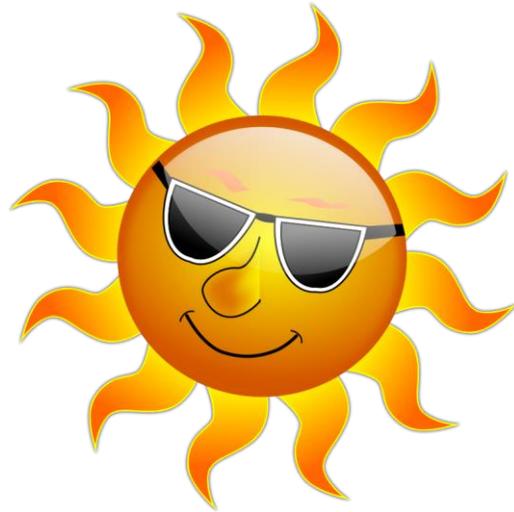


Summer Enrichment Packet

Rising Math Grade 8 Students

ANSWER KEY



PRINCE GEORGE'S COUNTY PUBLIC SCHOOLS

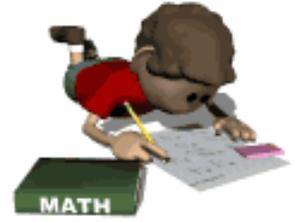
Division of Academics

Department of Curriculum and Instruction



Summer Student Enrichment Packet

Math 8



Note to the Student

You learned so much in Grade 7! It is important that you keep practicing your mathematical knowledge over the summer to be ready for Math 8. In this packet, you will find weekly activities for the summer break.

Directions:

- Create a personal and fun math journal by stapling several pieces of paper together or use a notebook or binder with paper. Be creative and decorate the cover to show math in your world.
- Each journal entry should:
 - ❖ Have the week number and the problem number.
 - ❖ Have a clear and complete answer that explains your thinking.
 - ❖ Be neat and organized.

- *Pay attention to the gray boxes that you see at the beginning of each week's activities. Those boxes indicate the Common Core domain and standard that the*

subsequent activities address. If you see a NON-CALCULATOR SYMBOL  next to a gray box, then do not use a calculator for the activities in that section!

Playing board games and card games are a good way to reinforce basic computation skills and mathematical reasoning. Try to play board and card games at least once a week. Some suggested games to play are: Monopoly, Chess, War, Battleship, Mancala, Dominoes, Phase 10, Yahtzee, 24 Challenge, Sudoku, KenKen, Connect Four, and Risk.

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Math 8

Where to Go to Get Help ... or Practice!

During the course of your math work this summer, you may need some assistance with deepening your understanding the skills and concepts. You also might want to get some more practice. Here are some sites you can visit online:



To get the exact definition of each standard, go to www.corestandards.org and search for the content standard (for example, *7.NS.1a*).



Khan Academy has helpful videos and self-guided practice problems for every grade level. Go to www.khanacademy.org to get started.

Summer Student Enrichment Packet

Math 8

WEEK 1 || Equations & Expressions Standards 7.EE.3-7.EE.4: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Directions: Read the problem below, then answer the questions.



The Dysons love to give parties. Last Friday they gave a party and the doorbell rang 15 times. At the first ring, one guest arrived. Each time the doorbell rang after that, two more guests arrived than the time before.

On Saturday they had another party. At the first ring of the doorbell a single guest arrived, at the second ring two guests appeared, at the third ring three guests and so on. If the doorbell rang 20 times Saturday night, how many guests attended? Was this party bigger than Friday's party? How do you know?

2. Draw a picture to show one way to solve this problem.

Answers will vary.

3. Create a table to show a second way to solve the problem.

F	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29					225	
S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	210

4. Write your answer below and explain how you arrived at your solution.

There were more guests at Friday's party. I found my solution by creating the table and determining the sums for each night. I paired the least and greatest group of each night to get a quick sum and then just added groups of 30 on Friday and 21 on Saturday (for example, on Friday, $1 + 29 = 30$; on Saturday, $1 + 20 = 21$)

Summer Student Enrichment Packet

Math 8

WEEK 2 || Ratios & Proportions Standards 7.RP.1-7.RP.3: Analyze proportional relationships and use them to solve real-world and mathematical problems.

Directions: Complete the following three problems to apply your understanding of percentages and ratios.



Problem #1:

Jesse's Awesome Autos advertised a special sale on cars - Dealer cost plus 5%! Quinten and Shapera bought a luxury sedan for \$23,727.90. What was the dealer's cost?

Dealer's cost = d

$$d + 0.05d = 23,727.90$$

$$1.05d = 23,727.90, \text{ so } d = \$22,598$$

Problem #2:

You and some friends went out to T.G.I. Fridays for dinner. You ordered a root beer, sweet potato fries, and cheese quesadillas. The total bill came to \$21.86. Your dad has told you many times that it's important to leave a good tip; about 20%. You have \$26.00 in your wallet. How much would the total be if you left a 20% tip? Can you cover the cost?

$21.86 \times 1.20 = 26.23$. If I left a 20% tip, the total would be \$26.23, so \$26 is not quite enough to cover the cost of the meal and a 20% tip.

