Problem Set
Answer Key

Table of Contents

GRADE 5 • MODULE 5

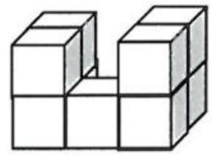
Addition and Multiplication with Volume and Area

Name ______________________________ Date ________________

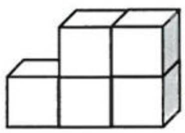
1. Use your centimeter cubes to build the figures pictured below on centimeter grid paper. Find the total volume of each figure you built, and explain how you counted the cubic units. Be sure to include units.

A.

D.



B.



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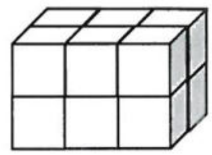

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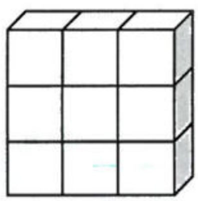

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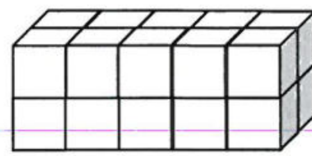
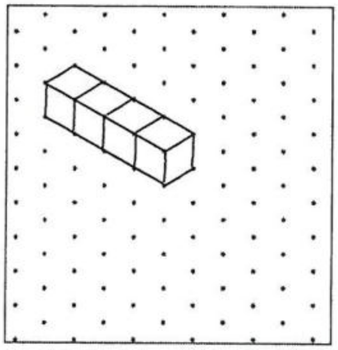


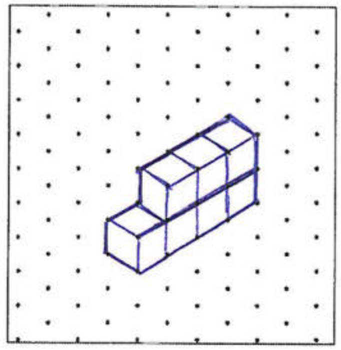
Figure	Volume	Explanation
A	1 cm^3	I just counted one cube.
B	5 cm^3	I added 3 cubes and 2 cubes.
C	9 cm^3	I multiplied 3 layers x 3 layers.
D	9 cm^3	I counted the front layer, then carefully counted the back.
E	12 cm^3	I counted the end layer (4 cubes) and then multiplied by 3.
F	20 cm^3	I counted the bottom layer, and then multiplied by 2. 10x2 = 20

2. Build 2 different structures with the following volumes using your unit cubes. Then, draw one of the figures on the dot paper. One example has been drawn for you.

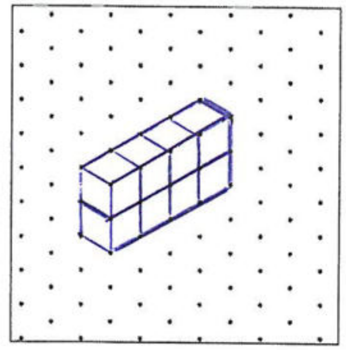
a. 4 cubic units



b. 7 cubic units

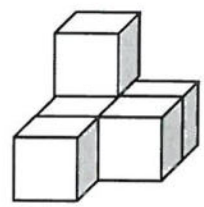


c. 8 cubic units



3. Joyce says that the figure below, made of 1 cm cubes, has a volume of 5 cubic centimeters.

a. Explain her mistake.



Joyce is not counting the one that is hidden. The cube that's on the second layer needs to be sitting on a hidden cube.

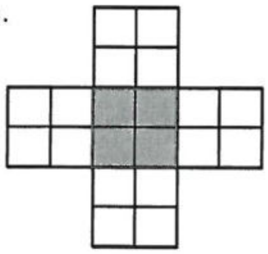
b. Imagine if Joyce wants to build a second layer of the same structure identical to the figure above. What would its volume be then? Explain how you know.

The volume would be 10 cm^3. I counted the first layer, and then multiplied by 2.

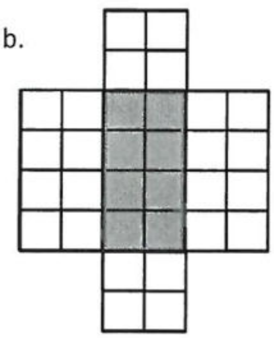
$5 \text{ cm}^3 \times 2 = 10 \text{ cm}^3$

Name ____________________ Date ____________

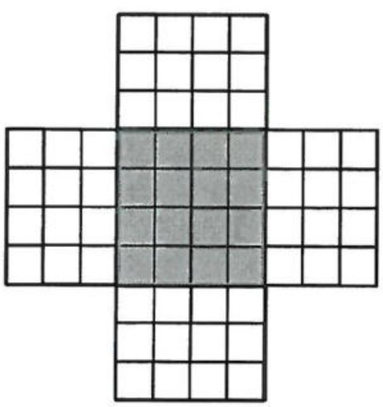
1. Shade the following figures on centimeter grid paper. Cut and fold each to make 3 open boxes, taping them so they hold their shapes. Pack each box with cubes. Write how many cubes fill the box.

a. 

Number of cubes: 8

b. 

Number of cubes: 16

c. 

Number of cubes: 48

2. Predict how many centimeter cubes will fit in each box, and briefly explain your prediction. Use cubes to find the actual volume. (The figures are not drawn to scale.)

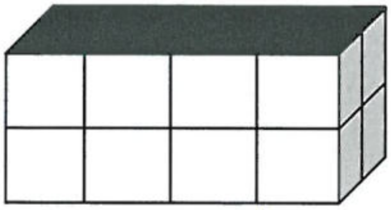
a. 

Prediction: $8 cm^3$

Actual: $8 cm^3$

It's 4 cubes across and 2 deep, so 8 cubes altogether.

b.

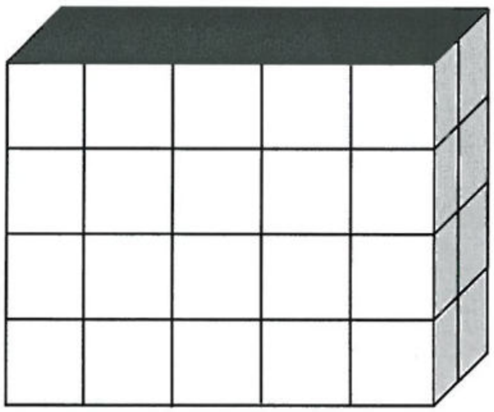


Prediction: $16\ m^3$

Actual: $16\ m^3$

There are 2 layers, top and bottom. Each layer has 8 cubes, 8 cubes x 2 = 16 cubes.

c.



Prediction: $40\ cm^3$

Actual: $40\ cm^3$

There are 4 layers. Each layer has 10 cubes, 10 cubes x 4 = 40 cubes

3. Cut out the net in the template, and fold it into a cube. Predict the number of 1-centimeter cubes that would be required to fill it. Test your prediction using as few cubes as possible. What did you discover?

Prediction: 1 cube

What I discovered:

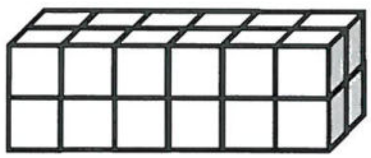
I saw that the net had six faces, so I knew it would not be an open box. When I folded the net, I discovered it had the shape of a cube.

Name ____________________________ Date ______________

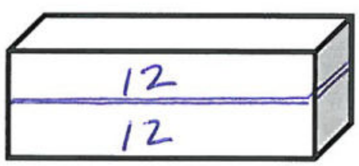
1. Use the prisms to find the volume.

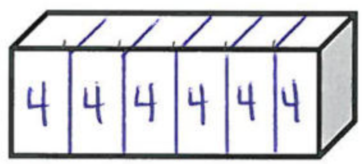
   - Build the rectangular prism pictured below to the left with your cubes, if necessary.
   - Decompose it into layers in three different ways, and show your thinking on the blank prisms.
   - Complete the missing information in the table.

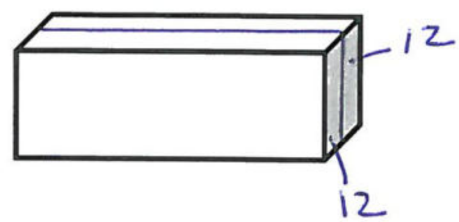
a.



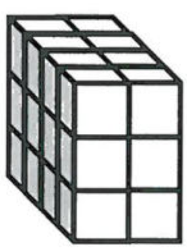
Number of Layers	Number of Cubes in Each Layer	Volume of the Prism
2	12	24 cubic cm
6	4	24 cubic cm
2	12	24 cubic cm



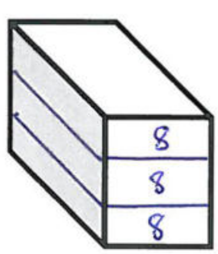


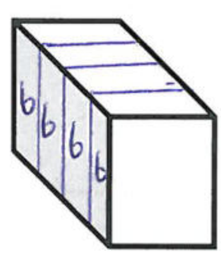


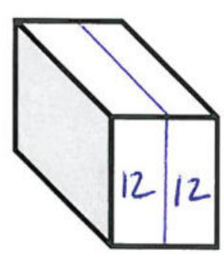
b.



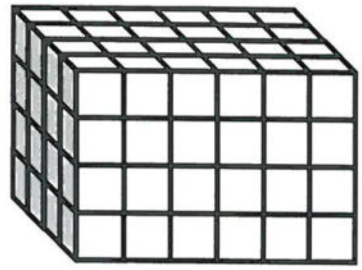
Number of Layers	Number of Cubes in Each Layer	Volume of the Prism
3	8	24 cubic cm
4	6	24 cubic cm
2	12	24 cubic cm







2. Josh and Jonah were finding the volume of the prism to the right. The boys agree that 4 layers can be added together to find the volume. Josh says that he can see on the end of the prism that each layer will have 16 cubes in it. Jonah says that each layer has 24 cubes in it. Who is right? Explain how you know using words, numbers, and/or pictures.

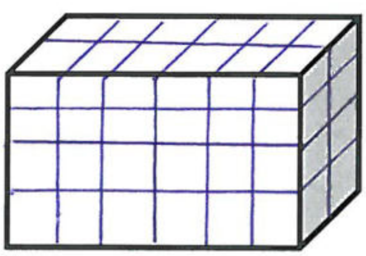


Jonah is right. Each layer has 6 across and 4 deep, so 24 cubes in each layer. 24 x 4 is 96. Josh sees 16 cubes on the end layer, but he'd have to multiply by 6 going across, not 4. He would get 16 x 4 = 64, not 96, so only Jonah is right.

3. Marcos makes a prism 1 inch by 5 inches by 5 inches. 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.

Number of Layers	Volume	Explanation
2	$50 in^3$	Each layer is $25 in^3$, 2 layers is $2 \times 25 in^3 = 50 in^3$.
4	$100 in^3$	4 layers is double 2 layers, so $2 \times 50 in^3 = 100 in^3$
7	$175 in^3$	I multiplied 1 layer ($25 in^3$) by 7, $7 \times 25 in^3 = 175 in^3$.

4. Imagine the rectangular prism below is 6 meters long, 4 meters tall, and 2 meters wide. Draw horizontal lines to show how the prism could be decomposed into layers that are 1 meter in height.



It has 4 layers from bottom to top.

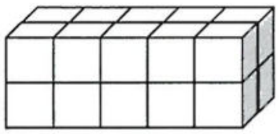
Each layer contains 12 cubic units.

The volume of this prism is $48 m^3$.

Name ______________________ Date ______________

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

a.

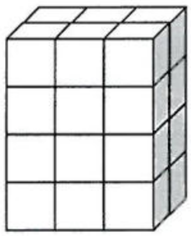


Length: 5 cm
Width: 2 cm
Height: 2 cm
Volume: 20 cm^3

$\underbrace{5 \times 2}_{10} \times 2$

$10 \times 2 = 20$

b.

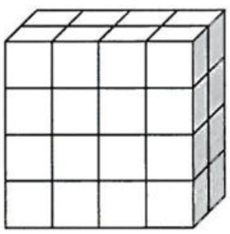


Length: 3 cm
Width: 2 cm
Height: 4 cm
Volume: 24 cm^3

$\underbrace{3 \times 2}_{6} \times 4$

$6 \times 4 = 24$

c.

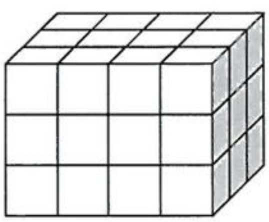


Length: 4 cm
Width: 2 cm
Height: 4 cm
Volume: 32 cm^3

$\underbrace{4 \times 2}_{8} \times 4$

$8 \times 4 = 32$

d.



Length: 4 cm
Width: 3 cm
Height: 3 cm
Volume: 36 cm^3

$4 \times 3 \times 3$

$12 \times 3 = 36$

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. 5 cm × 2 cm × 2 cm = 20 cm^3

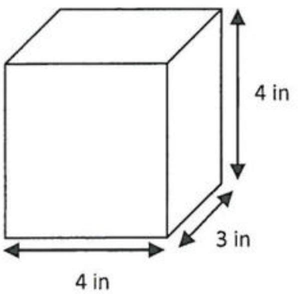
b. 3 cm × 2 cm × 4 cm = 24 cm^3

c. 4 cm × 2 cm × 4 cm = 32 cm^3

d. 4 cm × 3 cm × 3 cm = 36 cm^3

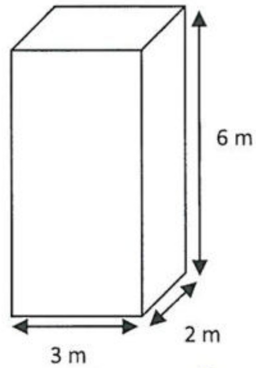
3. Calculate the volume of each rectangular prism. Include the units in your number sentences.

a.



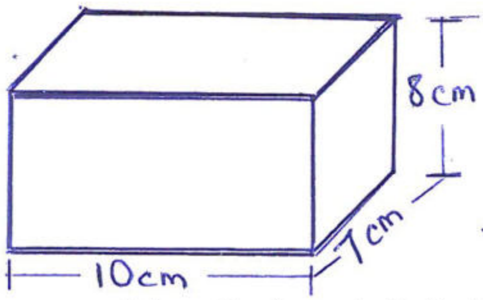
V = $4 \text{ in} \times 3 \text{ in} \times 4 \text{ in} = 48 \text{ in}^3$

b.



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

4. Tyron is constructing a box in the shape of a rectangular prism to store his baseball cards. It has a length of 10 centimeters, a width of 7 centimeters, and a height of 8 centimeters. What is the volume of the box?



$V = l \times w \times h$

$= 10 \text{ cm} \times 7 \text{ cm} \times 8 \text{ cm}$

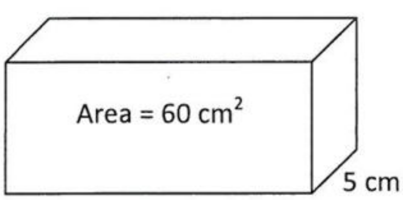
$= 70 \text{ cm}^2 \times 8 \text{ cm}$

$= 560 \text{ cm}^3$

The volume of the box is 560 cubic centimeters.

5. Aaron says more information is needed to find the volume of the prisms. Explain why Aaron is mistaken, and calculate the volume of the prisms.

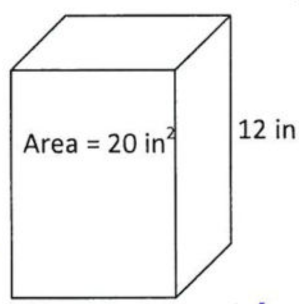
a.



