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Transformations - 8th Grade Math

Melanie R. Webb
Trinity University, melanierwebb@gmail.com

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Transformations - 8th Grade Math (15-17 days)

Stage 1 – Desired Results

Established Goals (e.g., standards)

8.3 Proportionality. The student applies mathematical process standards to use proportional relationships to describe dilations.

8.3(A) generalize that the ratio of corresponding sides of similar shapes are proportional, including a shape and its dilation

8.3(B) compare and contrast the attributes of a shape and its dilation(s) on a coordinate plane

8.3(C) use an algebraic representation to explain the effect of a given positive rational scale factor applied to two-dimensional figures on a coordinate plane with the origin as the center of dilation.

8.10 Two-dimensional shapes. The student applies mathematical process standards to develop transformational geometry concepts.

8.10(A) generalize the properties of orientation and congruence of rotations, reflections, translations, and dilations of two-dimensional shapes on a coordinate plane 8.10(B) differentiate between transformations that preserve congruence and those that do not

8.10(C) explain the effect of translations, reflections over the x- or y-axis, and rotations limited to 90°, 180°, 270°, and 360° as applied to two-dimensional shapes on a coordinate plane using an algebraic representation

8.10(D) model the effect on linear and area measurements of dilated two-dimensional shapes

Transfer

Students will independently use their learning to…

Apply several transformations to a coordinate plane, then construct a step by step guide using algebraic representation so that others may recreate the same transformations for the same result.

Meaning

Understandings

Students will understand that….

Being able to communicate in mathematics ensures you can speak to others in a common language.

Often, there is more than one way to get to the same result.

Transformations are connected to our spatial reasoning. Different people have different methods to master a topic.

Differences in mathematics determine categorization.

Essential Questions

How do mathematicians communicate ideas?

Why do mathematicians communicate ideas in this way?

How can I make sure others understand my mathematical thinking?

Why does order matter when following directions?

What are the limits of mathematical representation?

Acquisition

Knowledge

Students will know…

Underlined vocabulary.

Dilations form similar figures. Translations, reflections, and rotations (rigid transformations) do not change the size.

Ratios of corresponding sides of a dilation are proportional.

Which transformations preserve orientation and/or congruence.

If the scale factor of a dilation is x, the linear measurements are dilated by x, but the area measurements are dilated by x^2.

Skills

Students will be able to…

Determine and describe the transformation on the coordinate plane.

Use an algebraic representation to explain the effect of a transformation (translation, reflection, rotation, dilation).

Compare and contrast the image with its pre-image.

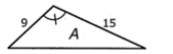
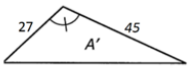
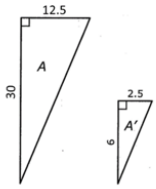
Model the effect on linear and area measurements of dilated shapes.

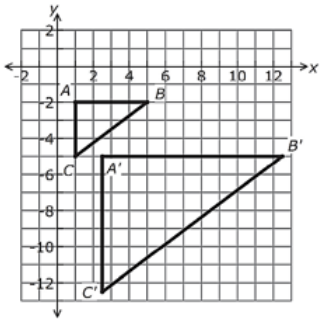
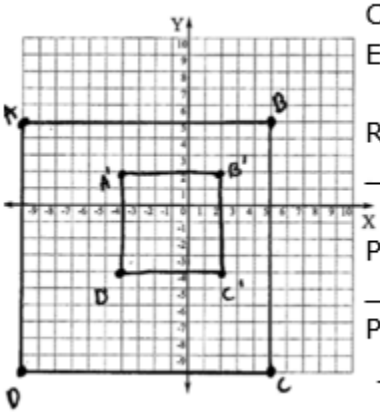
Stage 2 – Evidence

CODE (M or T)	Evaluative Criteria (for rubric)	
T	Create 5 images using the transformations (translation, reflection, rotation, and dilation).	Performance Task(s) *Students will demonstrate meaning-making and transfer by…* Students will create a pre-image and 5 subsequent images by applying transformations. They will write the algebraic representations of their transformations. In groups of 6, students will try to reconstruct the same images as their peers using their directions (like a game of telephone). Student will reflect on whether they gave good directions and determine whether there are other directions they could give to get to the same result. --- Other Evidence (e.g., formative) Pre-Test Exit tickets Homework Warm-ups Quizzes Test
T	Use algebraic representations to explain each transformation	
M	Describe the effect of each transformation in words.	
M	Reflect on classmates' ability to follow their directions given as algebraic representations.	

Stage 3 – Learning Plan

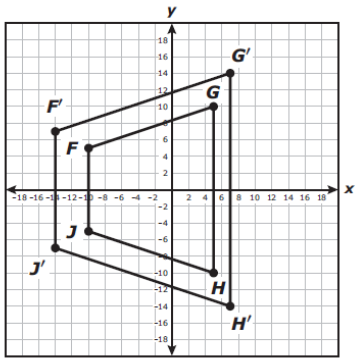
CODE (A, M, T)	Pre-Assessment *How will you check students' prior knowledge, skill levels, and potential misconceptions?*	
	Learning Activities **Day 0 – Pre-Test for Transformations** Prior to starting the unit, give students a pretest including the TEKS from grades 6 and 7, as well as the TEKS from the unit. 6.11A – Graphing in four quadrants 7.5A – Generalize attributes of similarity 7.5C – Solve problems involving similarity. I pull most of these questions for the pretest from the Released STAAR tests. I remove answer choices when possible, rewording problems if necessary. Administering a pre-test allows me to provide below grade level intervention to those students demonstrating need. Do this 2 -3 weeks in advance if necessary to give yourself time to complete interventions.	Progress Monitoring (e.g., formative data) Pre-Test
A	**Day 1 – Pre-Teach Vocabulary 8.10A,B** **Warm – Up –** Vocab Review – Matching words the students might know to everyday words (Vertex, Vertices, Corresponding, Figure, Preserve). Review naming images in the coordinate plane. **EQ Focus –** How do mathematicians communicate ideas?	As you walk round during warm-up, identify students who are struggling with the review

A	**Lesson/Activity –** Vocabulary activity. Students are given a recording sheet with important words for the unit. They complete the definitions and then use the definition to find the examples of the transformation in the coordinate plane. I have 3 examples each of the four transformations that are on cards cut apart. I have an additional example of each on regular white paper that I give students as their permanent, glued-into their notes, example. The definitions used for the vocabulary came from the glossary of the 8th Grade Go Math! textbook by Houghton Mifflin. I borrowed cards from Engaging Math 2 by Region 4 Education Services in a "Properties of Congruence and Orientation" Activity. It is important that students have the words to discuss all transformations so they can compare early on. The first time they talk about rotations should not be after a week into the unit. **Discussion –** Confirm students learning with four remaining examples that they can glue into their Vocabulary Reference Sheet. Using these four examples, ask which preserve congruence, and which preserve orientation. Review naming pre-images and images. Students with access to technology can go to Reflections, Rotations, Dilations, Translations (GeoGebra). Which object matches which transformation?	words. These students will likely need more support and scaffolding during the vocabulary activity.
A	**Independent Practice –** Take home vocab match and transformation ID. An example is started for you.	
	Day 2 – Introduction to Dilations 8.3A,B	
A	**Warm-Up** – Review similar figures. Find scale factor, use scale factor. (Similar figures are a readiness standard in 7th grade. Hopefully, students who have needed remediation as discovered by the pre-test, can know show understanding of the 7th grade TEKS). **Review**: Figure A and A′ are similar. What does it mean to be similar? Find the scale factor from A to A′. 1. Scale factor: _____ If the third side on A was 24, what would the third side on A′ be? _____   2. Scale factor: _____ If the third side on A was 32.5, what would the third side on A′ be? _____  To find the **scale factor** we divide ——	Look for students not using multiplication to find the scale **factor**. Potential rough spot, students simplifying old /new when it should be new/old.
M	**Discussion –** Have students discuss how to find scale factor. What is *scale factor*? Students refer to yesterday's vocabulary. What is a *dilation*? When would you use dilations? Words we might use to describe: *enlargement*, *reduction*. **EQ Focus -** How do mathematicians communicate ideas? **Lesson** – Two quick examples solidifying how to find scale factor. Can the scale factor be different for different vertices on the coordinate plane? See if students can come to the conclusion: For an enlargement, the scale factor is **greater** than one. For a reduction, the scale factor is **less** than one. Have students complete 1 or 2 straightforward problems before moving to the activity to check student understandings.	
M	**Activity –** With available technology, students can explore scale factor with resulting image: Exploring Dilations on the Coordinate Plane (GeoGebra), Coordinate Dilations (GeoGebra). Students may also explore the difference between dilating about the origin or not: Transformations – Dilations	Feedback opportunity: As students are working on the various activities, check student problems and confer with students displaying misconceptions.