Problem #3:

Builders have observed that windows in a home are most attractive if they have the width to length ratio 3:5. If a window is to be 48 inches wide, what should its length be for the most attractive appearance?

It would be 80 inches in length because a width of $3 \times 16 = 48$; to find an equivalent ratio, multiply 5×16 to get 80.

2. Create your own problems.

- Create one original problem involving a percentage (discount or tax).
- Create one original problem involving a ratio or part/whole relationship.
- Solve both and keep the answer key.
- Challenge a friend or family member to solve your problems.

Answers will vary.

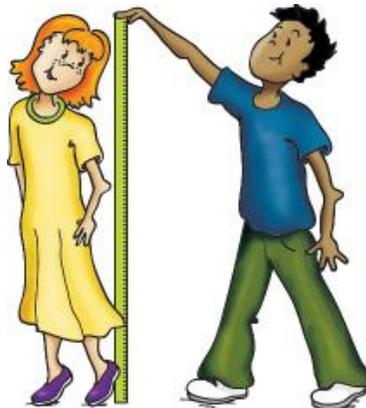
Summer Student Enrichment Packet

Math 8

WEEK 3 || Statistics & Probability Standards 7.SP.1- 7.SP.2: Use random sampling to draw inferences about a population.

Directions: Look at the following data set. It shows the heights, in centimeters, of a group of students:

Student	Height in cm
Tamu	145
Lisa	136
Michelle	154
Garnetta	178
Julius	164
Valerie	144
Zeke	170
Kolby	183
Beyunka	144



1. Answer the following questions based on the data set above.

What is the mode of the set? **144**

What is the range of the set? **47**

Whose height is closest to the median height for the set? **Michelle's (median = 154)**

Whose height is closest to the mean height for the set? **Michelle's (mean = 157.6)**

2. Create a box plot using all of the above data. Give the five-number summary the data displayed in the box plot.

5-number summary:

Lower extreme: 136 1st Quartile: 144 Median: 154 Third quartile: 174

Upper extreme: 183

Summer Student Enrichment Packet

Math 8

WEEK 4 || Ratios & Proportional Reasoning Standards 7.RP.1-7.RP.3: Analyze proportional relationships and use them to solve real-world and mathematical problems.

Directions: Solve the following problems.

The students in Ms. Brown's art class were mixing yellow and blue paint. She told them that two mixtures will be the same shade of green if the blue and yellow paint are in the same ratio.



The table below shows the different mixtures of paint that the students made.

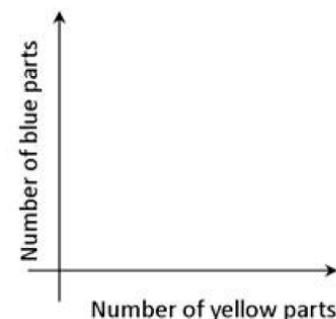
	A	B	C	D	E
Yellow	1 part	2 parts	3 parts	4 parts	6 parts
Blue	2 part	3 parts	6 parts	6 parts	9 parts

a. How many different shades of paint did the students make?

The students made two shades of paint.

b. Some of the shades of paint were bluer than others. Which mixture(s) were the bluest? Show work or explain how you know.

Mixtures A and C were bluer than B, D, and E because they contain a ratio of 2 parts blue to 3 total parts ($\approx 67\%$ blue) while B, D, and E have a ratio of 3 parts blue to 5 total parts ($\approx 60\%$ blue).



c. Carefully plot a point for each mixture on a coordinate plane like the one that is shown in the figure. (Graph paper might help.)

d. Draw a line connecting each point to (0,0). What do the mixtures that are the same shade of green have in common?

The mixtures that are the same shade of green lie on the same line that goes through (0, 0). It shows that they have equivalent ratios.

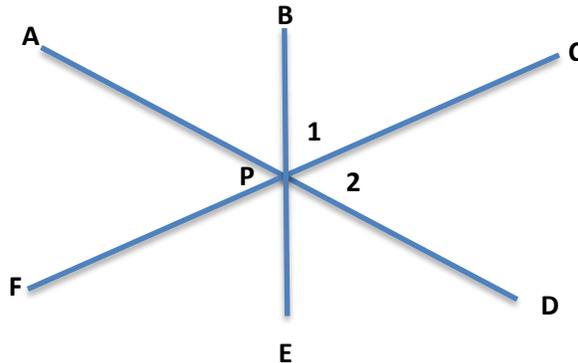
Summer Student Enrichment Packet

Math 8

WEEK 5 || Geometry Standards 7.G.4-7.G.6: Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Directions:

1. Study the diagram and information below.



Angle 1 is vertical with $\angle FPE$. Angle 2 is vertical with $\angle APF$.

In each case these pairs of angles form an X.

$\angle APF$ and $\angle APC$ are supplementary because they form the straight line FC.

$\angle APC$ and $\angle CPD$ are supplementary because they form the straight line AD.

$\angle APB$ and $\angle EPD$ are vertical.

$\angle EPF$ and $\angle EPC$ are supplementary because they form the straight line FC.

