{4}$ ft²

Area of 2 windows:

$1\ unit = 11\frac{1}{4}$ ft²

$2\ units = 2 \times 11\frac{1}{4}$ ft²

$(2 \times 11) + \left(2 \times \dfrac{1}{4}\right)$

$= 22 + \dfrac{2}{4}$

$= 22\dfrac{1}{2}$

> I can double the area of 1 window to find the area of 2 windows. The total area is $22\frac{1}{2}$ ft².

Area $= 22\dfrac{1}{2}$ ft²

Area of the wall:

$13\dfrac{1}{2}$ ft $\times$ 9 ft

$(13 \times 9) + \left(\dfrac{1}{2} \times 9\right)$

$= 117 + \dfrac{9}{2}$

$= 117 + 4\dfrac{1}{2}$

$= 121\dfrac{1}{2}$

Area $= 121\dfrac{1}{2}$ ft²

> I can subtract the area of the 2 windows from the area of the wall.

$121\dfrac{1}{2}$ ft² $- 22\dfrac{1}{2}$ ft² $= 99$ ft²

The paint needs to cover 99 square feet.

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Lesson 14: Solve real world problems involving area of figures with fractional side lengths using visual models and/or equations.

27

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2. Mason uses square tiles, some of which he cuts in half, to make the figure below. If each square tile has a side length of $3\frac{1}{2}$ inches, what is the total area of the figure?

Total tiles:

7 whole tiles + *6 half tiles* = *10 tiles*

> I can count the tiles in the figure.
> There are a total of 10 tiles.
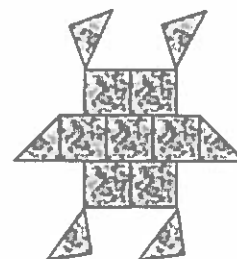
Area of 1 tile:

$3\frac{1}{2}$ in $\times$ $3\frac{1}{2}$ in

$\dfrac{7}{2} \times \dfrac{7}{2}$

> I can find the area of 1 square tile.
> $3\frac{1}{2}$ in $\times$ $3\frac{1}{2}$ in = $12\frac{1}{4}$ in².

$= \dfrac{49}{4}$

$= 12\dfrac{1}{4}$

Area = $12\dfrac{1}{4}$ in²

Area of 10 tiles:

> To find the area of 10 tiles, I can multiply the area of 1 tile by 10.

1 *unit* = $12\frac{1}{4}$ in²

10 *units* = $10 \times 12\frac{1}{4}$ in²

$(10 \times 12) + \left(10 \times \dfrac{1}{4}\right)$

$= 120 + \dfrac{10}{4}$

$= 120 + 2\dfrac{2}{4}$

$= 122\dfrac{1}{2}$

The total area of the figure is $122\frac{1}{2}$ *square inches.*

Lesson 14:   Solve real world problems involving area of figures with fractional side
lengths using visual models and/or equations.

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G5-M5-Lesson 15

1. The length of a flowerbed is 3 times as long as its width. If the width is $\frac{4}{5}$ meter, what is the area of the flowerbed?

$\frac{4}{5}$ m

width

length

?
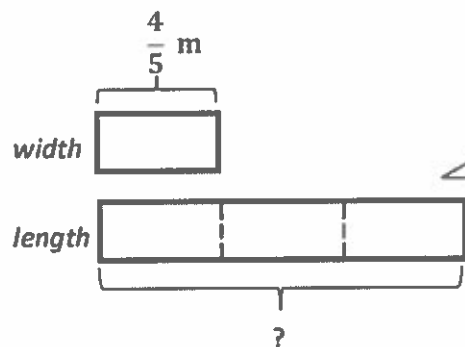
> Since the length is 3 times as long as the width, I draw a tape diagram with the width of 1 unit and the length of 3 units.

$$\frac{4}{5} \text{ m} \times 3 = \frac{12}{5} \text{ m}$$

> I find the length of the flowerbed by multiplying by 3.