Aaron can multiply the area of the face by the width to find the volume.

$V = 60 \text{ cm}^2 \times 5 \text{ cm} = 300 \text{ cm}^3$

b.



Aaron can multiply the area of the face by the height to find the volume.

$V = 20 \text{ in}^2 \times 12 \text{ in}$

$= 240 \text{ in}^3$

Name ____________________ Date ____________

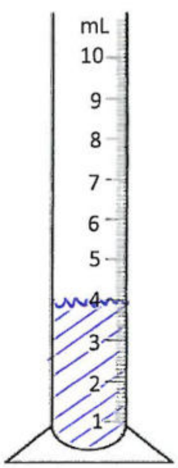
1. Determine the volume of two boxes on the table using cubes, and then confirm by measuring and multiplying.

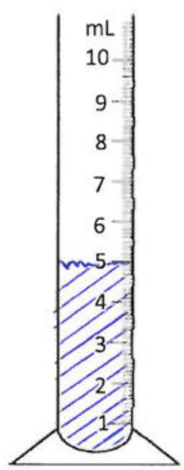
Box Number	Number of Cubes Packed	Measurements			Volume
		Length	Width	Height	
1	32	4 cm	4 cm	2 cm	32 cm^3
2	20	2 cm	5 cm	2 cm	20 cm^3

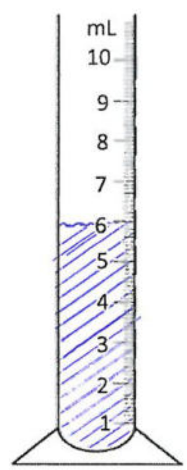
2. Using the same boxes from Problem 1, record the amount of liquid that your box can hold.

Box Number	Liquid the Box Can Hold
1	32 mL
2	20 mL

3. Shade to show the water in the beaker.







At first: 4 mL

After 1 mL water added: 5 mL

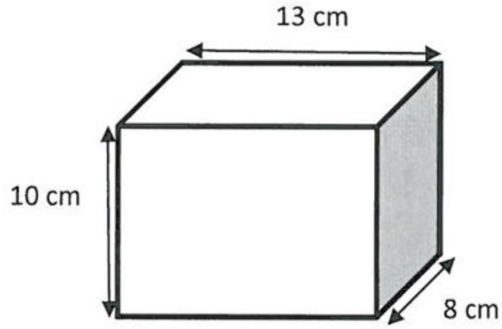
After 1 cm cube added: 6 mL

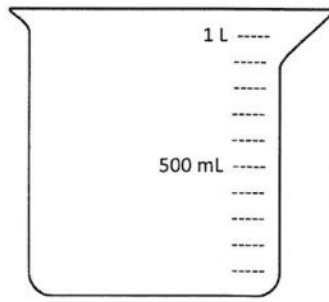
4. What conclusion can you draw about 1 cubic centimeter and 1 mL?

When 1 cubic centimeter is added, the water level rises 1 mL. Therefore, 1 cubic cm is equal to 1 mL.

$1 \text{ cm}^3 = 1 \text{ mL}$

5. The tank, shaped like a rectangular prism, is filled to the top with water.





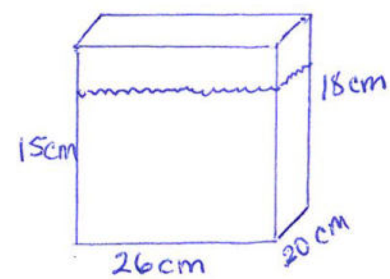
$1 \text{ L} = 1{,}000 \text{ mL}$

Will the beaker hold all the water in the tank? If yes, how much more will the beaker hold? If no, how much more will the tank hold than the beaker? Explain how you know.

$V_{tank} = 13 \text{ cm} \times 8 \text{ cm} \times 10 \text{ cm} = 1{,}040 \text{ cm}^3$. No, the beaker holds 40 mL less than the tank. $1 \text{ L} = 1{,}000 \text{ mL}$, and $1{,}040 \text{ cm}^3 = 1040 \text{ mL}$. 1040 mL is 40 mL more than 1,000 mL.

6. A rectangular fish tank measures 26 cm by 20 cm by 18 cm. The tank is filled with water to a depth of 15 cm.

$$\begin{array}{r} 520 \\ \times\ 15 \\ \hline 2600 \\ 5200 \\ \hline 7{,}800 \end{array}$$



a. What is the volume of the water in mL?

$26 \text{ cm} \times 20 \text{ cm} \times 15 \text{ cm}$
$= 520 \text{ cm}^2 \times 15 \text{ cm} = 7{,}800 \text{ cm}^3 = 7{,}800 \text{ mL}$

b. How many liters is that?

$7{,}800 \text{ mL} \div 1{,}000 = 7.8 \text{ L}$

c. How many more mL of water will be needed to fill the tank to the top? Explain how you know.

$26 \text{ cm} \times 20 \text{ cm} \times 3 \text{ cm}$
$= 26 \text{ cm} \times 60 \text{ cm}^2$
$= 1{,}560 \text{ cm}^3 = 1{,}560 \text{ mL}$

The remaining part is $26 \text{ cm} \times 20 \text{ cm} \times 3 \text{ cm}$. I multiplied to find the volume there is left to fill.

7. A rectangular container is 25 cm long and 20 cm wide. If it holds 1 liter of water when full, what is its height?

$25 \text{ cm} \times 20 \text{ cm} = 500$

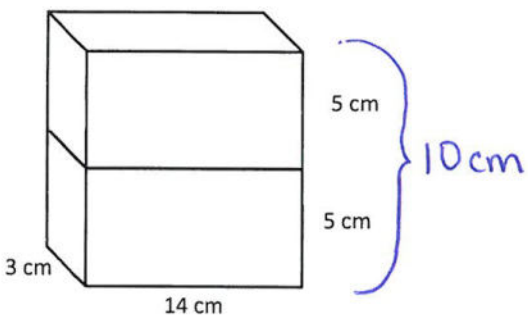
$1 \text{ L} = 1{,}000 \text{ cm}^3$ $\quad 1{,}000 \text{ cm}^3 \div 500 \text{ cm}^2 = 2 \text{ cm}$

It is 2 cm high.

Name ______________________   Date ______________

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

a.

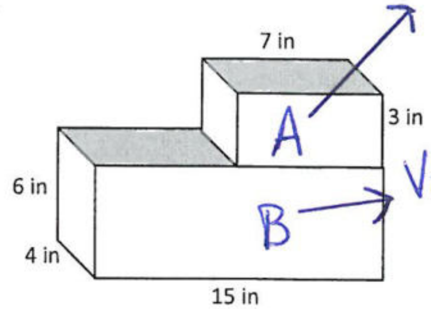


Volume: $V = 14\,cm \times 3\,cm \times 10\,cm = 420\,cm^3$

Solution Strategy:

I combined the 2 heights to get 10cm. Then I just used the formula for volume.

b.



$V_A = 7\,in \times 4\,in \times 3\,in$
$= 28\,in^2 \times 3\,in$
$= 84\,in^3$

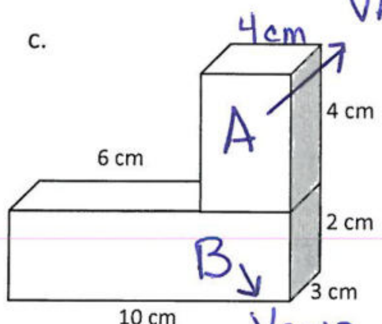
$V_B = 15\,in \times 4\,in \times 6\,in$
$= 60\,in^2 \times 6\,in$
$= 360\,in^3$

Volume: $84\,in^3 + 360\,in^3 = 444\,in^3$

Solution Strategy:

Prism A & B have the same width, so I used the volume formula and then added the 2 volumes to find the total.

c.



$V_A = 4\,cm \times 3\,cm \times 4\,cm$
$= 12\,cm^2 \times 4\,cm$
$= 48\,cm^3$

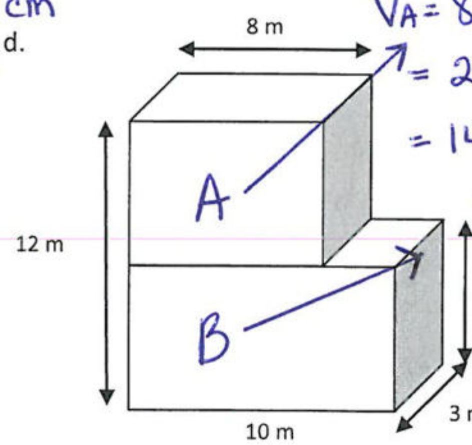
$V_B = 10\,cm \times 3\,cm \times 2\,cm$
$= 30\,cm^2 \times 2\,cm$
$= 60\,cm^3$

Volume: $48\,cm^3 + 60\,cm^3 = 108\,cm^3$

Solution Strategy:

10cm - 6cm shows that the length of A is 4cm. Then I found the volume of A & B and added them together.

d.



$V_A = 8\,m \times 3\,m \times 6\,m$
$= 24\,m^2 \times 6\,m$
$= 144\,m^3$

$V_B = 10\,m \times 3\,m \times 6\,m$
$= 30\,m^2 \times 6\,m$
$= 180\,m^3$

Volume: $144\,m^3 + 180\,m^3 = 324\,m^3$

Solution Strategy:

12m - 6m shows that the height of A is 6m. Again, I found the volume of each prism then added them together.

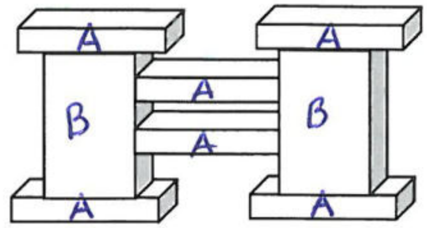
2. A sculpture (pictured below) is made of two sizes of rectangular prisms. One size measures 13 in by 8 in by 2 in. The other size measures 9 in by 8 in by 18 in. What is the total volume of the sculpture?

Volume A: 13 in × 8 in × 2 in
= 208 in^3

$$\begin{array}{r} 208\text{ in}^3 \\ \times\ 6 \\ \hline 1{,}248\text{ in}^3 \end{array}$$

Volume B: 9 in × 8 in × 18 in
= 72 in^2 × 18 in
= 1296 in^3

$$\begin{array}{r} 1296\text{ in}^3 \\ \times\ 2 \\ \hline 2{,}592\text{ in}^3 \end{array}$$



$$\begin{array}{r} 1248 \\ +\ 2592 \\ \hline 3{,}840 \end{array}$$

The total volume of the sculpture is 3,840 in^3.

3. The combined volume of two identical cubes is 128 cubic centimeters. What is the side length of each cube?

Total Volume 128 cm^3

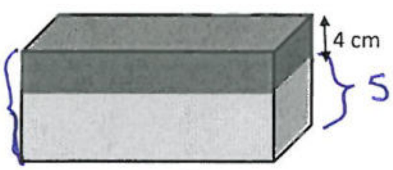
64 m^3	64 m^3

4 cm × 4 cm × 4 cm = 64 cm^3

Each side length on each cube is 4 cm.

4. A rectangular tank with a base area of 24 cm^2 is filled with water and oil to a depth of 9 cm. The oil and water separate into two layers when the oil rises to the top. If the thickness of the oil layer is 4 cm, what is the volume of the water?

24 cm^2 × 5 cm = 120 cm^3



The volume of the water is 120 cm^3.

5. Two rectangular prisms have a combined volume of 432 cubic feet. Prism A has half the volume of Prism B.

432 ft^3

144	144	144

A B

$$\begin{array}{r} 144 \\ 3\overline{)432} \\ -3 \\ \hline 13 \\ -12 \\ \hline 12 \end{array}$$

a. What is the volume of Prism A? Prism B?

The volume of Prism A is 144 ft^3.
The volume of Prism B is 288 ft^3.

b. If Prism A has a base area of 24 ft^2, what is the height of Prism A?

144 ÷ 12 = 12, so 144 ÷ 24 = 6 The height of prism A is 6 ft.

c. If Prism B's base is $\frac{2}{3}$ the area of Prism A's base, what is the height of Prism B?

$\frac{2}{3} \times 24 = \frac{2 \times \cancel{24}^{8}}{1\ \cancel{3}} = 16$

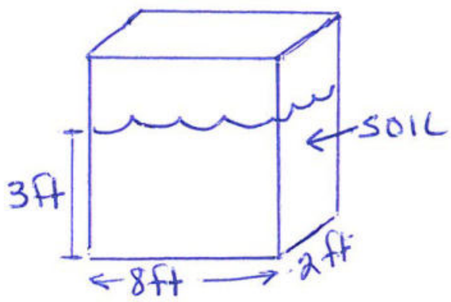
288 ft^3 ÷ 16 ft^2 = 18 ft.

The height of prism B is 18 ft.

Name ______________________________ Date ______________

Geoffrey builds rectangular planters.

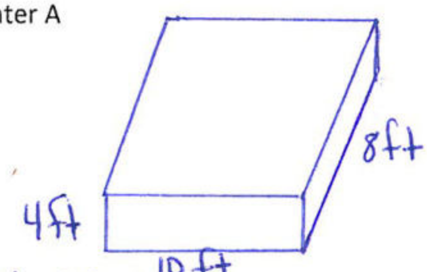
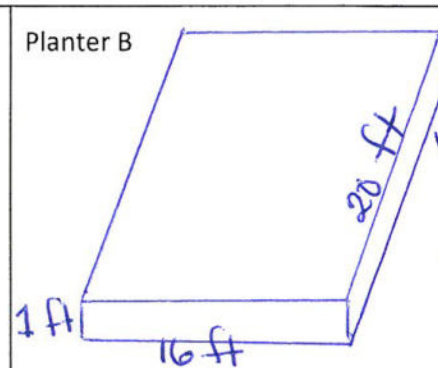
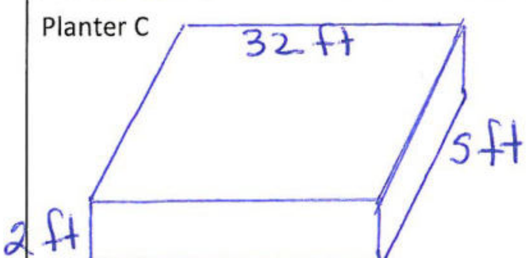
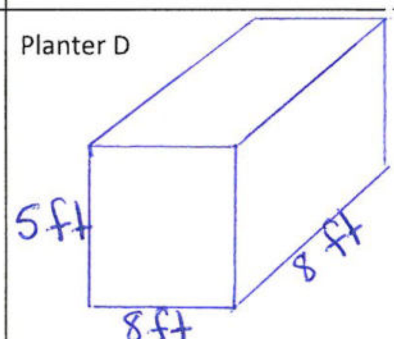
1. Geoffrey's first planter is 8 feet long and 2 feet wide. The container is filled with soil to a height of 3 feet in the planter. What is the volume of soil in the planter? Explain your work using a diagram.



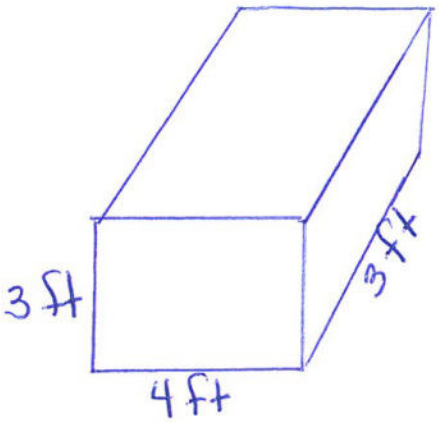
$V = L \times W \times H$
$= 8\text{ ft} \times 2\text{ ft} \times 3\text{ ft}$
$= 48\text{ ft}^3$

There is 48 ft^3 of soil in the planter.

