QUIZ DATE: ______________________ TEST DATE: ______________________

Math 2 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

____.

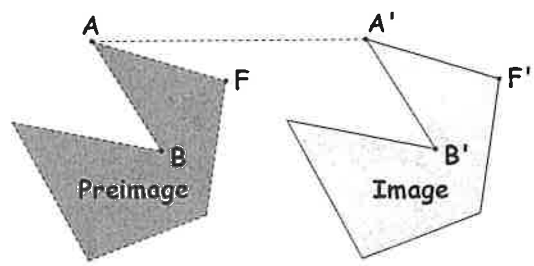
➢ **Transformation** of a geometric figure: change in its ____________, ____________, or ________.

➢ **Preimage** – ______________ figure

✓ Notation: __________

➢ **Image** – _______ or ______________ figure

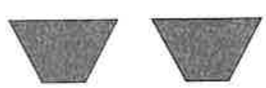
✓ Notation: __________



➢ **Isometry** – transformation in which preimage and image are the __________ __________ and

______________ (also called: ______________________________)

Examples:



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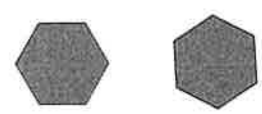

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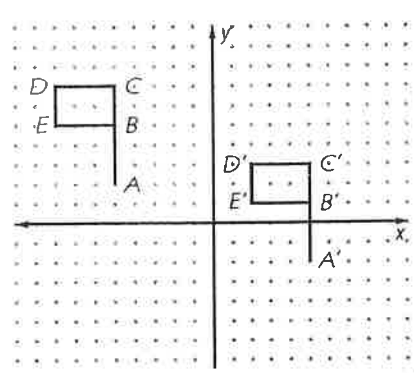
➢ **Translation** – an isometry that maps all points the __________ ______________ and the

__________ ______________.

❖ **Two 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.

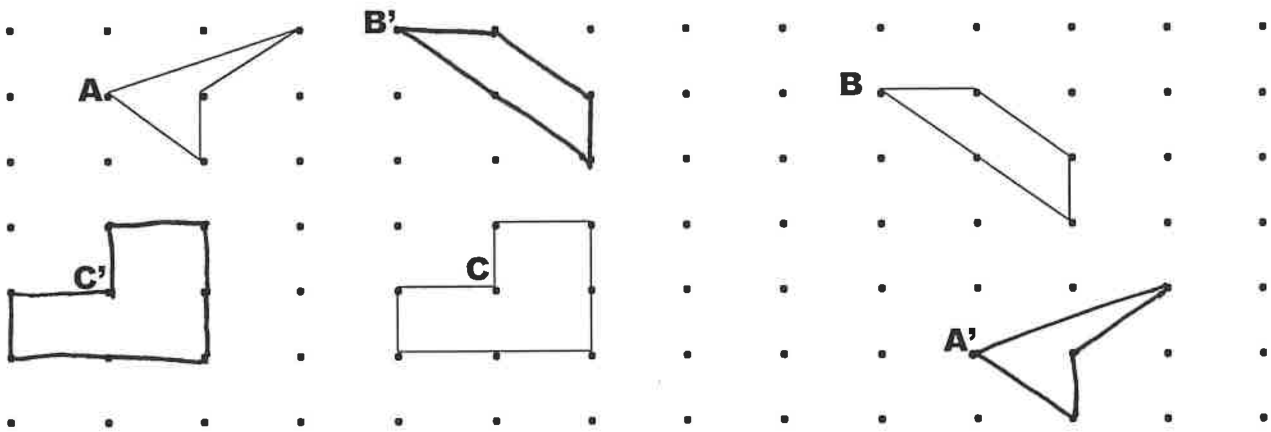
2) **Algebraic rule** (motion rule): $T: (x, y) \rightarrow (x + 10, y - 4)$