2. Find 2-3 real objects in your home or neighborhood that demonstrates one or more of the same relationships expressed in the diagram above. Take pictures of each of the objects you found and either download the pictures and paste them into an electronic document(s) or create a poster and paste your pictures on the poster. *If you do not have access to a digital camera and source for printing pictures, you may draw a picture of your objects instead.*



3. Finally, label each line, each angle, and each corresponding relationship. Use words to describe the angles and relationships formed by the intersecting lines on your document or poster (as done in the example above).

Answers will vary.

Summer Student Enrichment Packet

Math 8

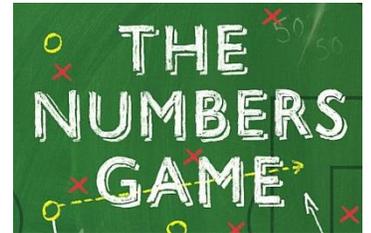
WEEK 6 || Number System Standards 7.NS.1-7.NS.3: Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.



Directions: Complete the two problems below.

Problem 1:

Using exactly four 4's and any operations or symbols [$+$, $-$, \times , \div , $()$, x^e] write an expression to equal each of the following:



*Example: $16 = (4 \times 4 \times 4) \div 4$

$$1 = (4 + 4) / (4 + 4)$$

$$4 = 4^{4-4} \times 4$$

$$7 = 4 + 4 - 4/4$$

$$2 = (4 \times 4) / (4 + 4)$$

$$5 = 4^{4-4} + 4$$

$$8 = 4 + 4 - 4 + 4$$

$$3 = 4 - 4^{4-4}$$

$$6 = 4 \times .4 \times 4 - .4$$

$$9 = 4 + 4 + 4/4$$

Problem 2:

Find three different ways to fill in operations in the boxes below to make the equations true.

*Hint: Operations include: $+$, $-$, \times , \div , $()$

Answers will vary. Sample:

$$6 \boxed{-} 1 \boxed{-} 2 \boxed{+} 2 = 5$$

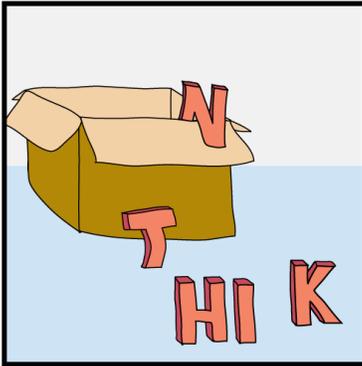
$$6 \boxed{-} 1 \boxed{\times} [2 \boxed{\div} 2] = 5$$

$$[6 \boxed{-} 1] \boxed{\times} 2 \boxed{\div} 2 = 5$$

Summer Student Enrichment Packet

Math 8

WEEK 7 || Expressions & Equations Standards 7.EE.3 -7.EE.4: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.



You have tried many ways to solve problems throughout this Math Summer Packet. Already you know that when one strategy does not lead you to a solution, you back up and try something else. Sometimes you can find a smaller problem inside the larger one that must be solved first. Sometimes you need to think about the information that is missing rather than what is there. Sometimes you need to read the problem again and look for a different point of view. Sometimes you need to tell your brain to try to think about the problem in an entirely different way – perhaps a way you have never used before. Looking for different ways to solve problems is like brainstorming. Try

*to solve this problem. You may need to **change your point of view.***

Directions:

Fishing Adventures rents small fishing boats to tourists for day-long fishing trips. Each boat can only carry 1200 pounds of people and gear for safety reasons. Assume the average weight of a person is 150 pounds. Each group will require 200 lbs of gear for the boat plus 10 lbs of gear for each person.

1. Create an inequality describing the restrictions on the number of people possible in a rented boat. Graph the solution set.



$$150x + 200 + 10x \leq 1200$$

6.25

2. Several groups of people wish to rent a boat. Group 1 has 4 people. Group 2 has 5 people. Group 3 has 8 people. Which of the groups, if any, can safely rent a boat? What is the maximum number of people that may rent a boat?

Group 1 and Group 2 can safely rent a boat because they have 6 people or less. Since the solution of the inequality is $x \leq 6.25$, then 6 is the greatest number of people who can rent a boat.

