

A Story of Units

Pleasanton Mathematics Curriculum



GRADE 5 • MODULE 5

Addition and Multiplication with Volume and Area

PROBLEM SETS

Video tutorials: http://bit.ly/eurekapusd Info for parents: http://bit.ly/pusdmath GRADE

Mathematics Curriculum



GRADE 5 • MODULE 5

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Addition and Multiplication with Volume and Area

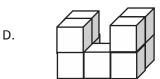
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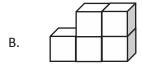


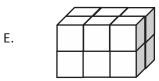
Name	Date

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.









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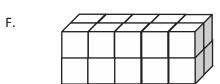
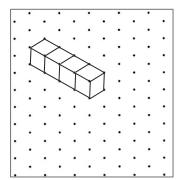


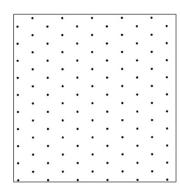
Figure	Volume	Explanation
А		
В		
С		
D		
Е		
F		

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.

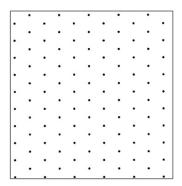
a. 4 cubic units



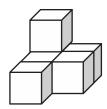
b. 7 cubic units



c. 8 cubic units



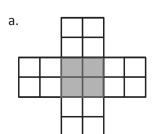
- 3. Joyce says that the figure below, made of 1 cm cubes, has a volume of 5 cubic centimeters.
 - a. Explain her mistake.



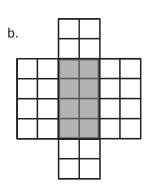
b. Imagine if Joyce wants to build a second layer of the same structure identical to the figure above. What would its volume be then? Explain how you know.

Name	Date	

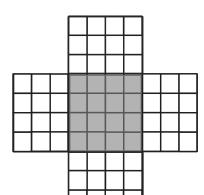
1. Shade the following figures on centimeter grid paper. Cut and fold each to make 3 open boxes, taping them so they hold their shapes. Pack each box with cubes. Write how many cubes fill the box.



Number of cubes:



Number of cubes: _____



Number of cubes:

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.

c.



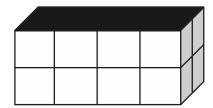
Prediction: _____

Actual: _____

Lesson 2:

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

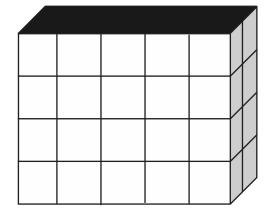
b.



Prediction: _____

Actual: _____

c.



Prediction: _____

Actual: _____

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?

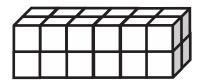
Prediction: _____

What I discovered:

Name	Date

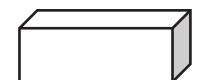
- 1. Use the prisms to find the volume.
 - Build the rectangular prism pictured below to the left with your cubes, if necessary.
 - Decompose it into layers in three different ways, and show your thinking on the blank prisms.
 - Complete the missing information in the table.

a.



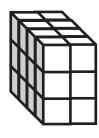
Number of Layers	Number of Cubes in Each Layer	Volume of the Prism
		cubic cm
		cubic cm
		cubic cm





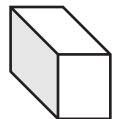


b.





Number of Layers	Number of Cubes in Each Layer	Volume of the Prism
		cubic cm
		cubic cm
		cubic cm

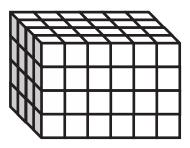




Lesson 3:

Compose and decompose right rectangular prisms using layers.

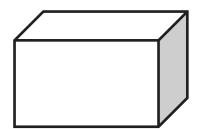
2. Josh and Jonah were finding the volume of the prism to the right. The boys agree that 4 layers can be added together to find the volume. Josh says that he can see on the end of the prism that each layer will have 16 cubes in it. Jonah says that each layer has 24 cubes in it. Who is right? Explain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



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		
4		
7		

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 _____ layers from bottom to top.

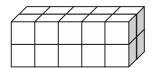
Each layer contains _____ cubic units.

The volume of this prism is _____.

Name	Date
Name	Date

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

a.



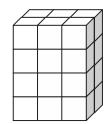
Length: ____ cm

Width: ____ cm

Height: _____ cm

Volume: _____ cm³

b.



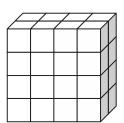
Length: ____ cm

Width: _____ cm

Height: _____ cm

Volume: _____ cm³

c.