2. Geoffrey wants to grow some tomatoes in four large planters. He wants each planter to have a volume of 320 cubic feet, but he wants them all to be different. Show four different ways Geoffrey can make these planters, and draw diagrams with the planters' measurements on them.

<table>
<tr><td>Planter A

$V = L \times W \times H$
$= 10\text{ ft} \times 8\text{ ft} \times 4\text{ ft}$
$= 320\text{ ft}^3$</td><td>Planter B

$V = L \times W \times H$
$= 16\text{ ft} \times 20\text{ ft} \times 1\text{ ft}$
$= 320\text{ ft}^3$</td></tr>
<tr><td>Planter C

$V = L \times W \times H$
$= 32\text{ ft} \times 5\text{ ft} \times 2\text{ ft}$
$= 320\text{ ft}^3$</td><td>Planter D

$V = L \times W \times H$
$= 8\text{ ft} \times 8\text{ ft} \times 5\text{ ft}$
$= 320\text{ ft}^3$</td></tr>
</table>

3. Geoffrey 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 36 cubic feet of soil, name one way he could build the planter so it is not taller than 3 feet. Explain how you know.



$36 \div 3 = 12$

$12 = 4 \times 3$

$V = L \times W \times H$

$= 4\text{ ft} \times 3\text{ ft} \times 3\text{ ft}$

$= 36\text{ ft}^3$

Since Geoffrey wants to build a planter, with a height of 3 ft and a volume of 36 ft^3, the base of the planter should have an area of 12 ft^2. I drew a planter with L = 4 ft, W = 3 ft, H = 3 ft.

4. After all of this gardening work, Geoffrey decides he needs a new shed to replace the old one. His current shed is a rectangular prism that measures 6 feet long by 5 feet wide by 8 feet high. He realizes he needs a shed with 480 cubic feet of storage.

a. Will he achieve his goal if he doubles each dimension? Why or why not?

Shed: $V = 6\text{ ft} \times 5\text{ ft} \times 8\text{ ft}$

$= 240\text{ ft}^3$

Shed dimensions doubled: $V = 240\text{ ft}^3 \times 8\text{ ft}$

$= 1{,}920\text{ ft}^3$

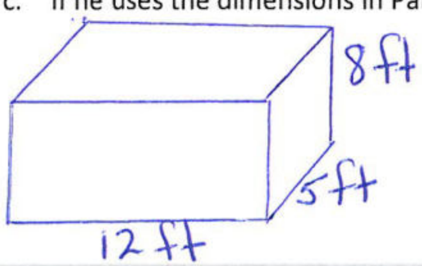
By doubling each dimension of the shed, Geoffrey will get a shed that is 8 times the current size because $(2 \times 2 \times 2 = 8)$. To double the volume he needs only to double one dimension, not all three.

b. If he wants to keep the height the same, what could the other dimensions be for him to get the volume he wants?

He could double the length and keep the width the same, or he could double the width and keep the length the same.

L = 12 ft, W = 5 ft, H = 8 ft OR L = 6 ft, W = 10 ft, H = 8 ft

c. If he uses the dimensions in Part (b), what could be the area of the new shed's floor?



$A = L \times W$

$= 12\text{ ft} \times 5\text{ ft}$

$= 60\text{ ft}^2$

The floor could have an area of 60 ft^2.

Name ____________________ Date ____________________

Using the box patterns, construct a sculpture containing at least 5, but not more than 7, rectangular prisms that meets the following requirements in the table below.

1.	My sculpture has 5 to 7 rectangular prisms. Number of prisms: 6	
2.	Each prism is labeled with a letter, dimensions, and volume.	
	Prism A 10 cm by 7 cm by 3 cm Volume = 210 cm^3 Prism B 9 cm by 5 cm by 4 cm Volume = 180 cm^3 Prism C 6 cm by 3 cm by 4 cm Volume = 72 cm^3 Prism D 5 cm by 2 cm by 9 cm Volume = 90 cm^3 Prism E 5 cm by 2 cm by 7 cm Volume = 70 cm^3 Prism F 4 cm by 3 cm by 1 cm Volume = 12 cm^3 Prism __ ______ by ______ by ______ Volume = ______	
3.	Prism D has $\frac{1}{2}$ the volume of prism B.	Prism D Volume = 90 cm^3 Prism B Volume = 180 cm^3
4.	Prism E has $\frac{1}{3}$ the volume of prism A.	Prism E Volume = 70 cm^3 Prism A Volume = 210 cm^3
5.	The total volume of all the prisms is 1,000 cubic centimeters or less.	Total volume: 634 cm^3 Show calculations: 210 180 72 90 70 + 12 634 cm^3

Name ______________________________ Date ______________

I reviewed project number ____________.

Use the rubric below to evaluate your friend's project. Ask questions and measure the parts to determine whether your friend has all the required elements. Respond to the prompt in italics in the third column. The final column can be used to write something you find interesting about that element if you like.

Space is provided beneath the rubric for your calculations.

	Requirement	Element present? (✓)	Specifics of Element	Notes
1.	Sculpture has 5 to 7 prisms.	✓	*# of prisms:* 5	
2.	All prisms are labeled with a letter.	✓	*Write letters used:* A - B	
3.	All prisms have correct dimensions with units written on the top.	✓	*List any prisms with incorrect dimensions or units:*	
4.	All prisms have correct volume with units written on top.	✓	*List any prism with incorrect dimensions or units:*	
5.	Prism D has $\frac{1}{2}$ the volume of another prism.	✓	*Record on next page:*	
6.	Prism E has $\frac{1}{3}$ the volume of another prism.	✓	*Record on next page:*	
7.	The total volume of all the parts together is 1,000 cubic units or less.	✓	*Total volume:* 650 cm^3	

Calculations:

$36\text{ cm}^3 + 420\text{ cm}^3 + 36\text{ cm}^3 + 18\text{ cm}^3 + 140\text{ cm}^3 = 650\text{ cm}^3$

8. Measure the dimensions of each prism. Calculate the volume of each prism and the total volume. Record that information in the table below. If your measurements or volume differ from those listed on the project, put a star by the prism label in the table below, and record on the rubric.

Prism	Dimensions	Volume
A	6 cm by 3 cm by 2 cm	36 cm^3
B	10 cm by 7 cm by 6 cm	420 cm^3
C	6 cm by 3 cm by 2 cm	36 cm^3
D	6 cm by 3 cm by 1 cm	18 cm^3
E	10 cm by 7 cm by 2 cm	140 cm^3
	______ by ______ by ______	
	______ by ______ by ______	

9. Prism D's volume is $\frac{1}{2}$ that of Prism A or C.
Show calculations below.

$36 \text{ cm}^3 \div 2 = 18 \text{ cm}^3$.

Both prisms A and C have the same volume of 36 cm^3. Prism D's volume of 18 cm^3 is $\frac{1}{2}$ of prism A or C's volume.

10. Prism E's volume is $\frac{1}{3}$ that of Prism B.
Show calculations below.

$420 \text{ cm}^3 \div 3 = 140 \text{ cm}^3$

Prism E's volume of 140 cm^3 is $\frac{1}{3}$ of prism B's volume.

11. Total volume of sculpture: 650 cm^3
Show calculations below.

$$\begin{array}{r} 420 \\ +\ 36 \\ \hline 456 \end{array} \quad \begin{array}{r} 456 \\ +\ 36 \\ \hline 492 \end{array} \quad \begin{array}{r} 492 \\ +\ 18 \\ \hline 510 \end{array} \quad \begin{array}{r} 510 \\ +140 \\ \hline 650 \end{array}$$

Name ______________________ Date ______________

Sketch the rectangles and your tiling. Write the dimensions and the units you counted in the blanks. Then, use multiplication to confirm the area. Show your work. We will do Rectangles A and B together.

1. **Rectangle A:** 3 units

2 units

$3 \times 2 = 6$

Rectangle A is

<u>3</u> units long <u>2</u> units wide

Area = <u>6</u> units^2

2. **Rectangle B:**

3 units

2

$\frac{1}{2}$

3 units × 2 units = 6 units^2

3 units × $\frac{1}{2}$ unit = $1\frac{1}{2}$ units^2

6 units + $1\frac{1}{2}$ units = $7\frac{1}{2}$ units^2

Rectangle B is

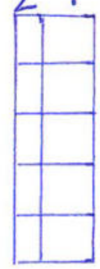
<u>3</u> units long <u>$2\frac{1}{2}$</u> units wide

Area = <u>$7\frac{1}{2}$</u> units^2

3. **Rectangle C:**

$\frac{1}{2}$ 1

5



1 unit × 5 units = 5 units^2

$\frac{1}{2}$ unit × 5 units = $2\frac{1}{2}$ units^2

5 units^2

+ $2\frac{1}{2}$ units^2

$7\frac{1}{2}$ units^2

Rectangle C is

<u>5</u> units long <u>$1\frac{1}{2}$</u> units wide

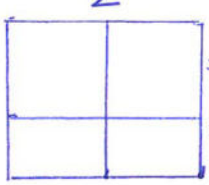
Area = <u>$7\frac{1}{2}$</u> units^2

4. **Rectangle D:**

2

1

$\frac{3}{4}$



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

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

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

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

Rectangle D is

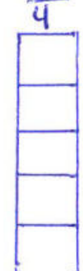
<u>2</u> units long <u>$1\frac{3}{4}$</u> units wide

Area = <u>$3\frac{1}{2}$</u> units^2

5. **Rectangle E:**

$\frac{3}{4}$

5



$\frac{3}{4}$ unit × 5 units

$= \frac{15}{4}$ units^2

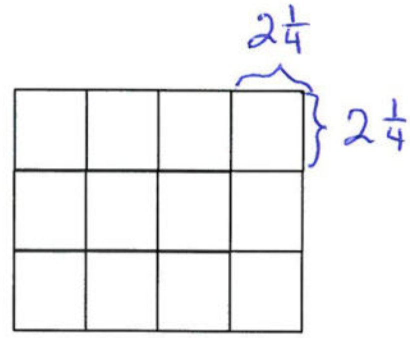
$= 3\frac{3}{4}$ units^2

Rectangle E is

<u>5</u> units long <u>$\frac{3}{4}$</u> units wide

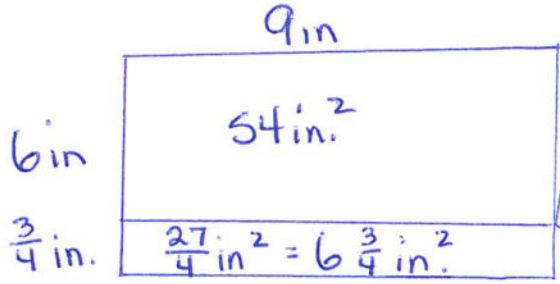
Area = <u>$3\frac{3}{4}$</u> units^2

6. The rectangle to the right is composed of squares that measure $2\frac{1}{4}$ inches on each side. What is its area in square inches? Explain your thinking using pictures and numbers.



$L = 2\frac{1}{4}\text{ in.} \times 4 = 9\text{ in.}$

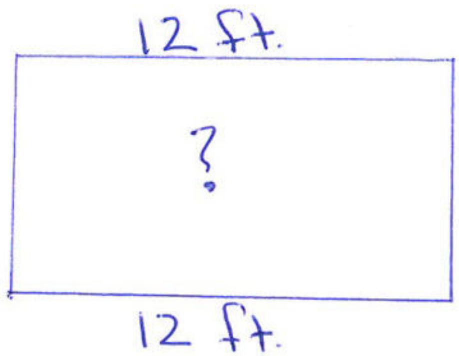
$W = 2\frac{1}{4}\text{ in.} \times 3 = 6\frac{3}{4}\text{ in.}$



$A = 54 + 6\frac{3}{4}$

$A = 60\frac{3}{4}\text{ in.}^2$

7. A rectangle has a perimeter of $35\frac{1}{2}$ feet. If the length is 12 feet, what is the area of the rectangle?



Perimeter: $35\frac{1}{2}$ ft.

$35\frac{1}{2} - 24 = 11\frac{1}{2}$ ft.

$11\frac{1}{2} \div 2 = \frac{23}{2} \times \frac{1}{2} = \frac{23}{4} = 5\frac{3}{4}$ ft.

A: $5\frac{3}{4} \times 12$

$= 60 + \frac{36}{4}$

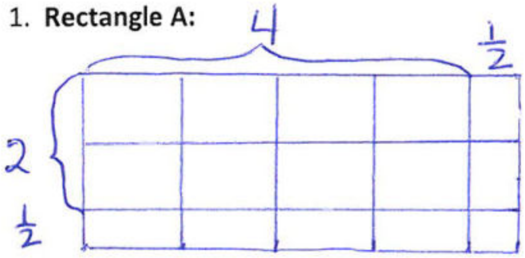
$= 69\text{ ft}^2$

The area of the rectangle is 69 ft^2.

Name ______________________ Date ______________

Draw the rectangle and your tiling.
Write the dimensions and the units you counted in the blanks.
Then, use multiplication to confirm the area. Show your work.

1. **Rectangle A:**



Rectangle A is

$4\frac{1}{2}$ units long $2\frac{1}{2}$ units wide

Area = $11\frac{1}{4}$ units²

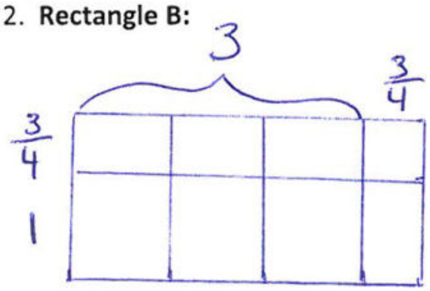
$4\frac{1}{2} \times 2\frac{1}{2}$

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

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

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

2. **Rectangle B:**



Rectangle B is

$3\frac{3}{4}$ units long $1\frac{3}{4}$ units wide

Area = $6\frac{9}{16}$ units²

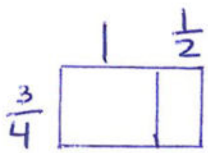
$3\frac{3}{4} \times 1\frac{3}{4}$

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

$= 3 + \frac{3}{4} + 2\frac{1}{4} + \frac{9}{16}$

$= 6\frac{9}{16}$

3. **Rectangle C:**



Rectangle C is

$1\frac{1}{2}$ units long $\frac{3}{4}$ units wide

Area = $1\frac{1}{8}$ units²

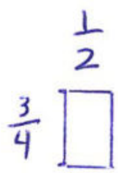
$1\frac{1}{2} \times \frac{3}{4}$

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

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

$= \frac{6}{8} + \frac{3}{8} = \frac{9}{8} = 1\frac{1}{8}$

4. **Rectangle D:**



Rectangle D is

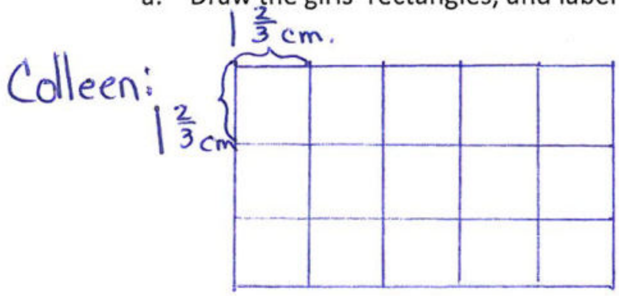
$\frac{3}{4}$ units long $\frac{1}{2}$ units wide

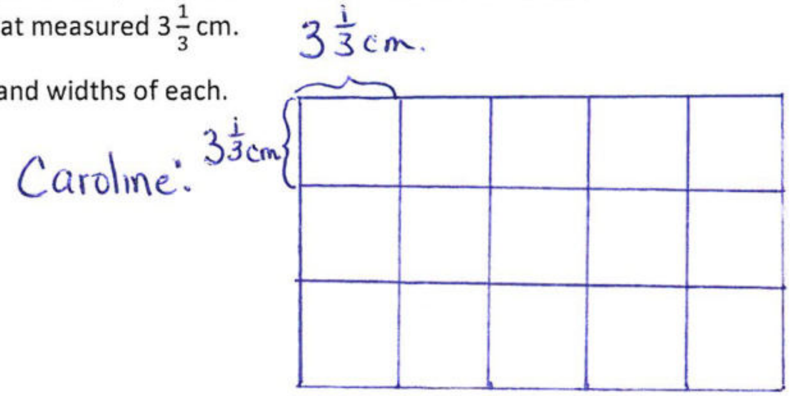
Area = $\frac{3}{8}$ units²

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

5. Colleen and Caroline each built a rectangle out of square tiles placed in 3 rows of 5. Colleen used tiles that measured $1\frac{2}{3}$ cm squares. Caroline used tiles that measured $3\frac{1}{3}$ cm.

   a. Draw the girls' rectangles, and label the lengths and widths of each.





   b. What are the areas of the rectangles in square centimeters?