Summer Student Enrichment Packet

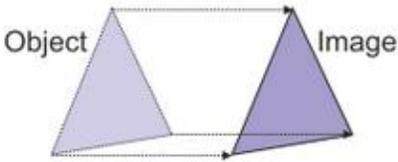
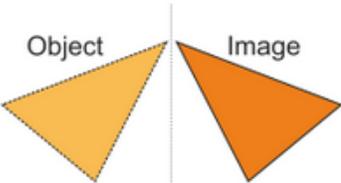
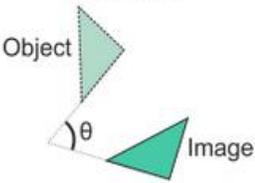
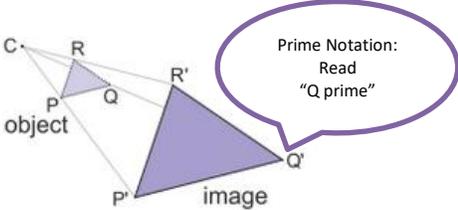
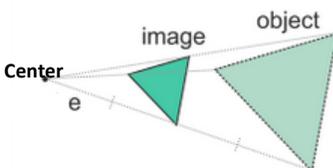
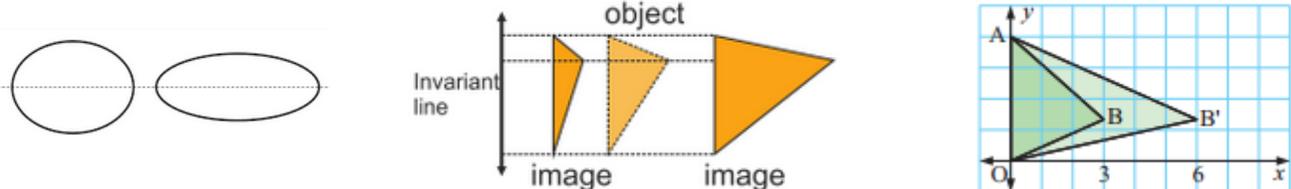
Math 8

WEEK 8 || MATH 8 UNIT 1 PREVIEW – Geometry Standards: 8.G.1- 8.G.5:
Understand congruence and similarity using physical models, transparencies, or geometry software.

Directions: Study the graphic below. Use it to complete the following tasks.

Transformations

A change in size, shape, orientation or position of an object is called transformation.

Congruence Transformations		
The object and image is always congruent. Side lengths and angle measures remain unchanged (equal).		
Translation (Slide)  Object Image Every point moves the same distance in a given direction	Reflection  Object Image Mirror image	Rotation  Object Image Rotating around a point O with angle θ
Similarity Transformations: Dilations		
The object and image is always similar. Side lengths are proportional and angle measures are unchanged (equal).		
Enlargement  $k = 3$ The "k" is the scale factor. For an enlargement, $k > 1$.	Reduction  $k = \frac{1}{2}$ The "k" is the scale factor. For a reduction, $k < 1$.	
Non-examples of Congruence or Similarity Transformations		
Stretch  Stretching: Increasing or decreasing an object in one deminsion/direction only. Stretches are define by a stretch factor and an invariant line. The image is neither congruent or similar to its object.		

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Math 8

Strange Pictures!

Look carefully at this picture of a playing card:

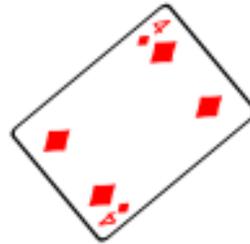


What has happened to these cards? In each case describe the changes.

A.



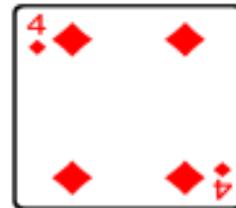
B.



C.



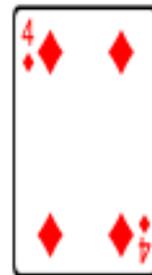
D.



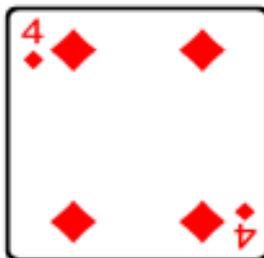
E.



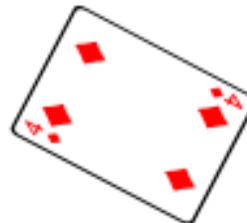
F.



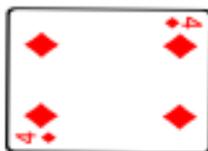
G.



H.



K.



M.



A - Enlargement

B - Rotation 45° clockwise

C - Reflection

D - Horizontal stretch

E - Rotation 90° clockwise and reduction

F - Vertical stretch

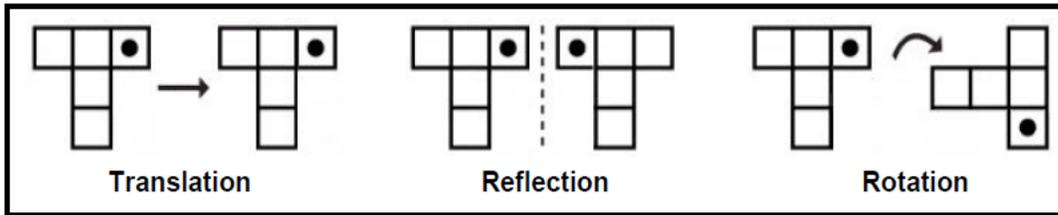
G - Enlargement and horizontal stretch

H - Rotation $\approx 45^\circ$ counterclockwise

K - Rotation 90° clockwise

M - No change

Translation, Rotation, and Reflection



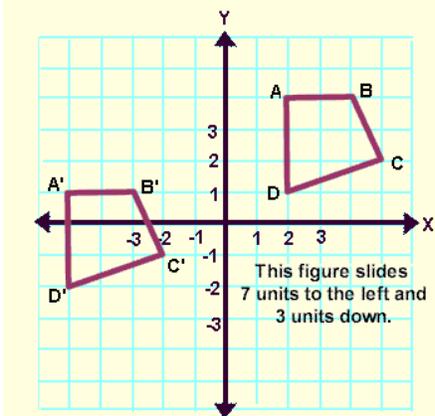
Identify each shape as translation, rotation, and reflection.