Area = length × width

$$= \frac{12}{5} \text{ m} \times \frac{4}{5} \text{ m}$$

> I find the area of the flowerbed by multiplying the length times the width.

$$= \frac{48}{25} \text{ m}^2$$

$$= 1\frac{23}{25} \text{ m}^2$$

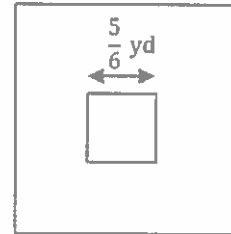*The flowerbed's area is $1\frac{23}{25}$ square meters.*

2. Mrs. Tran grows herbs in square plots. Her rosemary plot measures $\frac{5}{6}$ yd on each side.

a. Find the total area of the rosemary plot.

Area = length × width

$= \frac{5}{6}$ yd $\times \frac{5}{6}$ yd

$= \frac{25}{36}$ yd^2

> I multiply length times width to find the area of the rosemary plot.

$\boxed{\frac{5}{6} \text{ yd}}$

The total area of the rosemary plot is $\frac{25}{36}$ square yards.

b. Mrs. Tran puts a fence around the rosemary. If the fence is 2 ft from the edge of the garden on each side, what is the perimeter of the fence?

$\frac{5}{6}$ yd $= \frac{5}{6} \times 1$ yd

> I notice the unit here is feet, but the area I found from part (a) above was in yards.

$= \frac{5}{6} \times 3$ ft

$= \frac{15}{6}$ ft

$= 2\frac{3}{6}$ ft

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

> I convert the $\frac{5}{6}$ yard into feet. The length of the rosemary plot is $2\frac{1}{2}$ feet.

One side of the fence:

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

> I now find the length of one side of the fence. Since the fence is 2 feet from the edge of the garden on each side, I add 4 feet to the side of the rosemary plot, $2\frac{1}{2}$ feet.
>
> Each side of the fence is $6\frac{1}{2}$ feet long.

Perimeter of the fence:

$6\frac{1}{2}$ ft $\times 4$

> I multiply one side of the fence, $6\frac{1}{2}$ feet, by 4 to find the perimeter.

$= (6 \text{ ft} \times 4) + \left(\frac{1}{2} \text{ ft} \times 4\right)$

$= 24 \text{ ft} + \frac{4}{2}$ ft

$= 24 \text{ ft} + 2 \text{ ft}$

$= 26 \text{ ft}$

The perimeter of the fence is 26 feet.

EUREKA MATH

G5-M5-Lesson 16

1. What are polygons with four sides called?

    Quadrilaterals

    > I know that the prefix "quad" means "four."

2. What are the attributes of trapezoids?

    *   *They are quadrilaterals.*

    > I know that some trapezoids with more specific attributes are commonly known as parallelograms, rectangles, squares, rhombuses, and kites. But *ALL* trapezoids are quadrilaterals with at least one set of opposite sides parallel.

    *   *They have at least one set of opposite sides parallel.*

    > I know that some trapezoids have only right angles (90°), some have two acute angles (less than 90°) and two obtuse angles (more than 90° but less than 180°), and some have a combination of right, acute, and obtuse angles.
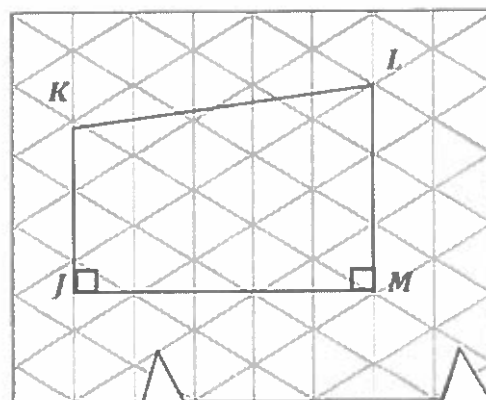
3. Use a straightedge and the grid paper to draw

    a. A trapezoid with 2 sides of equal length.