Colleen: Length $= 1\frac{2}{3} \times 5 = 5\frac{10}{3} = 8\frac{1}{3}$ cm.
Width $= 1\frac{2}{3} \times 3 = 3\frac{6}{3} = 5$ cm.

$$\begin{aligned} \text{Area} &= 8\tfrac{1}{3} \times 5 \\ &= (8 \times 5) + (\tfrac{1}{3} \times 5) \\ &= 40 + \tfrac{5}{3} \\ &= 41\tfrac{2}{3}\ \text{cm}^2 \end{aligned}$$

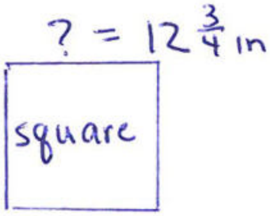
Caroline: Length $= 3\frac{1}{3} \times 5 = 15\frac{5}{3} = 16\frac{2}{3}$ cm
Width $= 3\frac{1}{3} \times 3 = 9\frac{3}{3} = 10$ cm

$$\begin{aligned} \text{Area} &= 16\tfrac{2}{3} \times 10 \\ &= (16 \times 10) + (\tfrac{2}{3} \times 10) \\ &= 160 + \tfrac{20}{3} \\ &= 166\tfrac{2}{3}\ \text{cm}^2 \end{aligned}$$

   c. Compare the area of the rectangles.

The area of Colleen's rectangle is smaller than Caroline's. $41\frac{2}{3}\ \text{cm}^2 < 166\frac{2}{3}\ \text{cm}^2$

6. A square has a perimeter of 51 inches. What is the area of the square?



Perimeter = 51 in.

$51 \div 4 = \frac{51}{4} = 12\frac{3}{4}$ in

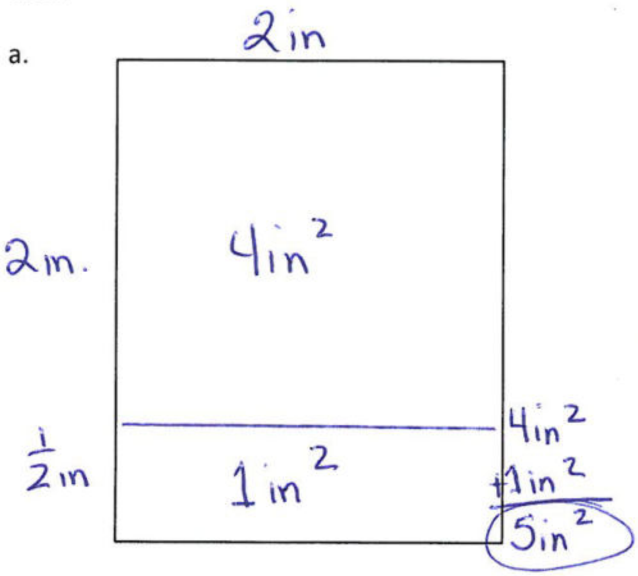
$$\begin{aligned} \text{Area} &= \text{length} \times \text{width} \\ &= 12\tfrac{3}{4} \times 12\tfrac{3}{4} \\ &= (12 \times 12) + (12 \times \tfrac{3}{4}) + (\tfrac{3}{4} \times 12) + (\tfrac{3}{4} \times \tfrac{3}{4}) \\ &= 144 + 9 + 9 + \tfrac{9}{16} \\ &= 162\tfrac{9}{16}\ \text{in.}^2 \end{aligned}$$

The area of the square is $162\frac{9}{16}\ \text{in}^2$

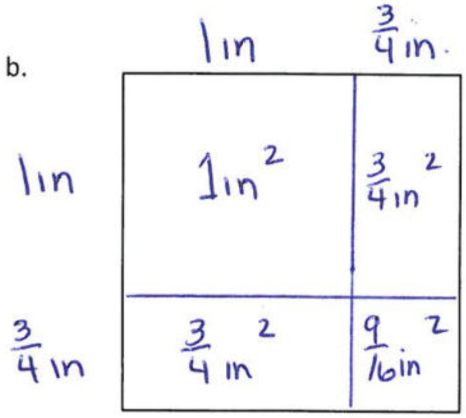
Name ____________________________ Date ________________

1. Measure each rectangle with your inch ruler, and label the dimensions. Use the area model to find each area.

a.



b.

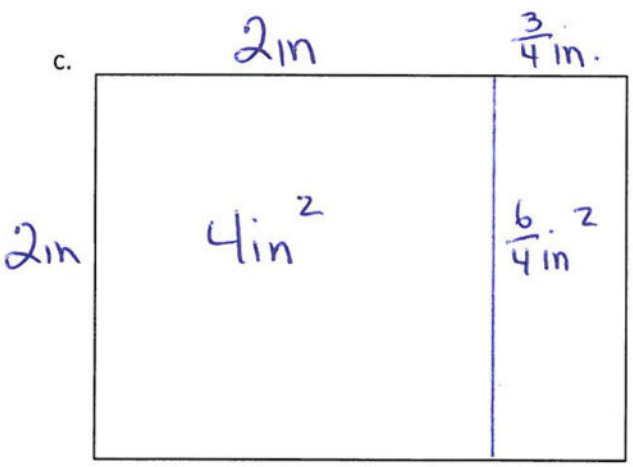


$1 + \frac{3}{4} + \frac{3}{4} + \frac{9}{16}$

$= 1 + \frac{12}{16} + \frac{9}{16}$

$= 1 + \frac{33}{16} = 3\frac{1}{16}\text{ in}^2$

c.

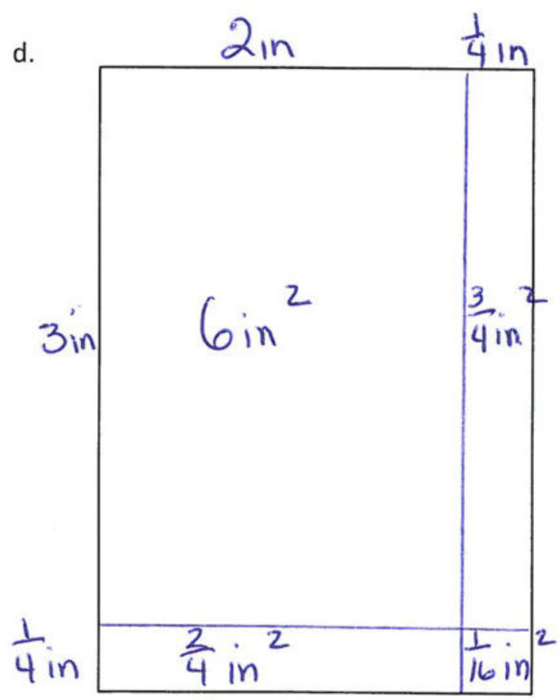


$4 + \frac{6}{4}$

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

$= 5\frac{1}{2}\text{ in}^2$

d.

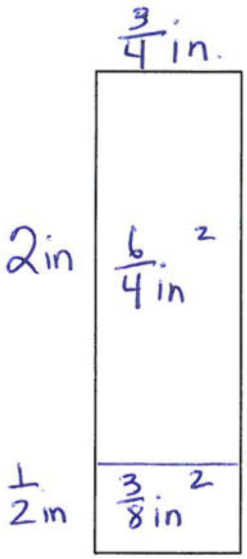


$6 + \frac{3}{4} + \frac{2}{4} + \frac{1}{16}$

$= 6 + \frac{12}{6} + \frac{8}{16} + \frac{1}{16} = 6\frac{21}{16}$

$= 7\frac{5}{6}\text{ in}^2$

e.

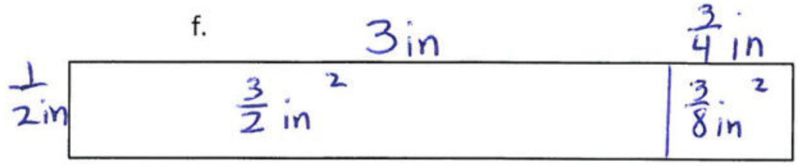


$\frac{6}{4} + \frac{3}{8}$

$= \frac{12}{8} + \frac{3}{8}$

$= \frac{15}{8} = 1\frac{7}{8}\text{ in}^2$

f.



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

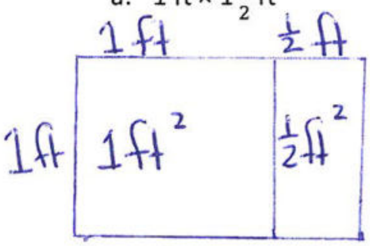
$= \frac{12}{8} + \frac{3}{8}$

$= \frac{15}{8}$

$= 1\frac{7}{8}\text{ in}^2$

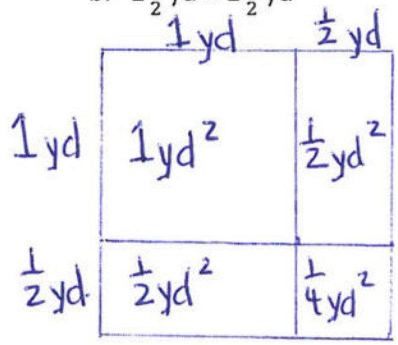
2. Find the area of rectangles with the following dimensions. Explain your thinking using the area model.

a. $1\text{ ft} \times 1\frac{1}{2}\text{ ft}$



$1\text{ ft}^2 + \frac{1}{2}\text{ ft}^2 = 1\frac{1}{2}\text{ ft}^2$

b. $1\frac{1}{2}\text{ yd} \times 1\frac{1}{2}\text{ yd}$



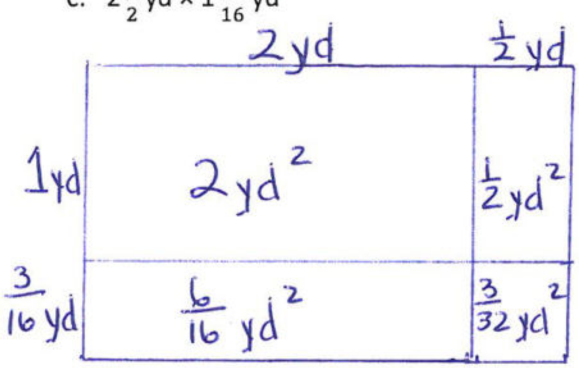
$1 + \frac{1}{2} + \frac{1}{2} + \frac{1}{4}$

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

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

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

c. $2\frac{1}{2}\text{ yd} \times 1\frac{3}{16}\text{ yd}$



$2 + \frac{1}{2} + \frac{6}{16} + \frac{3}{32}$

$= 2 + \frac{16}{32} + \frac{12}{32} + \frac{3}{32}$

$= 2 + \frac{31}{32}$

$= 2\frac{31}{32}\text{ yd}^2$

3. Hanley is putting carpet in her house. She wants to carpet her living room, which measures 15 ft × $12\frac{1}{3}$ ft. She also wants to carpet her dining room, which is $10\frac{1}{4}$ ft × $10\frac{1}{3}$ ft. How many square feet of carpet will she need to cover both rooms?

Living Room:

$15 \times 12\frac{1}{3}$

$= 180\frac{15}{3}$

$= 185 \text{ ft}^2$

Dining Room:

$10\frac{1}{4} \times 10\frac{1}{3}$

$= \frac{41}{4} \times \frac{31}{3}$

$= \frac{1271}{2}$

$= 105\frac{11}{12} \text{ ft}^2$

$185 + 105\frac{11}{12} = 290\frac{11}{12} \text{ ft}^2$

She will need $290\frac{11}{12}$ ft^2 of carpet to cover both rooms.

4. Fred cut a $9\frac{3}{4}$-inch square of construction paper for an art project. He cut a square from the edge of the big rectangle whose sides measured $3\frac{1}{4}$ inches. (See picture below.)

a. What is the area of the smaller square that Fred cut out?

$A = L \times W$

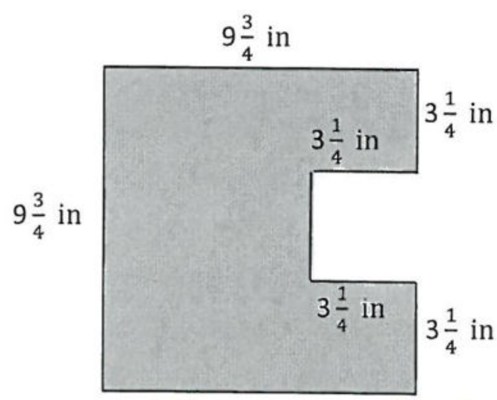
$= 3\frac{1}{4} \times 3\frac{1}{4}$

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

$= \frac{169}{16} = 10\frac{9}{16} \text{ in}^2$

The area of the smaller square that Fred cut was $10\frac{9}{16}$ in^2.

b. What is the area of the remaining paper?



Area of larger square: $9\frac{3}{4} \times 9\frac{3}{4}$

$= \frac{39}{4} \times \frac{39}{4}$

$= \frac{1521}{16} = 95\frac{1}{16} \text{ in}^2$

$95\frac{1}{16} - 10\frac{9}{16} = 94\frac{17}{16} - 10\frac{9}{16} = 84\frac{8}{16} = 84\frac{1}{2} \text{ in}^2$

The area of the remaining paper is $84\frac{1}{2}$ in^2.