	(Geogebra), which goes into negative scale factors, and may not be appropriate for all students.	
M	**Independent Practice –** Students practice finding scale factor, and applying scale factor to find missing side length.	
	Day 3 – Using the scale factor to write the algebraic rule 8.3C	
M	**Warm-Up –** Students check independent practice with a partner. Complete 2 minute review question on finding the scale factor.	
A	**Writing the Rule** **Warm up** We can write a rule to represent transformations in the coordinate plane. First: find the _____ factor $\frac{new}{old}$ =____= Next: Write the rule $(x, y) \rightarrow$ (____x, ____y) Last: Check! If B is at (5, -2), B' should be (_____) Try writing the rules on Dilations practice from yesterday! 	
M	**Discussion –** Each point on the coordinate plane is give *(x, y)*. How can we use this fact to describe the **effect** on each vertex of the pre-image to the image? **EQ Focus –** How can I make sure others understand my mathematical thinking?	Take a survey for what operation students think they will be using for dilations.
T	**Lesson –** Using the example from the warm – up, write the algebraic rule in the form $(x, y) \rightarrow$ (__x, __y). What is the meaning when there is a *coefficient* with x and y? Can they be different coefficients? How can we use the rule to find coordinates of the image when given the algebraic representation and the coordinates for the pre-image? **Activity –** I have…, Who has… activity where students can find a rule that matches their dilation. This activity increases student talk.	Potential Rough Spot: Coefficient is a word my students will have encountered in a previous unit. It may be a new word for others.
T	**Independent Practice –** Handout with practicing finding scale factor, then writing algebraic representation, and using algebraic representation to find image coordinates. This example also digs into 8.10D. 4  Circle: Enlarge or Reduce Rule: _____ Perimeter ABCD _____ Perimeter A'B'C'D' _____	
	Day 4 – Intro to Translations 8.10B,C	
	Warm-Up – STAAR question asking rule about dilation (Question #36, Released STAAR 2017). Then have students create rules that describe enlargement, rules that describe reduction.	Assign each table or pair an answer choice. Have them decide if the answer choice is correct, but defend their response.

M/T

36 Quadrilateral *FGHJ* was dilated with the origin as the center of dilation to create quadrilateral *F′G′H′J′*.



Which rule best represents the dilation that was applied to quadrilateral *FGHJ* to create quadrilateral *F′G′H′J′*?

F $(x, y) \rightarrow (\frac{5}{7}x, \frac{5}{7}y)$

G $(x, y) \rightarrow (x + 1, y + 2)$

H $(x, y) \rightarrow (1.4x, 1.4y)$

J $(x, y) \rightarrow (x - 2, y + 1)$

Released STAAR on TEA website

A

Discussion – Explain how translations are different from Dilations. Explain what they have in common. In the warm-up, answer choices G and J are the algebraic representation for translation. What do you think these representations tell us about the translation it is describing?

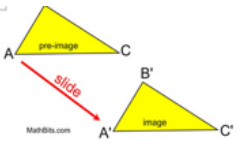
EQ Focus – How do mathematicians communicate ideas? Why do mathematicians communicate ideas in this way?

M

Lesson – Translations (GeoGebra) On white boards, Given words, perform the transformation (on graph side) and write the rule (white boards side). Students need to see that all three representations (verbal, graph, algebraic representation) go together! Use the rule to write the new coordinates.

The second transformation is called a _____, when you SLIDE a figure up, down, right, or left.

Translations preserve _____ and _____.



Slide **RIGHT** →	Slide **LEFT**←
(x,y)-> (**x+** ___, y)	(x,y)-> (**x-** ___, y)

Slide **UP** ↑	Slide **Down** ↓
(x,y)-> (x, **y+**___)	(x,y)-> (x, **y-**___)

Write the rule for JKLM to J'L'K'M'

M

Activity – Translations on Coordinate Plane (Geogebra) Give students a chance to visualize translations. The translation is given as a vector in this activity, but we can easily turn that into algebraic representations. Have students answer, "How?"

T

Independent Practice – Translations in the coordinate Plane Homework, though this assignment should no longer be translations in isolation. Including dilation rules, images of rotations and reflections and spiraling in congruence and orientation will keep students from neglecting what they've already learned. Kuta - Translations for great problems to use.

Day 5 – Practice with Dilations and Translations 8.3C, 8.10C

Have students flash their boards so you can quickly gauge levels of understanding.

M

Warm-Up – Given an algebraic representation, tell what transformation it is and describe in words what changes.

1) Rule: $(x, y) \rightarrow (3.2x, 3.2y)$	2. Rule: $(x, y) \rightarrow (x + 3.2, y - 4)$
Transformation ___**Dilation**___.	Transformation ___**Translation**___.
Describe in words __**Enlargement**__.	Describe in words __**Right 3.2, Down 4**__.

T

EQ Focus – Why does order matter when following directions?

Lesson – Hats off to the Wumps (GeoGebra). In the rule given in this online activity, they give the algebraic representation, or rule, for the dilation and translation as one. Can you split up the rules to have a rule for the dilation, and a rule for the translation? Which would you have to do first? Why?

Activity – Have students complete Mug's Hat (Desmos).

T

Independent Practice – Items from Closing the Distance by Region 4 Education Service Center – "Dilations in the Coordinate Plane," and Translation Match. May also include more exercises like the warm-up as exit ticket.

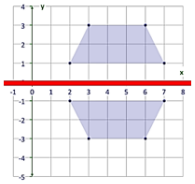
Exit Ticket.

Day 6 – Reflections 8.10A,C

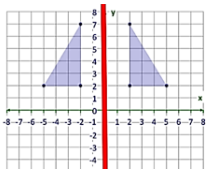
Warm-Up – Define Reflection.

A

A reflection is a transformation that _____ a figure across a line



Flips over the _____ axis!



Flips over the _____ axis!

A

Out of the 3 transformations we are now familiar with (Dilations, translations, reflections) remind your neighbor which ones **preserve congruence** and which ones **preserve orientation.**

Discussion – Based on the images in the warm-up, how do the coordinates change from pre-image to image and how do you think you would communicate this like a mathematician? If we only reflect over the x or y axis this year, how many possible rules for reflections are there?

EQ Focus – How do mathematicians communicate ideas? How can I make sure others understand my mathematical thinking?

M

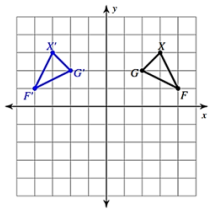
Lesson – Investigate reflections using patty paper and compare coordinates. Use this to write an algebraic representation. When you flip over the x-axis, which coordinate changes? Relate this to horizontal or vertical change.

Activity – Reflections in a Coordinate Plane (GeoGebra), Exploring Reflection of a Triangle (GeoGebra), focus on green and red examples.

During activity, check for understanding based on lesson items.

