QUIZ DATE: ____________________ TEST DATE: ____________________

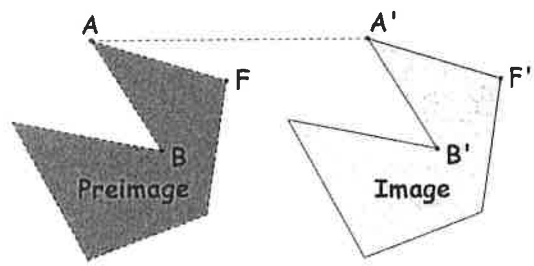
Math 2 – Honors Name____________________

Unit 1 – Geometric Transformations Date____________________Pd_____

Lesson 1 – Introduction to Transformations and Translations

Introduction to Transformations and Translations

- **Congruent figures**: ____.
  - ✓ When two figures are congruent, you can move one figure on top of the other figure with ____.
- **Transformation** of a geometric figure: change in its ____________, ____________, or ________.
- **Preimage** – ______________ figure
  - ✓ Notation: ________
- **Image** – ______ or ______________ figure
  - ✓ Notation: ________

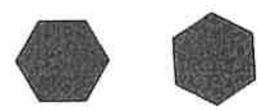


- **Isometry** – transformation in which preimage and image are the ____________ ____________ and ______________ (also called: ______________________________)

Examples:

____

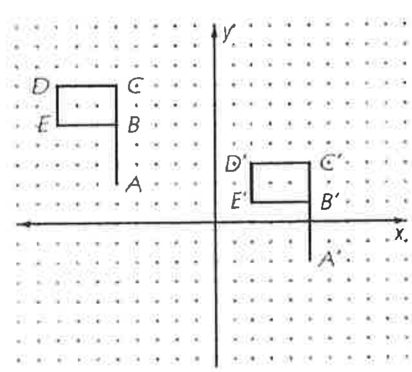
____



____

- **Translation** – an isometry that maps all points the ________ ______________ and the ________ ______________.

❖ **Three ways to describe a translation** (using example shown right):
- ✓ Always **be specific** when completing **any** type of description!!



1) **Words:** Translation to the right 10 units and down 4 units.
2) **Algebraic rule** (motion rule): $T: (x, y) \rightarrow (x + 10, y - 4)$
3) **Vector:** $< 10, -4 >$

❖ **Example: Dot Paper Translations**

1) Use the dots to help you draw the image of the first figure so that A maps to A'.

2) Use the dots to help you draw the image of the second figure so that B maps to B'.

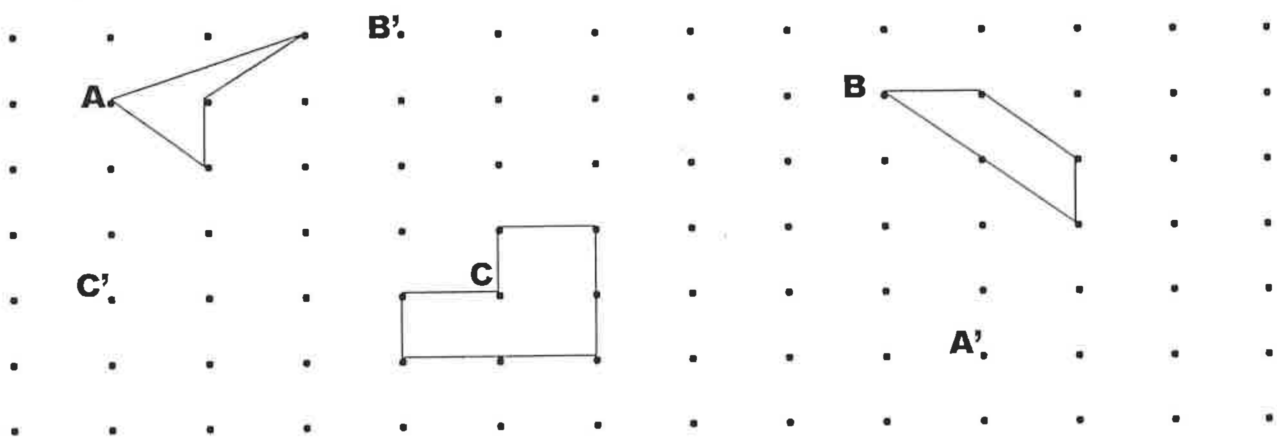
3) Use the dots to help you draw the image of the third figure so that C maps to C'.

4) Complete each of the following translation rules using your mappings from 1 – 3 above.

   a) For A, the translation rule is: T: $(x, y) \rightarrow$ (_______, _______) or <_____, _____>

   b) For B, the translation rule is: T: $(x, y) \rightarrow$ (_______, _______) or <_____, _____>

   c) For C, the translation rule is: T: $(x, y) \rightarrow$ (_______, _______) or <_____, _____>



❖ **Example:** ΔGEO has coordinates G$(-2, 5)$, E$(-4, 1)$ O$(0, -2)$. A **translation** maps G to G' $(3, 1)$.

1. Find the coordinates of: a) E' (_____, _____) b) O' (_____, _____)

2. Describe the transformation in words: ______________________________

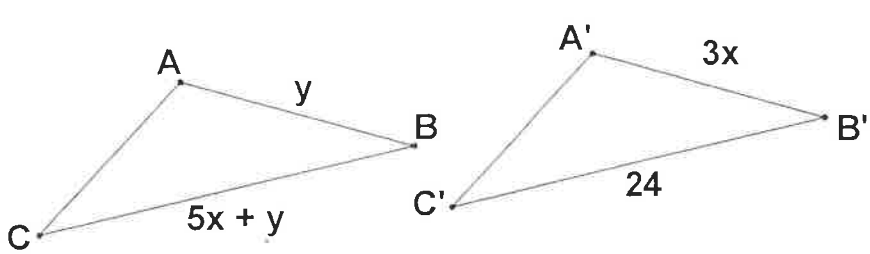
3. The translation rule is T: $(x, y) \rightarrow$ (_______, _______)

4. The vector is <_____, _____>

❖ **Example**: Given the translation from ΔABC to ΔA'B'C', find the specified values for x and y.
Hint: $\Delta ABC \cong \Delta A'B'C'$

$x =$ _______

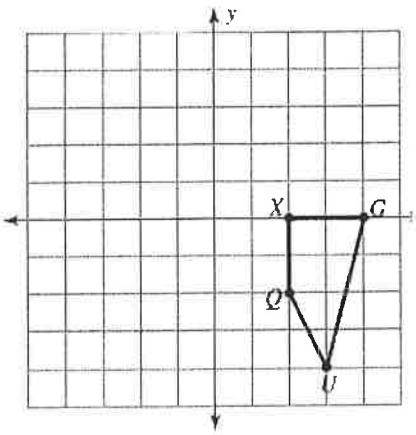
$y =$ _______



Lesson 1 – Translations Classwork

❖ **Graph the image of the figure using the transformation given write the algebraic rule and as requested write a specific verbal description or vector.**

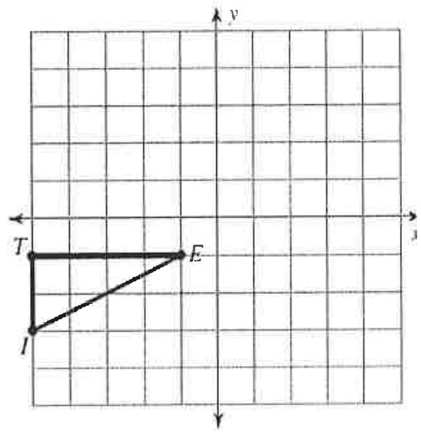
1) translation: 1 unit left



Algebraic Rule:

Vector:

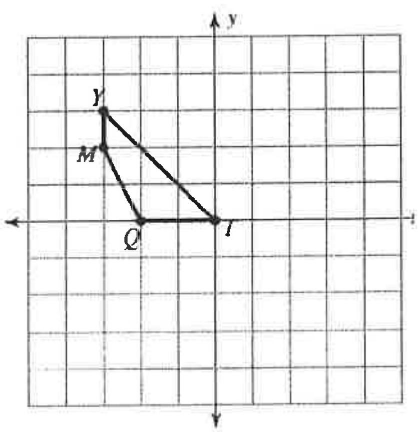
2) translation: 1 unit right and 2 units down



Algebraic Rule:

Vector:

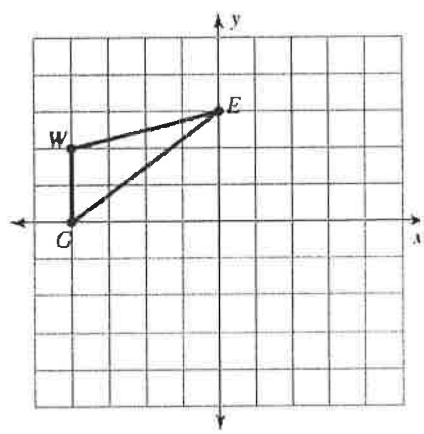
3) translation: 3 units right



Algebraic Rule:

Vector:

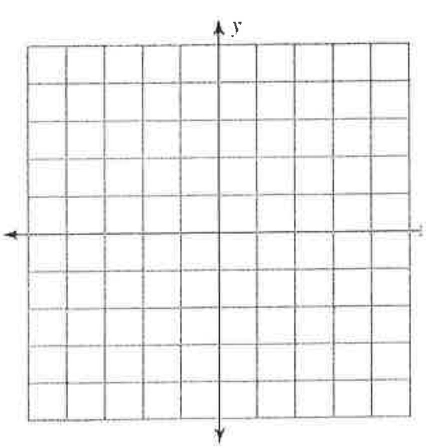
4) translation: $< 1, -2 >$



Algebraic Rule:

Description:

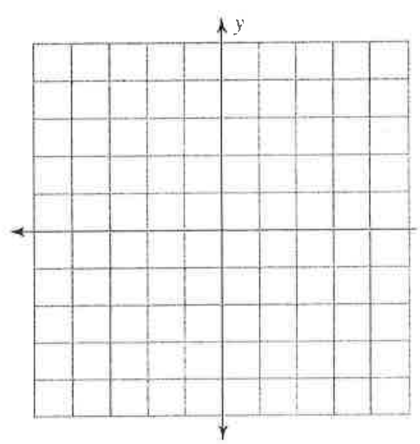
5) translation: 5 units up
$U(-3, -4)$, $M(-1, -1)$, $L(-2, -5)$



Algebraic Rule:

Vector:

6) translation: $< 0, 3 >$
$R(-4, -3)$, $D(-4, 0)$, $L(0, 0)$, $F(0, -3)$



Algebraic Rule:

Description:

❖ **Find the coordinates of the vertices of each figure after the given transformation and write the algebraic rule.**

7) Translation: 2 units left and 1 unit down
$W(0,-1), F(-2,2), H(2,4), S(3,0)$

Vertices:

Algebraic Rule:

Vector Notation:

8) Translation: 2 units down
$M(-4,1), A(-2,5), T(-1,4), H(-1,2)$

Vertices:

Algebraic Rule:

Vector Notation:

---

9) Translation: $< -4, 4 >$
$J(-1,-2), A(-1,0), N(3,-3)$

Vertices:

Algebraic Rule:

Words:

10) Translation: 3 units right and 4 units up
$P(-4,-3), L(-2,-2), T(-2,-4)$

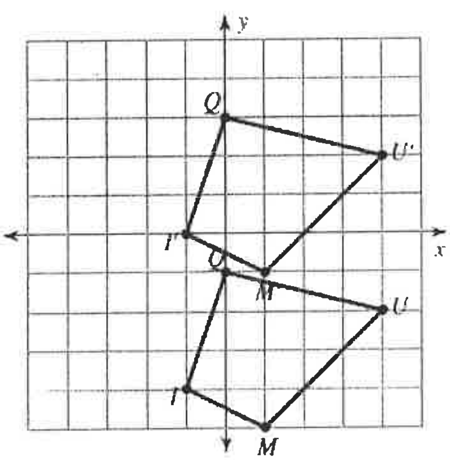
Vertices:

Algebraic Rule:

Vector Notation:

➢ **Write a specific description of each transformation and give the algebraic rule. Then use vector notation.**

11)

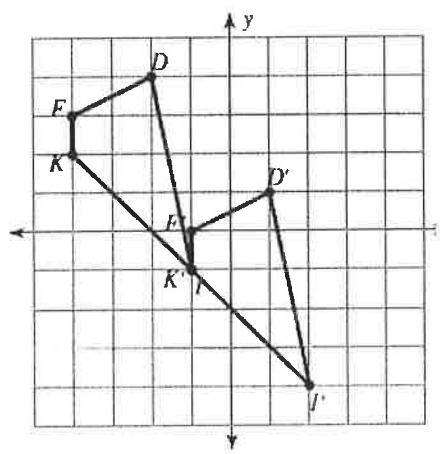


Description:

Algebraic Rule:

Vector Notation:

12)

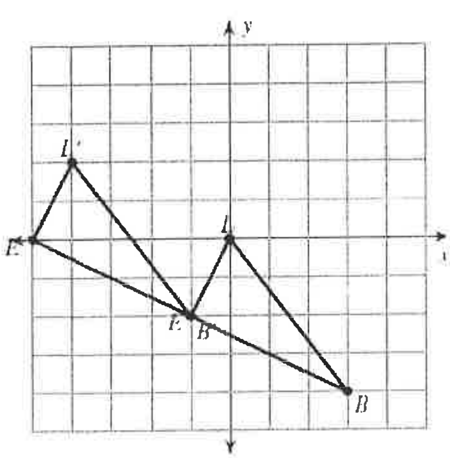


Description:

Algebraic Rule:

Vector Notation:

13)

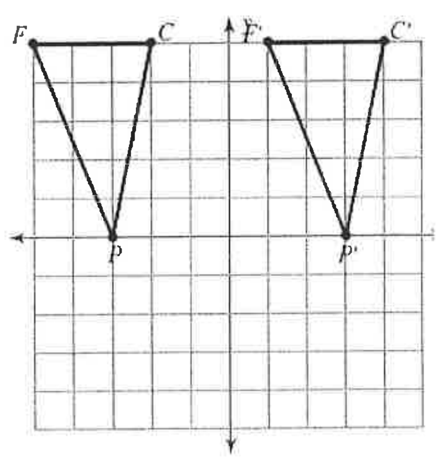


Description:

Algebraic Rule:

Vector Notation:

14)



Description:

Algebraic Rule:

Vector Notation:

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 1 – Translations HOMEWORK

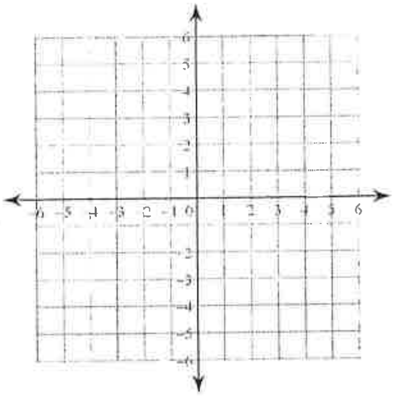
Name____________________
Date________________Pd______

1. Graph and label ΔABC with vertices $A(-3,-1)$, $B(-1,4)$, $and\ C(2,2)$. Graph and label the image of ΔABC under the translation $T: (x,y) \rightarrow (x+2, y-4)$.

A' __________

B' __________

C'__________



Write the rule in vector notation: ______________

Describe in words the shift:

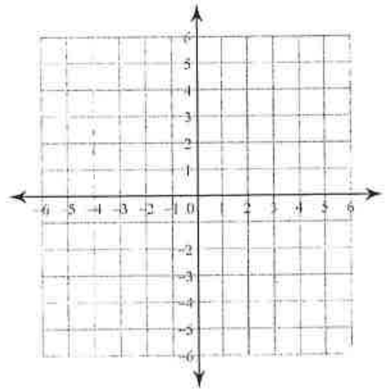
2. Graph and label quadrilateral DUCK with vertices $D(2,2), U(4,1), C(3,-2), and\ K(0,-1)$. Graph and label the image of Quadrilateral DUCK when the Quadrilateral is shifted left 4 and up 3.

D' __________

U' __________

C' __________

K' __________



Write the rule in vector notation: ______________

Write the rule in algebraic notation:

T:

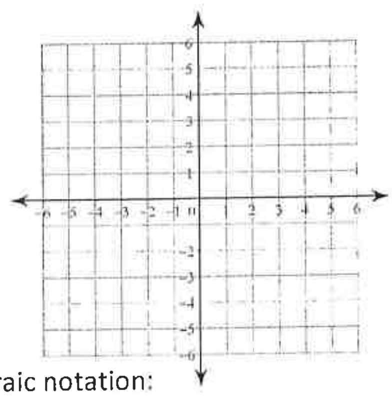
3. Graph and label quadrilateral MATH with vertices $M(4,1), A(2,4), T(0,6), and\ H(1,2)$. Graph and label the image of quad. MATH when the quadrilateral is shifted according to the vector $< -3, -4 >$.