Name ____________________________ Date ________________

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

a. $\frac{5}{4}\text{ km} \times \frac{12}{5}\text{ km}$

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

$= \frac{\cancel{5}^{1} \times \cancel{12}^{3}}{\cancel{4}_{1} \times \cancel{5}_{1}}$

$= 3\text{ km}^2$

b. $16\frac{1}{2}\text{ m} \times 4\frac{1}{5}\text{ m}$

	16 m	$\frac{1}{2}$ m
4 m	64 m²	2 m²
$\frac{1}{5}$ m	$\frac{16}{5} = 3\frac{1}{5}$ m²	$\frac{1}{10}$ m²

$64 + 2 + 3\frac{1}{5} + \frac{1}{10}$

$= 66 + 3\frac{2}{10} + \frac{1}{10}$

$= 69\frac{3}{10}\text{ m}^2$

c. $4\frac{1}{3}\text{ yd} \times 5\frac{2}{3}\text{ yd}$

	4 yd	$\frac{1}{3}$ yd
5 yd	20 yd²	$1\frac{2}{3}$ yd²
$\frac{2}{3}$ yd	$2\frac{2}{3}$ yd²	$\frac{2}{9}$ yd²

$20 + 1\frac{2}{3} + 2\frac{2}{3} + \frac{2}{9}$

$= 23 + \frac{6}{9} + \frac{6}{9} + \frac{2}{9}$

$= 23 + \frac{14}{9}$

$= 23 + 1\frac{5}{9}$

$= 24\frac{5}{9}\text{ yd}^2$

d. $\frac{7}{8}\text{ mi} \times 4\frac{1}{3}\text{ mi}$

$\frac{7}{8} \times 4\frac{1}{3}$

$= \frac{7}{8} \times \frac{13}{3}$

$= \frac{91}{24}$

$= 3\frac{19}{24}\text{ mi}^2$

2. Julie is cutting rectangles out of fabric to make a quilt. If the rectangles are $2\frac{3}{5}$ inches wide and $3\frac{2}{3}$ inches long, what is the area of four such rectangles?

	3 in	$\frac{2}{3}$ in.
2 in.	6 in²	$1\frac{1}{3}$ in²
$\frac{3}{5}$ in.	$\frac{9}{5} = 1\frac{4}{5}$ in²	$\frac{6}{15}$ in²

Area of 1 rectangle:

$6 + 1\frac{1}{3} + 1\frac{4}{5} + \frac{6}{15}$

$= 8 + \frac{5}{15} + \frac{12}{15} + \frac{6}{15}$

$= 8 + \frac{23}{15}$

$= 8 + 1\frac{8}{15}$

$= 9\frac{8}{15}\text{ in}^2$

Area of 4 rectangles:

$9\frac{8}{15} \times 4 = (9 \times 4) + (\frac{8}{15} \times 4)$

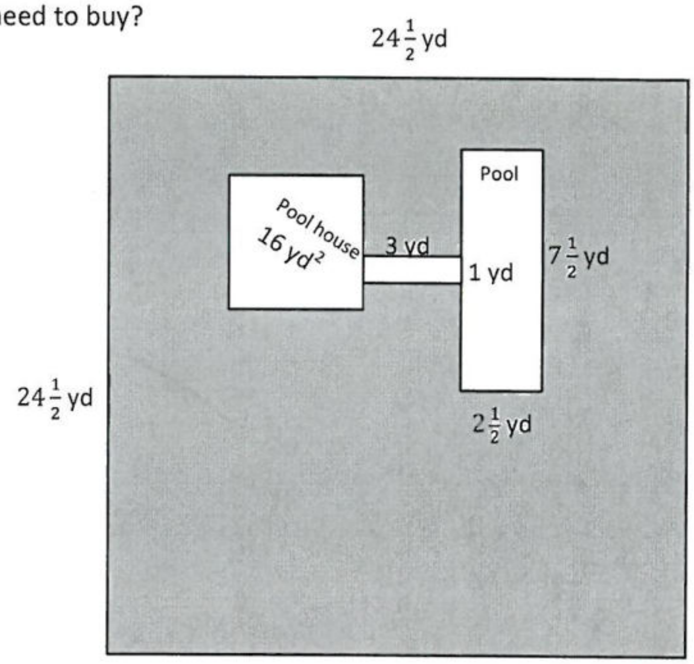
$= 36 + \frac{32}{15}$

$= 36 + 2\frac{2}{15}$

$= 38\frac{2}{15}\text{ in}^2$

The area of four rectangles is $38\frac{2}{15}\text{ in}^2$.

3. Mr. Howard's pool is connected to his pool house by a sidewalk as shown. He wants to buy sod for the lawn, shown in gray. How much sod does he need to buy?



	24 yd	$\frac{1}{2}$ yd.
24 yd	576 yd²	12 yd²
$\frac{1}{2}$ yd.	12 yd²	$\frac{1}{4}$ yd²

Area of square sod:

$24\frac{1}{2} \times 24\frac{1}{2}$

$= 576 + 12 + 12 + \frac{1}{4}$

$= 600\frac{1}{4}$ yd²

Area of the pool house = 16 yd²

Area of the sidewalk: 3 yd × 1 yd = 3 yd²

Area of the pool: $7\frac{1}{2}$ yd × $2\frac{1}{2}$ yd $= \frac{15}{2}$ yd × $\frac{5}{2}$ yd

$= \frac{75}{4}$ yd²

$= 18\frac{3}{4}$ yd²

total area of square sod
$600\frac{1}{4}$ yd²

16 yd²	3 yd²	$18\frac{3}{4}$ yd²	?
pool house	side walk	pool	left

$600\frac{1}{4} - 16 - 3 - 18\frac{3}{4}$

$= 581\frac{1}{4} - 18\frac{3}{4}$

$= 580\frac{5}{4} - 18\frac{3}{4}$

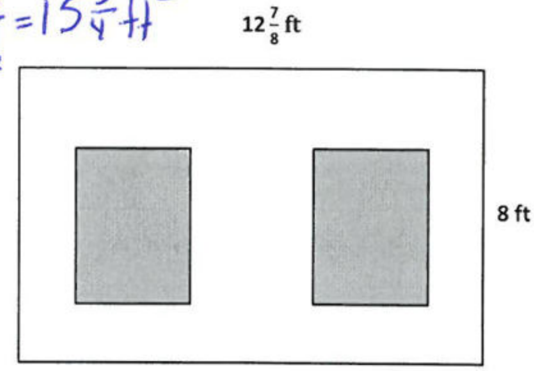
$= 562\frac{2}{4}$

$= 562\frac{1}{4}$ yd²

He will need to buy $562\frac{1}{2}$ yd² of sod for the lawn.

Name ______________________ Date ____________

1. George decided to paint a wall with two windows. Both windows are $3\frac{1}{2}$ ft by $4\frac{1}{2}$ ft rectangles. Find the area the paint needs to cover.



Area of window: $3\frac{1}{2} \times 4\frac{1}{2} = \frac{7}{2} \times \frac{9}{2} = \frac{63}{4} = 15\frac{3}{4}\ ft^2$

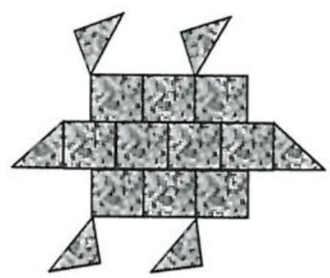
2 windows: $15\frac{3}{4} \times 2 = 30\frac{6}{4} = 31\frac{1}{2}\ ft.^2$

Area of wall: $12\frac{7}{8} \times 8 = 96 + 7 = 103\ ft^2$

Area to paint: $103 - 31\frac{1}{2} = 71\frac{1}{2}\ ft^2$

The paint needs to cover $71\frac{1}{2}\ ft^2$.

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



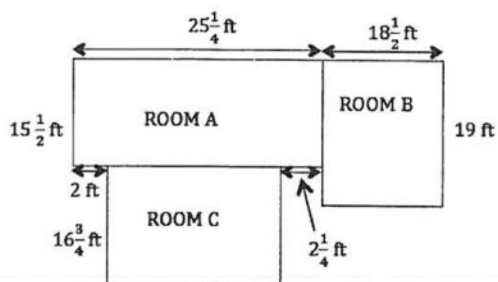
10 whole tiles + 6 half tiles = 13 tiles

Area of a tile: $2\frac{1}{2} \times 2\frac{1}{2} = \frac{5}{2} \times \frac{5}{2} = \frac{25}{4} = 6\frac{1}{4}\ in.^2$

$13 \times 6\frac{1}{4} = 78\frac{13}{4} = 81\frac{1}{4}\ in^2$

The total area is $81\frac{1}{4}$ square inches.

3. All-In-One Carpets is installing carpeting in three rooms. How many square feet of carpet are needed to carpet all three?



Room A: $25\frac{1}{4} \times 15\frac{1}{2} = \frac{101}{4} \times \frac{31}{2} = \frac{3131}{8} = 391\frac{3}{8}\ ft^2$

Room B: $19 \times 18\frac{1}{2} = 342\frac{19}{2} = 351\frac{1}{2}\ ft^2$

Room C: Length $= 25\frac{1}{4} - 4\frac{1}{4} = 21$

$21 \times 16\frac{3}{4} = 336\frac{63}{4} = 351\frac{3}{4}\ ft^2$

$1{,}094\frac{5}{8}$ square feet of carpet is needed.

$A + B + C = 391\frac{3}{8} + 351\frac{1}{2} + 351\frac{3}{4} = 391\frac{3}{8} + 351\frac{4}{8} + 351\frac{6}{8} = 1{,}093 + \frac{13}{8} = 1{,}094\frac{5}{8}\ ft^2$

4. Mr. Johnson needs to buy sod for his front lawn.

   a. If the lawn measures $36\frac{2}{3}$ ft by $45\frac{1}{6}$ ft, how many square feet of sod will he need?

$$36\tfrac{2}{3} \times 45\tfrac{1}{6} = (36 \times 45) + (36 \times \tfrac{1}{6}) + (\tfrac{2}{3} \times 45) + (\tfrac{2}{3} \times \tfrac{1}{6})$$
$$= 1620 + 6 + 30 + \tfrac{1}{9}$$
$$= 1656\tfrac{1}{9}\ \text{ft}^2$$

He needs $1656\frac{1}{9}$ square feet of sod.

   b. If sod is only sold in whole square feet, how much will Mr. Johnson have to pay?

Sod Prices

Area	Price per square foot
First 1,000 sq ft	\$0.27
Next 500 sq ft	\$0.22
Additional square feet	\$0.19

1657 whole square feet:

$1{,}000 \times \$0.27 = \$270.00$

$500 \times \$0.22 = \$110.00$

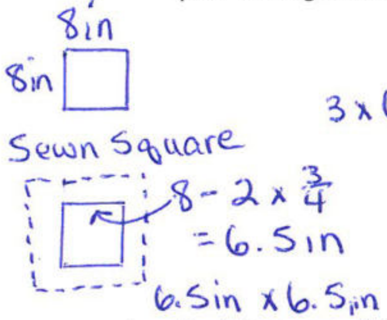
$157 \times \$0.19 = \$29.83$

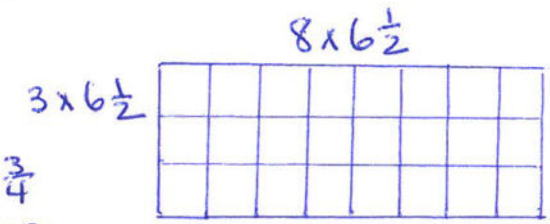
$\$409.83$

He will have to pay \$409.83.

5. Jennifer's class decides to make a quilt. Each of the 24 students will make a quilt square that is 8 inches on each side. When they sew the quilt together, every edge of each quilt square will lose $\frac{3}{4}$ of an inch.

   a. Draw one way the squares could be arranged to make a rectangular quilt. Then, find the perimeter of your arrangement.





$8 \times 6\frac{1}{2} = \frac{8 \times 13}{2} = \frac{104}{2} = 52$

$3 \times 6\frac{1}{2} = \frac{3 \times 13}{2} = \frac{39}{2} = 19\frac{1}{2}$

$P = 52 + 52 + 19\frac{1}{2} + 19\frac{1}{2}$

$= 104 + 39$

$= 143$ in

The perimeter of my arrangement is 143 in.

   b. Find the area of the quilt.

Each square area: $8\text{in} - 1\frac{1}{2}\text{in} = 6\frac{1}{2}$ in.

	6	$\frac{1}{2}$
6	36	3
$\frac{1}{2}$	3	$\frac{1}{4}$

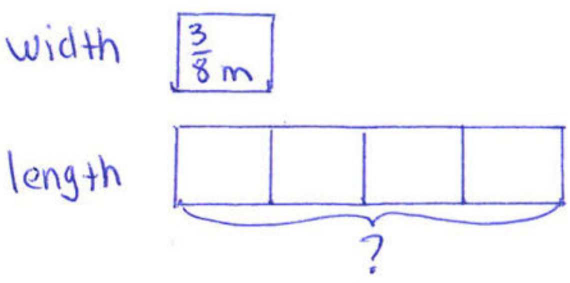
$39 + 3\frac{1}{4} = 42\frac{1}{4}\ \text{in}^2$

All the squares: $42\frac{1}{4} \times 24 = \frac{169}{\cancel{4}_1} \times \frac{\cancel{24}^6}{1} = 1{,}014\ \text{in}^2$

The quilt's area is $1{,}014\ \text{in}^2$.

Name ______________________________ Date ________________

1. The length of a flowerbed is 4 times as long as its width. If the width is $\frac{3}{8}$ meter, what is the area?



$\frac{3}{8} \times 4 = \frac{12}{8} = \frac{3}{2}$ m

$A = L \times W$

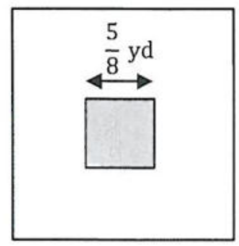
$= \frac{3}{2}\text{m} \times \frac{3}{8}\text{m}$

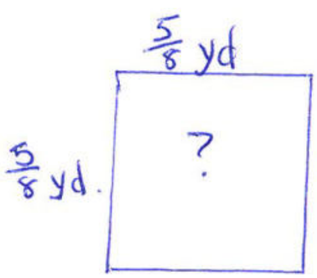
$= \frac{9}{16}\text{m}^2$

The flowerbed's area is $\frac{9}{16}\text{m}^2$.

2. Mrs. Johnson grows herbs in square plots. Her basil plot measures $\frac{5}{8}$ yd on each side.

   a. Find the total area of the basil plot.





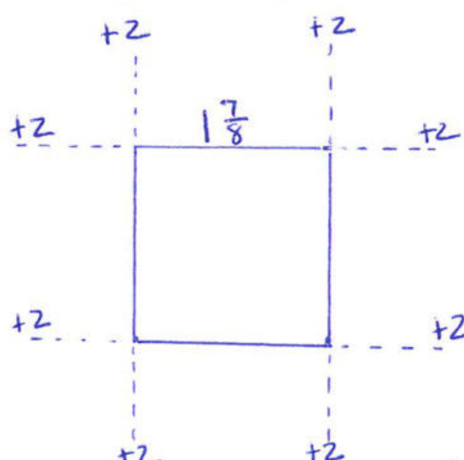
$A = L \times W$

$= \frac{5}{8}\text{yd} \times \frac{5}{8}\text{yd}$

$= \frac{25}{64}\text{yd}^2$

The total area of the basil plot is $\frac{25}{64}\text{yd}^2$.

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



$\frac{5}{8}\text{yd} = \frac{5}{8} \times 1\text{yd}$

$= \frac{5}{8} \times 3\text{ft}$

$= \frac{15}{8}\text{ft}$

$= 1\frac{7}{8}\text{ft}$

$1\frac{7}{8}\text{ft} + 4\text{ft} = 5\frac{7}{8}\text{ft}$

Perimeter: $5\frac{7}{8}\text{ft} \times 4$

$= 20\frac{28}{8}\text{ft}$

$= 20 + 3\frac{4}{8}\text{ft}$

$= 23\frac{1}{2}\text{ft}$

The perimeter of the fence is $23\frac{1}{2}$ ft.

c. What is the total area that the fence encloses?