    b. A trapezoid with no sides of equal length.
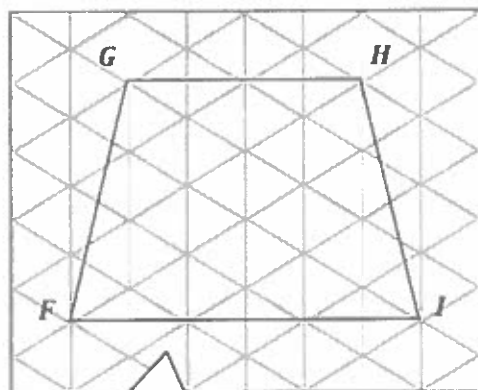
    > Since this trapezoid has 2 sides of equal length ($\overline{FG}$ and $\overline{HI}$), it is called an isosceles trapezoid.

    > ∠J and ∠M are right angles and measure 90°.

    > In this trapezoid, none of the sides are equal in length.

G5-M5-Lesson 17

1. Circle all of the words that could be used to name the figure below.

$\widehat{parallelogram}$ triangle $\widehat{quadrilateral}$ $\widehat{trapezoid}$ square

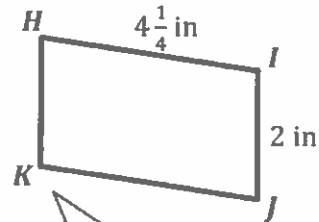This figure is a parallelogram because it's a quadrilateral with both pairs of opposite sides parallel.

This figure is a trapezoid because it's a quadrilateral with at least one pair of opposite sides parallel.

2. $HIJK$ is a parallelogram not drawn to scale.

    a. Using what you know about parallelograms, give the lengths of $\overline{KJ}$ and $\overline{HK}$.

H $4\frac{1}{4}$ in I

K 2 in J

This is $\angle HKJ$.

$KJ = \underline{\quad 4\frac{1}{4} \text{ in} \quad}$ $HK = \underline{\quad 2 \text{ in} \quad}$

I know that opposite sides of a parallelogram are equal in length. $HI = KJ$.

    b. $\angle HKJ = 99°$. Use what you know about angles in a parallelogram to find the measure of the other angles.

I know that opposite angles of a parallelograms are equal in measure.

$\angle IHK = \underline{\quad 81 \quad}°$ $\angle JIH = \underline{\quad 99 \quad}°$ $\angle KJI = \underline{\quad 81 \quad}°$

I know that angles that are next to one another, or adjacent, add up to $180°$.
$180° - 99° = 81°$

Lesson 17:   Draw parallelograms to clarify their attributes, and define parallelograms based on those attributes.

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3. $PQRS$ is a parallelogram not drawn to scale. $PR = 10$ mm and $MS = 4.5$ mm. Give the lengths of the following segments:

$PM = \underline{\quad 5\ mm \quad}$ $QS = \underline{\quad 9\ mm \quad}$

> I know that the diagonals of a parallelogram bisect, or cut one another in two equal parts. So the length of $\overline{PM}$ is equal to half the length of $\overline{PR}$.
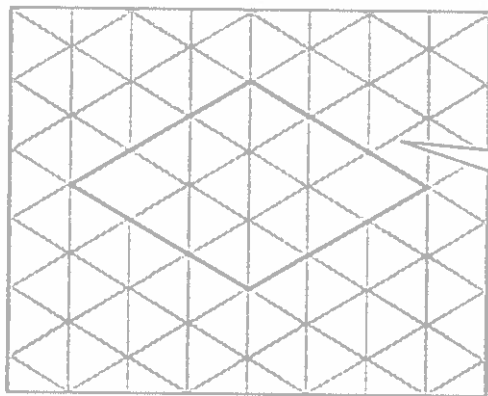
EUREKA MATH   Lesson 17:   Draw parallelograms to clarify their attributes, and define parallelograms based on those attributes.
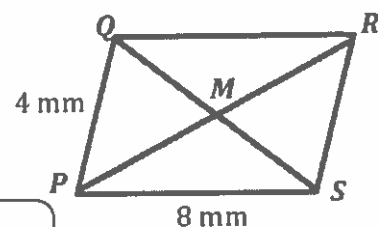
G5-M5-Lesson 18