M' __________

A' __________

T' __________

H' __________

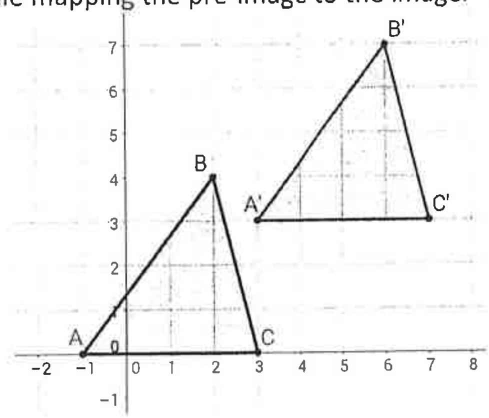


Write the rule in algebraic notation:

T:

Describe in words the shift:

4. Write the rule mapping the pre-image to the image.



Write the rule in vector notation: ______________

Write the rule in algebraic notation:

T:

Describe in words the shift:

For # 5 – 6, Given ΔABC translates to $\Delta A'B'C'$

5. **Find x, y, $m\angle C$, and $m\angle A'$** given $m\angle A = y$, $m\angle A' = 2x + 5$, $m\angle C = 3x - y$, $m\angle C' = 4$

$x =$ ______

$y =$ ______

$m\angle C =$ ______

$m\angle A' =$ ______

6. **Find x, y, BC, and AC** given $BC = 3x - 2y$, $B'C' = 11$, $AC = 3x - y$, and $A'C' = 7$.

$x =$ ______

$y =$ ______

$BC =$ ______

$AC =$ ______

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 2 – Reflections

Name________________________________
Date__________________________ Pd______

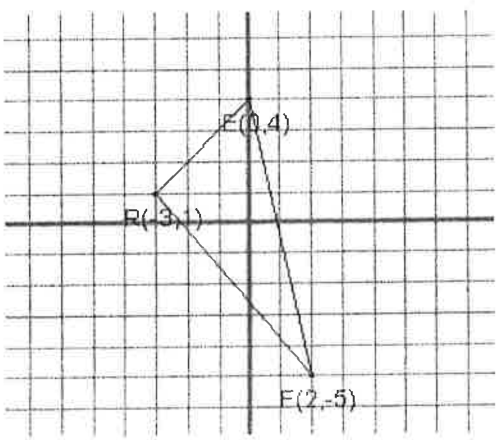
Reflections:

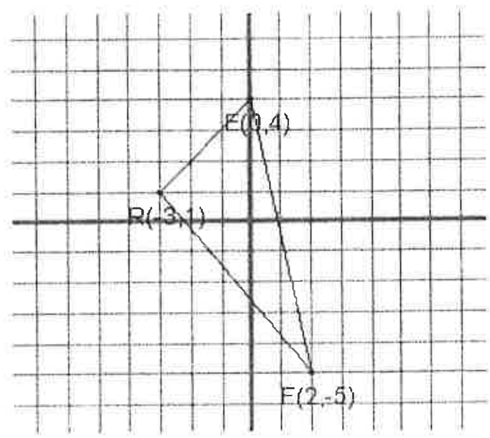
- A reflection is a transformation in which the image is a mirror image of the preimage.
- A point on the line of reflection maps to ____________________.
- Other points map to the ________________________ side of the reflection line so that the reflection line is the ______________________ of the segment joining a preimage and image point.
- Preimage and image points are **equidistant** from the line of ________________________.
- Notation for reflections is $R_{Line\ of\ Reflection}$. Example: R_{x-axis} means reflection in or across the $x - axis$.

Reflections in the coordinate plane. Given ΔREF: $R(-3,1), E(0,4), F(2,-5)$

1) On the first grid, draw the reflection of ΔREF in the $x - axis$. Notation: ______________
Record the new coordinates: R'(____,____), E'(____,____), F'(____,____)

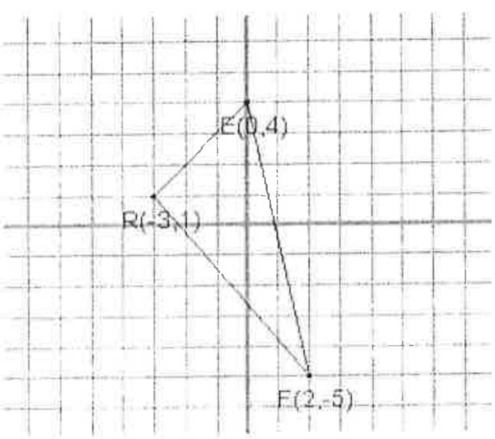
2) On the second grid, draw the reflection of ΔREF in the $y - axis$. Notation: ______________
Record the new coordinates: R'(____,____), E'(____,____), F'(____,____)

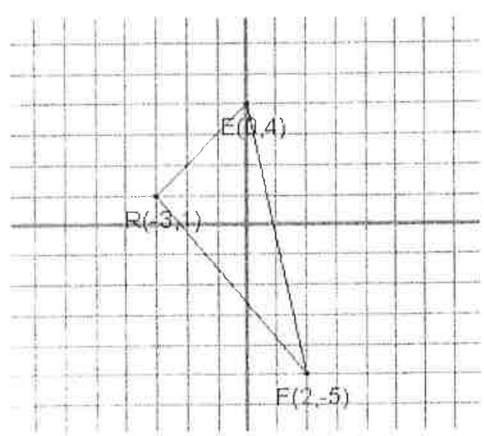




3) Graph the line $y = x$ on the third coordinate grid. Reflect the triangle in the line $y = x$.
Record the new coordinates: R'(____,____), E'(____,____), F'(____,____) Notation: ____________

4) Graph the line $y = -x$ on the fourth coordinate grid paper. Reflect the triangle in the line $y = -x$.
Record the new coordinates: R'(____,____), E'(____,____), F'(____,____) Notation: ____________



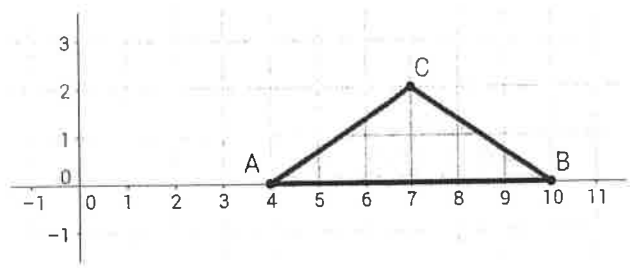


Look at the patterns and complete the rule. Then write the rule using proper notation.

1. Reflection in the $x-axis$ maps $(x, y) \rightarrow$ (______, ______) Notation: ____________
2. Reflection in the $y-axis$ maps $(x, y) \rightarrow$ (______, ______) Notation: ____________
3. Reflection in the line $y = x$ maps $(x, y) \rightarrow$ (______, ______) Notation: ____________
4. Reflection in the line $y = -x$ maps $(x, y) \rightarrow$ (______, ______) Notation: ____________

Reflections with Polygons

Reflection Symmetry



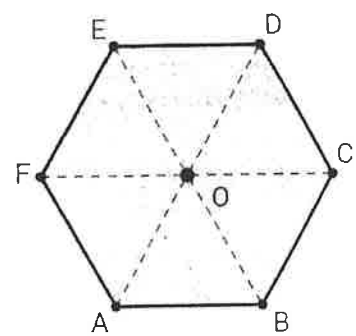
1. Given *Triangle ABC*.
   a. What is the equation of the line of reflection that maps angle A onto angle B? ________________

   b. If we reflect *Triangle ABC* over the line of reflection found in part a, $\overline{AC}$ maps to ______________.

   c. What can we conclude about the **measures** of $\angle A$ and $\angle B$?
   What can we conclude about the **lengths** of $\overline{AC}$ and $\overline{BC}$?

   d. What kind of triangle is ABC?

2. Given *Regular Hexagon ABCDEF*.
   a. List the three lines of symmetry drawn on the diagram at right: _________, _________, _________

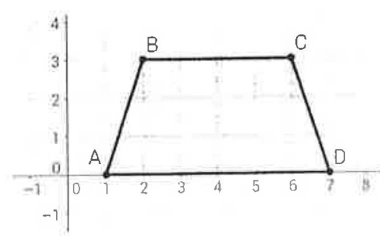


   b. What is the image of point D when reflected across $\overleftrightarrow{BE}$?

   c. What is the image of $\angle OED$ when reflected across $\overleftrightarrow{FC}$?

   d. What conclusions can you make about these angles?

   e. Draw the **other** 3 lines of symmetry not already shown on the diagram.



3. Given *Quadrilateral ABCD*.
   a. The slope of $\overleftrightarrow{BC}$ is ______. The slope of $\overleftrightarrow{AD}$ is ______.
   What kind of quadrilateral is ABCD? Explain how you know.

   b. Let line m be the equation of the reflection line mapping $\overline{CD}$ to $\overline{BA}$.
   Write the equation of line m.

   c. Reflect *Quadrilateral ABCD* over *line m*.

$\angle A$ maps to __________ $\angle B$ maps to __________

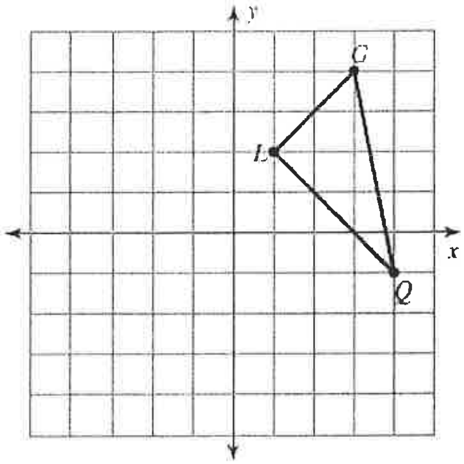
What can be concluded about both pairs of base angles?

Therefore an ____________________ trapezoid

Lesson 2 – Reflections Classwork

❖ **Graph the image using the transformation given, write the proper notation, and give the algebraic rule as requested.**

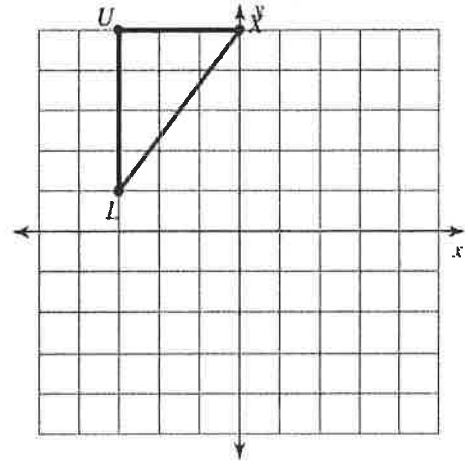
1) reflection across the $y - axis$



Notation:

Algebraic Rule:

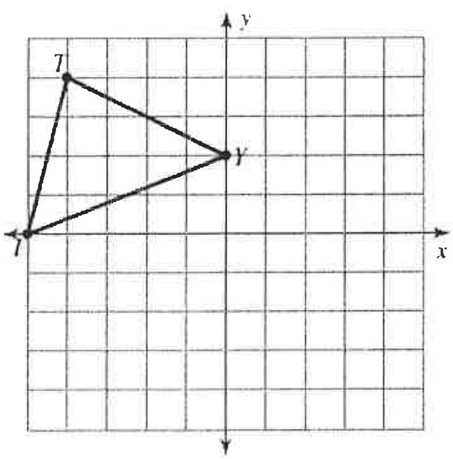
2) reflection across $y = x$



Notation:

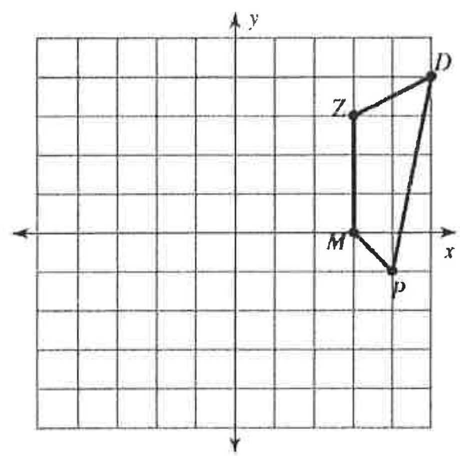
Algebraic Rule:

3) reflection across $y = 1$



Notation:

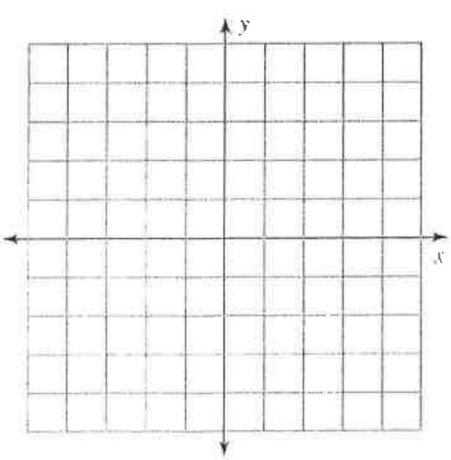
4) reflection across the x-axis



Notation:

Algebraic Rule:

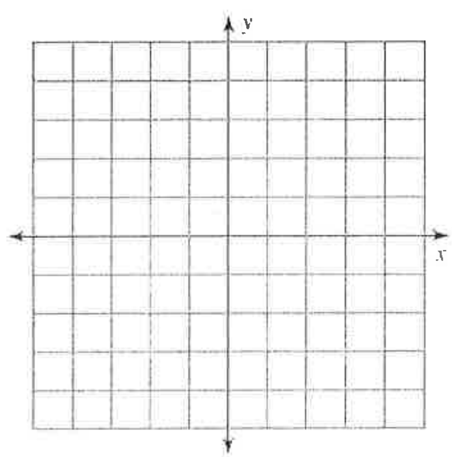
5) reflection across the x-axis
$T(2, 2)$, $C(2, 5)$, $Z(5, 4)$, $F(5, 0)$



Algebraic Rule:

Notation:

6) reflection across $y = -2$
$H(-1, -5)$, $M(-1, -4)$, $B(1, -2)$, $C(3, -3)$



Notation:

Find the coordinates of the vertices of each figure after the given transformation and give the algebraic rule and notation, as requested.

7) Reflection across the $x - axis$
$K(1,-1), N(4,0), Q(4,-4)$

Algebraic Rule:

Notation:

8) Reflection across $y = -x$
$R(-3,-5), N(-4,0), V(-2,-1), E(0,-4)$

Algebraic Rule:

Notation:

9) Reflection across the $y - axis$
$F(2,2), W(2,5), K(3,2)$

Algebraic Rule:

Notation:

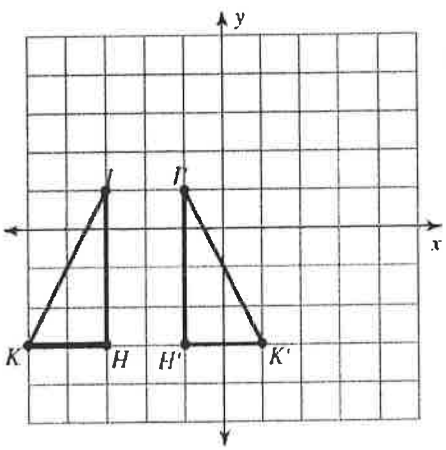
10) Reflection across $y = x$
$V(-3,-1), Z(-3,2), G(-1,3), M(1,1)$

Algebraic Rule:

Notation:

Write a specific description of each transformation and give the algebraic rule, as requested.

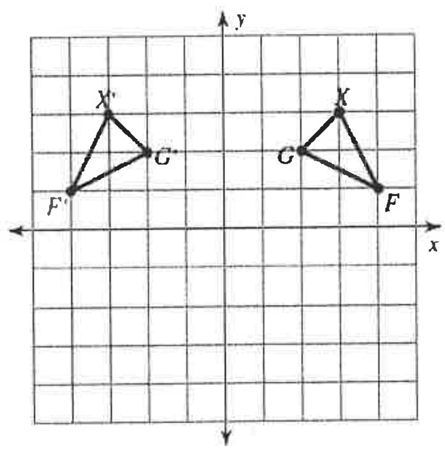
11)



Description:

Notation:

12)

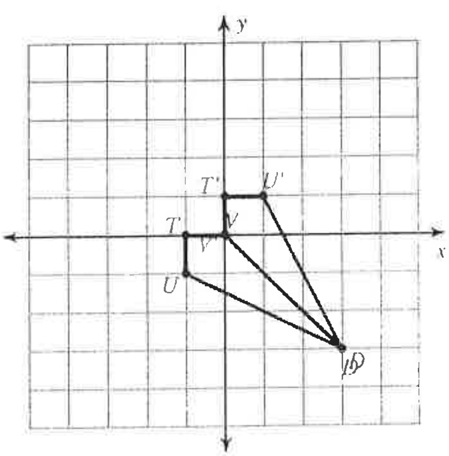


Description:

Algebraic Rule:

Notation:

13)

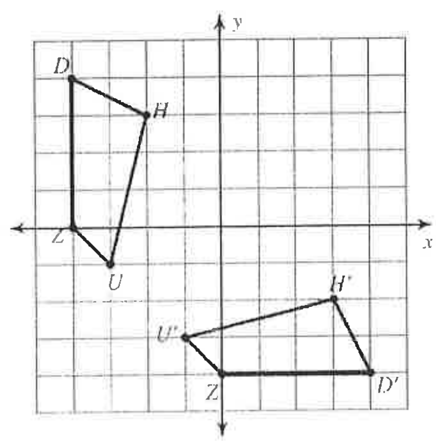


Description:

Algebraic Rule:

Notation:

14)



Description:

Algebraic Rule:

Notation:

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 2 – Reflections HOMEWORK

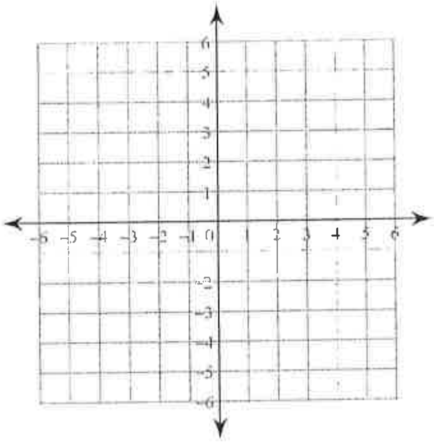
Name________________________________
Date________________________Pd______

1. ΔEFG if $E(-1,2), F(2,4)$ and $G(2,-4)$ reflected over the $y-axis$.