	5	$\frac{7}{8}$
5	25	$\frac{35}{8} = 4\frac{3}{8}$
$\frac{7}{8}$	$\frac{35}{8} = 4\frac{3}{8}$	$\frac{49}{64}$

$$\begin{array}{r} 29\frac{3}{8} \\ +\ 5\frac{9}{64} \\ \hline 34\frac{33}{64} \end{array}$$

$4\frac{3}{8} + \frac{49}{64}$

$= 4\frac{24}{64} + \frac{49}{64}$

$= 4\frac{73}{64}$

$= 5\frac{9}{64}$

$29\frac{3}{8} + 5\frac{9}{64}$

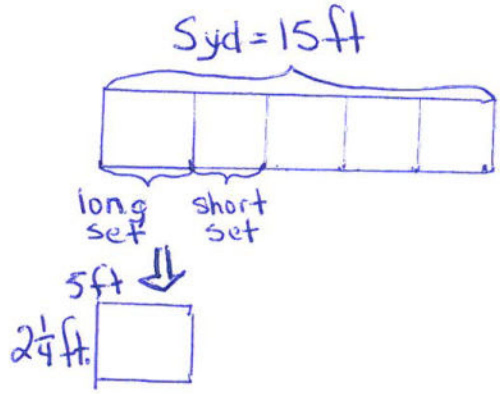
$= 29\frac{24}{64} + 5\frac{9}{64}$

$= 34\frac{33}{64}\ ft^2$

The fence area is $34\frac{33}{64}\ ft^2$. That's a little more than $34\frac{1}{2}\ ft^2$.

3. Janet bought 5 yards of fabric $2\frac{1}{4}$ feet wide to make curtains. She used $\frac{1}{3}$ of the fabric to make a long set of curtains and the rest to make 4 short sets.

a. Find the area of the fabric she used for the long set of curtains.



$\frac{1}{3}$ of 15 ft = 5 ft

$A = L \times W$

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

$= 10\frac{5}{4}\ ft^2$

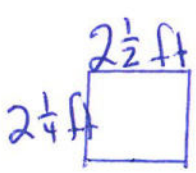
$= 11\frac{1}{4}\ ft^2$

The area of the long set of curtain is $11\frac{1}{4}\ ft^2$.

b. Find the area of the fabric she used for each of the short sets.

15 ft − 5 ft = 10 ft.

$\frac{1}{4}$ of 10 ft $= \frac{10}{4} = 2\frac{2}{4} = 2\frac{1}{2}$ ft.



$A = L \times W$

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

$= \frac{5}{2} \times \frac{9}{4}$

$= \frac{45}{8}$

$= 5\frac{5}{8}\ ft^2$

The area of each set of short curtains is $5\frac{5}{8}\ ft^2$.

4. Some wire is used to make 3 rectangles: A, B, and C. Rectangle B's dimensions are $\frac{3}{5}$ cm larger than Rectangle A's dimensions, and Rectangle C's dimensions are $\frac{3}{5}$ cm larger than Rectangle B's dimensions. Rectangle A is 2 cm by $3\frac{1}{5}$ cm.

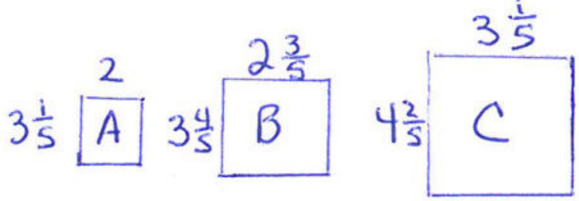
   a. What is the total area of all three rectangles?

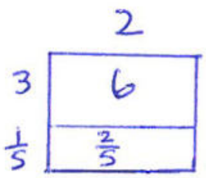
Total area: $6\frac{2}{5} + 9\frac{22}{25} + 14\frac{2}{25}$

$= 6\frac{10}{25} + 9\frac{22}{25} + 14\frac{2}{25}$

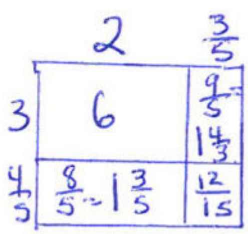
$= 29\frac{34}{25}$

$= 30\frac{9}{25}\text{ cm}^2$

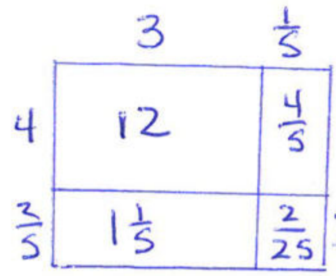




$6\text{ cm}^2 + \frac{2}{5}\text{ cm}^2 = 6\frac{2}{5}\text{ cm}^2$



$7\frac{4}{5}\text{ cm}^2 + 2\frac{2}{25}\text{ cm}^2 = 9\frac{22}{25}\text{ cm}^2$



$12\frac{4}{5}\text{ cm}^2 + 1\frac{7}{25}\text{ cm}^2 = 14\frac{2}{25}\text{ cm}^2$

The total area is $30\frac{9}{25}\text{ cm}^2$.

   b. If a 40 cm coil of wire was used to form the rectangles, how much wire is left?

perimeter: A: $2 + 2 + 3\frac{1}{5} + 3\frac{1}{5} = 4 + 6\frac{2}{5} = 10\frac{2}{5}$ cm

B: $2\frac{3}{5} + 2\frac{3}{5} + 3\frac{4}{5} + 3\frac{4}{5} = 4\frac{6}{5} + 6\frac{8}{5} = 10\frac{14}{15} = 12\frac{4}{5}$ cm

C: $3\frac{1}{5} + 3\frac{1}{5} + 4\frac{2}{5} + 4\frac{2}{5} = 6\frac{2}{5} + 8\frac{4}{5} = 14\frac{6}{5} = 15\frac{1}{5}$ cm

Total perimeter: $10\frac{2}{5} + 12\frac{4}{5} + 15\frac{1}{5}$

$= 37\frac{7}{5}$

$= 38\frac{2}{5}$ cm

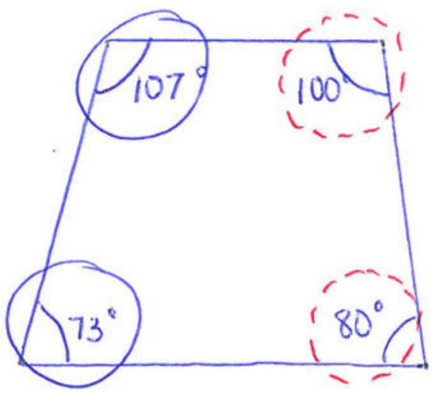
$40\text{ cm} - 38\frac{2}{5} = 1\frac{3}{5}$ cm

There was $1\frac{3}{5}$ cm of wire left.

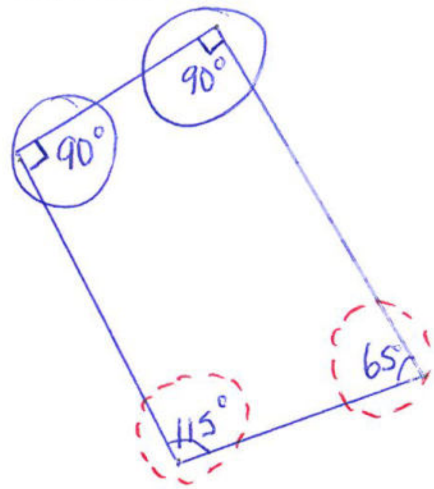
Name ______________________________ Date ______________

1. Draw a pair of parallel lines in each box. Then, use the parallel lines to draw a trapezoid with the following:

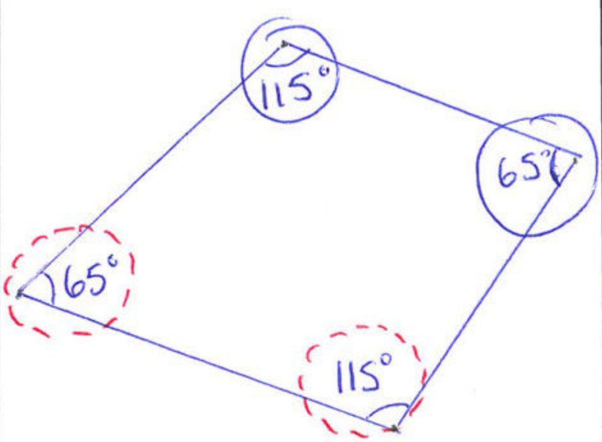
a. No right angles



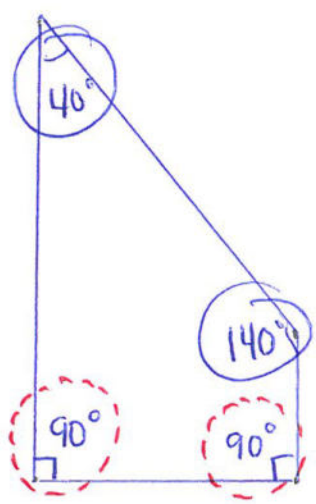
b. Only 1 obtuse angle



c. 2 obtuse angles



d. At least 1 right angle



2. Use the trapezoids you drew to complete the tasks below.
   a. Measure the angles of the trapezoid with your protractor, and record the measurements on the figures.
   b. Use a marker or crayon to circle pairs of angles inside each trapezoid with a sum equal to 180°. Use a different color for each pair.

3. List the properties that are shared by all the trapezoids that you worked with today.

They have 4 straight sides, but they don't all look the same.

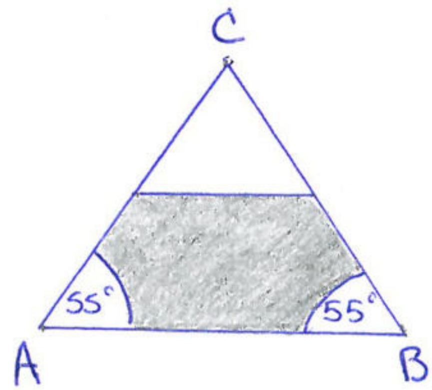
They are quadrilaterals. They have different side lengths and angle measures.

They have at least one pair of sides that are parallel.

4. When can a quadrilateral also be called a trapezoid?

A quadrilateral can also be called a trapezoid when it has at least one pair of opposite, parallel sides.

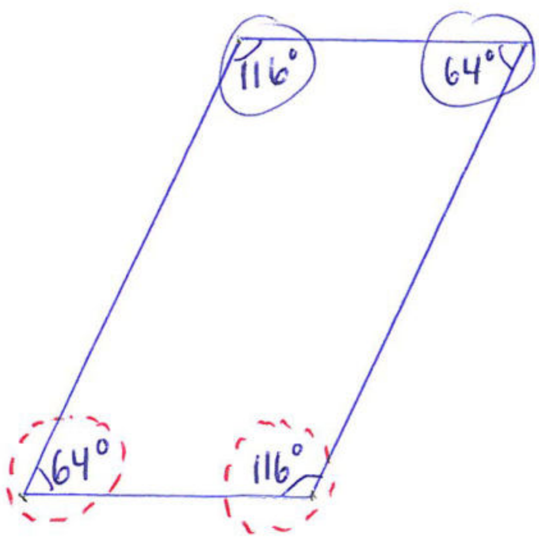
5. Follow the directions to draw one last trapezoid.
   a. Draw a segment $\overline{AB}$ parallel to the bottom of this page that is 5 cm long.
   b. Draw two 55° angles with vertices at A and B so that an isosceles triangle is formed with $\overline{AB}$ as the base of the triangle.
   c. Label the top vertex of your triangle as C.
   d. Use your set square to draw a line parallel to $\overline{AB}$ that intersects both $\overline{AC}$ and $\overline{BC}$.
   e. Shade the trapezoid that you drew.



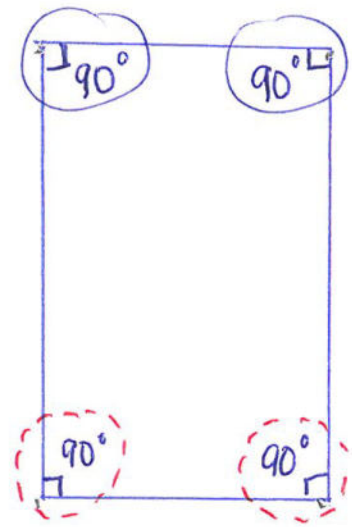
Name ______________________________ Date ____________________

1. Draw a parallelogram in each box with the attributes listed.

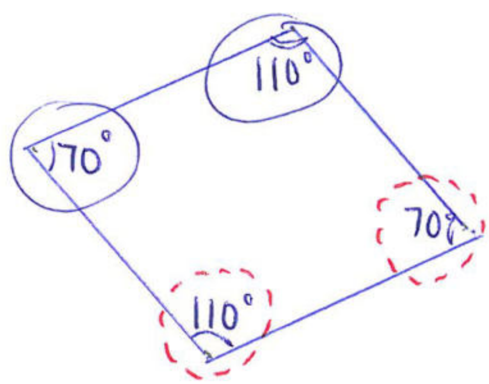
a. No right angles.



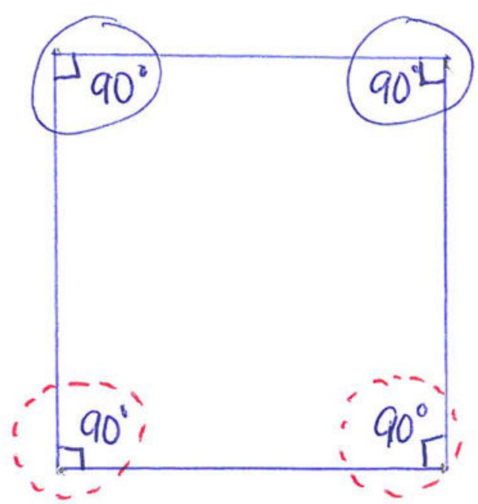
b. At least 2 right angles.



c. Equal sides with no right angles.



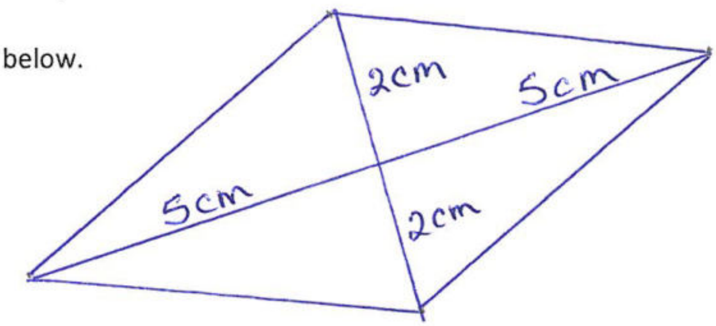
d. All sides equal with at least 2 right angles.



In each parallelogram there are 2 pairs of angles that add up to 180°.

2. Use the parallelograms you drew to complete the tasks below.
   a. Measure the angles of the parallelogram with your protractor, and record the measurements on the figures.
   b. Use a marker or crayon to circle pairs of angles inside each parallelogram with a sum equal to 180°. Use a different color for each pair.

3. Draw another parallelogram below.



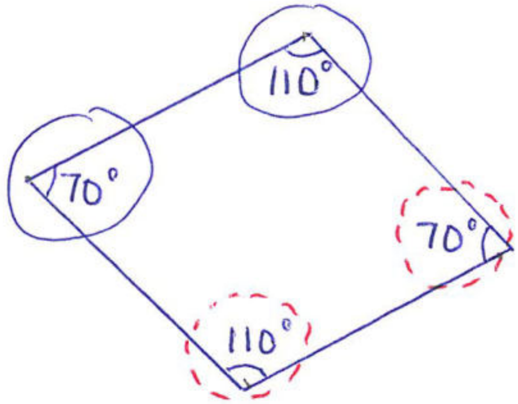
   a. Draw the diagonals and measure their lengths. Record the measurements to the side of your figure.
   b. Measure the length of each of the four segments of the diagonals from the vertices to the point of intersection of the diagonals. Color the segments that have the same length the same color. What do you notice? The diagonals bisect each other. Each diagonal cuts the parallelogram into two congruent triangles.