1. What is the definition of a rhombus? Draw an example.

   *A rhombus is a quadrilateral (a shape with 4 sides) with all sides equal in length.*

   One example of a rhombus looks like this:

   > My rhombus looks like a diamond, but I could have drawn it other ways, too. As long as it is a quadrilateral with 4 sides of equal length, it is a rhombus.

2. What is the definition of a rectangle? Draw an example.

   A rectangle is a quadrilateral with four right (90 degree) angles.
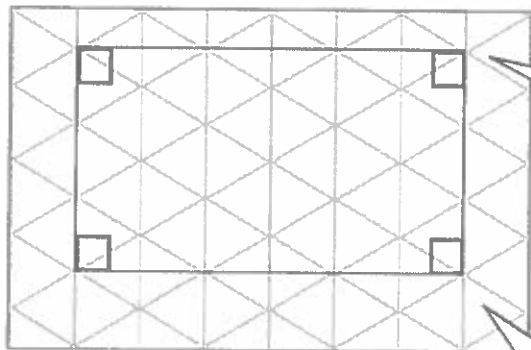
   > My rectangle has 2 long sides and 2 short sides, but I could have drawn it other ways, too. As long as it is a quadrilateral with 4 right angles, it is a rectangle.

   > The boxes in the corners of my rectangle show that all the angles are 90 degrees.

Lesson 18:   Draw rectangles and rhombuses to clarify their attributes, and define.

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G5-M5-Lesson 19

1. What are the attributes of a square? Draw an example.

   The attributes of a square are

   - *Four sides that are equal in length (same as a rhombus)*
   - *Four right angles (same as a rectangle)*
   - *A square is a type of rhombus and a type of rectangle!*
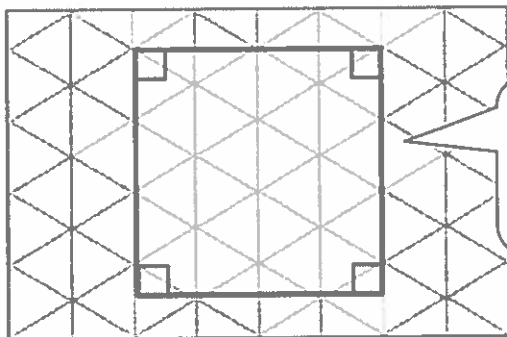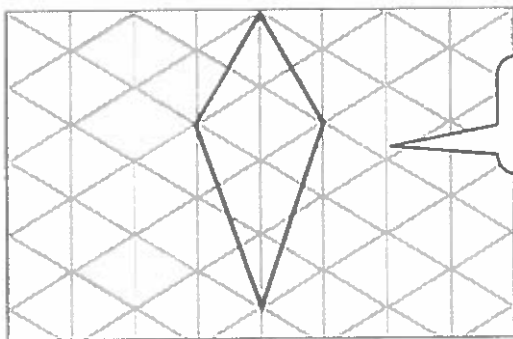
   > This is a square.
   > It is also a rhombus because it has 4 sides of equal length.
   > It is also a rectangle because it has 4 right angles.

2. What are the attributes of a kite? Draw an example.

   The attributes of a kite are

   - *A quadrilateral in which 2 consecutive (next to each other) sides are equal in length.*
   - *The other 2 side lengths are equal to one another as well.*

   > The 2 sides on "top" are equal in length, and the
   > 2 sides on the "bottom" are equal in length.

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Lesson 19: Draw kites and squares to clarify their attributes, and define kites and squares based on those attributes.

35

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3. Is the kite you drew in Problem 2, a parallelogram? Why or why not?