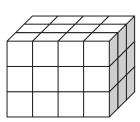
Length: _____ cm

Width: _____ cm

Height: _____ cm

Volume: _____ cm³

d.



Length: ____ cm

Width: _____ cm

Height: cm

Volume: _____ 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.

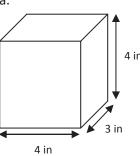
a. _____

b. _____

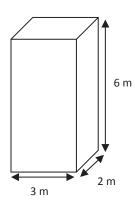
d. _____

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

a.



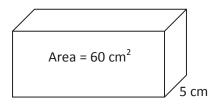
b.



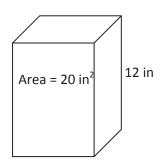
4. Tyron is constructing a box in the shape of a rectangular prism to store his baseball cards. It has a length of 10 centimeters, a width of 7 centimeters, and a height of 8 centimeters. What is the volume of the box?

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.



b.



Name	_ Date	

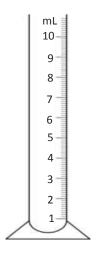
1. Determine the volume of two boxes on the table using cubes, and then confirm by measuring and multiplying.

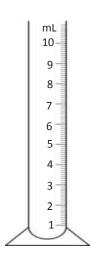
Вох	Number of Cubes	Measurements		Valuma	
Number	Packed	Length	Width	Height	Volume

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	
	mL	
	mL	

3. Shade to show the water in the beaker.





13	mL	
	10-	
	9	
	8	
	7	
	6 5	
	4	
	3	
	2	
	1-	
_	$\overline{}$	1

At first:

After 1 mL water added:

After 1 cm cube added:

____mL

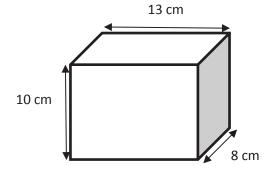
_____ mL

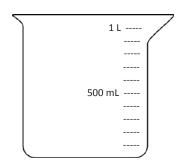
_____mL

Lesson 5:

Use multiplication to connect volume as packing with volume as

- 4. What conclusion can you draw about 1 cubic centimeter and 1 mL?
- 5. The tank, shaped like a rectangular prism, is filled to the top with water.



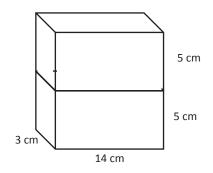


Will the beaker hold all the water in the tank? If yes, how much more will the beaker hold? If no, how much more will the tank hold than the beaker? Explain how you know.

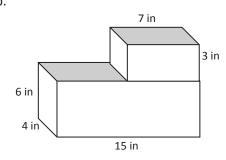
- 6. A rectangular fish tank measures 26 cm by 20 cm by 18 cm. The tank is filled with water to a depth of 15 cm.
 - a. What is the volume of the water in mL?
 - b. How many liters is that?
 - c. How many more mL of water will be needed to fill the tank to the top? Explain how you know.
- 7. A rectangular container is 25 cm long and 20 cm wide. If it holds 1 liter of water when full, what is its height?

Name	Date	

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



b.

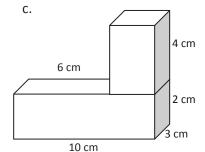


Volume: _____

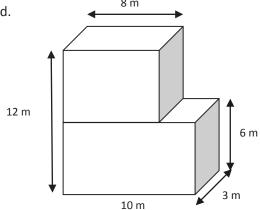
Volume: _____

Solution Strategy:

Solution Strategy:



d.



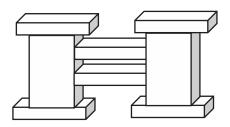
Volume: _____

Volume:

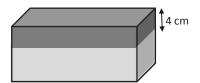
Solution Strategy:

Solution Strategy:

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?



- 3. The combined volume of two identical cubes is 128 cubic centimeters. What is the side length of each cube?
- 4. A rectangular tank with a base area of 24 cm² 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?



- 5. Two rectangular prisms have a combined volume of 432 cubic feet. Prism A has half the volume of Prism B.
 - a. What is the volume of Prism A? Prism B?
 - b. If Prism A has a base area of 24 ft², what is the height of Prism A?
 - c. If Prism B's base is $\frac{2}{3}$ the area of Prism A's base, what is the height of Prism B?

Name		Date	
Ge	offrey builds rectangular planters.		
1.	Geoffrey's first planter is 8 feet long and 2 feet win the planter. What is the volume of soil in the	wide. The container is filled with soil to a height of 3 feet planter? Explain your work using a diagram.	
2.		large planters. He wants each planter to have a volume orent. Show four different ways Geoffrey can make these measurements on them.	
	Planter A	Planter B	
	Planter C	Planter D	

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.