Exit Ticket –

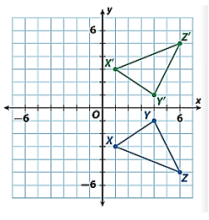
Given the following, state the line of reflection, its impact, and write the rule



Line of reflection _____
Same _____
Opposite_____
Rule$(x, y) \rightarrow$_____

A (9, 2) B (5, 0) C (3, -4)
A′ (9, -2) B′(5, 0) C′(3, 4)

Line of reflection _____
Same _____
Opposite_____
Rule$(x, y) \rightarrow$_____



Line of reflection _____
Same _____
Opposite_____
Rule$(x, y) \rightarrow$_____

Exit Ticket

	Independent Practice – Graphing Reflections Practice	
T	**Day 7 – Mixed Practice/Quiz Review 8.3B,C, 8.10A,B,C** **Warm-Up –** **Warm up** – Given the following name the transformation and give the missing information. 1. $(x, y) \rightarrow (\frac{2}{3}x, \frac{2}{3}y)$ Transformation _____ Describe _____ 2. $(x, y) \rightarrow (x - 2, y + 3)$ Transformation _____ Describe _____ 3. $(x, y) \rightarrow (-x, y)$ Transformation _____ Describe _____ 4. $(1, 3) \rightarrow (5, 8)$ Transformation _____ Describe _____	If students cannot complete 1 – 3 independently, they should be in small group for activity.
	Discussion – How does the algebraic representation tell you what transformation it is? What if you just have coordinates? What can you do?	
T	**EQ Focus –**Why do mathematicians communicate ideas in this way? How can I make sure others understand my mathematical thinking?	
	Activity – Using the same example cards as Day 1, students will go beyond identifying the transformation, and apply writing the algebraic representation for a mix of transformations.	
T	7. **Card _____L_____** **Transformation** _____ **Describe**_____ **Rule**_____ **Preserve Orientation?**_____ **Preserve Congruence?**_____ 8. **Card _____N_____** **Transformation** _____ **Describe**_____ **Rule**_____ **Preserve Orientation?**_____ **Preserve Congruence?**_____ 9. **Card _____P_____** **Transformation** _____ **Describe**_____ **Rule**_____ **Preserve Orientation?**_____ **Preserve Congruence?**_____	
M	They will not be able to complete the activity for the rotation cards.	
	Independent Practice – Are you ready for your quiz? Example problems:	
T	5. A(-4, -3) and B(2, -1) are **reflected over the y axis**. State the new ordered pairs. A′ (___, ___) B′ (___, ___) Rule _____ 6. Write a rule that would **NOT** result in congruent figures $(x, y) \rightarrow$ _____ What type of transformation is this? _____ 7. Write a rule that will preserve orientation. $(x, y) \rightarrow$ _____ What type of transformation is this? _____	Writing the algebraic rule is the readiness standard.
	8. A(-4, -3) and B(2, -1) are **translated 2 down and 3 right**. State the new ordered pairs. A′ (___, ___) B′ (___, ___) Rule _____ 9. A(-4, -3) and B(2, -1) are **dilated using a scale factor of** $\frac{1}{2}$. State the new ordered pairs. A′ (___, ___) B′ (___, ___) Rule _____ 10. A quadrilateral is transformed using the rule $(x, y) \rightarrow (2x, 2y)$. Will the sides of the quadrilaterals be the same length? _____ Will the angles be the same? _____ Will they have the same orientation? _____	
T	**Day 8 – Mid Unit Quiz 8.3A,B,C, 8.10A,B,C** **Warm-Up –** Last minute questions **Activity –** QUIZ over Dilations, Translations, Reflections	Formative Assessment
	Independent Practice – Practice GRAPHING given the pre-image and the algebraic representation. The TEKS in these units do not stress graphing for transformations, but it is important skill for the performance assessment and future math courses. Kuta- All Transformations – Would need to edit to exclude reflecting over lines that are not the x or y axis.	
	Day 9 – Intro to Rotations 8.10A,B,C **Discussion –** Rotations Exploration Example:	

T

A

A

M

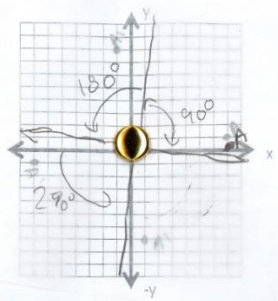
Exploring *Rotations*

Choose a point in Quadrant I close to the X-axis, such as (7, 1).

Put patty paper on top and trace axes and put brad in the origin

Rotate the point about the origin and complete the table below.

Unless otherwise specified, rotations are always **counterclockwise** (to the left).



Rotation	Image of Your Point	(x,y) Rule
90°	(-1, 7)	(x, y) → (-y, x) in words: Switch x and y change
180°	(-7, -1)	(x, y) → (-x, -y) in words: opposite x opposite y
270°	(1, -7)	(x, y) → (y, -x) in words: Switch x and y opposite one number
360°	(7, 1)	(x, y) → (x, y) in words: same

**Now add these rules to your transformation foldable!

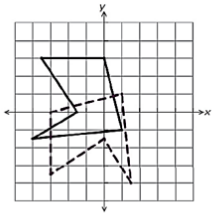
Do rotations preserve orientation and/or congruence? What can you do to help you recall the algebraic representations? How can identifying the quadrant of the pre-image and image help?

EQ Focus – How do mathematicians communicate ideas? Why do mathematicians communicate ideas in this way?

Lesson –

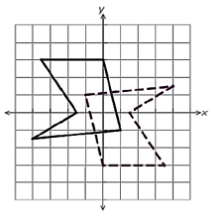
Summarize - Using what you learned in the exploration, write the algebraic rules.

90° counter clockwise
270° clockwise



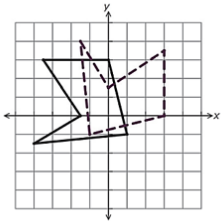
$(x, y) \rightarrow$ (____, ____)

180° counter clockwise
180° clockwise



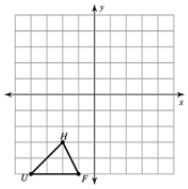
$(x, y) \rightarrow$ (____, ____)

270° counter clockwise
90° clockwise



$(x, y) \rightarrow$ (____, ____)

12. 180°rotation counter clockwise:

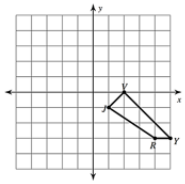


Pre-Image quadrant ____3____

Image quadrant _____

Rule: $(x, y) \rightarrow$ (____, ____)

13. 270°clockwise



Pre-Image quadrant ____4____

Image quadrant _____

Rule: $(x, y) \rightarrow$ (____, ____)

And graph the image.

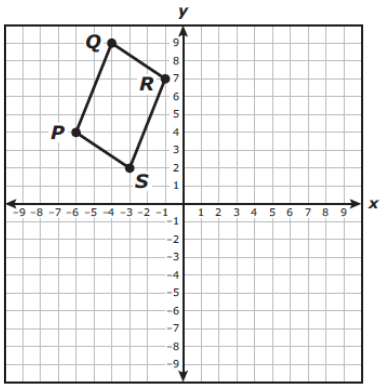
With rotation especially, I show students HOW TO FIND the rule by comparing the pre-image coordinate to the corresponding image coordinate, and HOW TO USE the algebraic representation to find the image coordinates when given the pre-image. It is much easier than the students attempting to free-hand rotate and land on the correct coordinates.

Activity – Transformations – Rotation (GeoGebra)

Independent Practice – Rotations Day 1 Practice.

Potential Rough Spots: x and y being transposed and only one being opposite sign.

Feedback opportunity during activity time.