No, the kite I drew is not a parallelogram. A parallelogram must have both sets of opposite sides parallel. There are no parallel sides in my kite. The only time a kite is a parallelogram is when the kite is a square or a rhombus.

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G5-M5-Lesson 20

1. Fill in the table below.

Shape	Defining Attributes
Trapezoid	• Quadrilateral • Has at least one pair of parallel sides
Parallelogram	• *A quadrilateral in which both pairs of opposite sides are parallel*
Rectangle	• A quadrilateral with 4 right angles
Rhombus	• A quadrilateral with all sides of equal length
Square	• A rhombus with four 90° angles • A rectangle with 4 equal sides
Kite	• *Quadrilateral with 2 consecutive sides of equal length* • *Has 2 remaining sides of equal length*

2. $TUVW$ is a square with an area of 81 cm², and $UB = 6.36$ cm. Find the measurements using what you know about the properties of squares.
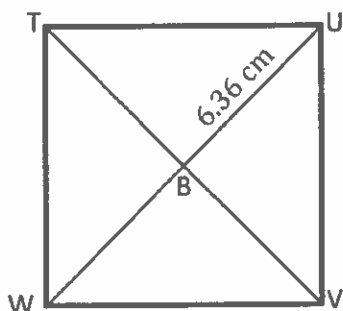
a. $UW = \underline{\ 12.72\ }$ cm

> Diagonals of a square bisect each other, so $\overline{UB}$ and $\overline{BW}$ are equal in length. $6.36 + 6.36 = 12.72$

b. $TV = UW = 12.72$ cm

> I know that in a square the diagonals are equal in length.

c. Perimeter $= \underline{\ 36\ }$ cm

> I know that in a square every side length is equal, so I need to think about what times itself is equal to 81. I know that 9×9 is 81, so each side is 9 cm. Since there are 4 equal sides, I can multiply 9×4 to get the perimeter.

d. $m\angle TUV = \underline{\ 90\ }$ °

> I know every angle in a square must be 90° because it is a defining attribute of a square.

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Lesson 20: Classify two-dimensional figures in a hierarchy based on properties.

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37

G5-M5-Lesson 21

Finish each sentence below by writing "sometimes" or "always" in the first blank, and then state the reason why. Sketch an example of each statement in the space to the right.

a.   A rectangle is _sometimes_ a square because _a rectangle has 4 right angles, and a_
square is a special type of rectangle with 4 equal sides.

> This is a rectangle. It is _not_ a square because all 4 sides are not equal in length.

b.   A square is _always_ a rectangle because _a rectangle is a parallelogram with 4_
right angles. A square is a rectangle with 4 equal sides.

> This is a square and a rectangle because it has 4 right angles and 4 equal sides.

c.   A rectangle is _sometimes_ a kite because _a square fits the definition of a kite and_
rectangle. A kite has two pairs of sides that are equal, which is the same as a
square.

> This is a kite, a square, and a rectangle. It has 4 right angles and 2 sets of consecutive sides equal in length.
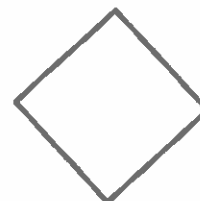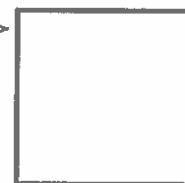
d.   A rectangle is _always_ a parallelogram because _it has two pairs of parallel sides_.

> All rectangles can also be called parallelograms.

e.   A square is _always_ a trapezoid because _it has at least one pair of parallel sides._

> This square, and all squares, has 2 pairs of opposite sides that are parallel. All squares can also be called trapezoids.

f.   A trapezoid is _sometimes_ a parallelogram because _a trapezoid has to have at_
least one pair of parallel sides, but it could have two pairs, which fits the
definition of a parallelogram.

> This figure is a trapezoid but _not_ a parallelogram. It only has 1 pair of opposite sides parallel. (The "top" and "bottom" sides are parallel.)

Lesson 21:   Draw and identify varied two-dimensional figures from given attributes.

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