E' ______

F' ______

G' ______



Notation:

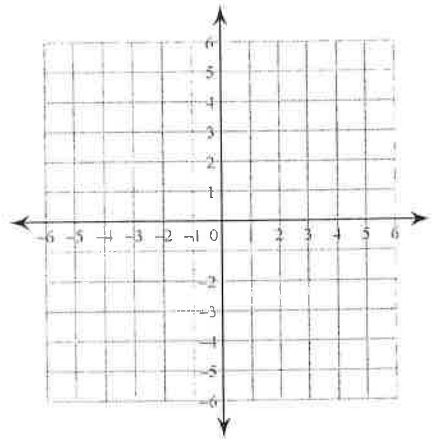
Rule:

2. ΔPQR if $P(-3,4), Q(4,4)$ and $R(2,-3)$ reflected over the $x-axis$.

P' ______

Q' ______

R' ______



Notation:

Rule:

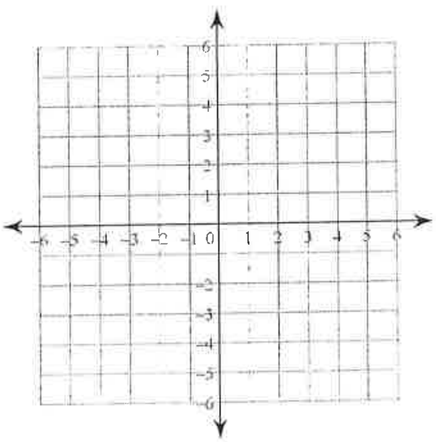
3. Quadrilateral $VWXY$ if $V(0,-1), W(1,1), X(4,-1),$ and $Y(1,-5)$ reflected over the line $y = x$.

V' ______

W' ______

X' ______

Y' ______



Notation:

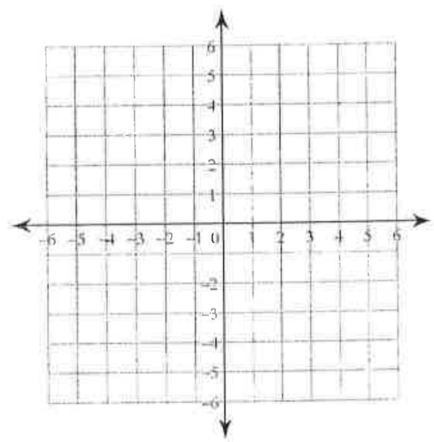
Rule:

4. ΔBEL if $B(-2,3), E(2,4),$ and $L(3,1)$ reflected over the line $y = -x$.

B' ______

E' ______

L' ______



Notation:

Rule:

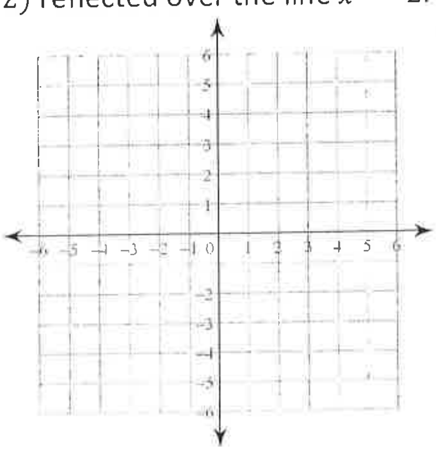
5. Square $SQUR$ if $S(2,4), Q(4,0), U(0,-4),$ and $R(-2,2)$ reflected over the line $x = 2$.

S' ______

Q' ______

U' ______

R' ______



Notation:

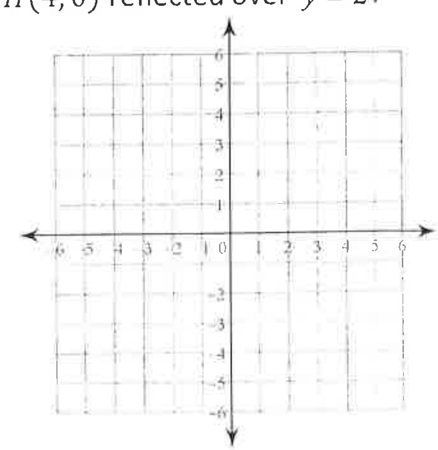
6. Quadrilateral $MATH$ if $M(1,4),$ $A(-1,2),$ $T(2,0)$ and $H(4,0)$ reflected over $y = 2$.

M' ______

A' ______

T' ______

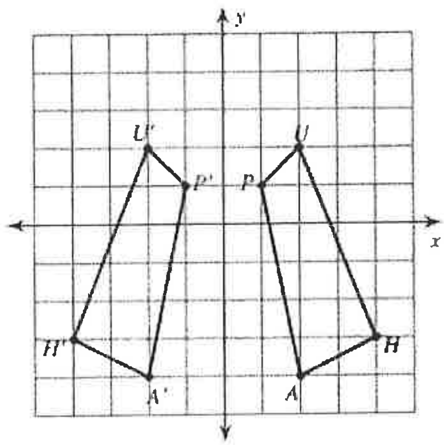
H' ______



Notation:

Write a specific description of each transformation and give the algebraic rule, as requested.

7.

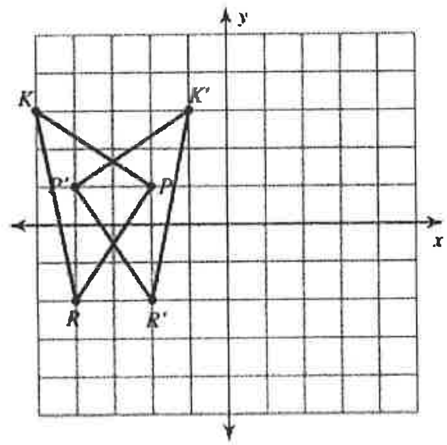


Description:

Algebraic Rule:

Notation:

8.

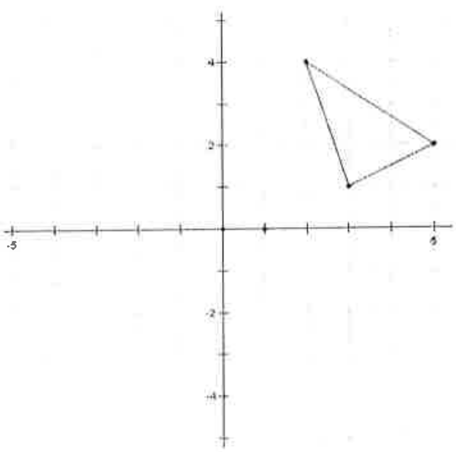


Description:

Notation:

Find the image of the following transformations and give a specific description.
Hint: If you get stuck, review the Checkpoints after today's activities. ☺

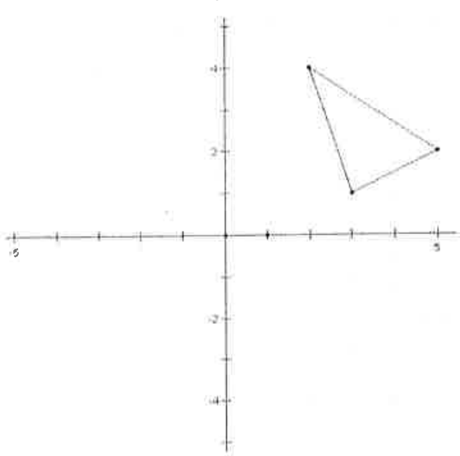
9. The points (2,4), (3,1), (5,2) are reflected with the rule $(x, y) \rightarrow (x, -y)$



Description:

Notation:

10. The points (2,4), (3,1), (5,2) are reflected with the rule $(x, y) \rightarrow (-x, y)$



Description:

Notation:

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 3 – Rotations with Coordinates

Name______________________________
Date________________________Pd_____

Rotations

Definition:

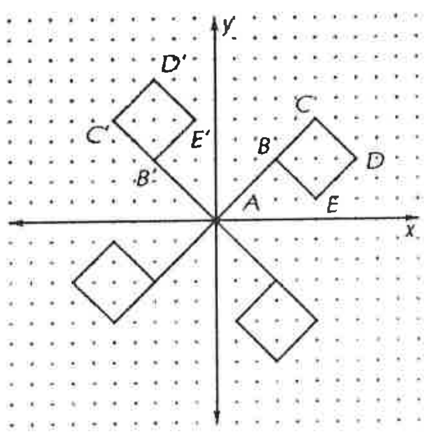
A **rotation** is a type of transformation which is a ________________ in a given direction for a given number of ______________ around a fixed _______________. To rotate an object, you must specify the _________________ of rotation, the ______________ around which the rotation is to occur, and the direction.

- Rotations can be completed in two directions: counter-clockwise & clockwise
- In Math 3: Negative angle measures will indicate a clockwise rotation.

Rotations with a Coordinate Plane

- **Visualizing Rotations Centered About the Origin**

The flag shown below is rotated about the origin 90°, 180°, and 270°. Flag ABCDE is the **preimage**. Flag A'B'C'D'E' is a 90° counterclockwise rotation of ABCDE.



__________ - ____________

______________ Degrees!

____

________________ Degrees!

NOTE: Unless otherwise specified, the standard for rotations is **counterclockwise!**

- **Notation for Rotations:** $\mathcal{R}$____________________

- **Examples:**

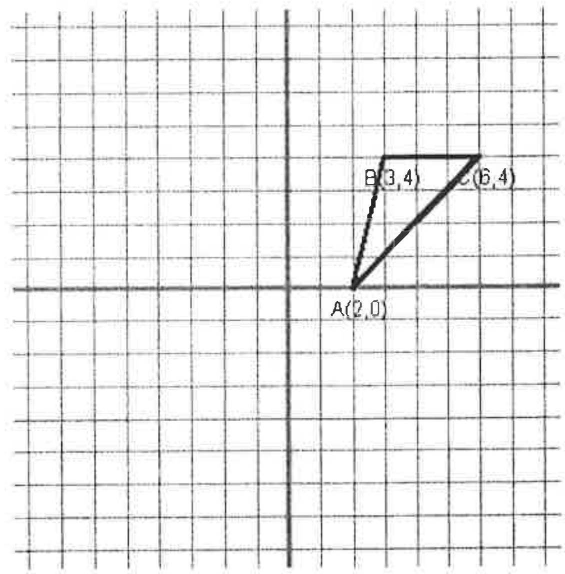
$\mathcal{R}_{90^\circ}$ | $\mathcal{R}_{270^\circ CW}$
$\mathcal{R}_{180^\circ}$ | $\mathcal{R}_{180^\circ CW}$
$\mathcal{R}_{270^\circ}$ | $\mathcal{R}_{90^\circ CW}$

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 3 – Rotations with Coordinates

Name______________________________
Date_______________________Pd______

➢ **Rotations on the Coordinate Plane Exploration:** Triangle ABC has coordinates A(2, 0), B(3, 4), C(6, 4).

Trace the triangle and the $x -$ and $y - axes$ on patty paper.



1) Rotate $Triangle\ ABC$ 90°, using the axes you traced to help you line it back up. Record the new coordinates.

A'(_____ , _____), B'(_____ , _____), C'(_____ , _____)

2) Rotate $Triangle\ ABC$ 270°, using the axes you traced to help you line it up. Record the new coordinates.

A'(_____ , _____), B'(_____ , _____), C'(_____ , _____)

3) Rotate $Triangle\ ABC$ 180°, using the axes you traced to help you line it back up correctly. Record the new coordinates.

A'(_____ , _____), B'(_____ , _____), C'(_____ , _____)

➢ **Rotation Algebraic Rules:**
- ✓ **Look for patterns in the above examples to help complete the following rotation rules.**
- ✓ **Then write the rule using <u>proper notation</u> for 1 – 3.**

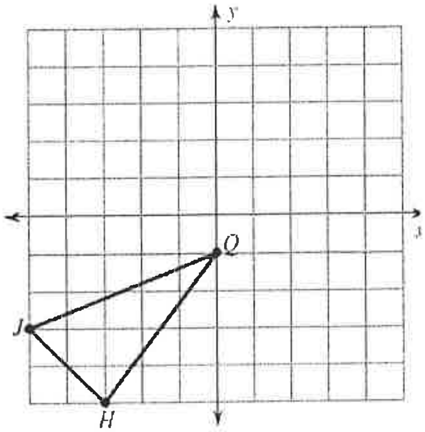
1. A 90° counter-clockwise rotation maps $(x, y) \rightarrow$ (_______ , _______). Notation: __________
2. A 270° counter-clockwise rotation maps $(x, y) \rightarrow$ (_______ , _______). Notation: __________
3. A 180° rotation maps $(x, y) \rightarrow$ (_______ , _______). Notation: __________
4. A rotation of 270° **clockwise** is equivalent to a rotation of ______________________________.
5. A rotation of 270° **counterclockwise** is equivalent to a rotation of ______________________________.
6. A rotation of 180° **counterclockwise** is equivalent to a rotation of ______________________________.

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 3 – Rotations CLASSWORK/HOMEWORK

Name______________________________
Date_____________________ Pd______

➢ **Graph the image of the figure using the transformation given. Also, give the coordinates of the image, the algebraic rule, and the proper notation for the transformation.**

1) rotation 180° about the origin

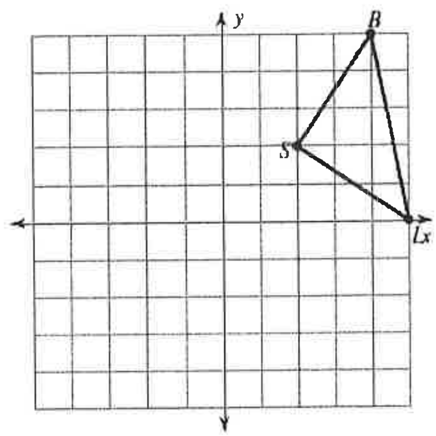


Coordinates:

Algebraic Rule:

Notation:

2) rotation 90° about the origin

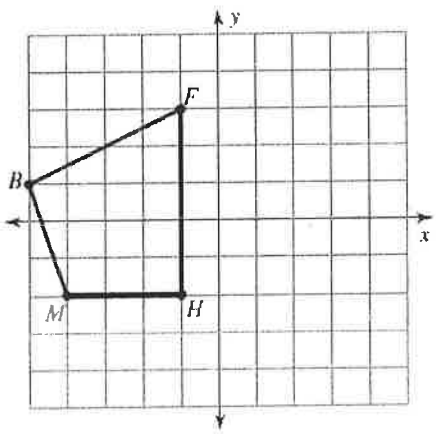


Coordinates:

Algebraic Rule:

Notation:

3) rotation 270° about the origin

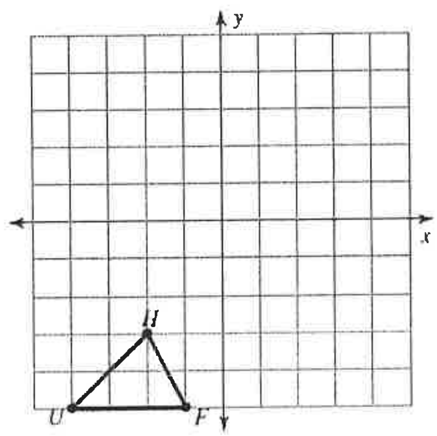


Coordinates:

Algebraic Rule:

Notation:

4) rotation 180° about the origin

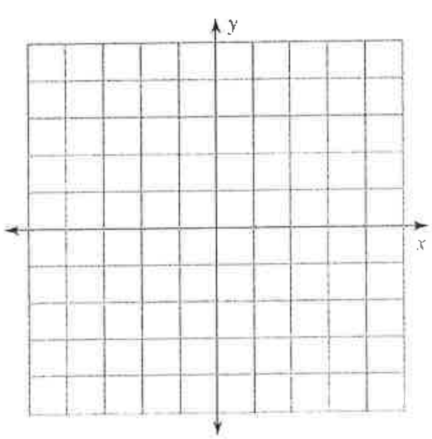


Coordinates:

Algebraic Rule:

Notation:

5) rotation 90° CW about the origin
$U(1, -2)$, $W(0, 2)$, $K(3, 2)$, $G(3, -3)$

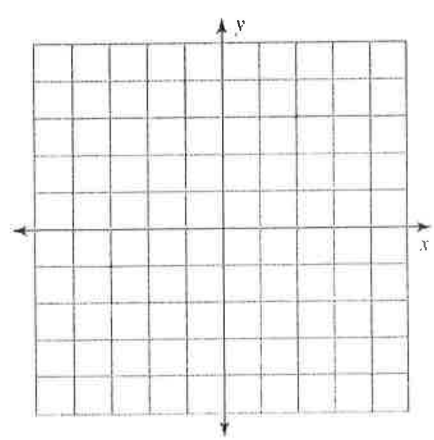


Coordinates:

Algebraic Rule:

Notation:

6) rotation 180° about the origin
$V(2, 0)$, $S(1, 3)$, $G(5, 0)$



Coordinates:

Algebraic Rule:

Notation:

➢ **Identify the coordinates of the vertices for each figure after the given transformation. Also, give the algebraic rule and correct notation for each transformation.**

7) rotation 180° about the origin

$Z(-1,-5), K(-1,0), C(1,1), N(3,-2)$

Vertices:

Algebraic Rule:

Notation:

8) rotation 180° about the origin

$L(1,3), Z(5,5), F(4,2)$

Vertices:

Algebraic Rule:

Notation:

9) rotation 90° about the origin

$S(1,-4), W(1,0), J(3,-4)$

Vertices:

Algebraic Rule:

Notation:

10) rotation 270° about the origin

$W(-5,-3), A(-3,1), G(0,-3)$

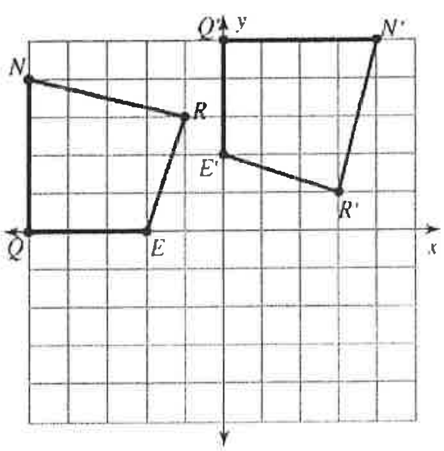
Vertices:

Algebraic Rule:

Notation:

➢ **Write a specific description of each transformation AND give the algebraic rule and notatio.**

11)

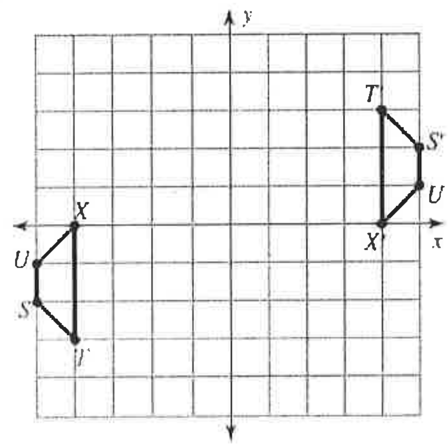


Description:

Algebraic Rule:

Notation:

12)

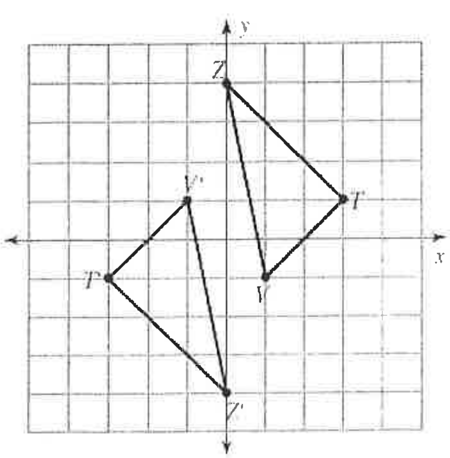


Description:

Algebraic Rule:

Notation:

13)

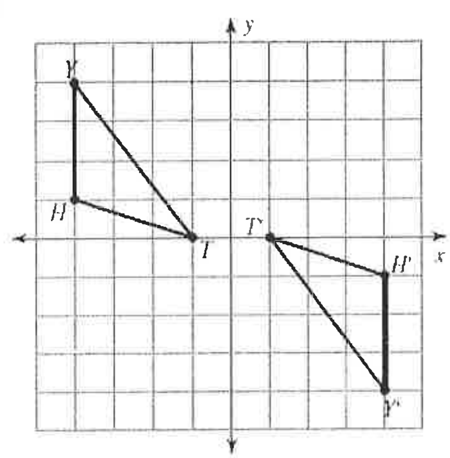


Description:

Algebraic Rule:

Notation:

14)



Description:

Algebraic Rule:

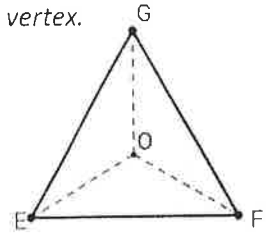
Notation:

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 4 – Rotations with Polygons

Name________________________________
Date__________________________Pd_____

Part 1 – Regular Polygons and Rotational Symmetry

*A **regular polygon** is a **polygon** that is equiangular (all angles are equal in measure) and equilateral (all sides have the same length). In the case of **regular polygons** the **center** is the point that is equidistant from each vertex.*

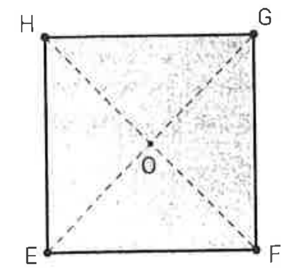


1. Given $Regular\ Triangle\ EFG$ with center O.
   a. F is rotated about O. If the image of F is G, what is the angle of rotation?

   b. $\overline{FG}$ is rotated 120° about O. What is the image of $\overline{FG}$?

> General Rule: The regular triangle has rotation symmetry with respect to the center of the polygon
>
> and angles of rotation that measure _______, _______ and _______.

Side note: A regular triangle is also called an ________________ triangle or an ________________ triangle.



2. Given $Regular\ Quadrilateral\ EFGH$ with center O.
   a. F is rotated about O. If the image of F is G, what is the angle of rotation?

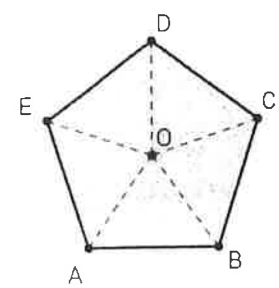
   b. F is rotated about O. If the image of F is H, what is the angle of rotation?

   c. $\overline{FG}$ is rotated 270° about O. What is the image of $\overline{FG}$?

> General Rule: The regular quadrilateral has rotation symmetry with respect to the center of the polygon
>
> and angles of rotation that measure _______, _______, _______ and _______.

Side note: A regular quadrilateral is often called a ________________.

3. Given $Regular\ Pentagon\ ABCDE$ with center O.



   a. C is rotated about O. If the image of C is D, what is the angle of rotation?

   b. C is rotated about O. If the image of C is E, what is the angle of rotation?

   c. C is rotated about O. If the image of C is A, what is the angle of rotation?

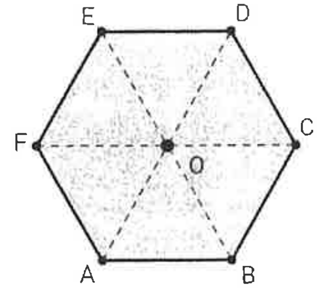
   d. $\overline{DC}$ is rotated 288° about O, what is the image of $\overline{DC}$?

   e. $Pentagon\ ABCDE$ is rotated 72° about O, what is the image of $pentagon\ ABCDE$ (in terms of the original points' labels – do not use $A'B'C'D'E'$)?

   f. Explain the significance of the multiples of 72°.

> General Rule: The regular pentagon has rotation symmetry with respect to the center of the polygon and angles of rotation that measure _________, _________, _________, _________ and _________.

4. Given *Regular Hexagon ABCDEF* with center O.



   a. C is rotated 60° about O, what is the image of C?

   b. C is rotated 120° about O, what is the image of C?

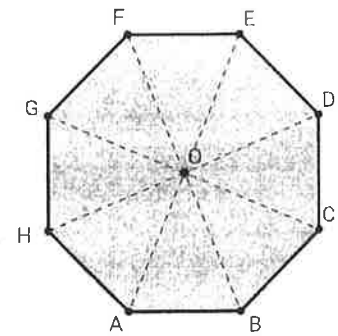
   c. C is rotated 180° about O, what is the image of C?

   d. $\overline{DC}$ is rotated 240° about O, what is the image of $\overline{DC}$?

   e. Explain the significance of the multiples of 60°.

> General Rule: The regular hexagon has rotation symmetry with respect to the center of the polygon and angles of rotation that measure ______, ______, ______, ______, ______ and ______.

5. Given *Regular Octagon ABCDEFGH* with center O.



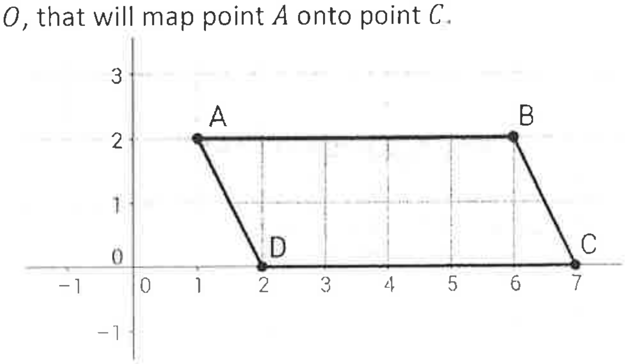
   a. When point C is rotated about O, the image of point C is point D. Describe the rotation (be sure to include degree).

   b. When point C is rotated about O, the image of point C is point F. Describe the rotation (be sure to include degree).

> A regular polygon can be mapped onto itself if we rotate in multiples of the central angle measure.
>
> The central angle of a regular polygon is found by ______________________

Part 2 – Parallelograms and Rotational Symmetry

6. Given *Parallelogram ABCD*, there is a center of rotation, O, that will map point A onto point C.



   a. What are the coordinates of O?

   b. What degree of rotation mapped C onto A using the center O?

   c. If we rotate the parallelogram around center O using the degree measure found in part b, $\angle D$ maps to ________.

   d. If $\angle A$ maps to $\angle C$, then $\angle A$ and $\angle C$ are ________.

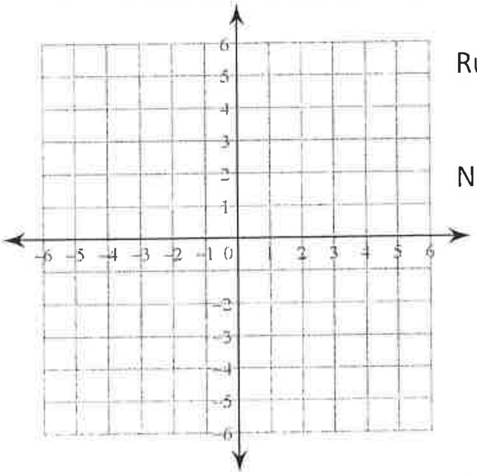
   e. If $\angle D$ maps to ______, then $\angle D$ and ________ are __________.

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 4 – More Rotations HOMEWORK

Name________________________
Date____________________Pd______

❖ **Graph the preimage and image. List the coordinates of the image. Then write the rule and proper notation.**

1) ΔRST: $R(2,-1), S(4,0), and\ T(1,3)$
90° *counterclockwise* about the origin.

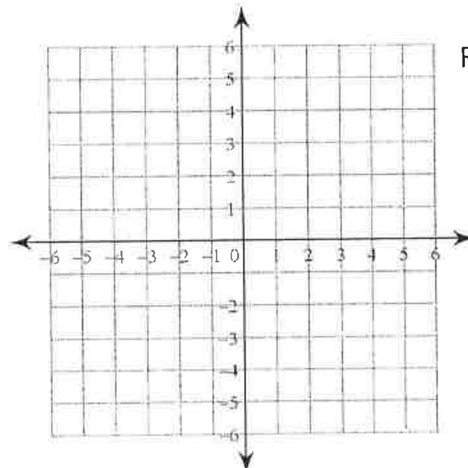


Rule:

Notation:

R' (___,___) S' (___,___) T' (___,___)

2) ΔFUN: $F(-4,-1), U(-1,3), and\ N(-1,1)$
180° *clockwise* about the origin.

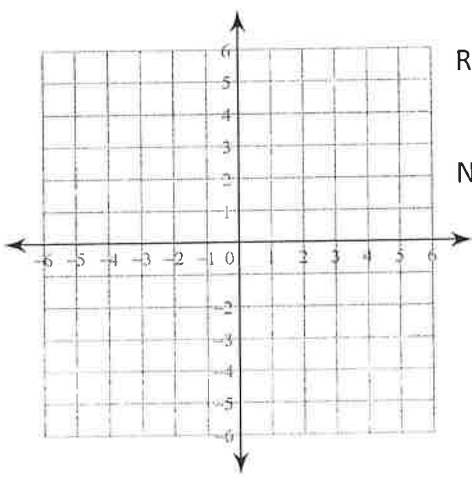


Rule:

Notation:

F' (___,___) U' (___,___) N'(___,___)

3) ΔTRL: $T(2,-1), R(4,0), and\ L(1,3)$
90° *clockwise* about the origin.

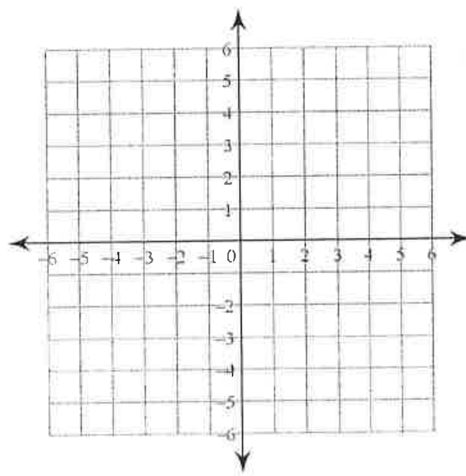


Rule:

Notation:

T' (___,___) R'(___,___) L'(___,___)

4) ΔCDY: $C(-4,2), D(-1,2), and\ Y(-1,-1)$
180° *counter clockwise* about the origin.



Rule:

Notation:

C' (___,___) D' (___,___) Y' (___,___)

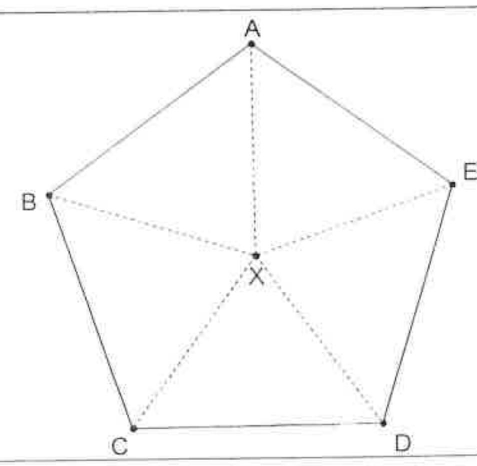
5) Application

$ABCDE$ is a regular pentagon with center X.

a. Name the image of point E for a *counterclockwise* 72° rotation about X.

b. Given the image for a *clockwise* 216° rotation about X is $\overline{CB}$. What was its preimage?

c. Describe 2 rotations with a preimage of point D and image of B.



Practice: Rotations with Coordinates

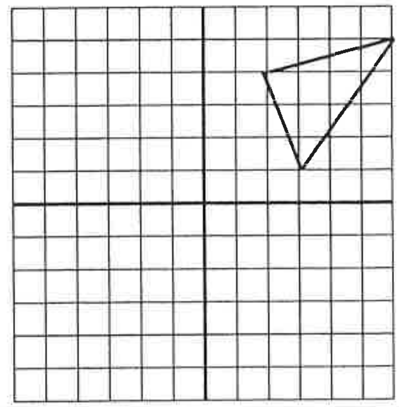
For each problem graph the image points. Specifically describe in words the rotation that occurred. Then, write the Algebraic Rule and the proper notation for the rotation.

1) The coordinates of ΔABC are $A(3,1), B(6,5)$ and $C(2,4)$. The coordinates of A'B'C' are $A'(-1,3), B'(-5,6), and\ C'(-4,2)$.

Description:

Algebraic Rule:

Notation:

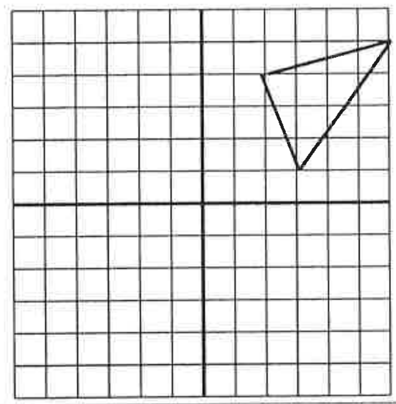


2) The coordinates of ΔABC are $A(3,1)$, $B(6,5)\ and\ C(2,4)$. The coordinates of A'B'C' are $A'(1,-3), B'(5,-6), and\ C'(4,-2)$.