1)			2)				_____	_____	_____
3)			4)				_____	_____	_____
5)			6)				_____	_____	_____
7)			8)				_____	_____	_____

- 1) reflection, rotation, translation
- 3) reflection, rotation, translation
- 5) rotation, reflection, translation
- 7) rotation, reflection, translation

- 2) translation, rotation, reflection
- 4) translation, rotation, reflection
- 6) translation, rotation, reflection
- 8) rotation, reflection, translation

Translations in the Coordinate Plane



Description:

7 units to the left, 3 units down.

Mapping Rule:

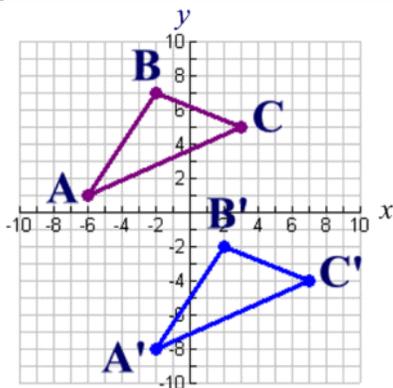
$$(x, y) \rightarrow (x - 7, y - 3)$$

(This is read: "the x and y coordinates will be translated into x-7 and y-3.")

Notice that adding a negative value (subtraction), moves the image left and/or down, while adding a positive value moves the image right and/or up.)

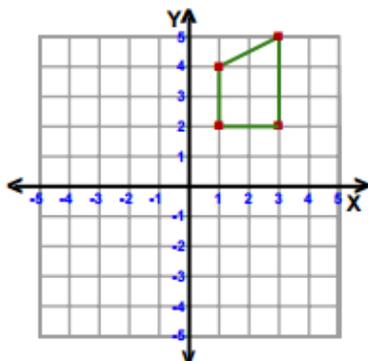
Notation: $T_{(-7, -3)}$

(The -7 tells you to subtract 7 from all of your x-coordinates, while the -3 tells you to subtract 3 from all of your y-coordinates.)



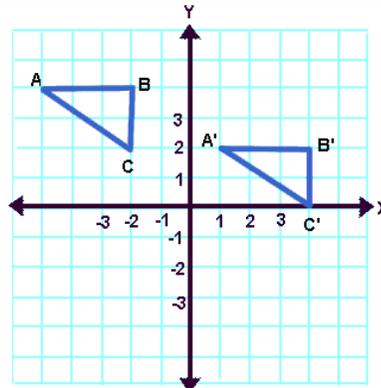
Describe the translation that will move triangle **ABC** onto triangle **A'B'C'**. Name the corresponding parts. **5 units right and 9 units down.** $AB \cong A'B'$, $BC \cong B'C'$, $CA \cong C'A'$

Translation: 4 left and 3 down



Graph the image of the figure using the given translation. Provide the notation of the translation.

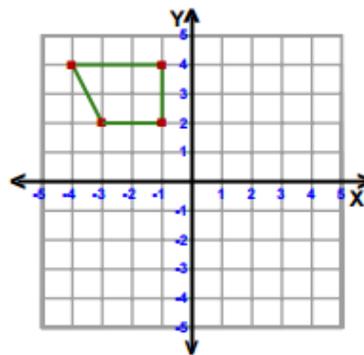
See student graph. $T_{(-4, -3)}$



Give the mapping rule for the translation that will move triangle **ABC** onto triangle **A'B'C'**.

$$(x, y) \rightarrow (x + 6, y - 2)$$

Translation: 3 right and 4 down



Graph the image of the figure using the given translation. Provide the notation and mapping rule of the translation.

See student graph. $T_{(3, -4)}$ $(x, y) \rightarrow (x + 3, y - 4)$

Summer Student Enrichment Packet

Math 8

Triangle Reflections Task Sheet

Perform each reflection and name the location of each point for the image.