M M T M T A/M	**Day 10 – Rotations Practice 8.10A,B,C** **Warm-Up –**Question 8 from Released STAAR 2016 on TEA website **8** The coordinate grid shows parallelogram *PQRS*.  Parallelogram *PQRS* is rotated 90° clockwise about the origin to create parallelogram *P′Q′R′S′*. Which rule describes this transformation? **F** $(x, y) \rightarrow (x, -y)$ **G** $(x, y) \rightarrow (-x, y)$ **H** $(x, y) \rightarrow (y, x)$ **J** $(x, y) \rightarrow (y, -x)$ **Lesson –** Given a **coordinate** from the pre-image and image, write the algebraic representation. Given a **graph** of the pre-image and image, write the algebraic representation. Given the coordinates of the pre-image and the algebraic representation, find the coordinates of the image. Given the graph of the pre-image and the algebraic representation, graph the image. Can you do any combination of the above for Rotation? For any transformation? **EQ Focus –**Why do mathematicians communicate ideas in this way? How can I make sure others understand my mathematical thinking? **Activity –** Transformatch! A triangle is graphed on the coordinate plane. For each transformation provided, match the letter of the graph that matches the transformation. Then record the algebraic representation of the transformation. Also Transformation Golf – Rigid Motion (Desmos). **Independent Practice –** Quiz Correction **Day 11 – Model Effect of dilations on linear and area measurements 8.10D** **Warm-Up –** Find Scale Factor of dilation. **EQ Focus –** Why does order matter when following directions? **Activity –** Explore: Effect of Dilation on Perimeter and Area. **Lesson –** Linear is one dimension, so we would have the same change as the scale factor. Area is two dimensions so we end up with the change being scale factor squared. Usable examples and further extension from Conroe ISD Dilations Investigation **Day 12 – Day one of Performance Assessment** **Warm-Up –** On a white board or graph paper: Graph a triangle in quadrant II of the coordinate plane. Write down the coordinates of your pre-image. Apply the transformation $(x, y) \rightarrow (x + 2, y - 1)$. Then to your subsequent image, apply the transformation $(x, y) \rightarrow (2x, 2y)$. Then to that subsequent image, apply the transformation $(x, y) \rightarrow (x, -y)$. Lastly, apply the transformation $(x, y) \rightarrow (-y, -x)$. Take a picture using your phone (if	This question gives very little scaffolding. J is the only rotation rule, if they recognize that F/G are reflections and H is not a rule. If students are struggling, have them choose one point that they can then try to drive the Rule. For example, R is (-1, 7) -> ? and it is a clockwise rotation, so it would end up in the first quadrant. Have them rotate the paper if necessary -> (7,1) So y goes to the first spot, and x changes sign to the y spot. (x,y)->(y,-x) . Answer J. Those who do not find a strategy that works should be pulled for small group.

	possible) of your final result and write down the coordinates of your final image. Compare your results with your table mates. Now using the same transformations, apply them in a DIFFERENT order.	
M	**Discussion –** How were your results different from the first time? Why does the order matter? **EQ Focus –** Why does order matter when following directions? **Lesson –** Performance Assessment Exemplar, including error analysis. What can go wrong? Students take turns giving algebraic representation directions to get from START to FINISH.	
	Examples of misconceptions to cover: Mixing up reflection and rotation rules. When a transformation can look like a translation but is in fact a rotation because of where the vertices end up – possible with rectangles. Or reflections that look like rotations or translations. Mixing up order – dilation then translation OR translation then dilation? How	Use to look for common misconceptions to see who may need more scaffolding for performance task.
T	do the results differ? Using the scale factor for enlargement if it is reduction and vice versa. **Independent Practice –** Students receive performance task guidelines. Come ready to start tomorrow.	
	Day 13 – Day two of Performance Assessment, Create the Path **Activity –** Complete steps 1-3 in class. Make a pre-image and perform 5 transformations. (Total of 6 images on the graph paper) Write algebraic representation in sequential order and include a verbal description of each. **Independent Practice –** Finish Step 4	
	Day 14 – Day three of Performance Assessment: The Game of Telephone **EQ Focus –** How do mathematicians communicate ideas? Why do mathematicians communicate ideas in this way? How can I make sure others understand my mathematical thinking? Why does order matter when following directions?	
T	**Activity –** Students play "Telephone" with their transformations. Students sit in a circle with their own performance task. They pass it to the left. Everyone completes step one from the algebraic representation guide to their neighbor's preimage. Then, they pass it to the left again. Now everyone is completing step two to the image left by the previous person. This happens until all 5 transformations are completed and the final coordinates are written down. **Discussion –** Respond to the short answer questions, then use these as discussion points for the group.	
T	**Independent Practice –** Finish Step 6**:** Send image back to pre-image in fewest transformations possible, include algebraic representation and verbal description.	
T	**Day 15 – Debrief Performance Assessment/Flex Day** **Independent Practice –** COMPLETE REVIEW	Feedback opportunity
T	**Day 16 – REVIEW FOR TEST**	
T	**Day 17 – TEST**	Summative Assessment

Works Cited

Desmos Classroom Activities, teacher.desmos.com/.

Create Custom Pre-Algebra, Algebra 1, Geometry, Algebra 2, Precalculus, and Calculus Worksheets, www.kutasoftware.com/.

Bolen-Abbot, Shelley, et al. *Engaging Mathematic: Grade 8*. Vol. 2, Region 4 Education Service Center, 2014.

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Burger, Edward B, et al. *Texas Go Math! Grade 8* . Houghton Mifflin Harcourt, 2015.

"GeoGebra | Free Math Apps - Used by over 100 Million Students & Teachers Worldwide." *GeoGebra - Dynamic Mathematics*, www.geogebra.org/.

Motivation Math, Mentoring Minds, 2017.

"STAAR Released Test Questions." 21 June 2018, tea.texas.gov/student.assessment/STAAR_Released_Test_Questions/.

Name: _____ 8th Grade Math Period: _____

Transform This! – Performance Assessment

Task Outline

1. Create a preimage on a coordinate plane with four quadrants. You must use integer coordinates.
2. Transform the pre-image FIVE times. Use each transformation AT LEAST ONCE. When complete, this will serve as your key.
3. One a separate sheet of paper, write your 5 transformations as algebraic rules.
4. Make two other coordinate planes
    a. One should have only your pre-image exactly as you created it the first time
    b. The other should have your preimage and the last image you created.

Steps 1 – 4 must be complete in order to participate in Steps 5 and 6

5. In groups of 6, you will take turns applying the rules to each other's coordinate plane from A, like a game of telephone. Students sit in a circle with their own performance task. They pass it to the left. Everyone completes step one from the algebraic representation guide to their neighbor's preimage. Then, they pass it to the left again. Now everyone is completing step two to the image left by the previous person. This happens until all 5 transformations are completed and the final coordinates are written down. When you get yours back, compare it to the key you made.	6. For your coordinate plane B, send your image back to your pre-image in as few transformations as possible using algebraic representations.

Short Answer (After completing Step 5)

1. After participating in Telephone, what is something you learned?

2. Did the result of Telephone match your key perfectly? If not, what were the mistakes?

3. What is something you think could be improved?

After writing your short answer responses, each person in your group will need to share and discuss and least TWO of the questions.

Reflection.

On lined notebook paper, reflect on your performance task. Make sure you answer all of the following questions and that you use complete sentences and paragraph form.

1. What transformations did you use? How did you come up with your algebraic representation step by step guide?
2. How is each transformation described in the algebraic representation? What do the rules *mean* for each transformation?
3. Did you find step 6 easier or more difficult? What strategy did you use to find your path of transformations?

Reflection:

Rubric for Transform This!

Name: _____ Math 8 Period: _____

	Exceeding Expectations	Meeting Expectations	Approaching Expectations	Below Expectations	Comments
Five transformations are created in the coordinate plane based on the pre-image. 20%	Five transformations are created creatively and correctly in the coordinate plane based on the pre-image. Each transformation is included at least once.	Five transformations are created correctly in the coordinate plane based on the pre-image. Each transformation is included at least once.	Five transformations are created in the coordinate plane based on the pre-image, with up to three minor errors (misplaced vertex). Or one transformation is not included.	There are fewer than 5 transformations or the attempted transformations do not maintain the integrity if the pre-image.	
Algebraic representations are used correctly. 30%	Algebraic representations are used correctly on final draft, and step 6 draft. Directions are given in correct form for the Telephone draft.	Algebraic representations are used correctly on final draft, and step 6 draft. Directions are given in correct form for the Telephone draft.	Algebraic representations are used correctly with up to three minor errors.	Algebraic representations are not included or contain major errors including incorrect form of algebraic representation.	
Transformations are described using words. 20%	Transformations are described using words explaining the effect on the transformation. Attributes are compared with pre-image in final draft and step 6 draft. Mathematical language is embraced.	Transformations are described using words explaining the effect on the transformation. Attributes are compared with pre-image in final draft.	Transformations are described using words explaining the effect on the transformation with up to two errors. Transformations are not compared to pre-image in final draft.	Description in words is not included or are incorrect. Mathematical language is avoided.	
Second set of directions gives path from final image back to original pre-image (Using fewer Transformations if possible). 15%	Second set of directions creatively gives path from final image back to original pre-image. **F**ewer transformations are used.	Second set of directions gives path from final image back to original pre-image. Either fewer transformations are used or justification given if not.	Second set of directions gives path from final image back to original pre-image. The same number of transformations are used or more.	Second set of directions does not get final image back to original pre-image or is not included.	
Reflection addresses all questions on prompt thoughtfully. 15%	Reflection addresses all questions on prompt thoughtfully and then some. Mathematical language is embraced. Student's thinking is clear, concise, and profound.	Reflection addresses all questions on prompt thoughtfully. Student's thinking is clear and concise.	Reflection addresses most questions on prompt. Student's meaning is not clear nor necessarily concise.	Reflection is not included or does not address questions from prompt. Mathematical language is avoided.	