- 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?

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

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

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:					
2.	Each prism is labeled with a letter, dimensions, and volume.					
	Prism A	Volume = Volume = Volume = Volume =				
	Prism by					
3.	Prism D has $\frac{1}{2}$ the volume of prism	Prism D Volume = Prism Volume =				
4.	Prism E has $\frac{1}{3}$ the volume of prism	Prism E Volume = Prism Volume =				
5.	The total volume of all the prisms is 1,000 cubic centimeters or less.	Total volume: Show calculations:				

Name	Date	

Evaluation Rubric

CATEGORY	4	3	2	1	Subtotal
Completeness of Personal Project and Classmate Evaluation	All components of the project are present and correct, and a detailed evaluation of a classmate's project has been completed.	Project is missing 1 component, and a detailed evaluation of a classmate's project has been completed.	Project is missing 2 components, and an evaluation of a classmate's project has been completed.	Project is missing 3 or more components, and an evaluation of a classmate's project has been completed.	(× 4) /16
Accuracy of Calculations	Volume calculations for all prisms are correct.	Volume calculations include 1 error.	Volume calculations include 2–3 errors.	Volume calculations include 4 or more errors.	(× 5) /20
Neatness and Use of Color	All elements of the project are carefully and colorfully constructed.	Some elements of the project are carefully and colorfully constructed	Project lacks color or is not carefully constructed.	Project lacks color and is not carefully constructed.	(× 2) /4
					TOTAL: /40



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:	
2.	All prisms are labeled with a letter.		Write letters used:	
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:	

Calculations:



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.

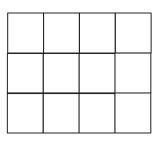
Prism	Dimensions	Volume
А	by by	
В	by by	
С	by by	
D	by by	
Е	by by	
	by by	
	by by	

- 9. Prism D's volume is $\frac{1}{2}$ that of Prism ______. Show calculations below.
- 10. Prism E's volume is $\frac{1}{3}$ that of Prism _____. Show calculations below.

11. Total volume of sculpture: _____. Show calculations below.

Name	Date	
Sketch the rectangles and your tiling. Write the dim Then, use multiplication to confirm the area. Show	•	
1. Rectangle A:	Rectangle A is	
	units long	units wide
	Area = units ²	
2. Rectangle B:	3. Rectangle C:	
Rectangle B is	Rectangle C is	
units long units wide	units long	units wide
Area = units ²	Area = units ²	
4. Rectangle D:	5. Rectangle E:	
Rectangle D is	Rectangle E is	
units long units wide	units long	units wide
Area = units ²	Area = 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.



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?

Name	Date	
Draw the rectangle and your tiling. Write the dimensions and the units you counted in Then, use multiplication to confirm the area. Show		
1. Rectangle A:	2. Rectangle B:	
Rectangle A is	Rectangle B is	
units long units wide	units long units wide	
Area = units ²	Area = units ²	
3. Rectangle C:	4. Rectangle D:	
Rectangle C is units long units wide	Rectangle D is units long units wide	
Area = units ²	Area = units ²	

- 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.

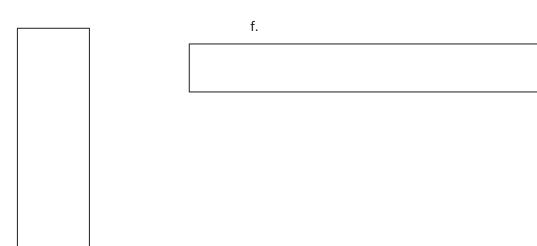
b. What are the areas of the rectangles in square centimeters?

c. Compare the area of the rectangles.

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

a	b.	
C.	d.	

e.



- 2. Find the area of rectangles with the following dimensions. Explain your thinking using the area model.
 - a. $1 \text{ ft} \times 1\frac{1}{2} \text{ ft}$

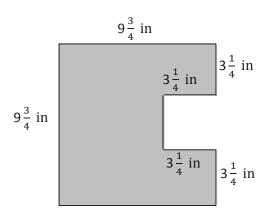
b. $1\frac{1}{2}$ yd × $1\frac{1}{2}$ yd

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

3. Hanley is putting carpet in her house. She wants to carpet her living room, which measures 15 ft \times 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?

- 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?

b. What is the area of the remaining paper?