1. Reflect figure ABC over the x axis

$$A (-10, -9) \rightarrow A'(-10, 9)$$

$$B (-6, -8) \rightarrow B'(-6, 8)$$

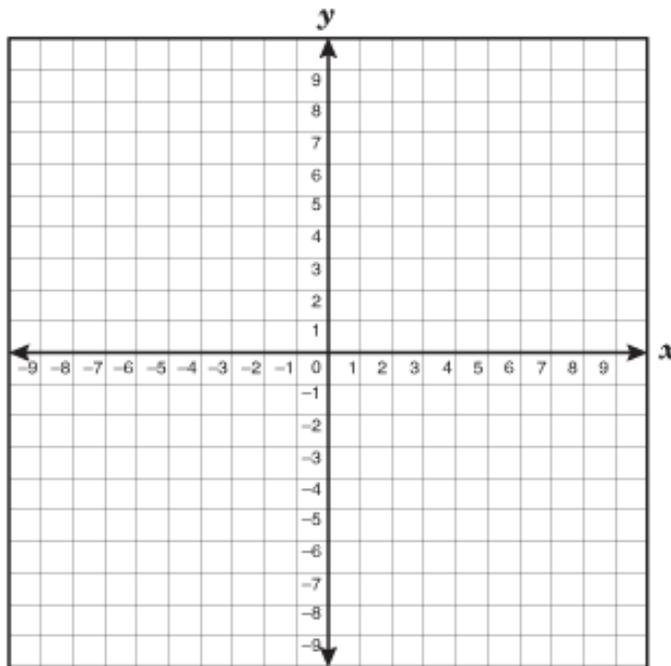
$$C (-4, -10) \rightarrow C'(-4, 10)$$

2. Reflect figure DEF over the y axis

$$D (-5, -3) \rightarrow D'(5, -3)$$

$$E (-1, -1) \rightarrow E'(1, -1)$$

$$F (-2, -6) \rightarrow F'(2, -6)$$



What are the shortcuts that can be applied to each coordinate?

When reflecting a figure over the x-axis ... *just give the opposite sign to the y-coordinates of each of the points.*

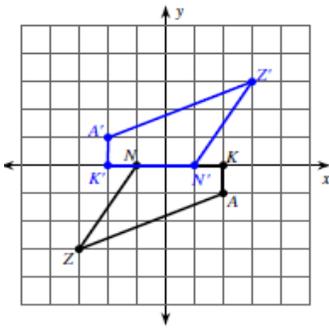
When reflecting a figure over the y-axis ...

just give the opposite sign to the x-coordinates of each of the point.

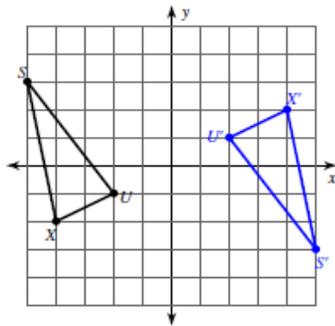
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Math 8 Rotations Made Easy!

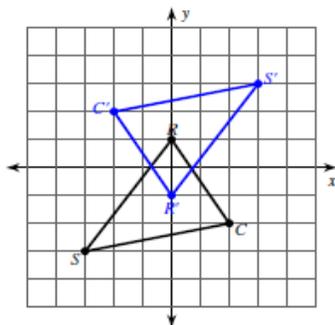
Look at the images of the figures below after their rotations 180° about the origin. The coordinates are given in the table. Fill in the coordinates of the images after the rotations. Then examine the pairs of coordinates and determine the coordinate mapping rule. Use the coordinate mapping rule to determine what the shortcut is when rotating figures 180° about the origin.



Quadrilateral ZNKA	Z (-3, 3)	N (-1, 0)
Coordinate Mapping Rule: $(x,y) \rightarrow (\underline{\quad}, \underline{\quad})$	Z' (3, 3)	N' (1, 0)
	K (2, 0)	A (2, -1)
	K' (-2, 0)	A' (-2, 1)



Triangle XUS	X(-4, -2)	U(-2, -1)
Coordinate Mapping Rule: $(x,y) \rightarrow (\underline{\quad}, \underline{\quad})$	X' (4, 2)	U' (2, 1)
	S(-5, 3)	
	S' (5, -3)	



Triangle CRS	C(2, -2)	R(0, 1)
Coordinate Mapping Rule: $(x,y) \rightarrow (\underline{\quad}, \underline{\quad})$	C' (-2, 2)	R' (0, -1)
	S(-3, -3)	
	S' (3, 3)	

What is the shortcut for rotating figures 180° ?

Give the opposite sign to both the x- and the y-coordinate in order to get the correct new coordinate.

Provide a congruency statement for the rotation of Triangle CRS.

$CRS \cong C'R'S'$ Corresponding points must be on the same position on each side of the \cong .

Math 8



Reasoning with Transformations



Homer

reflect across the y-axis, then the x-axis, then the y-axis, then the x-axis

180° counterclockwise rotation



Lisa

Which set of transformations returns a given figure to its original location?



Bart

90° clockwise rotation, then reflection across the axis it just rotated over

translation 2 units left, then 3 units up, then 3 units right, then 2 units down



Maggie

Who is correct? Explain why the others are wrong.



Marge

Use the space provided to write a note to Maggie.

- Homer is correct. Two reflections over each of the axes will return the figure to its original location.
- Maggie is not correct. A 180-degree rotation would essentially put the figure upside down in the diagonally opposite quadrant.
- Marge is not correct. Since the first two translations are 2 units left and 3 units up, then the next two translations would have to include 2 units right and 3 units down to return the figure to its original position.
- Bart's transformations would return squares or circles to their original location, but not other figures, which would return to the same quadrant they started in but would not be facing in the same direction.