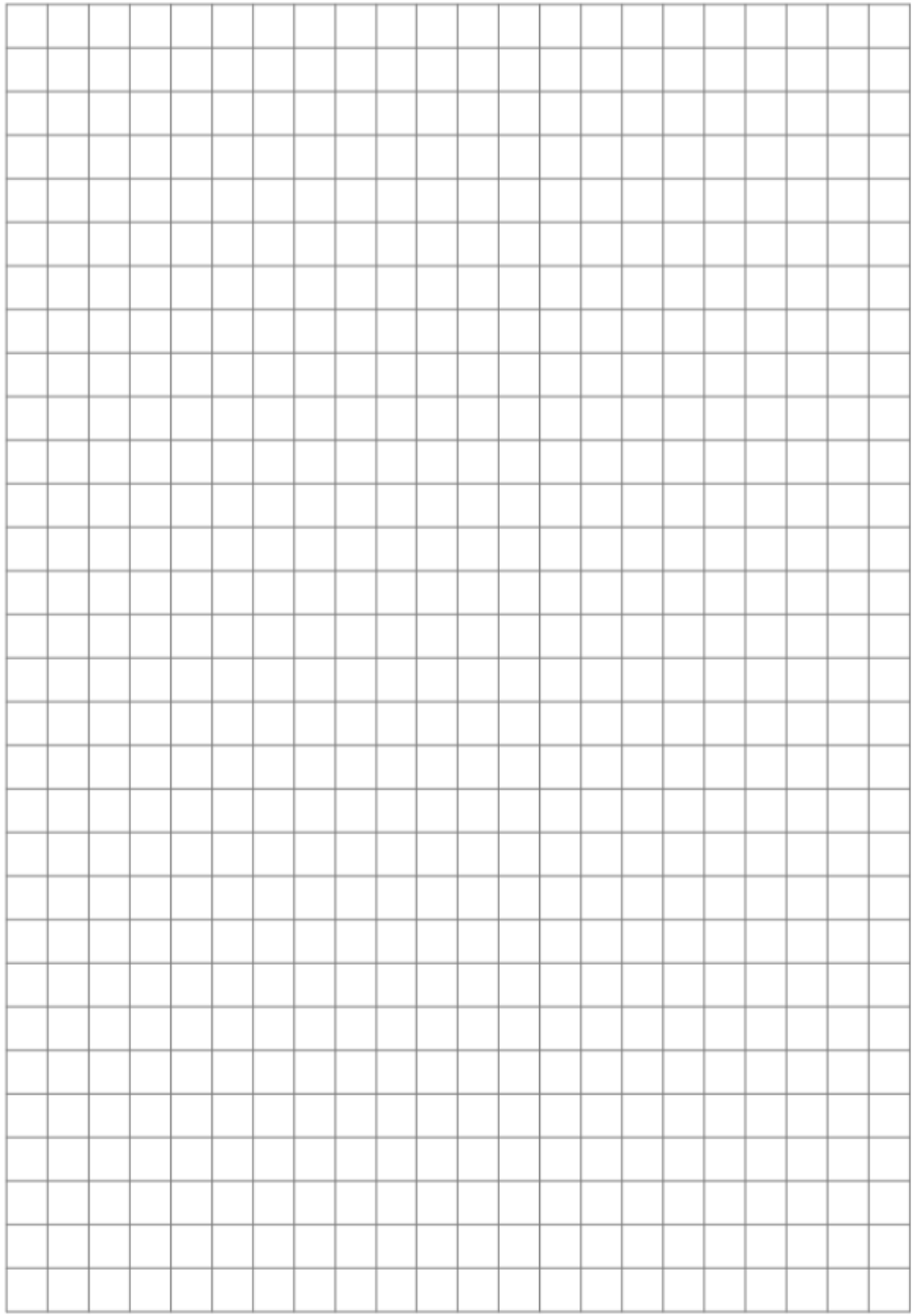
Steps 1 -3 Rough Draft Name: _____ 8 Math: _____

Helpful Hints:

Draw and label your x-axis and y-axis.

Make sure you plot your vertices on integer coordinates.

Use a different color for each image.



Algebraic Representations

First 3 Coordinates of Pre-Image:

A: _____ B: _____ C: _____

Step One:

$(x, y) \rightarrow$ _____

Verbal:

Step Two:

$(x, y) \rightarrow$ _____

Verbal:

Step Three:

$(x, y) \rightarrow$ _____

Verbal:

Step Four:

$(x, y) \rightarrow$ _____

Verbal:

Step Five:

$(x, y) \rightarrow$ _____

Verbal:

Corresponding 3 Coordinates of Final Image:

A': _____ B': _____ C': _____

Transform This! Steps 1- 3 Final Draft

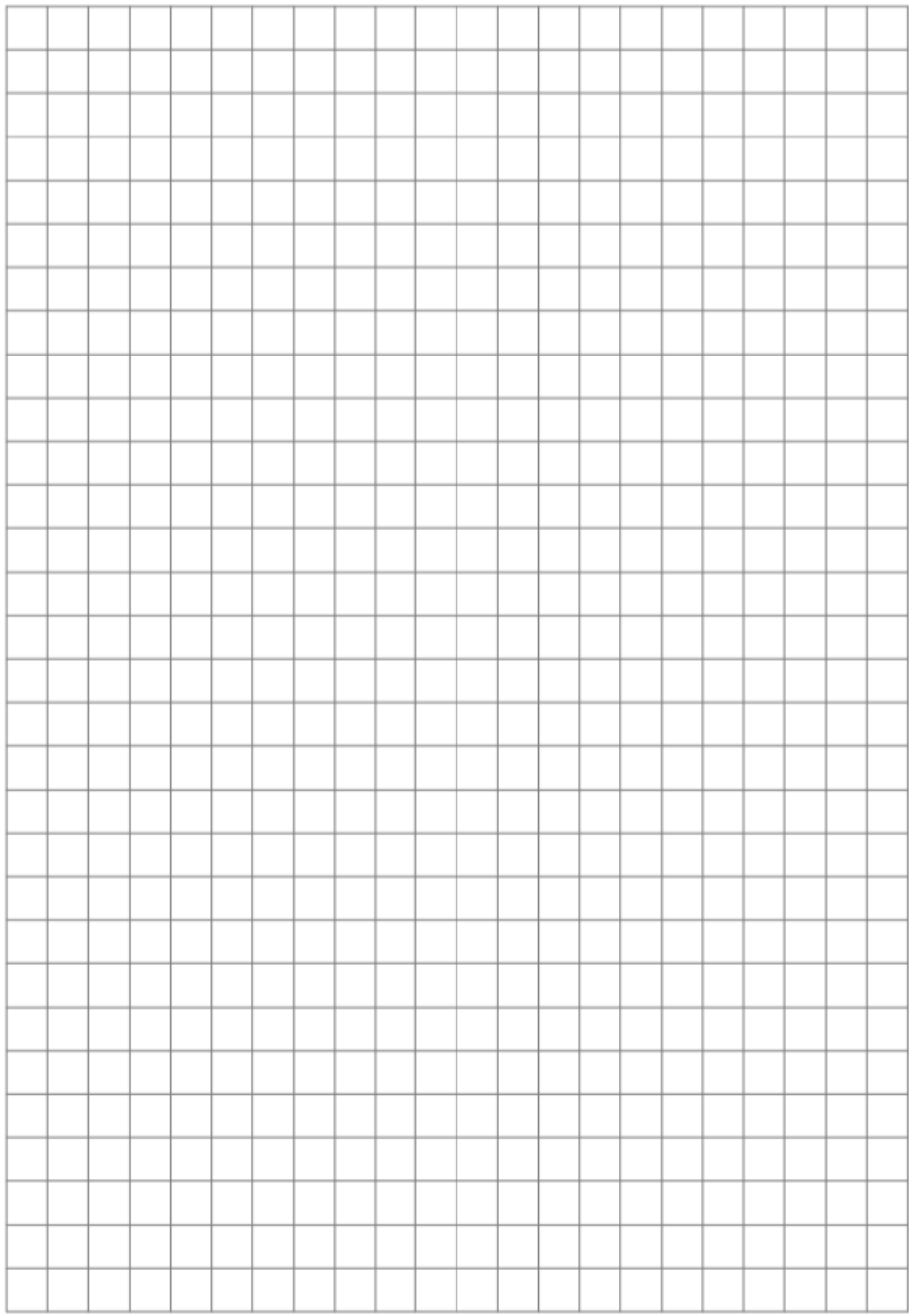
Name: _____ 8 Math: _____

Helpful Hints:

Draw and label your x-axis and y-axis.

Make sure you plot your vertices on integer coordinates.

Use a different color for each image.



Algebraic Representations

First 3 Coordinates of Pre-Image:

A: _____ B: _____ C: _____

Step One:

$(x, y) \rightarrow$ _____

Verbal:

Step Two:

$(x, y) \rightarrow$ _____

Verbal:

Step Three:

$(x, y) \rightarrow$ _____

Verbal:

Step Four:

$(x, y) \rightarrow$ _____

Verbal:

Step Five:

$(x, y) \rightarrow$ _____

Verbal:

Corresponding 3 Coordinates of Final Image:

A': _____ B': _____ C': _____

Transform This! Steps 4 -5 A

Name: _____ 8 Math: _____

Draw and label your x-axis and y-axis.

Plot the PRE-Image as you did on your final draft!

Copy your algebraic rules from your final draft – IN ORDER!

Get ready for our game of

Telephone!

Initials of Person Completing:

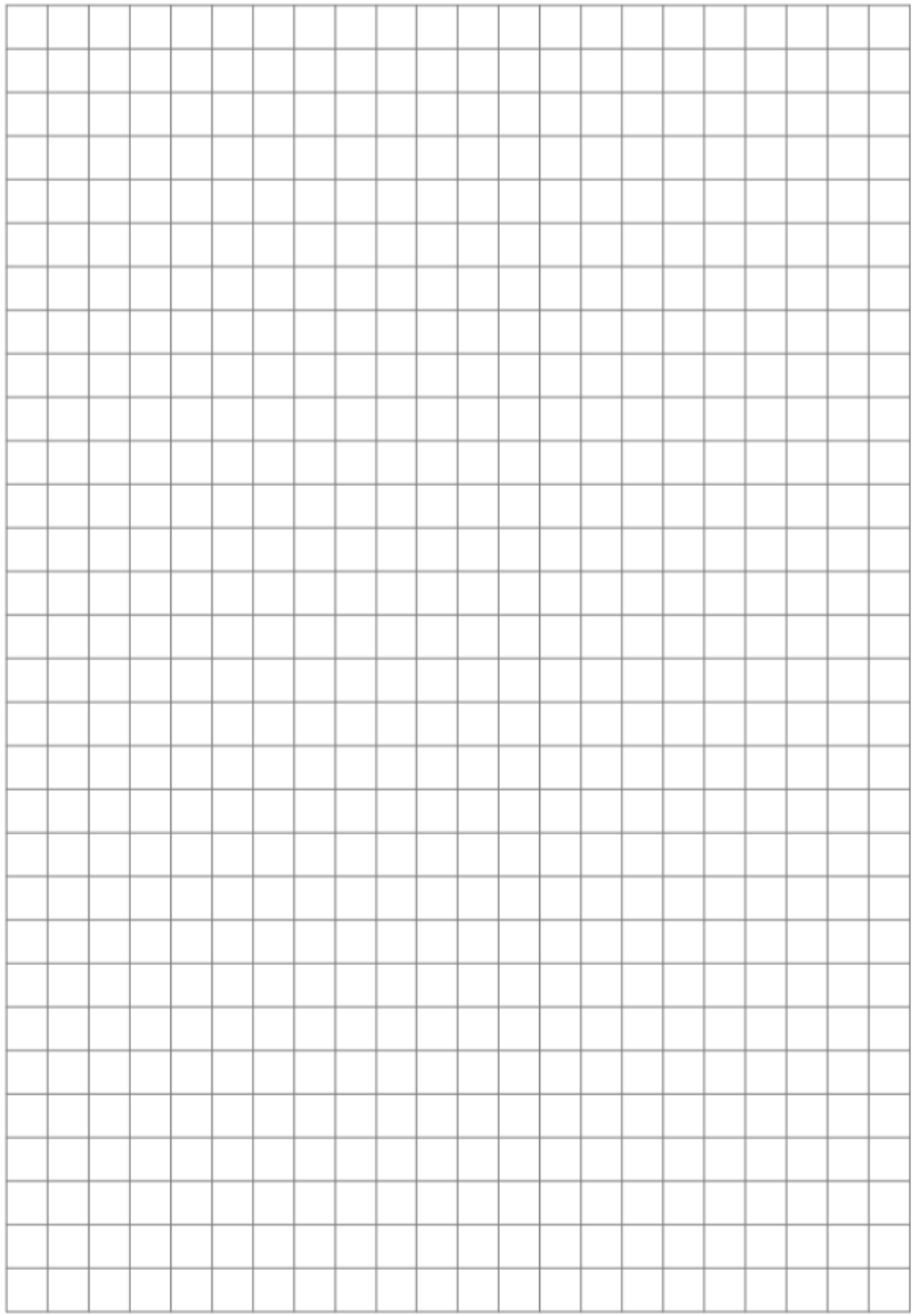
Step 1: _____

Step 2: _____

Step 3: _____

Step 4: _____

Step 5: _____



Algebraic Representations

First 3 Coordinates of Pre-Image:

A: _____ B: _____ C: _____

Step One:

$(x, y) \rightarrow$ _____

Verbal:

Step Two:

$(x, y) \rightarrow$ _____

Verbal:

Step Three:

$(x, y) \rightarrow$ _____

Verbal:

Step Four:

$(x, y) \rightarrow$ _____

Verbal:

Step Five:

$(x, y) \rightarrow$ _____

Verbal:

Corresponding 3 Coordinates of Final Image:

A': _____ B': _____ C': _____

Do these match your final draft?