Date _____

- 1. Find the area of the following rectangles. Draw an area model if it helps you.
 - a. $\frac{5}{4} \text{ km} \times \frac{12}{5} \text{ km}$

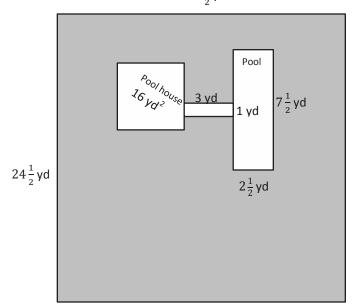
b. $16\frac{1}{2}$ m × $4\frac{1}{5}$ m

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

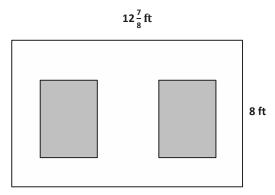
d. $\frac{7}{8}$ mi × $4\frac{1}{3}$ mi

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?

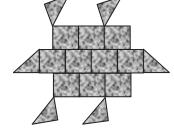
3. Mr. Howard's pool is connected to his pool house by a sidewalk as shown. He wants to buy sod for the lawn, shown in gray. How much sod does he need to buy? $24\frac{1}{2}$ yd



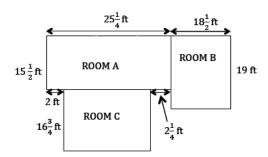
1. George decided to paint a wall with two windows. Both windows are $3\frac{1}{2}$ ft by $4\frac{1}{2}$ ft rectangles. Find the area the paint needs to cover.



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?



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



- 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?

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

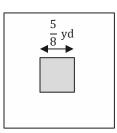
- 5. Jennifer's class decides to make a quilt. Each of the 24 students will make a quilt square that is 8 inches on each side. When they sew the quilt together, every edge of each quilt square will lose $\frac{3}{4}$ of an inch.
 - a. Draw one way the squares could be arranged to make a rectangular quilt. Then, find the perimeter of your arrangement.

b. Find the area of the quilt.

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?

- 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.



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?

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

- 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.

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

- 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?

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

Na	ime	Date
1.	Draw a pair of parallel lines in each box. T following:	hen, use the parallel lines to draw a trapezoid with the
	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.

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

- 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
L. Draw a parall	elogram in each box with the a	ttributes listed.
a. No right	angles.	b. At least 2 right angles.
c. Equal sid	es with no right angles.	d. All sides equal with at least 2 right angles.

- 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?
- 4. List the properties that are shared by all of the parallelograms that you worked with today.

- a. When can a quadrilateral also be called a parallelogram?
- b. When can a trapezoid also be called a parallelogram?

Name Date		Date	
1.	Draw the figures in each box with the attributes lis	sted.	
	a. Rhombus with no right angles b. Rectangle with not all s		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.

Draw a rhombus and a rectangle belo	W.
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- 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.

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

- c. When can a trapezoid also be called a rhombus?
- d. When can a parallelogram also be called a rectangle?
- e. When can a quadrilateral also be called a rhombus?

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 b. Kite with all sides equal d. Kite with 2 pairs of adjacent sides equal c. Kite with 4 right angles (The pairs are not equal to each other.)
- 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.

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

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

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

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

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



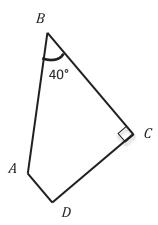
Name	_ Date	

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

		Т	F
a.	All trapezoids are quadrilaterals.		
b.	All parallelograms are rhombuses.		
C.	All squares are trapezoids.		
d.	All rectangles are squares.		
e.	Rectangles are always parallelograms.		
f.	All parallelograms are trapezoids.		
g.	All rhombuses are rectangles.		
h.	Kites are never rhombuses.		
i.	All squares are kites.		
j.	All kites are squares.		
k.	All rhombuses are squares.		

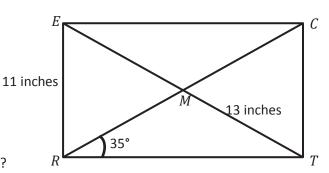
- 2. Fill in the blanks.
 - a. *ABCD* is a trapezoid. Find the measurements listed below.

What other names does this figure have?



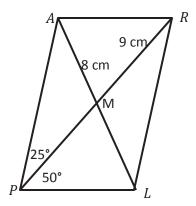
b. *RECT* is a rectangle. Find the measurements listed below.

What other names does this figure have?



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

What other names does this figure have?



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

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

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





Video tutorials: http://bit.ly/eurekapusd Info for parents: http://bit.ly/pusdmath