4. List the properties that are shared by all of the parallelograms that you worked with today.
   Parallelograms have 4 straight sides.
   They have 2 pairs of parallel sides.
   Their opposite angles are congruent.
   The diagonals bisect each other.
   Opposite sides are congruent.
   a. When can a quadrilateral also be called a parallelogram?
   When the quadrilateral has two pairs of parallel sides it can also be called a parallelogram.
   b. When can a trapezoid also be called a parallelogram?
   A trapezoid can also be called a parallelogram when it has not just one pair of parallel sides, but when it has two pairs of parallel sides.

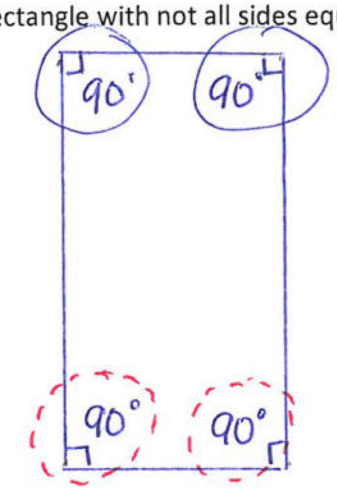
Name ______________________________ Date ____________________

1. Draw the figures in each box with the attributes listed.

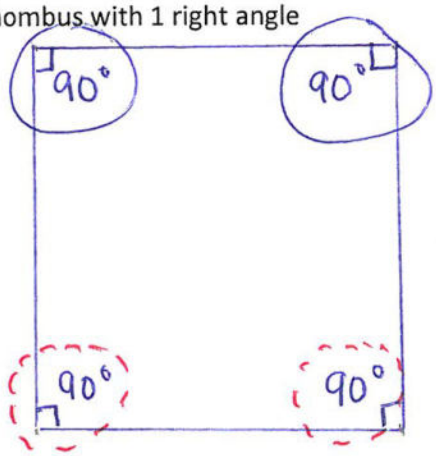
a. Rhombus with no right angles



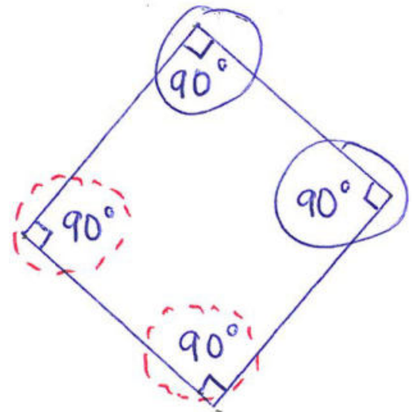
b. Rectangle with not all sides equal



c. Rhombus with 1 right angle

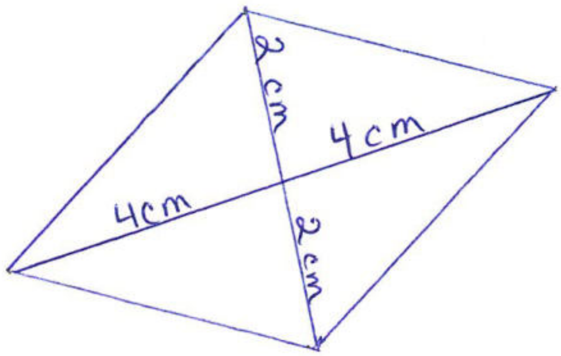


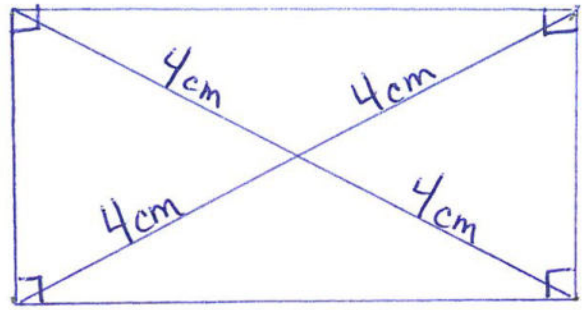
d. Rectangle with all sides equal



2. Use the figures you drew to complete the tasks below.
   a. Measure the angles of the figures with your protractor, and record the measurements on the figures.
   b. Use a marker or crayon to circle pairs of angles inside each figure with a sum equal to 180°. Use a different color for each pair.

3. Draw a rhombus and a rectangle below.





a. Draw the diagonals and measure their lengths. Record the measurements on the figure.

b. Measure the length of each segment of the diagonals from the vertex to the intersection point of the diagonals. Using a marker or crayon, color segments that have the same length. Use a different color for each different length.

4.

a. List the properties that are shared by all of the rhombuses that you worked with today.

Rhombuses have 4 straight sides of equal lengths. Opposit sides are parallel. The diagonals are perpendicula bisectors. The angles next to each other add up to 180°.

b. List the properties that are shared by all of the rectangles that you worked with today.

Rectangles have 4 straight sides. Opposit sides are parallel and equal in length. Rectangles have 4 right angles. Diagonals are equal and bisect each other.

c. When can a trapezoid also be called a rhombus?

A trapezoid is also a rhombus when all 4 sides are the same length.

d. When can a parallelogram also be called a rectangle?

A parallelogram is also a rectangle when the 4 angles are 90°.

e. When can a quadrilateral also be called a rhombus?

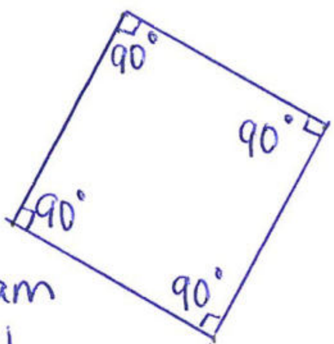
A quadrilateral can also be called a rhombus when all 4 sides are equal in length.

Name ______________________________ Date ________________

1. Draw the figures in each box with the attributes listed. If your figure has more than one name, write it in the box.

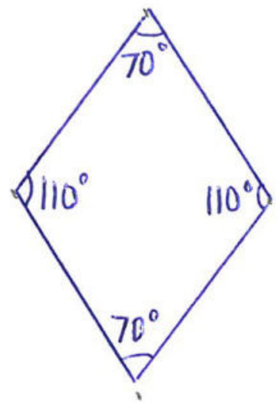
a. Rhombus with 2 right angles

Rhombus
Rectangle
Square
Kite
Parallelogram
Trapezoid
Quadrilateral



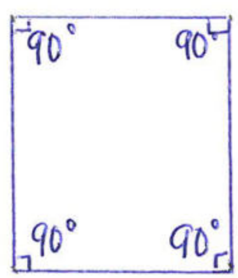
b. Kite with all sides equal

Kite
Rhombus
Parallelogram
Trapezoid
Quadrilateral

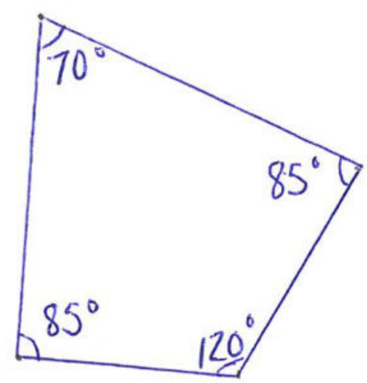


c. Kite with 4 right angles

Kite
Square
Rhombus
Rectangle
Parallelogram
Trapezoid
Quadrilateral



d. Kite with 2 pairs of adjacent sides equal
(The pairs are not equal to each other.)



Kite
Quadrilateral

2. Use the figures you drew to complete the tasks below.
   a. Measure the angles of the figures with your protractor, and record the measurements on the figures.
   b. Use a marker or crayon to circle pairs of congruent angles inside each figure. Use a different color for each pair.

3.

a. List the properties shared by all of the squares that you worked with today.

Squares have 4 straight sides that are equal in length.
They have 4 90° angles.
Opposite sides are parallel.
The diagonals are perpendicular bisectors.

b. List the properties shared by all of the kites that you worked with today.

Kites have 4 straight sides.
Kites have 2 pairs of equal sides. Equal sides are adjacent.
They have at least 2 congruent angles which are across from each other where the unequal sides meet.
Diagonals cross at right angles. One of the diagonals bisects the other.

c. When can a rhombus also be called a square?

A rhombus can also be called a square when all 4 of its angles measure 90°.

d. When can a kite also be called a square?

A kite can also be called a square when all 4 sides are the same length, and when all 4 angles measure 90°.

e. When can a trapezoid also be called a kite?

A trapezoid can also be called a kite when it has 2 pairs of equal adjacent sides.

Name ______________________________ Date ____________________

1. True or false. If the statement is false, rewrite it to make it true.

		T	F
a.	All trapezoids are quadrilaterals.	✓	
b.	All parallelograms are rhombuses. Some parallelograms are rhombuses.		✓
c.	All squares are trapezoids.	✓	
d.	All rectangles are squares. All squares are rectangles.		✓
e.	Rectangles are always parallelograms.	✓	
f.	All parallelograms are trapezoids.	✓	
g.	All rhombuses are rectangles. Some rhombuses are rectangles.		✓
h.	Kites are never rhombuses. Kites are sometimes rhombuses.		✓
i.	All squares are kites.	✓	
j.	All kites are squares. Some kites are squares.		✓
k.	All rhombuses are squares. All squares are rhombuses		✓

2. Fill in the blanks.

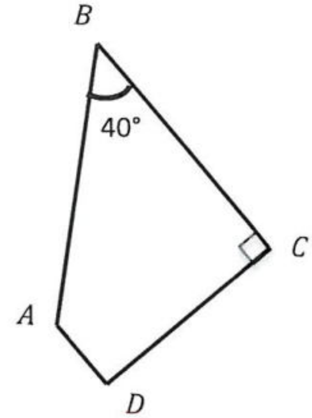
   a. $ABCD$ is a trapezoid. Find the measurements listed below.

      $\angle A$ = 140 °

      $\angle D$ = 90 °

      What other names does this figure have?

      Quadrilateral



   b. $RECT$ is a rectangle. Find the measurements listed below.

      Line TE = 26 inches

      Line RC = 26 inches

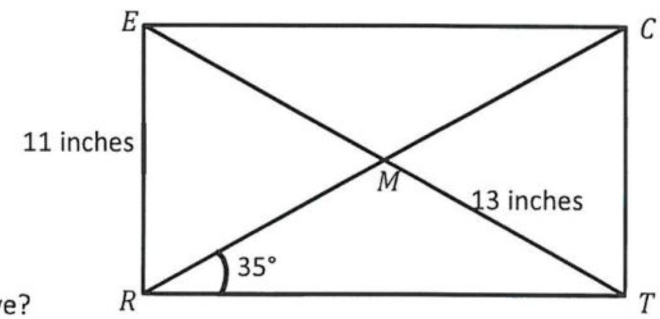
      Line CT = 11 inches

      $\angle ERM$ = 55 °

      $\angle CTR$ = 90 °

      What other names does this figure have?

      Quadrilateral
      Trapezoid
      Parallelogram



   c. $PARL$ is a parallelogram. Find the measurements listed below.

      Line AL = 16 inches

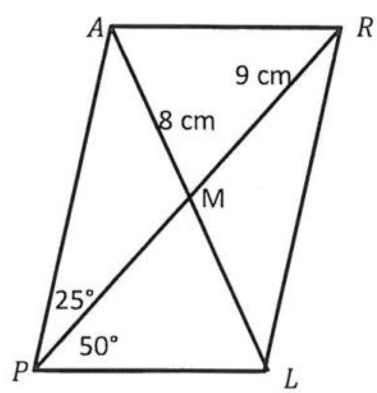
      Line PR = 18 inches

      $\angle ARL$ = 75 °

      $\angle PAR$ = 105 °

      $\angle RLP$ = 105 °

      What other names does this figure have?



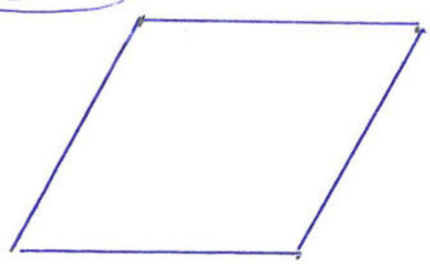
Name ______________________ Date ______________

1. Write the number on your task card and a summary of the task in the blank. Then, draw the figure in the box. Label your figure with as many names as you can. Circle the most specific name.

Task # 17: Parallelogram with 60° angle.

Quadrilateral, Trapezoid

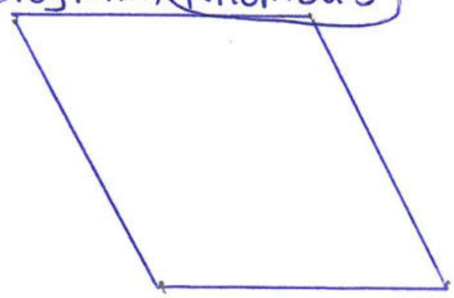
Parallelogram



Task # 7: Quadrilateral with 4 equal sides

Quadrilateral, Trapezoid, Kite,

Parallelogram, Rhombus



Task # 2: Rectangle with a length twice its width

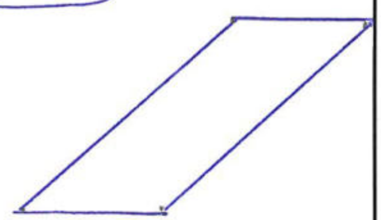
Quadrilateral, Trapezoid

Parallelogram, Rectangle

Task # 11: Parallelogram with no right angles.

Quadrilateral, Trapezoid,

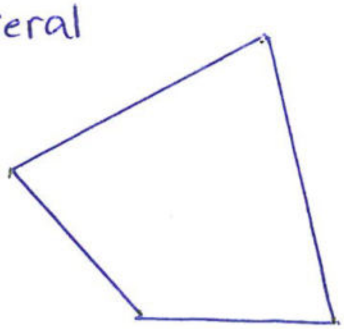
Parallelogram



Task # 21: Kite that's not a parallelogram.

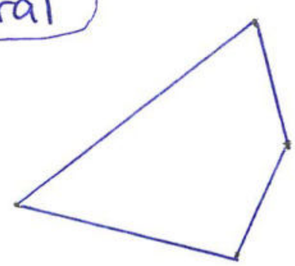
Quadrilateral

Kite



Task # 24: Quadrilateral whose diagonals do not bisect each other.

Quadrilateral



2. John says that because rhombuses do not have perpendicular sides, they cannot be rectangles. Explain his error in thinking.

In order to be a rhombus a quadrilateral needs 4 equal sides. Some rhombuses do have perpendicular sides. These are squares, and squares are rectangles.

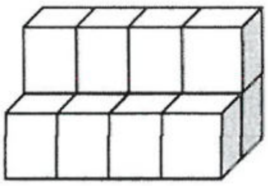
3. Jack says that because kites don't have parallel sides, a square is not a kite. Explain his error in thinking.

A Kite needs to have 2 pairs of equal adjacent sides. If the 2 pairs are the same length, and the angles are all 90°, then the kite could be a square.

Name Jane Date

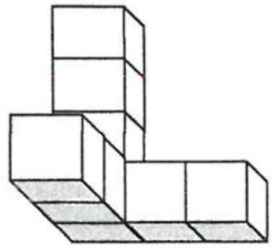
1. Tell the volume of each solid figure made of 1-inch cubes. Specify the correct unit of measure.

a.