Description:

Algebraic Rule:

Notation:

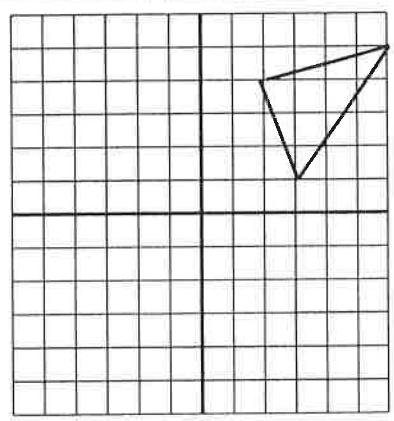


3) The coordinates of ΔABCABC are $A(3,1)$, $B(6,5)\ and\ C(2,4)$. The coordinates of A'B'C' are $A'(-3,-1), B'(-6,-5), and\ C'(-2,-4)$.

Description:

Algebraic Rule:

Notation:

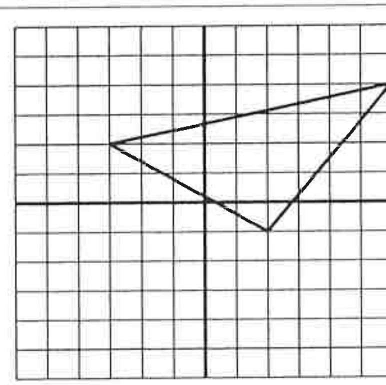


4) The coordinates of ΔABC are $A(2,-1)$, $B(6,4)\ and\ C(-3,2)$. The coordinates of A'B'C' are $A'(-1,-2), B'(4,-6), and\ C'(2,3)$.

Description:

Algebraic Rule:

Notation:



Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 5 – Dilations

Name________________________________
Date__________________________Pd______

Alice in Wonderland

In the story, Alice's Adventures in Wonderland, Alice changes size many times during her adventures. The changes occur when she drinks a potion or eats a cake. Problems occur throughout her adventures because Alice does not know when she will grow larger or smaller.

Part 1

As Alice goes through her adventure, she encounters the following potions and cakes:

Red potion – shrink by $\frac{1}{9}$

Blue potion – shrink by $\frac{1}{36}$

Green potion – shrink by $\frac{1}{15}$

Yellow potion – shrink by $\frac{1}{4}$

Chocolate cake – grow by 12 times

Red velvet cake – grow by 18 times

Carrot cake – grow by 9 times

Lemon cake – grow by 10 times

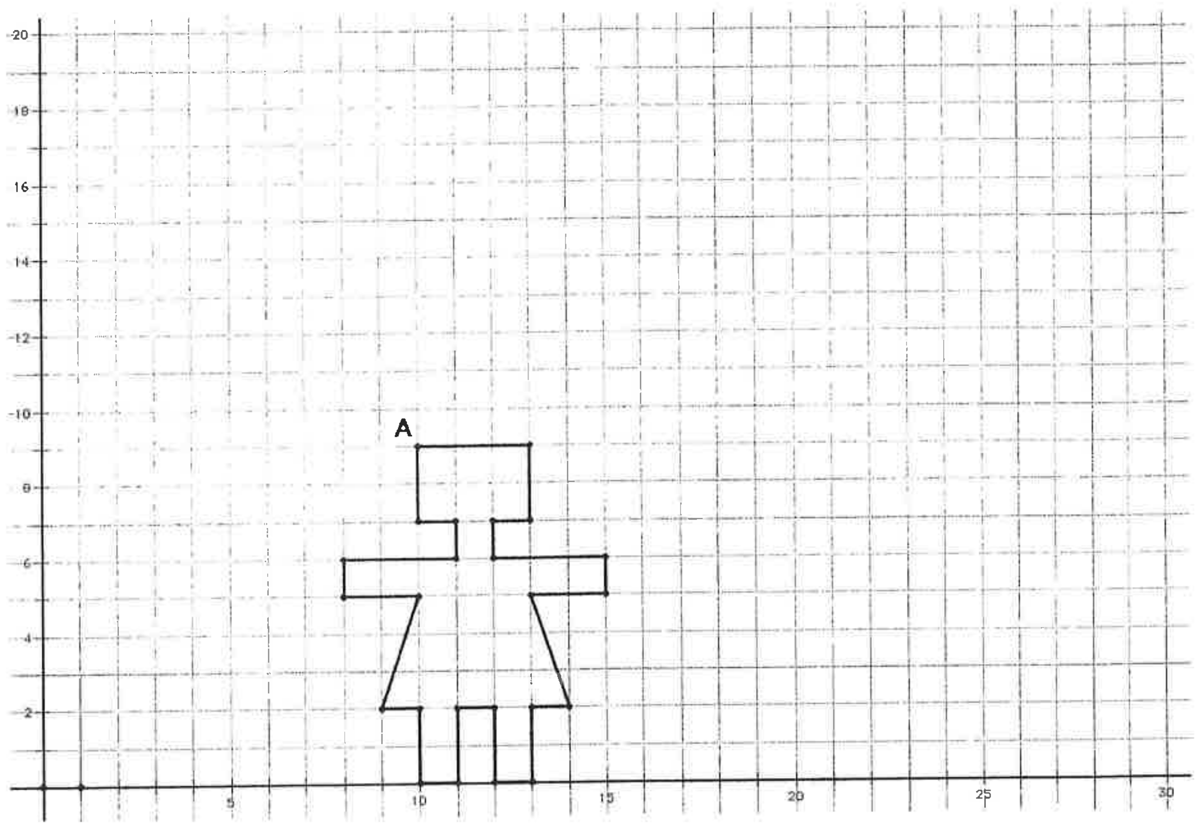
Find Alice's height after she drinks each potion or eats each bite of cake. **If everything goes correctly, Alice will return to her normal height by the end.**

Starting Height	Alice Eats or Drinks	Scale factor from above	New Height
54 inches	Red potion	$\frac{1}{9}$	6 inches
6 inches	Chocolate cake		
	Yellow potion		
	Carrot cake		
	Blue potion		
	Lemon cake		
	Green potion		
	Red velvet cake		**54 inches**

Part 2

A) The graph below shows Alice at her normal height.

B) Plot point A' such that it is twice as far from the origin as point A. Do the same with all of the other points. Connect the points to show Alice after she has grown.



C) Answer the following questions:

1. How many times larger is the new Alice? ____________________

2. How much farther away from the origin is the new Alice? ____________________

3. What are the coordinates for point A? __________ Point A'? __________

4. What arithmetic operation do you think happened to the coordinates of A?

5. Write your conclusion as an Algebraic Rule $(x, y) \rightarrow (\quad , \quad)$

6. What arithmetic operation on the coordinates do you think would shrink Alice in half?

7. Write your conclusion as an algebraic rule.

8. If Alice shrinks in half, how far away from the origin will her image be from her preimage?

9. Sketch Alice after she shrinks.

10. Choose a diagonal segment on Alice's dress. Calculate the slope of this segment on all three dresses.
    What do you notice about all three of the slopes? ____________________
    What is the name given to this geometric relationship? ____________________

➢ A **DILATION** stretches or shrinks the original figure.

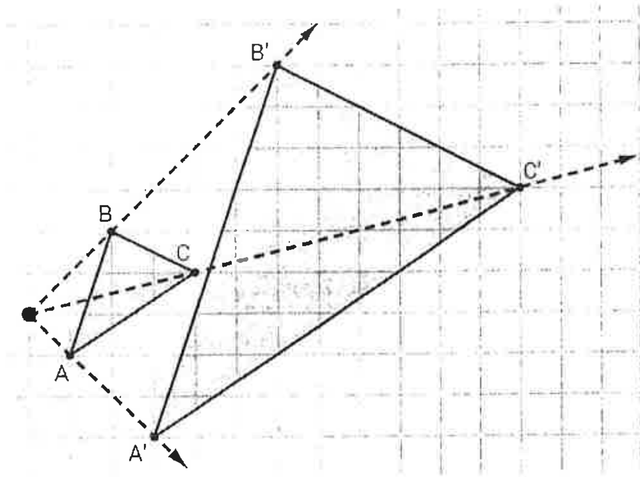
- The **description** of a dilation should include the ________ ________, the ________ of the dilation, and whether the dilation is an ________ or a ________.
- The amount by which the image grows or shrinks is called the "________ ________."
- The ________ of dilation is a fixed point in the plane about which all points are expanded or contracted.
- A dilation is an enlargement of the pre-image if the ________ ________ is ________.
- A dilation is a reduction of the pre-image if the ________ ________ is ________.
- If the scale factor is 1, then the pre-image and image are ________.

❖ **Algebraic Rule: (x, y) → (ax, ay)**

If a > 1 then the dilation is __ ________

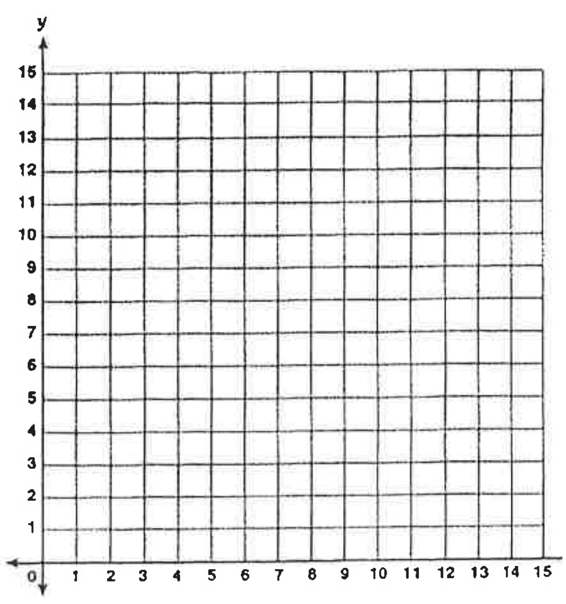
If 0 < a < 1 then the dilation is __ ________

The distance between the center of a dilation and any point on the pre-image is equal to the ________ ________ multiplied by the distance between the dilation center and the corresponding point on the image.



❖ **A dilation is SOMETIMES / ALWAYS / NEVER an 'Isometry'.**

1. Graph and connect these points: (2, 2) (4, 6) (6, 2) (6, 6).



2. Graph the image on the same coordinate plane by applying a scale factor of 2.

   Write the rule: ________

3. Graph the image on the same coordinate plane by applying a scale factor of $\frac{1}{2}$.

   Write the rule: ________

4. Choose a diagonal segment on the trapezoid. Calculate the slope of this segment on all three figures.
   What do you notice about all three of the slopes? ________
   What is the name given to this geometric relationship?
   ____

Math 2
Unit 1 – Geometric Transformations
Lesson 5 – Dilations CLASSWORK

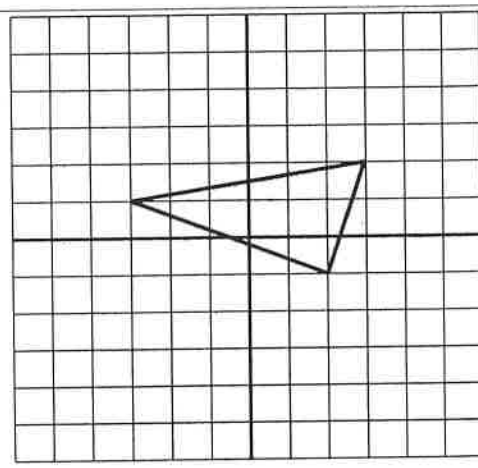
Name______________________________
Date________________________Pd_____

For each problem, graph the image points, and describe the transformation that occurred. Specify if the transformation is an **enlargement or reduction** and by what **scale factor**. Then, examine the coordinates to create an Algebraic Rule.

1) The coordinates of ΔABC are $A(2,-1), B(3,2)\ and\ C(-3,1)$.
The coordinates of A'B'C' are $A'(1,\frac{-1}{2}), B'\left(\frac{3}{2},1\right)\ and\ C'(\frac{-3}{2},\frac{1}{2})$.

Transformation:
Scale Factor:

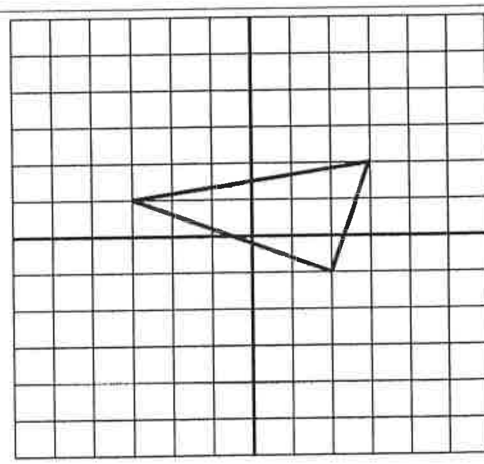
Algebraic Rule:



2) The coordinates of ΔABC are $A(2,-1), B(3,2)\ and\ C(-3,1)$.
The coordinates of A'B'C' are $A'(4,-2), B'(6,4), and\ C'(-6,2)$.

Transformation:
Scale Factor:

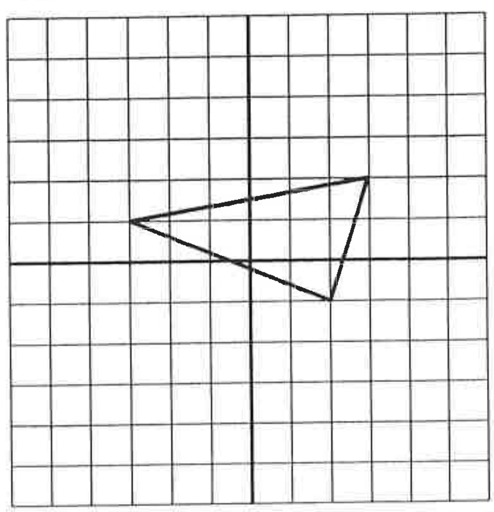
Algebraic Rule:



3) The coordinates of ΔABC are $A(2,-1), B(3,2)\ and\ C(-3,1)$.
The coordinates of A'B'C' are $A'(3,\frac{-3}{2}), B'(\frac{9}{2},3), and\ C'(\frac{-9}{2},\frac{3}{2})$.

Transformation:
Scale Factor:

Algebraic Rule:



Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 5 – Dilations HOMEWORK

Name______________________________
Date________________________Pd______

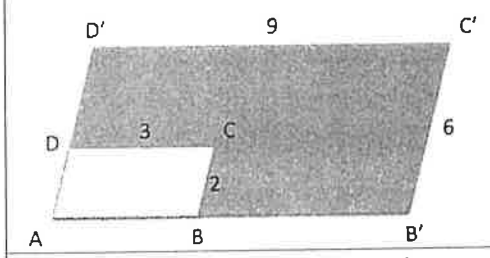
1. Describe the transformation given by rule $(x, y) \rightarrow (3x, 3y)$. Is it an "Isometry"? Why or why not?

2. Write an algebraic rule for the dilation:

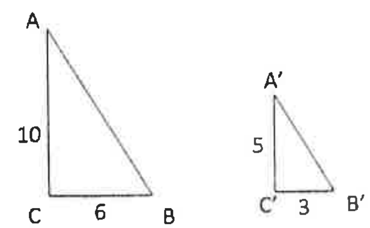
A. by a factor of 3

B. by a factor of $\frac{1}{2}$.

3. Find the scale factor of the dilation that maps ABCD to A'B'C'D'.

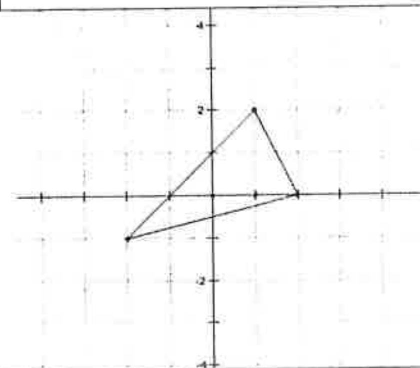


4. Find the scale factor of the dilation that maps ABC to A'B'C'.



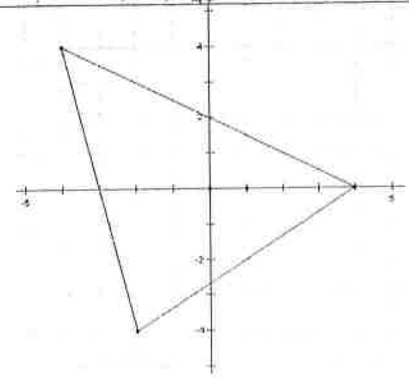
5. Graph the dilation of the object shown using a scale factor of 2.

Algebraic Rule:



6. Graph the dilation of the object shown using a scale factor of ½.

Algebraic Rule:



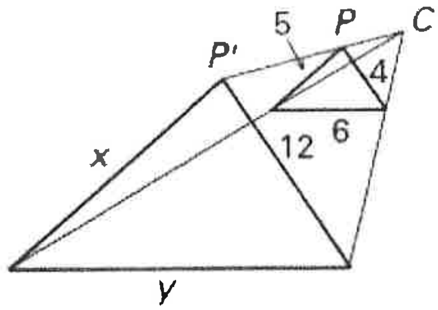
Applications:

7. The package for a model airplane states the scale is $1\ cm: 63\ m$. The length of the model is $7.6\ cm$. What is the length of the actual airplane?

8. Another model airplane states the scale is $1\ in: 96\ ft$. The length of the real airplane is $432\ feet$. What is the length of the model?

Find the scale factor. Tell whether the dilation is an enlargement or a reduction. Then find the values of the variables.