Summer Student Enrichment Packet

Math 8

Changing Shapes

Suppose you are going to be designing a logo for a club at your school. To prepare for this project, draw a non-rectangular shape in the coordinate plane so that portions of the shape are in each of the four quadrants. Explain what would happen to your shape if you transformed it using each of the given rules with the center of dilation at the origin.

a. $(4x, 4y)$

The figure would enlarge by a scale factor of 4. The distance from the origin to the object would increase by a scale factor of 4

d. $(3x, 3y + 5)$

The figure would grow by a scale factor of 3 and move up 5 units.

b. $(0.25x, 0.25y)$

The figure would reduce by a scale factor of 0.25. The distance from the origin to the object would decrease by a scale factor of 0.25.

e. $(x + 5, y - 5)$

The figure would move right five units and down five units.

c. $(2x, y)$

The figure would increase on one dimension by a scale factor of 2; the other dimension would stay the same.

f. $(\frac{1}{2}x, \frac{1}{2}y)$

The figure would reduce by a scale factor of $\frac{1}{2}$

g. Will any of the transformed figures be similar to the original figure? Explain.

Figures a, b, d, e, and f will be similar to the original figure. Both dimensions increase by the same scale factor. Figure e will be congruent to the original figure because the side lengths and shape do not change. The ratio of the lengths of the corresponding sides will be 1:1 and the measures of the corresponding angles will be equal. Note that congruence is a special case of similarity. [Figure e is congruent to the original figure.]

h. If you make a new figure by adding 2 units to the length of each side of your shape, will the two figures be similar? Why or why not?

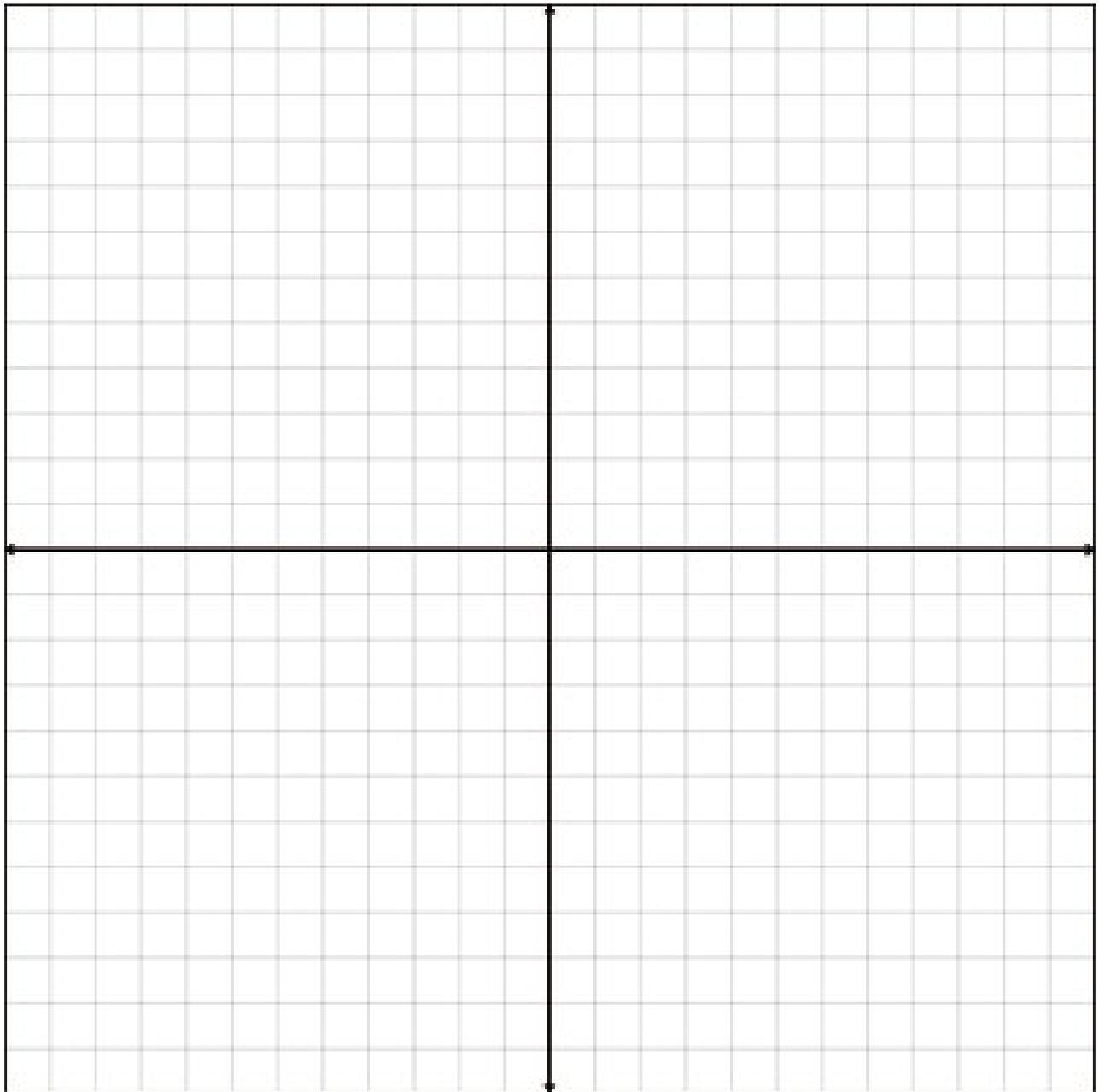
The figures would not be similar. Adding a constant amount to each side will distort the figure. The ratio of the lengths of the corresponding sides will not be constant.

i. Write a general rule for transformations in the plane that produce similar figures.