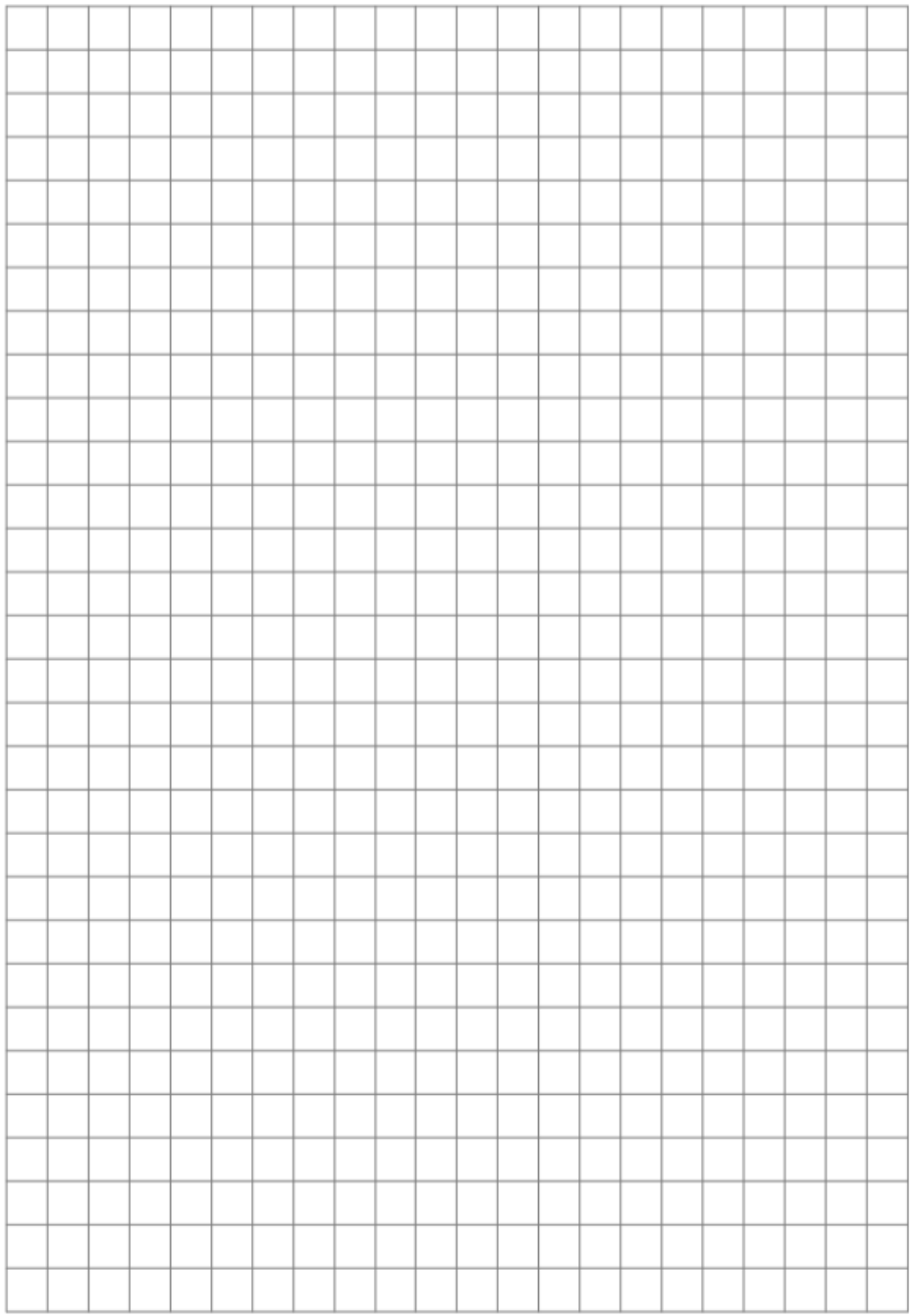
Transform This! Step 6 B

Name: _____ 8 Math: _____

Draw and label your x-axis and y-axis.

Plot the PRE-Image **AND** FINAL Image as you did on your final draft!

Use a different color for each image.



Algebraic Representations

First 3 Coordinates of Pre-Image (Last image from Final Draft):

A: _____ B: _____ C: _____

Step One:

$(x, y) \rightarrow$ _____

Verbal:

Step Two:

$(x, y) \rightarrow$ _____

Verbal:

Step Three:

$(x, y) \rightarrow$ _____

Verbal:

Step Four:

$(x, y) \rightarrow$ _____

Verbal:

Step Five:

$(x, y) \rightarrow$ _____

Verbal:

Corresponding 3 Coordinates of Final Image (Pre-Image from Final Draft):

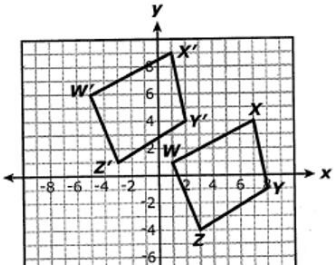
A': _____ B': _____ C': _____

Name: _____ Math 8 _____

TRANSFORMATIONS

Warm – Up Vocabulary – Write one word that give the meaning of the following vocabulary words.

Vertex:	Vertices:
Corresponding:	Figure:
Preserve:	



Word Bank

Shape

Corner

Matching

Keep

Corners

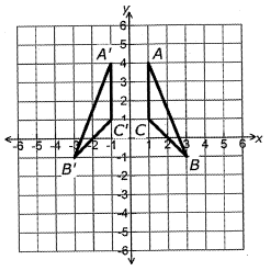
Find the Card with the definitions, fill in the blanks on your paper.

TRANSFORMATION:

A _____ in the _____ or _____ of a _____.

PRE-IMAGE:

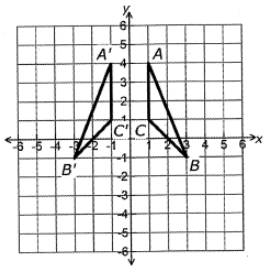
The _____ _____ in a _____.



Card that circles the Pre-Image: _____

IMAGE:

A _____ resulting from a _____.



Card that circles the Image: _____

On the cards with coordinate planes, find the cards (3) that show the transformation in the definition.

TRANSLATION: A _____ is a _____ that _____ a figure **along** a _____ _____. The image has the same _____ and _____ as the preimage.

REFLECTION: A _____ is a _____ that _____ a figure **across** a _____. The _____ is called the _____ __ _____. Each point and its image are the _____ _____ from the line of _____. The image has the same _____ and _____ as the preimage.

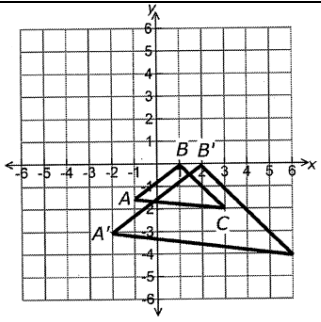
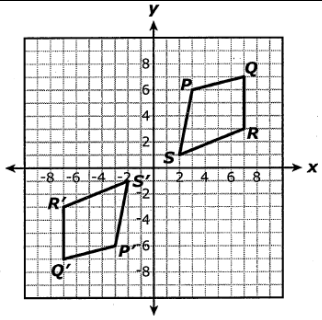
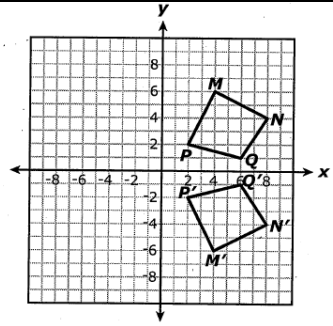
Cards that show a translation:	Leave BLANK for Example!	Cards that show a reflection:	Leave BLANK for Example

ROTATION: A _____ is a _____ that _____ a figure **around** a _____ _____ called the _____ ____ _____. The image has the same _____ and _____ as the preimage.		**DILATION**: A _____ is a _____ that _____ or _____ a figure. Every _____ has a fixed _____ called the _____ of _____. _____ change the _____ (but **NOT** _____) of a figure.	
Cards that show a rotation:	Leave BLANK for Example	Cards that show a dilation:	Leave BLANK for Example

Using the same cards, sort into which transformations preserve CONGRUENCE or ORIENTATION.

CONGRUENCE: A _____ that _____ _____ results in an _____ that is the _____ _____ and _____ _____ as the _____ _____.	**ORIENTATION**: A _____ that _____ _____ results in an _____ that is _____ the _____ _____ as the _____ _____. It is _____ _____ or _____.
Transformation cards that preserve congruence:	Transformation cards that preserve orientation:

PRACTICE naming the image and pre-image of each transformation:

		
Pre-Image:	**Pre-Image:**	**Pre-Image:**
Image:	**Image:**	**Image:**

Translation:

A translation is a transformation that slides a figure **along** a straight line The image has the same size and shape as the preimage.

Reflection:

A reflection is a transformation that flips a figure **across** a line. The line is called the line of reflection. Each point and its image are the same distance from the line of reflection. The image has the same size and shape as the preimage.

Rotation:

A rotation is a transformation that turns a figure **around** a given point called the center of rotation. The image has the same size and shape as the preimage.