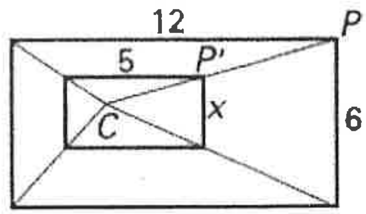
9.



SF = ____________ ____________

x = ____________ y = ____________

10.



SF = ____________ ____________

x = ____________

Determine if the following scale factor would create an enlargement, a reduction, or an isometric figure. ***Explain your reasoning using the scale factor.***

11. 3.5

12. $^2/_5$

13. 0.6

14. 1

15. $^4/_3$

16. $^5/_8$

Given the point and its image, determine the scale factor.

17. $A(3,6)$ $A'(4.5,9)$

18. $G'(3,6)$ $G(1.5,3)$

19. $B(2,5)$ $B'(1,2.5)$

20. The sides of one right triangle are 6, 8, and 10. The sides of another right triangle are 10, 24, and 26.

Determine if the triangles are similar. If so, what is the ratio of corresponding sides?

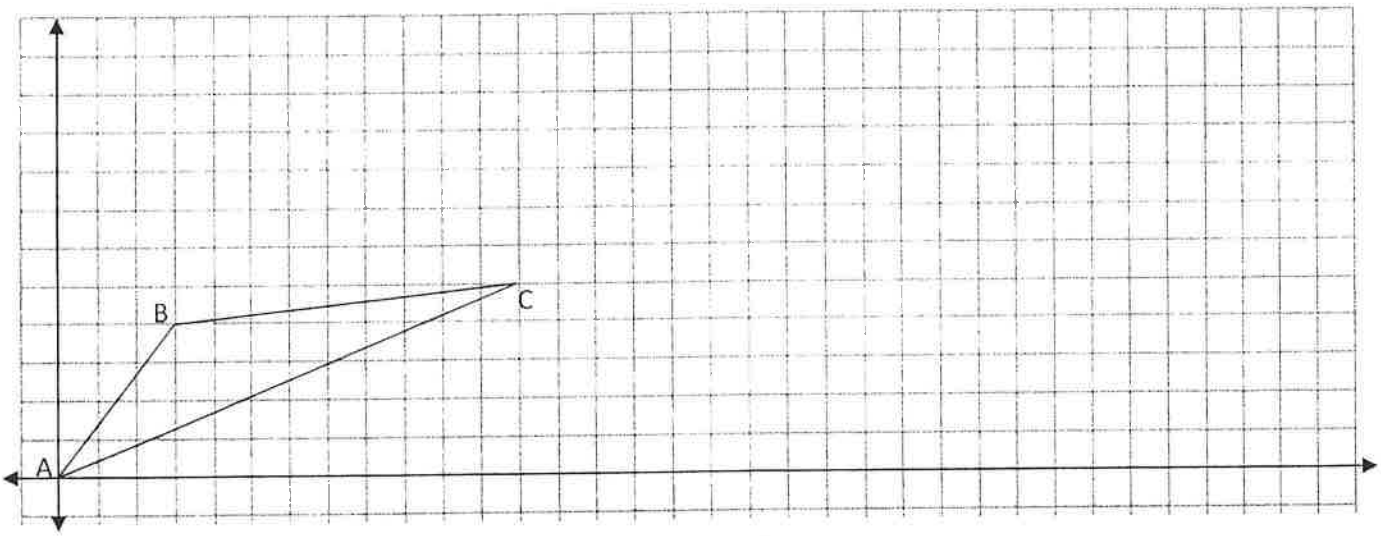
Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 6 – Dilations and Similarity

Name________________________
Date____________________Pd_____

Dilations and Similarity

Properties of Dilation Investigation

- Dilate ΔABC about the origin with a scale factor of 2. Graph the new triangle; label the vertices $A', B', \& C'$.



- Complete the following using your dilation of ΔABC and $\Delta A'B'C'$.

1. What conclusion can you make about the measures of $\angle A$ and $\angle A'$? $\angle B$ and $\angle B'$? $\angle C$ and $\angle C'$?

2. What conclusion can you make about the lengths of $\overline{AB}$ and $\overline{A'B'}$? $\overline{AC}$ and $\overline{A'C'}$? $\overline{BC}$ and $\overline{B'C'}$?

3. Dilations create **similar figures.** Based on your conclusions from 1 and 2, what can we say about similar figures?

4. What do you notice about the placement of $\overline{AB}$ and $\overline{A'B'}$ on the coordinate plane? $\overline{AC}$ and $\overline{A'C'}$? Note that A and A' lie on the origin. What conclusion can you make about the segments of an image when the corresponding segments of the preimage <u>pass</u> through the center of dilation?

5. Using your prior knowledge about slope, find the slopes of $\overline{BC}$ and $\overline{B'C'}$. What do you notice about the slopes? What does that tell you about the relationship of the lines to one another? What conclusion can you make about the segments of an image when the corresponding segments of the preimage <u>do not</u> pass through the center of dilation?

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 6 – Dilations and Similarity

Name______________________________
Date________________________Pd_____

❖ Definitions:

- When a line segment **passes through the center of dilation**, the line segment and its image lie on the ____________ ____________.

- When a line segment **does not pass through the center of dilation**, the line segment and its image are ______________________.

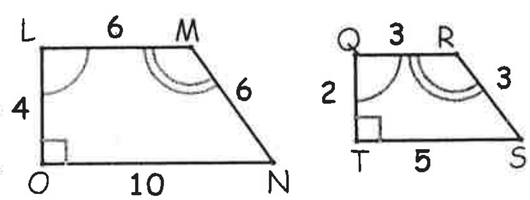
- Dilations create figures that are always ___________________ to one another.

- Two figures are similar (~) if they have the same _______________ but not necessarily the same _______________.

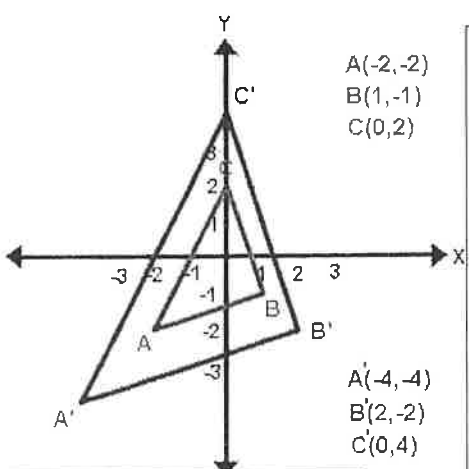
- The _______________ _________________ is the ratio of the lengths of the corresponding sides.

- Two figures are congruent $(\cong)$ if they are similar and ____.

- Two polygons are similar if:
  1) Corresponding _____________ are __________________
  2) Corresponding _____________ are __________________



❖ Examples: Using the dilated figures below, name the scale factor used and find the slopes of the segments listed.



Scale Factor:__________

Slopes:

$\overline{AB}$=________

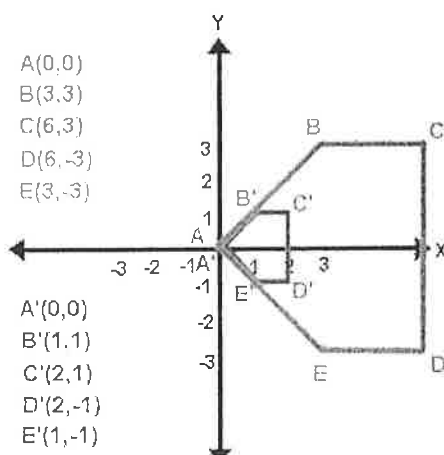
$\overline{A'B'}$=________

$\overline{AC}$=________

$\overline{A'C'}$=________

$\overline{BC}$=________

$\overline{B'C'}$=________



Scale Factor:__________

Slopes:

$\overline{AB}$=________

$\overline{A'B'}$=________

$\overline{AE}$=________

$\overline{A'E'}$=________

$\overline{BC}$=________

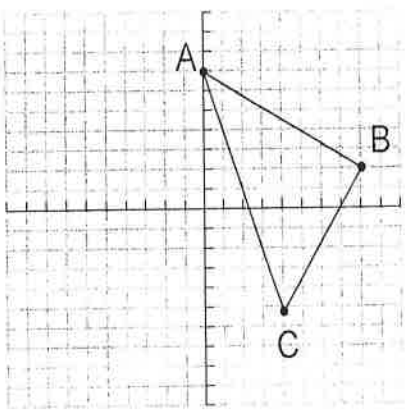
$\overline{B'C'}$=________

Math 2 – Honors
Unit 1 – Geometric Transformations
QUIZ REVIEW HOMEWORK

Name________________________
Date____________________ Pd_____

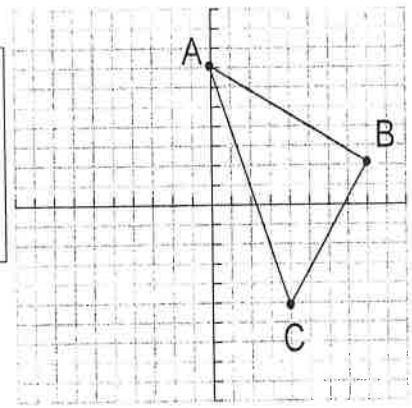
- **For each of the following, graph and label the image for each transformation using proper prime notation.**

1. Reflect over the line $x = 2$



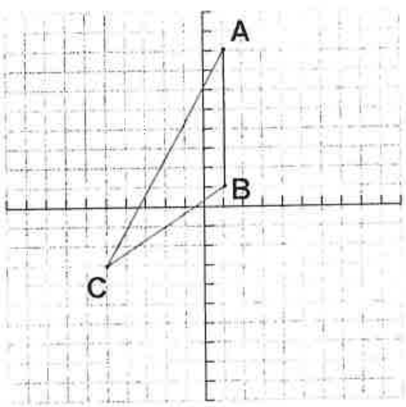
Notation:

2. Dilate with a scale factor $r = \frac{1}{2}$



Algebraic Rule:

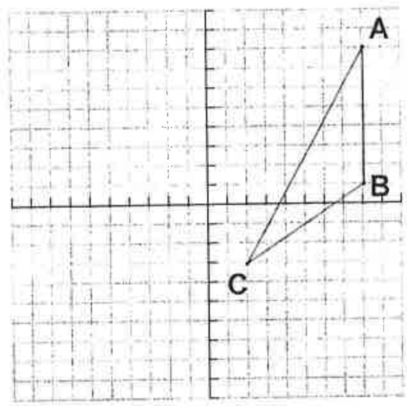
3. Rotate about the origin 90°



Algebraic Rule:

Notation:

4. Translate: $(x, y) \rightarrow (x - 5, y + 2)$



Vector Notation:

- **Perform each of the transformations for # 5 – 10 using the ordered pairs below.**
- **Write each answer as ordered pairs.**

$(1, -5), (-2, 4), (3, 0)$

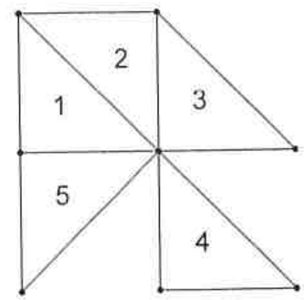
5. Reflect over the $x - axis$	6. Reflect over the line $y = x$	7. Rotate 90°
8. Rotate 180°	9. Dilate with a scale factor of 3	10. $< 3, -4 >$

Math 2 – Honors
Unit 1 – Geometric Transformations
QUIZ REVIEW HOMEWORK

Name______________________________
Date______________________ Pd______

❖ **State whether the isosceles triangle mapped to the other triangle is by a reflection, translation, or rotation.**

11. Triangle 1 to Triangle 5 ______________________
12. Triangle 5 to Triangle 2 ______________________
13. Triangle 2 to Triangle 4 ______________________
14. Triangle 3 to Triangle 4 ______________________
15. Triangle 1 to Triangle 4 ______________________



❖ **Answer each of the following.**

16. Describe the translation that maps all points down 7 units and right 12 units.

a) **Algebraic Rule:**______________________ b) **Vector:**______________________

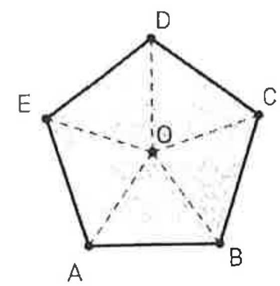
17. If the translation $(-1, 7) \to (5, -2)$, then $(0, 5) \to$ (______, ______)

18. If $T: (x, y) \to (x - 2,\ \ y + 6)$, then point D' = $(8, -1)$, find point D. ______________

19. W is reflected over the $y-$ $axis$. If W is $(3, -8)$, find W'. ______________

20. M is dilated with a scale factor $r\ =\ \frac{3}{4}$. If M is $(9, -3)$, find M'. ______________

21. Given $Regular\ Pentagon\ ABCDE$ with center O.



a) A is rotated about O. If the image of A is C, what is the angle of rotation?

b) E is rotated about O. If the image of E is A, what is the angle of rotation?

c) $\overline{BC}$ is rotated 288° about O. What is the image of $\overline{BC}$?

❖ Solve each system:

22. $y = -4x + 2$ $x - y = 3$	23. $4x + 5y = 9$ $11x + 9y = 20$

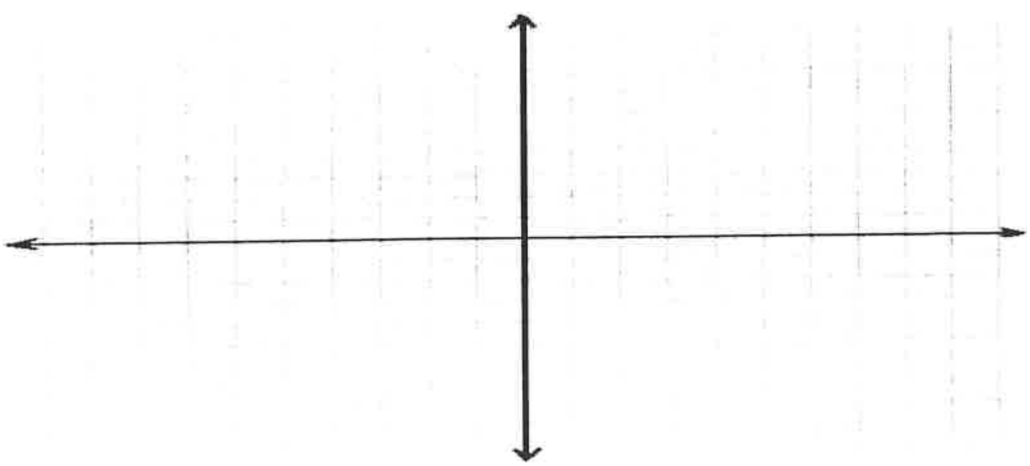
Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 7 – Compositions of Transformations

Name______________________________
Date____________________________Pd______

A **composition** is a sequence of ____.
An example of a composition is a **glide reflection** since it is the composition of a ______________________ and a ___________________________.

> **Composition of Motions with Algebraic Rules**
>
> **Using your algebraic rules, write a new rule after both transformations have taken place.**
>
> 1) Translate a triangle 4 units right and 2 units up, and then reflect the triangle over the line $y = x$.
>
> 2) Rotate a triangle 90 degrees counterclockwise, and then dilate the figure by a scale factor of 3.
>
> 3) Translate a triangle 4 units left and 2 units down, and then reflect the triangle over the $y - axis$.
>
> 4) Rotate a triangle 90 degrees clockwise, and then dilate the figure by a scale factor of $^1/_3$.
>
> 5) Translate a triangle 4 units right and 2 units down, and then reflect the triangle over the $x - axis$.
>
> 6) Rotate a triangle 180 degrees counterclockwise, and then dilate the figure by a scale factor of 2.
>
> 7) Translate a triangle 4 units left and 2 units up, and then reflect the triangle over the line $y = x$.
>
> 8) Rotate a triangle 180 degrees clockwise, and then dilate the figure by a scale factor of $^1/_2$.

9) **a.** On a coordinate grid, draw a triangle using $A(-9,-2), B(-6,-1), C(-6,-3)$ to represent a duck foot.