$(nx + a, ny + b)$

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Math 8 Changing Shapes

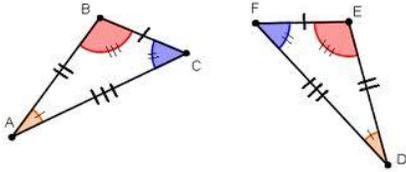
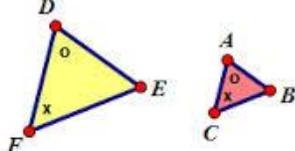


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Math 8

Summing It Up ... TRANSFORMATIONS!

Complete this graphic organizer.

Congruence	Similarity														
 <p style="text-align: center;">$\triangle ABC \cong \triangle DEF$</p>	 <p style="text-align: center;">$\triangle DEF \sim \triangle ABC$</p>														
<p style="text-align: center;">Imprecise Language (avoid) The same, equal, "same shape and same size"</p>	<p style="text-align: center;">Imprecise Language (avoid) Stretch, scaled, resized, shrink, expand, "same shape"</p>														
<p style="text-align: center;">Precise Academic Language (use) "corresponding angles equal and corresponding line segments equal"</p>	<p style="text-align: center;">Precise Academic Language (use) "corresponding angles equal and corresponding line segments proportional"</p>														
<p style="text-align: center;">Definition</p> <p>A two- dimensional figure is congruent to another if the 2nd can be obtained from the 1st by a combination of translations, rotations, and reflections.</p>	<p style="text-align: center;">Definition</p> <p>A two- dimensional figure is similar to another if the 2nd can be obtained from the 1st by a combination of congruence and dilation.</p>														
<p style="text-align: center;">Properties</p> <p style="text-align: center;">Congruency Statement: $\triangle ABC \cong \triangle DEF$</p> <table border="1" data-bbox="191 1251 792 1394"> <thead> <tr> <th>Corresponding Angles</th> <th>Corresponding Sides</th> </tr> </thead> <tbody> <tr> <td>$\angle A \cong \angle D$</td> <td>$AB \cong DE$</td> </tr> <tr> <td>$\angle B \cong \angle E$</td> <td>$BC \cong EF$</td> </tr> <tr> <td>$\angle C \cong \angle F$</td> <td>$AC \cong DF$</td> </tr> </tbody> </table>	Corresponding Angles	Corresponding Sides	$\angle A \cong \angle D$	$AB \cong DE$	$\angle B \cong \angle E$	$BC \cong EF$	$\angle C \cong \angle F$	$AC \cong DF$	<p style="text-align: center;">Properties</p> <p style="text-align: center;">Similarity Statement: $\triangle ABC \sim \triangle DEF$</p> <table border="1" data-bbox="828 1251 1429 1394"> <thead> <tr> <th>Corresponding Angles</th> <th>Corresponding Sides</th> </tr> </thead> <tbody> <tr> <td>$\angle A \cong \angle D$</td> <td rowspan="3" style="text-align: center;">$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$</td> </tr> <tr> <td>$\angle B \cong \angle E$</td> </tr> <tr> <td>$\angle C \cong \angle F$</td> </tr> </tbody> </table>	Corresponding Angles	Corresponding Sides	$\angle A \cong \angle D$	$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$	$\angle B \cong \angle E$	$\angle C \cong \angle F$
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<p style="text-align: center;">Examples</p> <p style="text-align: center;">Answers will vary.</p>	<p style="text-align: center;">Examples</p> <p style="text-align: center;">Answers will vary.</p>														
<p style="text-align: center;">Non-examples</p> <p style="text-align: center;">Answers will vary.</p>	<p style="text-align: center;">Non-examples</p> <p style="text-align: center;">Answers will vary.</p>														

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Math 8

Complete the table.

Transformations	What Changes	What Stays the Same
Translation	<i>Position</i>	<i>Orientation, Side lengths, angle measures</i>
Rotation	<i>Position and Orientation</i>	<i>Side lengths, angle measures</i>
Reflection	<i>Position and Orientation</i>	<i>Side lengths, angle measures</i>
Dilation	<i>Position and Side lengths</i>	<i>Angle measures</i>

TRANSFORMATIONS from A to Z

Reflect on what you learned by filling in a word or phrase related to transformations for each letter.

A ngles and sides	J ustify with congruence and similarity statements	S imilarity
B oth x- and y-coordinate have sign changes for 180° rotation	K = scale factor	T ranslations
C ongruence	L eft or right	U p or down
D ilation	M apping Rule	V ertical Movement with y
E nlargement	N otation	W ork backwards
F igure	O rientation	X -coordinates
G raph	P roportional	Y -coordinates
H orizontal Movement with x	Q uadrant	Z ero, zero (origin)
I nvariant line	R otation	