Dilation:

A dilation is a transformation that enlarges (makes bigger) or reduces (makes smaller) a figure. Every dilation has a fixed point called the center of dilation. Dilations change the size (but **NOT** shape) of a figure.

Congruence:

A transformation that preserves congruence results in an image that is the same size and the same shape as the original figure.

Orientation:

A transformation that preserves orientation results in an image that is facing the same direction as the original figure. It is **not** flipped or turned.

Pre-Image:

The original figure in a transformation. It is named by the vertices, without apostrophes. Example: Triangle ***ABC***

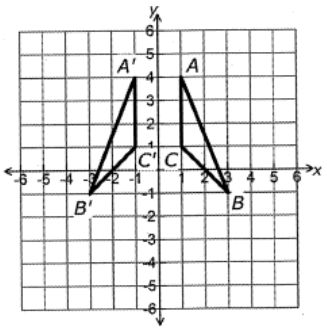
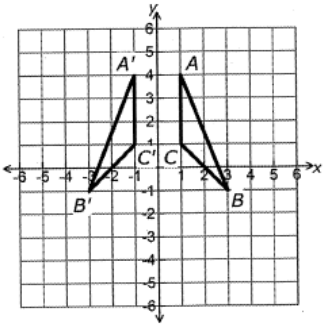


Image:

A figure resulting from a transformation. It is named by the vertices with apostrophes. Example: Triangle ***A'B'C'***



Transformation:

A change in the size or position of a figure.

Example cards not provided.

Name_____ Math 8 Period_____

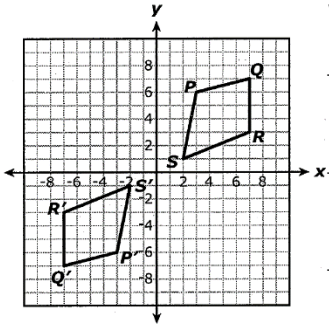
Introduction to Transformations Homework

Use your notes from today's lesson to match the vocabulary word with the corresponding definition.

Vocabulary Word		**Definition**
1. Reflection	Letter _____	**A.** Original figure BEFORE a transformation. No apostrophes on vertices.
2. Dilation	Letter _____	**B.** Facing the same direction that is not a flip or turn.
3. Orientation	Letter _____	**C.** FLIP
4. Image	Letter _____	**D.** TURN
5. Transformation	Letter _____	**E.** Same SIZE Same SHAPE
6. Translation	Letter _____	**F.** One figure changes to form another
7. Congruence	Letter _____	**G.** The figure AFTER a transformation occurs. Vertices have apostrophes.
8. Rotation	Letter _____	**H.** SLIDE
9. Pre-Image	Letter _____	**I.** When a figure is ENLARGED (gets bigger) or REDUCED (gets smaller)

For 1-8, answer the questions about each transformation. The first example is done for you.

1.



What type of transformation?

ROTATION

Does it preserve congruence?

YES

Does it preserve orientation?

NO

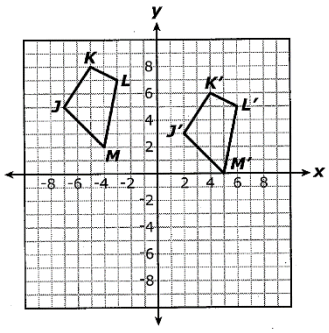
Name the pre-image

PQRS

Name the image

P'Q'R'S'

2.



What type of transformation?

_____

Does it preserve congruence?

_____

Does it preserve orientation?

_____

Name the pre-image

_____

Name the image

_____

I Have… Who Has….? Starter cards.

I have…	I have…
$(2, -3)$	$(6, -9)$
Who has….?	**Who has….?**
The image after dilating by a scale factor of 3?	The image after translating left 9 units and up 3 units?

I have…	I have…
$(-3, -6)$	$(-1, -2)$
Who has….?	**Who has….?**
The image after dilating by a scale factor of $\frac{1}{3}$?	The image after translating 4 units right and 2 units down?

I have…	I have…
$(3, -4)$	$(15, -20)$
Who has….?	**Who has….?**
The image after dilating by a scale factor of 5?	The image after translating 11 units left?

Create cards to continue. Have last card's answer inserted in first card's "I do!" spot.

Name_____ Math 8 Period_____

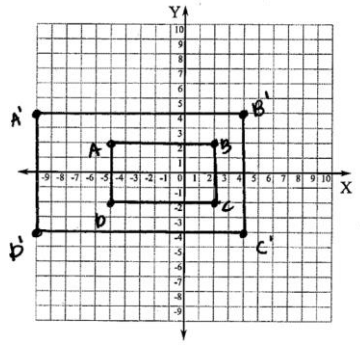
Explore: Effect of Dilation on Perimeter and Area

Review: To find **perimeter**, Add up the Sides To find **area** it is Length times Width

1.
Scale Factor:

Perimeter ABCD
_____
Perimeter A'B'C'D'
_____

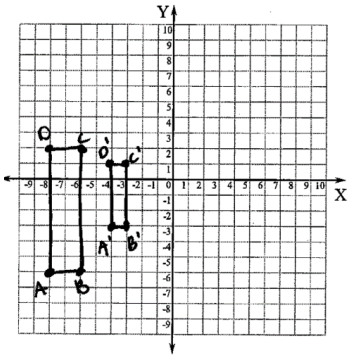
Area ABCD
_____
Area A'B'C'D'
_____



2.
Scale Factor:

Perimeter ABCD
_____
Perimeter A'B'C'D'
_____

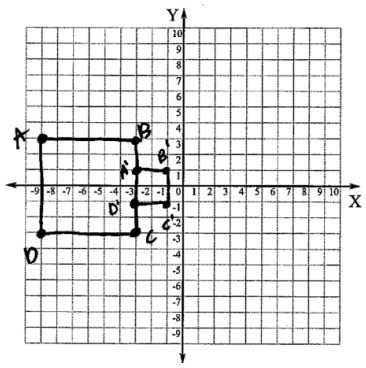
Area ABCD
_____
Area A'B'C'D'
_____



3.
Scale Factor:

Perimeter ABCD
_____
Perimeter A'B'C'D'
_____

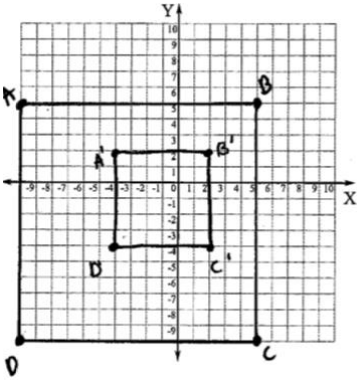
Area ABCD
_____
Area A'B'C'D'
_____



4
Scale Factor:

Perimeter ABCD
_____
Perimeter A'B'C'D'
_____

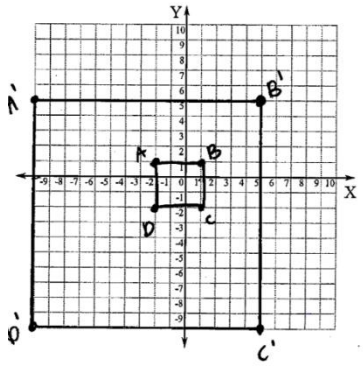
Area ABCD
_____
Area A'B'C'D'
_____



5.
Scale Factor:

Perimeter ABCD
_____
Perimeter A'B'C'D'
_____

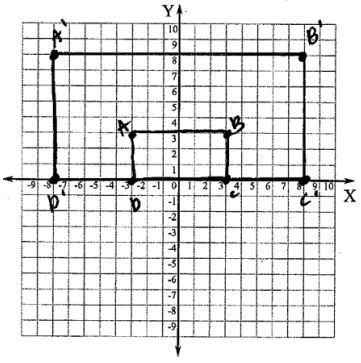
Area ABCD
_____
Area A'B'C'D'
_____



6.
Scale Factor:

Perimeter ABCD
_____
Perimeter A'B'C'D'
_____

Area ABCD
_____
Area A'B'C'D'
_____



Do you see a relationship between the scale factor and each perimeter?

Do you see a relationship between the scale factor and each area?