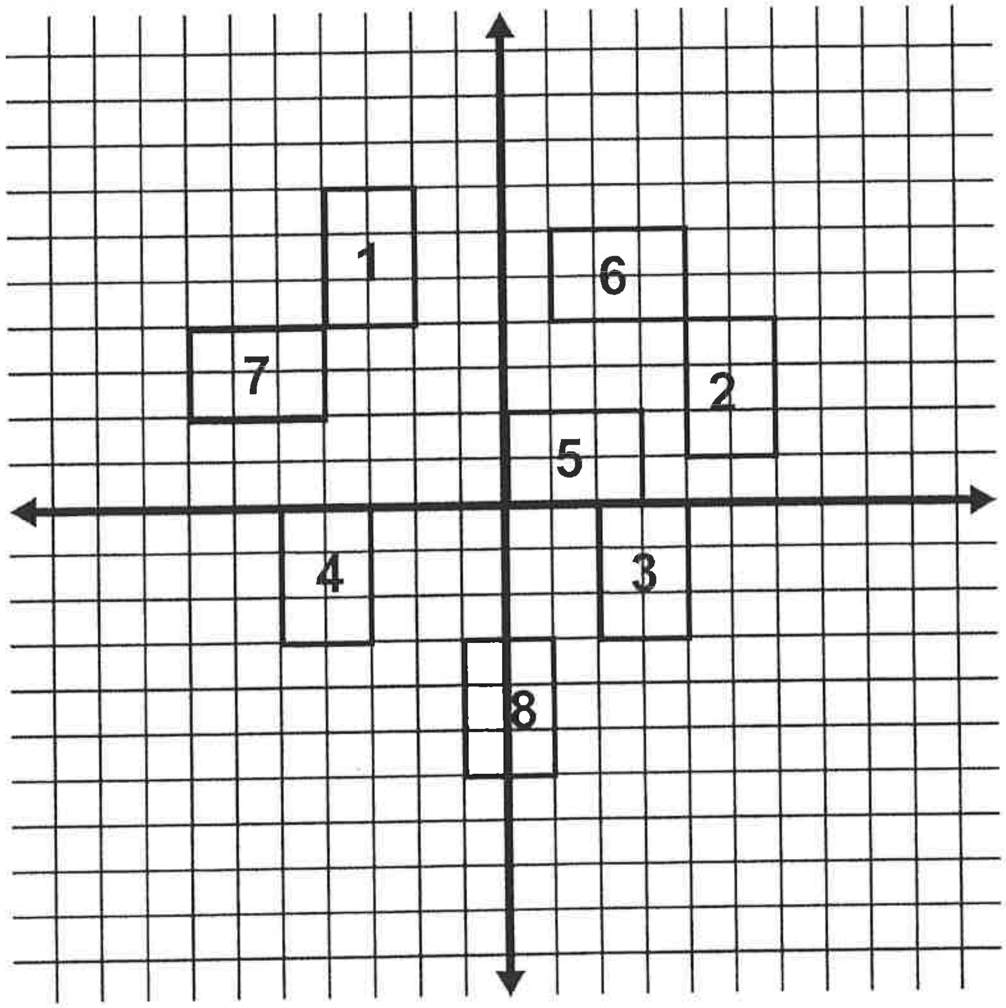
b. Transform ΔABC using R_{x-axis}, followed by $T: (x, y) \rightarrow (x + 5, y)$. Label the final image ΔA'B'C'.

c. Write a coordinate rule for this composite transformation.

d. Now apply the coordinate rule you gave in Part c two more times to ΔA'B'C'.

Classwork: Compositions of Transformations with Coordinates

All rectangles in the grid below are congruent. Follow the instructions and then write the number of the rectangle that matches the location of the final image.



Which rectangle is the final image of each transformation?

1. Reflect Rectangle 1 over the $y-axis$. Then translate down three units and rotate 90° *counterclockwise* around the point $(3,1)$. (Hint: redraw the axes so that the origin corresponds to $(3,1)$).

2. Translate Rectangle 2 down *one unit* and reflect over the $x-axis$. Then reflect over the line $x = 4$.

3. Reflect Rectangle 3 over the $y-axis$ and then rotate 90° *clockwise* around the point $(-2,0)$. Finally, translate *five units* to the right.

4. Rotate Rectangle 4 90° *clockwise* around the point $(-3,0)$. Reflect over the line $y = 2$ and then translate *one unit* left.

5. Translate Rectangle 5 left *five units*. Rotate 90° *clockwise* around the point $(-2,2)$ and slide up *two units*.

6. Rotate Rectangle 6 90° *clockwise* around the point $(4,4)$ and translate down *three units*.

7. Rotate Rectangle 7 90° *clockwise* around $(-4,4)$ and reflect over the line $x = -4$.

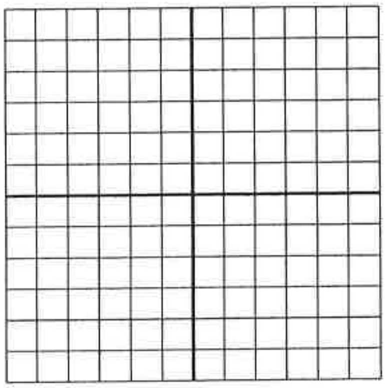
8. Reflect Rectangle 8 over the $x-axis$. Translate *four units* left and reflect over the line $y = 1.5$.

Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 7 – Composition HOMEWORK

Name______________________________
Date________________________ Pd______

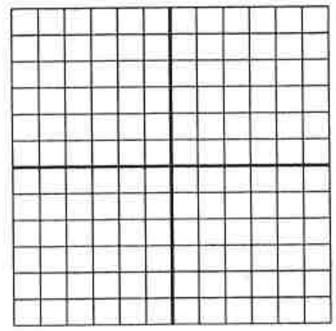
Part 1: Given the description, write an algebraic rule to represent the transformation. Then graph the pre-image and image on the graph below. Use ΔABC with $A(2,-2), B(3,1), and\ C(1,2)$.

1) ΔABC is dilated by 2.



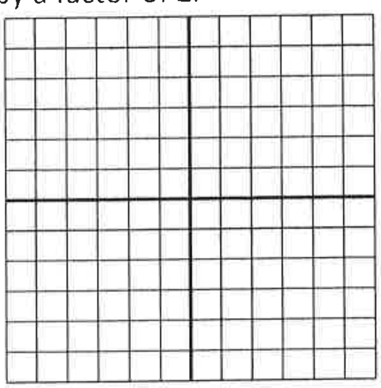
Algebraic Rule: ____________________

2) ΔABC is moved up 4 and 2 to the right.



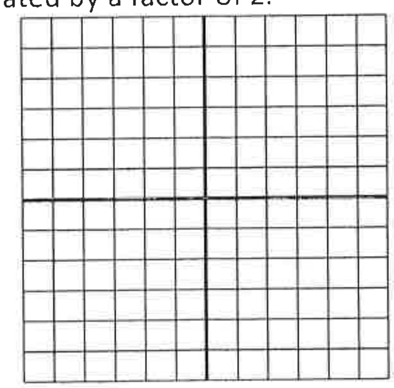
Algebraic Rule: ____________________

3) ΔABC is rotated 180° then dilated by a factor of 2.



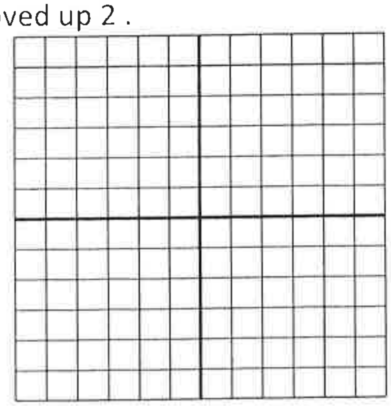
Algebraic Rule: ____________________

4) ΔABC is reflected over the $y-axis$ then dilated by a factor of 2.



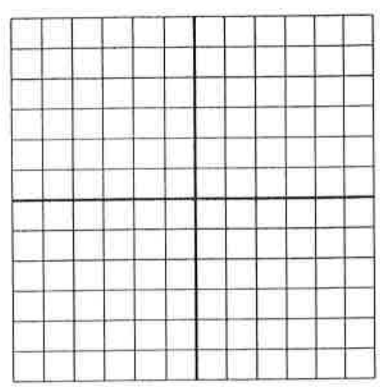
Algebraic Rule: ____________________

5) ΔABC is reflected over $y = -x$ and moved up 2 .



Algebraic Rule: ____________________

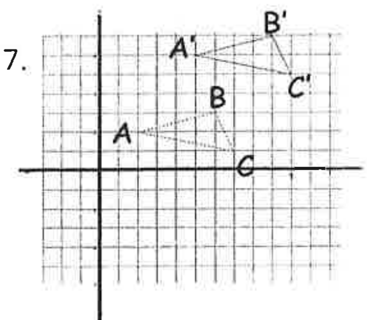
6) ΔABC is reflected over the $x-axis$, dilated by ½ and then moved down 2 and left 1.



Algebraic Rule: ____________________

Part 2: Describe the transformations on the graph verbally and by writing an algebraic rule.
Hint: The triangle with dotted lines is the preimage.

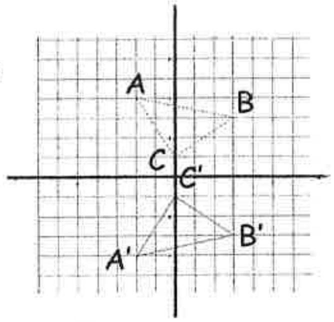
7.



Description: ______________

Algebraic Rule: ____________

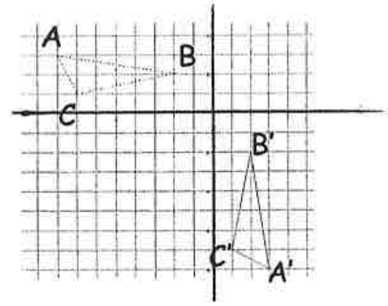
8.



Description: ______________

Algebraic Rule: ____________

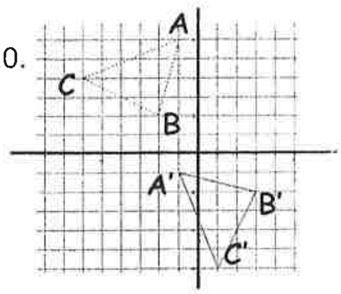
9.



Description: ______________

Algebraic Rule: ____________

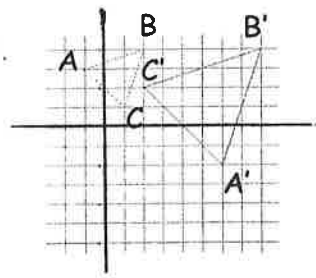
10.



Description: ______________

Algebraic Rule: ____________

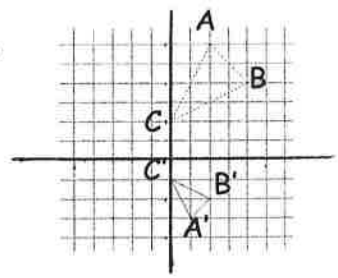
11.



Description: ______________

Algebraic Rule: ____________

12.



Description: ______________

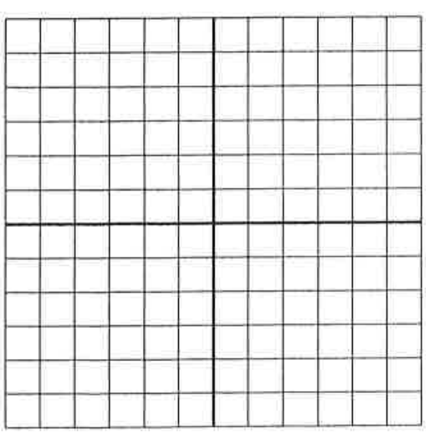
Algebraic Rule: ____________

13. The coordinates of ΔABC are $A(-1,1),\ B(0,3)\ and\ C(-3,1)$.

The coordinates of $\Delta A'B'C'$ are $A'(1,1),\ B(3,0)\ and\ C(1,3)$.

Description: __________________

Algebraic Rule: ________________

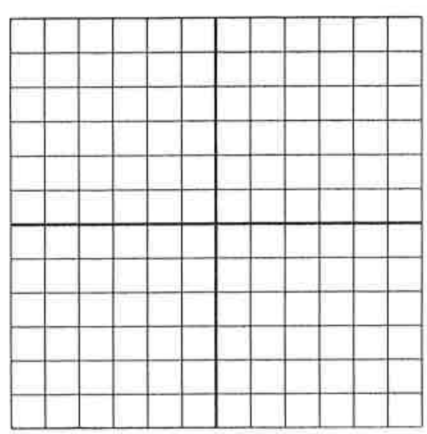


14. The coordinates of ΔABC are $A(-3,0),\ B(-2,3)\ and\ C(1,-3)$.

The coordinates of $\Delta A'B'C'$ are $A'(6,0),\ B(4,-6)\ and\ C(-2,6)$.

Description: __________________

Algebraic Rule: ________________

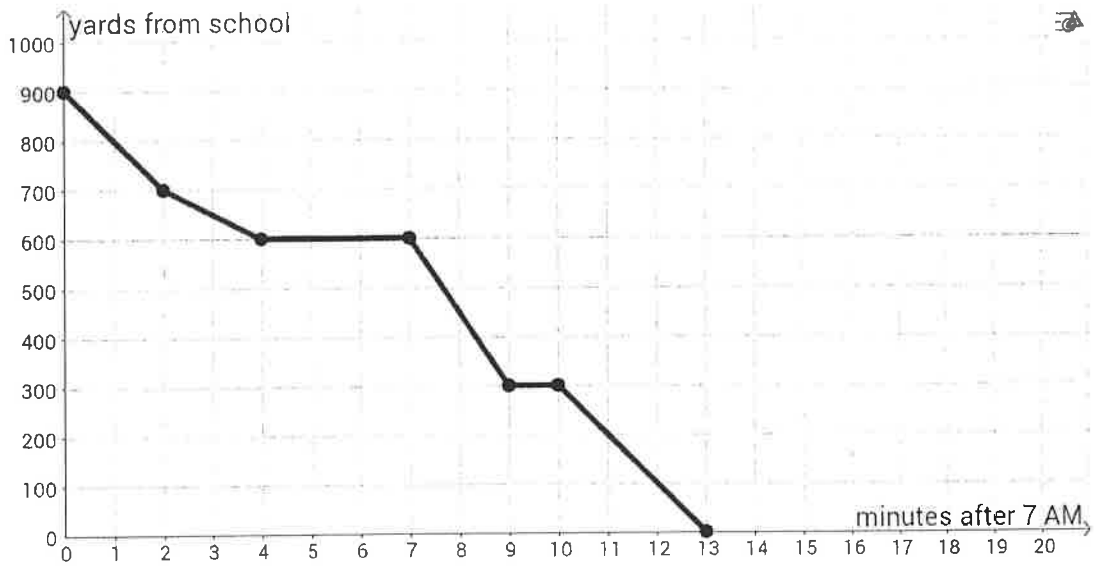


Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 8 – Interpreting Functions

Name______________________________
Date________________________Pd______

Interpreting Functions

Kim and Jim are twins and live at the same home. They each walk to school along the same path at exactly the same speed. However, Jim likes to arrive at school early and Kim is happy to arrive 7 minutes later, just as the bell rings. Pictured at right is a graph of Jim's distance from school over time.



1. Use a dotted line to sketch Kim's graph of distance from school over time (once she leaves for school).
2. How many minutes after 7AM does Jim leave for school? ____________
3. How many minutes after 7AM does Jim arrive at school? ____________
4. How many minutes after 7AM does Kim leave for school? ____________
5. How many minutes after 7AM does Kim arrive at school? ____________
6. What is Jim's farthest distance from school? ____________
7. What is Jim's closest distance to school? ____________
8. What is Kim's farthest distance from school? ____________
9. What is Kim's closest distance to school? ____________

➢ **Use your answers to the above questions to fill in the following:**

10. Jim's domain: ________ $\leq x \leq$ ________ (where x represents time after 7AM)

11. Kim's domain: ________ $\leq x \leq$ ________ (where x represents time after 7AM)

12. Jim's range: ________ $\leq y \leq$ ________ (where y represents distance from school)

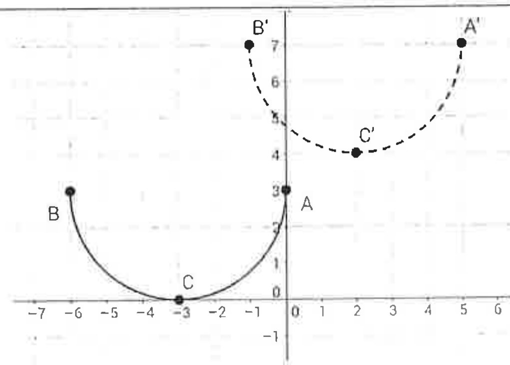
13. Kim's range: ________ $\leq y \leq$ ________ (where y represents distance from school)

➢ Inequalities can also be written in **interval notation**. Parentheses and/or brackets are used to show whether the endpoints are excluded or included. For example, [3, 8) is the **interval** of real numbers between 3 and 8, **including** 3 and **excluding** 8. Another example, [4, ∞) is the interval of real numbers greater than or equal to 4.

Domain and Range in Translations

- Quick review: The **domain** is the set of all possible $x - values$ on the graph. The **range** is the set of all possible $y - values$ on the graph.

1. **Describe the translation(s) from the pre-image to the image.**



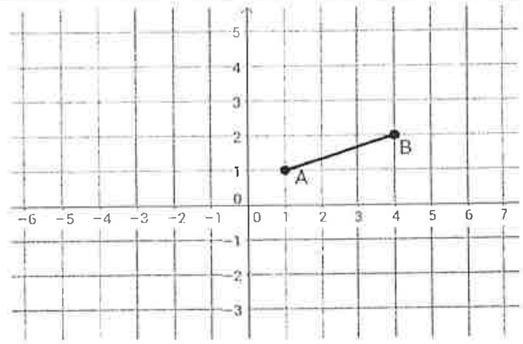
   a. Given the following graph, state the domain and range of the pre-image in **inequality** notation:

   Domain: ________________ Range: ________________.

   b. State the domain and range of the image in **interval** notation:

   Domain: ________________ Range: ________________.

2. **Draw and label the image of $\overline{AB}$ translated left 2 and down 3.**



   a. State the domain and range of the pre-image:

   Domain: ________________ Range: ________________.