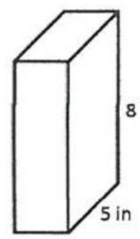
12 in^3

b.



8 in^3

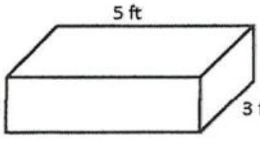
2. Jack found the volume of the prism pictured to the right by multiplying 5 × 8 and then adding: 40 + 40 + 40 = 120. He says the volume is 120 cubic inches.



a. Jill says he did it wrong. He should have multiplied the bottom first (3 × 5) and then multiplied by the height. Explain to Jill why Jack's method works and is equivalent to her method.

Jack thought of it like slices. He figured the area of one slice (8x5). Then he visualized 2 more slices, so he added 40 + 40 + 40 which is 120. This is the same answer he would have gotten if he multiplied (3x5) x 8.

b. Use Jack's method to find the volume of this right rectangular prism.

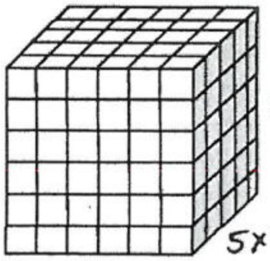


3 x 2 = 6

6 + 6 + 6 + 6 + 6 = 30

The volume of this right rectangular prism is 30ft^3.

3. If the figure below is made of cubes with 2 cm side lengths, what is its volume? Explain your thinking.



$6 \times 2 = 12$

$5 \times 2 = 10$

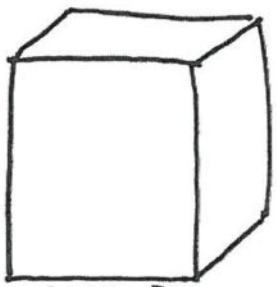
$6 \times 2 = 12$

$12 \times 12 \times 10 = 144 \times 10 = 1{,}440$

First I counted the cubes. Since each cube is worth 2 cm each, I doubled the number on each side. Then I could have added the layers, but multiplying is faster.

The volume is 1,440 cm^3.

4. The volume of a rectangular prism is 840 in^3. If the area of the base is 60 in^2, find its height. Draw and label a model to show your thinking.



$V = 840 \text{ in}^3$

14 in

60 in^2

$\frac{84\cancel{0}}{6\cancel{0}} = \frac{84}{6} = 14$

The height is 14 inches.

5. The following structure is composed of two right rectangular prisms that each measure 12 inches by 10 inches by 5 inches and one right rectangular prism that measures 10 inches by 8 inches by 36 inches. What is the total volume of the structure? Explain your thinking.

$12 \text{ in} \times 10 \text{ in} \times 5 \text{ in} = 120 \text{ in}^2 \times 5 = 600 \text{ in}^3$

$600 \text{ in}^3 \times 2 = 1{,}200 \text{ in}^3$

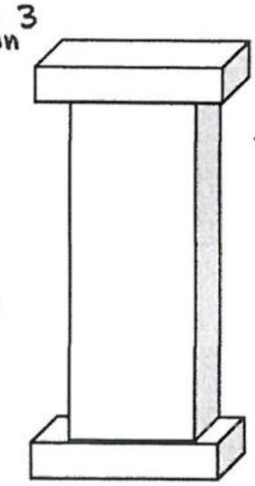
$10 \text{ in} \times 8 \text{ in} \times 36 \text{ in} = 360 \text{ in}^2 \times 8 \text{ in}$

$= 2{,}880 \text{ in}^3$

$$\begin{array}{r} 360 \\ \times\ 8 \\ \hline 2{,}880 \end{array}$$

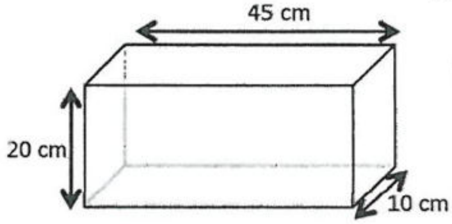
$$\begin{array}{r} 2{,}880 \\ +\ 1{,}200 \\ \hline 4{,}080 \end{array}$$

I found the volume of the top piece, then doubled it. I added that to the volume of the middle piece.



The volume of the structure is 4,080 in^3.

6. a. Find the volume of the rectangular fish tank. Explain your thinking.

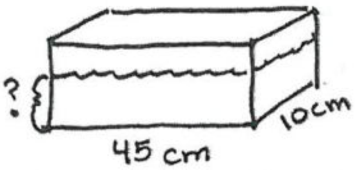


45 cm × 20 cm × 10 cm = 900 cm² × 10 cm = 9,000 cm³

I multiplied all the sides to get the volume.

The volume of the fish tank is 9,000 cm³.

b. If the fish tank is completely filled with water, and then 900 cubic centimeters are poured out, how high will the water be? Give your answer in centimeters, and show your work.

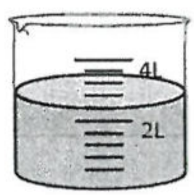


$$\begin{array}{r} 9{,}000\text{ cm}^3 \\ -\ 900\text{ cm}^3 \\ \hline 8{,}100\text{ cm}^3 \end{array}$$

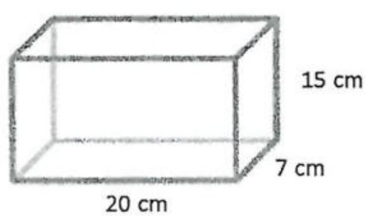
$$\begin{array}{r} 18 \\ 450\overline{)8{,}100} \\ -4\,50 \\ \hline 3{,}600 \\ -3{,}600 \\ \hline 0 \end{array}$$

The water is 18 cm high.

7. Juliet wants to know if the chicken broth in this beaker will fit into this rectangular food storage container. Explain how you would figure it out without pouring the contents in. If it will fit, how much more broth could the storage container hold? If it will not fit, how much broth will be left over? **(Remember 1 cm³ = 1 mL.)**



beaker



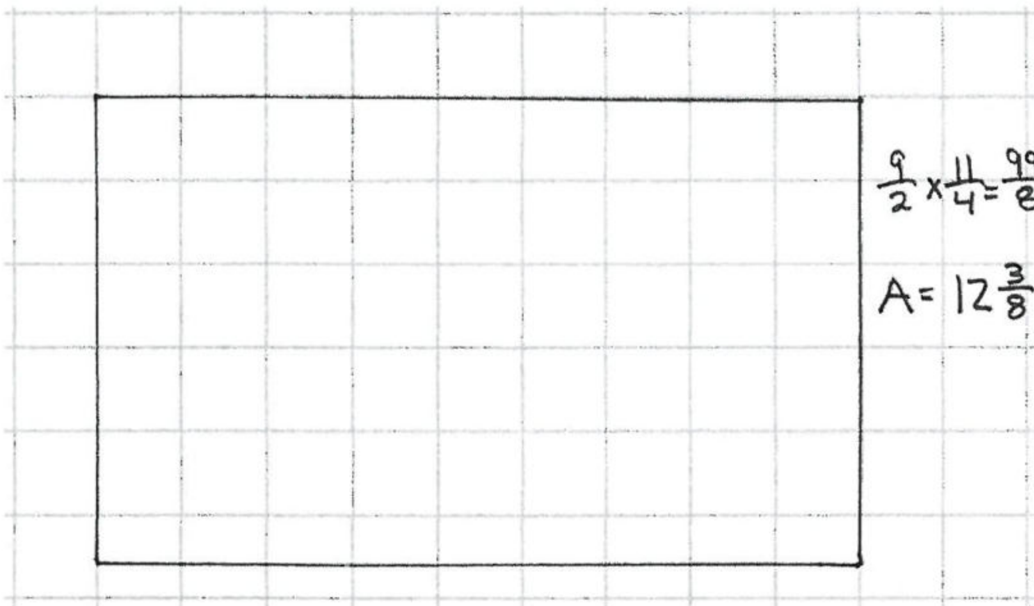
storage container

First, I found the volume of the storage container.
20 cm × 15 cm × 7 cm = 300 cm² × 7 cm = 2,100 cm³ = 2.1 L

Since each line on the beaker is 400 mL, the beaker is holding 2.4 L of broth. The broth will not fit in the container. 2.4 L − 2.1 L = 0.3 L Juliet will have 0.3 L or 300 mL of broth left over.

Name Jean Date ____________

1. Use your ruler to draw a rectangle that measures $4\frac{1}{2}$ by $2\frac{3}{4}$ inches, and find its area.

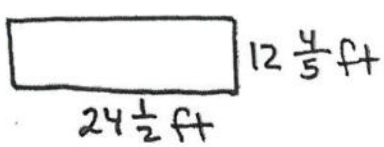


$\frac{9}{2} \times \frac{11}{4} = \frac{99}{8} = 12\frac{3}{8}$

$A = 12\frac{3}{8}\ in^2$

2. Heather has a rectangular yard. She measures it and finds out it is $24\frac{1}{2}$ feet long by $12\frac{4}{5}$ feet wide.

   a. She wants to know how many square feet of sod she will need to completely cover the yard. Draw the yard, and label the measurements.



$$\begin{array}{r} 64 \\ \times\ 49 \\ \hline 576 \\ +\ 2560 \\ \hline 3{,}136 \end{array} \qquad \begin{array}{r} 1568 \\ 2\overline{)3136} \\ -2 \\ \hline 11 \\ -10 \\ \hline 13 \\ -12 \\ \hline 16 \\ -16 \\ \hline 0 \end{array} \qquad \begin{array}{r} 313\frac{3}{5} \\ 5\overline{)1568} \\ -15 \\ \hline 6 \\ -5 \\ \hline 18 \\ -15 \\ \hline 3 \end{array}$$

   b. How much sod will Heather need to cover the yard?

$12\frac{4}{5} \times 24\frac{1}{2} = \frac{64}{5} \times \frac{49}{2} = \frac{3136}{10} = \frac{1568}{5} = 313\frac{3}{5}$

She'll need $313\frac{3}{5}\ ft^2$ of sod to cover her yard.

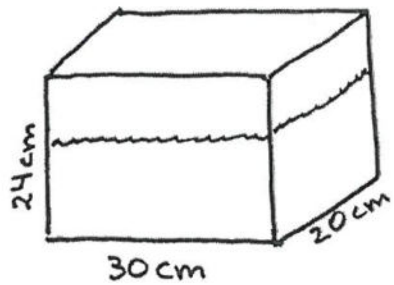
   c. If each square foot of sod costs 65 cents, how much will she have to pay to cover her yard?

$313\frac{3}{5} = 313.6$

$$\begin{array}{r} 313.6 \\ \times\ .65 \\ \hline 15680 \\ +\ 188160 \\ \hline 203.840 \end{array}$$

Heather will have to pay \$203.84 to cover her yard.

3. A rectangular container that has a length of 30 cm, a width of 20 cm, and a height of 24 cm is filled with water to a depth of 15 cm. When an additional 6.5 liters of water is poured into the container, some water overflows. How many liters of water overflow the container? Use words, pictures, and numbers to explain your answer. **(Remember 1 cm^3 = 1 mL.)**



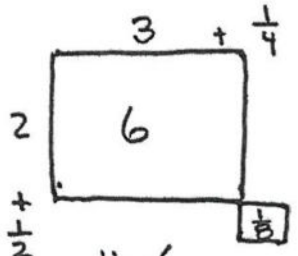
$30 \times 20 \times 24 = 720 \times 20 = 14{,}400$
Volume of the container = 14,400 cm^3

$30 \times 20 \times 15 = 450 \times 20 = 9{,}000$
Volume of water 9,000 cm^3

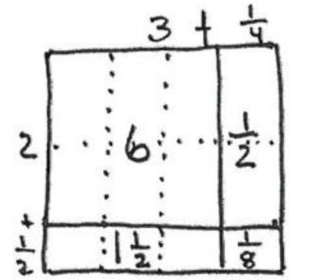
$14{,}400 - 9{,}000 = 5{,}400$
Room left in the container = 5,400 cm^3 or 5.4 L

$6.5\text{ L} - 5.4\text{ L} = 1.1\text{ L}$ The water overflowed by 1.1 L or 1,100 cm^3.

4. Jim says that a $2\frac{1}{2}$ inch by $3\frac{1}{4}$ inch rectangle has a section that is 2 inches × 3 inches and a section that is $\frac{1}{2}$ inch × $\frac{1}{4}$ inches. That means the total area is just the sum of these two smaller areas, or $6\frac{1}{8}$ in^2. Why is Jim incorrect? Use an area model to explain your thinking. Then, give the correct area of the rectangle.



Jim's Incorrect Model



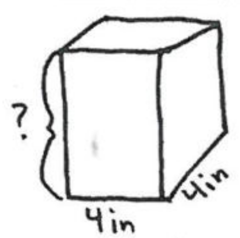
Correct Model

In order to find the area, all sections of the area model must be calculated and added.

$6 + \frac{1}{2} + 1\frac{1}{2} + \frac{1}{8} = 8\frac{1}{8}$

The area of the rectangle is $8\frac{1}{8}$ in^2.

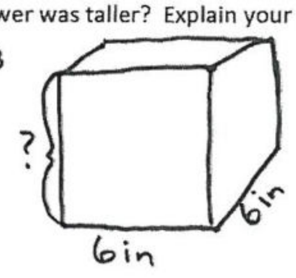
5. Miguel and Jacqui built towers out of craft sticks. Miguel's tower had a 4-inch square base. Jacqui's tower had a 6-inch square base. If Miguel's tower had a volume of 128 cubic inches and Jacqui's had a volume of 288 cubic inches, whose tower was taller? Explain your reasoning.



Miguel

V = 128 in^3

$128 \div 16 = 8$
$128 - 128 = 0$



V = 288 in^3

$288 \div 36 = 8$
$288 - 288 = 0$

Both towers have the same height of 8 in. I divided the volumes by the bases and got a height of 8 in.

6. Read the statements. Circle *True* or *False*. Explain your choice for each using words and/or pictures.

a. All parallelograms are quadrilaterals. True False

All parallelograms have 4 straight sides, so all parallelograms are a type of quadrilateral.

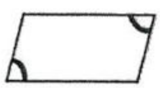
b. All squares are rhombuses. True False

All rhombuses have 4 equal sides, and so do all squares. Some rhombuses do not have 4 right angles, so not all rhombuses are squares.

c. Squares are rhombuses, but not rectangles. True False

All squares are both rhombuses and rectangles. Squares and rhombuses both have 4 equal sides. Squares and rectangles both have 4 right angles.

d. The opposite angles in a parallelogram have the same measure. True False



The opposite sides of parallelograms are parallel and equal in length. The four angles always add up to 360°. Opposite angles are always equal.

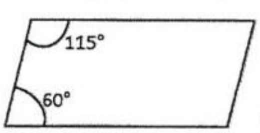
e. Because the angles in a rectangle are 90°, it is not a parallelogram. True False

All rectangles are parallelograms because all rectangles have 2 pairs of parallel sides.

f. The sum of the angle measures of any trapezoid is greater than the sum of the angle measures of any parallelogram. True False

The sum of the 4 angles of any quadrilateral, including trapezoids and parallelograms, is always 360°.

g. The following figure is a parallelogram. True False



Opposite angles in a parallelogram are always equal. If you add up these angles (60° + 60° + 115° + 115°) the sum is only 350°. Therefore, the opposite angles can't be equal, and this isn't a parallelogram. The angles need to add up to 360°.