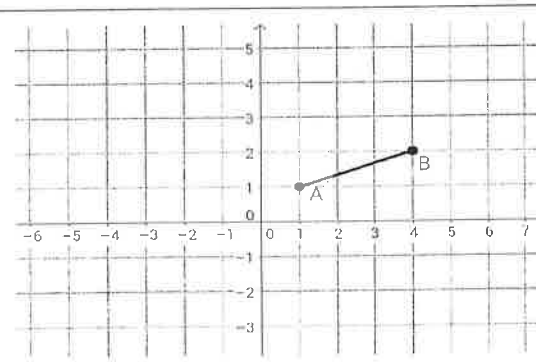
   Domain: ________________ Range: ________________.

   b. State the domain and range of the image:

   Domain: ________________ Range: ________________.

   Domain: ________________ Range: ________________.

3. **Draw and label the image of $\overline{AB}$ reflected over the x-axis.**



   a. State the domain and range of the pre-image:

   Domain: ________________ Range: ________________.

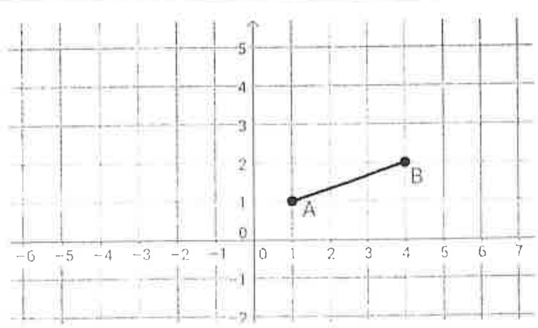
   Domain: ________________ Range: ________________.

   b. State the domain and range of the image:

   Domain: ________________ Range: ________________.

   Domain: ________________ Range: ________________.

4. **Draw and label the image of $\overline{AB}$ reflected over the y-axis.**



   a. State the domain and range of the pre-image:

   Domain: ________________ Range: ________________.

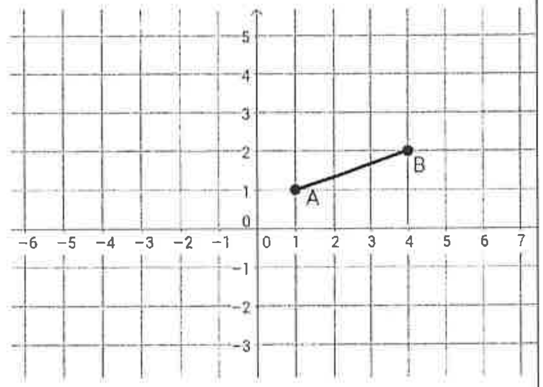
   Domain: ________________ Range: ________________.

   b. State the domain and range of the image:

   Domain: ________________ Range: ________________.

   Domain: ________________ Range: ________________.

5. **Draw and label the image of $\overline{AB}$ reflected over the line $y = x$.**



a. State the domain and range of the pre-image:

Domain: ________________Range: ________________.

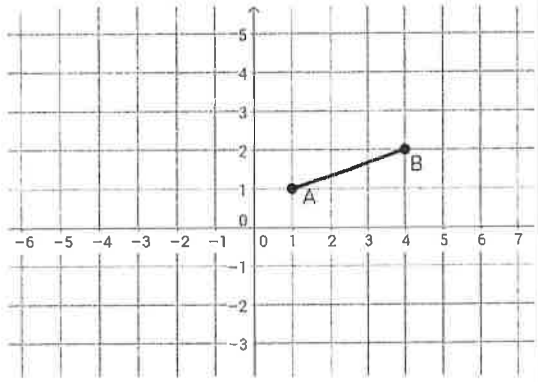
Domain: ________________Range: ________________.

b. State the domain and range of the image:

Domain: ________________Range: ________________.

Domain: ________________Range: ________________.

6. **Draw and label the image of $\overline{AB}$ rotated 90°.**



a. State the domain and range of the pre-image:

Domain: ________________Range: ________________.

Domain: ________________Range: ________________.

b. State the domain and range of the image:

Domain: ________________Range: ________________.

Domain: ________________Range: ________________.

7. **Draw and label the image of $\overline{AB}$ dilated by a scale factor of 3.**

a. State the domain and range of the pre-image:

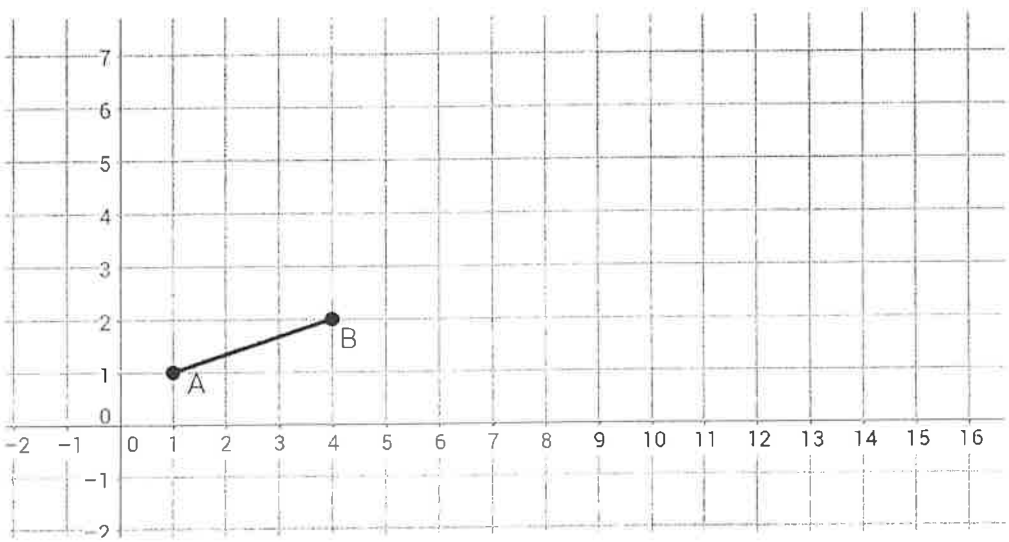
Domain: ________________Range: ________________.

Domain: ________________Range: ________________.

b. State the domain and range of the image:

Domain: ________________Range: ________________.

Domain: ________________Range: ________________.



Math 2 – Honors
Unit 1 – Geometric Transformations
Lesson 8 – Functions CLASSWORK/HOMEWORK

Name_______________________________
Date_______________________Pd______

Side note about notation:
If your data are Discrete, their domain is a* ***list of values *written in this notation: { 1, 5, 7}*

If your data are continuous, their domain is an* ***interval of values *written in a variety of notations. We are using this:* $-7 \le x < 3$

Classwork: Given the patterns seen above, can you predict the domain/range of an image given a pre-image domain/range? Let's try:

1. Given a relation composed of points $A(2,5)$, $B(1,-6)$, and $C(4,7)$,

A) State the domain and range of the relation as a **list of values:**

D: {____________} R: {____________}

B) State the domain and range of the image when the relation as a **list of values:**

a) **Translated right 2 and down 3:**

D: {____________} R: {____________}

b) **Reflected in the** $x-axis$**:**

D: {____________} R: {____________}

c) **Reflected in the** $y-axis$**:**

D: {____________} R: {____________}

d) **Reflected in the line** $y = x$**:**

D: {____________} R: {____________}

e) **Rotated 90°:**

D: {____________} R: {____________}

f) **Dilated by a factor of 7 with C(0,0)**

D: {____________} R: {____________}

2. Given a **line segment** with endpoints $(0,4)$ and $(3,0)$

A) State the domain and range of the segment. D: ____$\le x \le$____ R: ____$\le y \le$____

B) State the domain and range of the image **interval notation** when the relation is:

a) **Translated right 2 and down 3:**

D: ____________

R: ____________

b) **Reflected in the** $x-axis$**:**

D: ____________

R: ____________

c) **Reflected in the** $y-axis$**:**

D: ____________

R: ____________

d) **Reflected in the line** $y = x$:

D: ____________

R: ____________

e) **Rotated 90°:**

D: ____________

R: ____________

f) **Dilated by a factor of 7:**

D: ____________

R: ____________

Math 2 – Honors
Unit 1 – Geometric Transformations
Unit Review

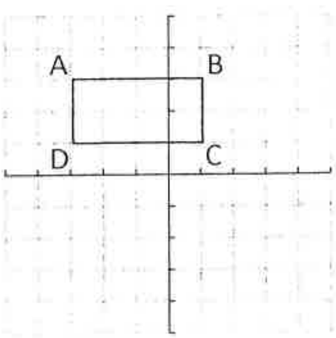
Name________________________
Date____________________ Pd______

- For each transformation, state the coordinates for each:

	Image of (x, y)	Image of $(1,4)$	Image of $(-2, 7)$
1. Reflect over $y - axis$			
2. Reflect over $x - axis$			
3. Reflect over $y = x$			
4. Reflect over $y = -x$			
5. Rotate 90° *clockwise* about the origin			
6. Rotate 90° *counterclockwise* about the origin			
7. Rotate 180° about the origin			
8. Rotate 270° about the origin			

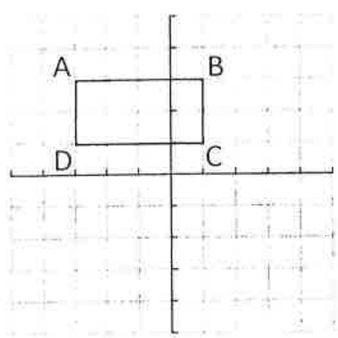
- For each of the following, graph and label the image for each transformation described.
- Then write using the correct notation.

8. Reflect over the line $y = -1$



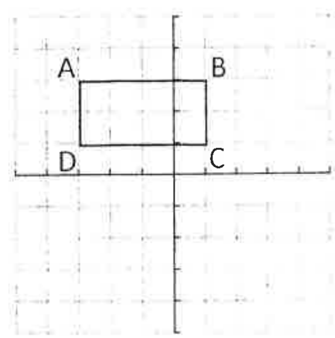
____

9. Rotate 180° about the origin



____

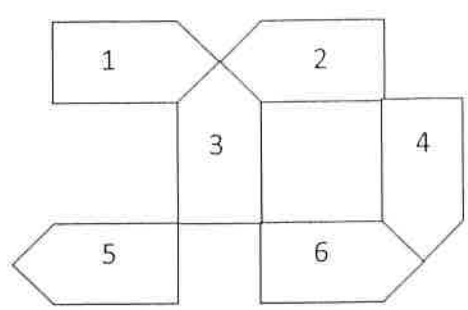
10. Translate right 4 units & down 3 units



____

- State whether the specified pentagon is mapped to the other pentagon by a reflection, translation, or rotation

11. Pentagon 1 to Pentagon 3 ______________________
12. Pentagon 5 to Pentagon 6 ______________________
13. Pentagon 2 to Pentagon 5 ______________________
14. Pentagon 1 to Pentagon 2 ______________________
15. Pentagon 4 to Pentagon 6 ______________________



- Perform each of the transformations using the set of points below for #16-19.

$$\{(7,-4)\ \ (0,6)\ \ (-2,3)\}$$

16. Reflect over the $y-axis$	18. Rotate 90° $counter-clockwise$
17. Reflect over the line $y = -x$	19. Dilate by a scale factor r = ½

- Answer each of the following.

20. If translation $(5,-3) \rightarrow (-4,0)$, then $(8,2) \rightarrow$ (______, ______)

21. If $T: (x,y) \rightarrow (x-5,\ \ y+2)$and the point F' $(7,-6)$, then find the point F. ______________

22. M is reflected over the $y-axis$. If M is $(6,-1)$, find M'. ______________

23. C is rotated about the origin 90°. If C' is $(-9,5)$, find C. ______________

24. Y is rotated $counterclockwise$ 180°. If the image of Y' is (0, -3) find Y. ______________

25. A figure is reflected over the line $y = x$. If the preimage is (2, 7), find the image. ____________

26. ΔABC has vertices $A(5,-2),\ B(-4,0),\ C(7,1)$.

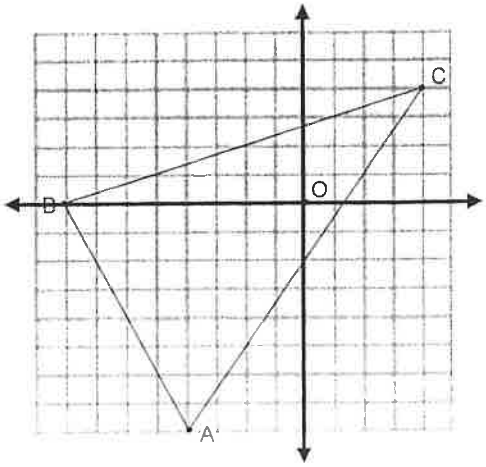
Find the coordinates of the image of the triangle if it is dilated by a scale factor r = 3.

A'(_____, _____)

B'(_____, _____)

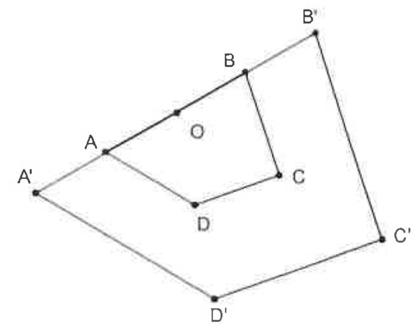
C'(_____, _____)

27. Dilate ΔABC using a scale factor r = $\frac{1}{4}$.



Explain why the two triangles are similar.

28. $ABCD$ is dilated by a scale factor of $r = 2$ to produce $A'B'C'D'$.
The lengths of the segments of the preimage are as follows:
$AB = 6 \quad BC = 5 \quad CD = 3 \quad AD = 4$



a. What is the length of $\overline{B'C'}$?

b. What is the length of $\overline{A'B'}$?

c. If the slope of $\overline{CD}$ is $\frac{1}{3}$, what is the slope of $\overline{C'D'}$?
What allows you to make this conclusion?

29. $PQRST \sim UWXYZ$ with a scale factor of $2:5$. If the perimeter of $UWXYZ$ is 40 inches, what is the perimeter of $PQRST$?

30. For each problem, there is a composition of motions. Using your algebraic rules, come up with a new rule after both transformations have taken place.

a. Translate a triangle 5 $units\ left$ and 3 $units\ up$, and then reflect the triangle over the $x - axis$.

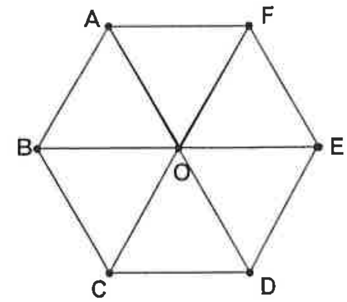
b. Translate a triangle 2 $units\ right$ and 7 $units\ down$, and then rotate 90° $clockwise$.

c. Rotate a triangle 90 $degrees\ counterclockwise$, and then reflect in the line $y = x$.

d. Reflect in the line $y = -x$, and then translate $right$ 4 $units$ and $down$ 2 $units$.

31. An equilateral triangle with sides of length 12 cm is reflected consecutively across two lines that are parallel and 12 cm apart. Describe the result using another type of transformation.

32. The diagonals of *Regular Hexagon ABCDEF* form six equilateral triangles as shown.



Fill in the correct **letter** after the given transformation:

a. Rotate 60° *clockwise*: $E \rightarrow$ ______

b. Rotate 60° *counter – clockwise*: $D \rightarrow$ ______

c. Rotate 120° *clockwise*: $F \rightarrow$ ______

d. Rotate 60° *clockwise*: ______ $\rightarrow B$

e. If a **translation** maps A to B, then it also maps O to ________ and E to ________.

f. A reflection occurs over $\overleftrightarrow{FC}$, B maps to ________ and F maps to ________.

Solve:

33. $\frac{2}{x} = \frac{4}{x+3}$	34. $2x + 6 = 4(x + 8)$	35. $2x + 3y = 6$ $y = \frac{-1}{3}x + 3$
36. $2x + 3y = 7$ $3x - 3y = -12$	37. $3x + 5y = 6$ $2x - 4y = -7$	38. $6x - 8y = 50$ $4x + 6y = 22$

KNOW FOR TEST!!!!!

Transformation Rules:

Translation: $T: (x, y) \rightarrow (x \pm a, y \pm b)$	**Vector Notation:** $\langle a, b \rangle$	Remember translations can also be described in words.
Reflection: $(x, y) \rightarrow (x, -y)$ $(x, y) \rightarrow (-x, y)$ $(x, y) \rightarrow (y, x)$ $(x, y) \rightarrow (-y, -x)$	**Reflection Notation:** R_{x-axis} R_{y-axis} $R_{y=x}$ $R_{y=-x}$	Remember reflection can occur over other lines on the coordinate plane.
Rotation: $(x, y) \rightarrow (-y, x)$ $(x, y) \rightarrow (y, -x)$ $(x, y) \rightarrow (-x, -y)$	**Rotation Notation:** $\mathcal{R}_{90°}$ $\mathcal{R}_{90°CW}$ or $\mathcal{R}_{270°}$ $\mathcal{R}_{180°}$	Remember to always rotate counter-clockwise (left) unless otherwise specified.
Dilation: $(x, y) \rightarrow (ax, ay)$		Remember a dilation can be an enlargement or a reduction