✓ **Right and Up are always** $(+)$

✓ **Left and Down are always** $(-)$

❖ **Example: Dot Paper Translations**

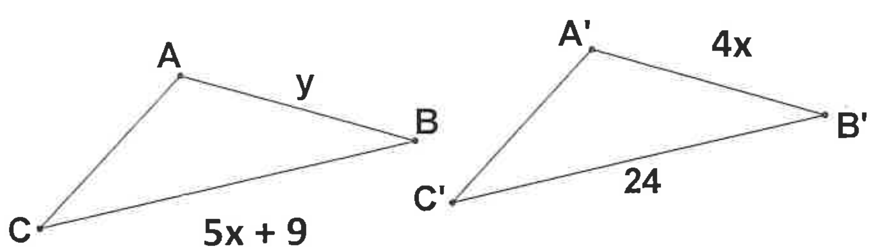
1) Use the dots to help you draw the image of the first figure so that A maps to A’.
2) Use the dots to help you draw the image of the second figure so that B maps to B’.
3) Use the dots to help you draw the image of the third figure so that C maps to C’.
4) Complete each of the following translation rules using your mappings from 1 – 3 above.
   a) For A, the translation **rule** is: T: $(x, y) \to$ (________, ________)
   b) For B, the translation **rule** is: T: $(x, y) \to$ (________, ________)
   c) For C, the translation **rule** is: T: $(x, y) \to$ (________, ________)



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

1. The translation **rule** is **T:** $(x, y) \to$ (________, ________)
2. Describe the transformation in **words:** ____
3. Find the coordinates of: a) E’ (______, ______) b) O’ (______, ______)

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



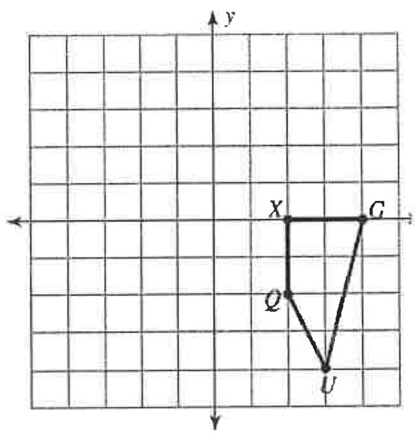
x = ____________

y = ____________

Lesson 1 – Translations Classwork

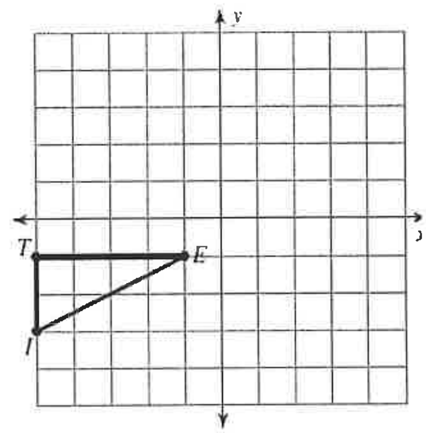
❖ **Graph the image of the figure using the transformation given write the algebraic rule and as requested write a specific verbal description or vector.**

1) translation: 1 unit left



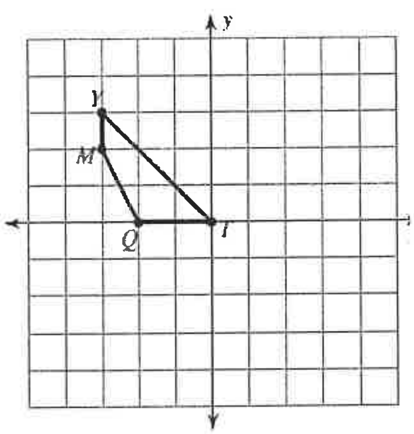
Algebraic Rule:

2) translation: 1 unit right and 2 units down



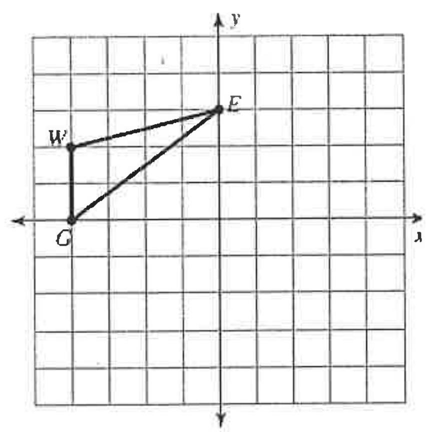
Algebraic Rule:

3) translation: 3 units right



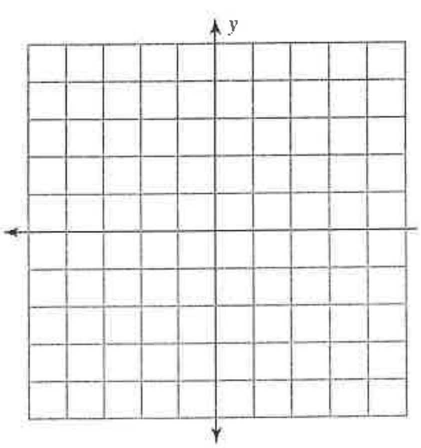
Algebraic Rule:

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



Description:

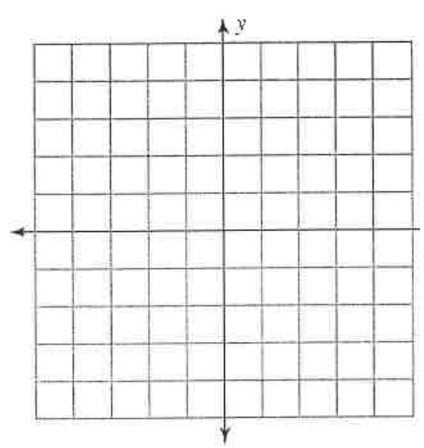
5) translation: 5 units up
$U(-3, -4)$, $M(-1, -1)$, $L(-2, -5)$



Description:

Algebraic Rule:

6) $T(x, y) \rightarrow (x, y + 3)$
$R(-4, -3)$, $D(-4, 0)$, $L(0, 0)$, $F(0, -3)$



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:

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

Vertices:

Algebraic Rule:

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9) Translation: $T(x,y) \rightarrow (x-4, y+4)$
$J(-1,-2), A(-1,0), N(3,-3)$

Vertices:

Words:

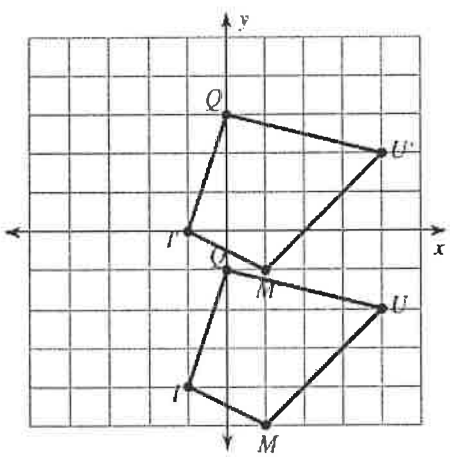
10) Translation: $T(x,y) \rightarrow (x+3, y)$
$P(-4,-3), L(-2,-2), T(-2,-4)$

Vertices:

Words:

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

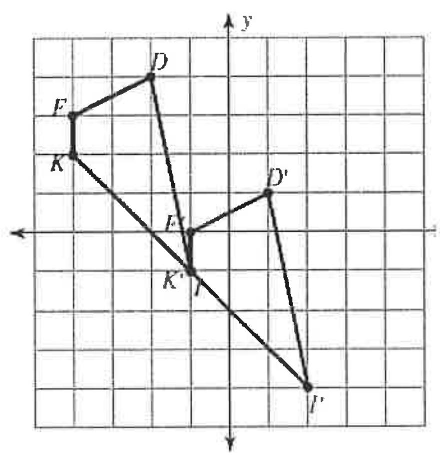
11)



Description:

Algebraic Rule:

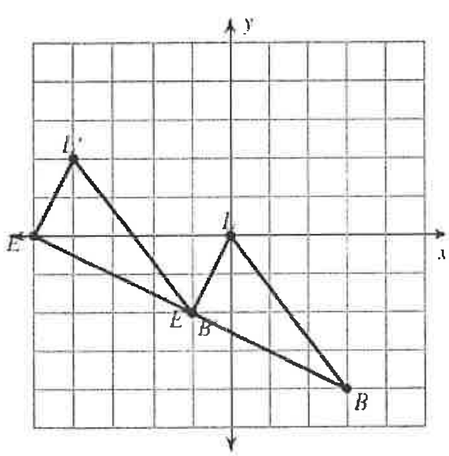
12)



Description:

Algebraic Rule:

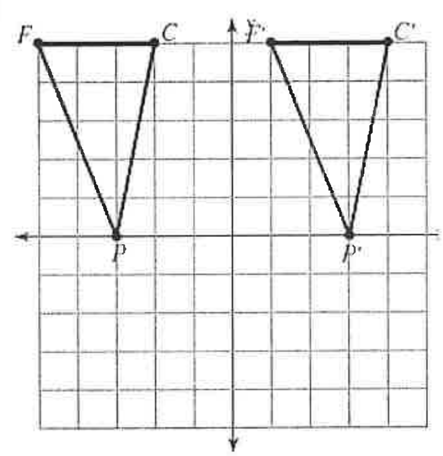
13)



Description:

Algebraic Rule:

14)



Description:

Algebraic Rule:

4

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

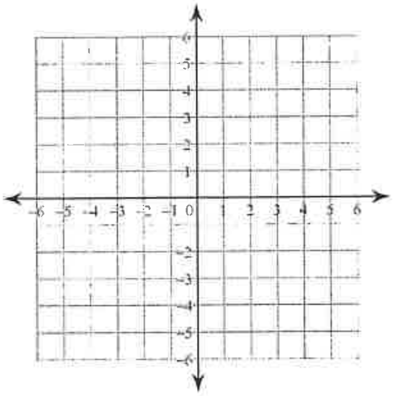
Name_______________________
Date_______________________Pd______

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' __________



Describe the translation in words:

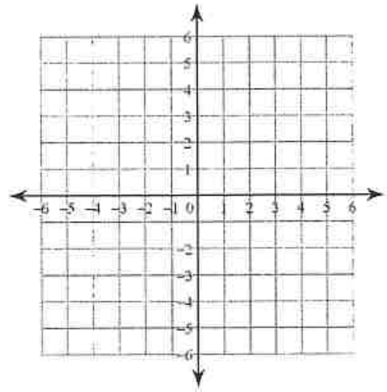
2. Graph and label quadrilateral DUCK with vertices $D(2,2), U(4,1), C(3,-2), and\ K(0,-1)$. Graph and label the image of Quadrilateral DUCK when the Quadrilateral is **shifted left 4 and up 3.**

D' __________

U' __________

C' __________

K' __________



Write the rule in algebraic notation:
T:

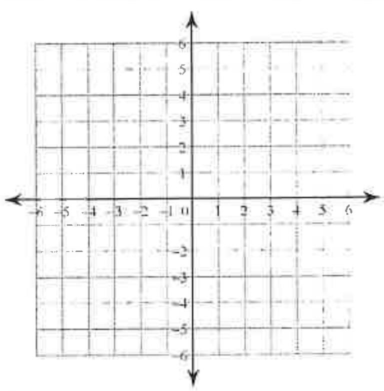
3. Graph and label quadrilateral MATH with vertices $M(4,1)$, $A(2,4)$, $T(0,6)$, and $H(1,2)$. Graph and label the image of quad. MATH when the quadrilateral is shifted according to the rule $T: (x, y) \rightarrow (x-3, y-4)$.

M' __________

A' __________

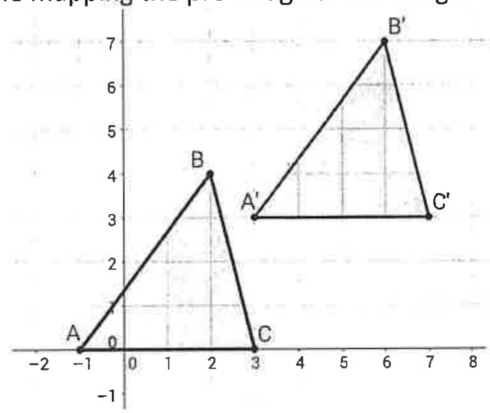
T' __________

H' __________



Describe the translation in words:

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



Write the rule in algebraic notation:
T:

Describe the translation in words:

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

5. **Find x and y,** given $m\angle A = y$, $m\angle A' = 2x+5$, $m\angle C = 3x+7$, $m\angle C' = 13$

$x =$ __________

$y =$ __________

6. **Find x and y,** given $BC = 4x - 2y$, $B'C' = 11$, $AC = 3x$, and $A'C' = 27$.

$x =$ __________

$y =$ __________

Math 2 | Name________________________________
Unit 1 – Geometric Transformations | Date_____________________________Pd______
Lesson 2 – Reflections

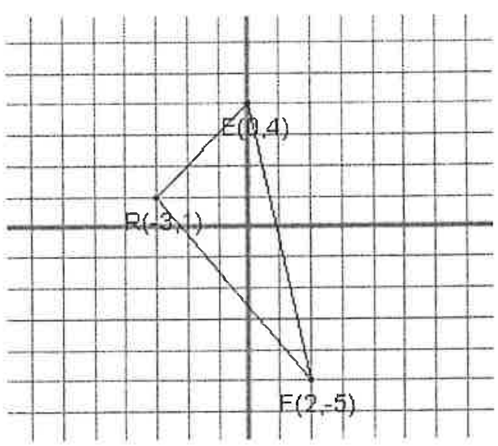
<u>Reflections:</u>

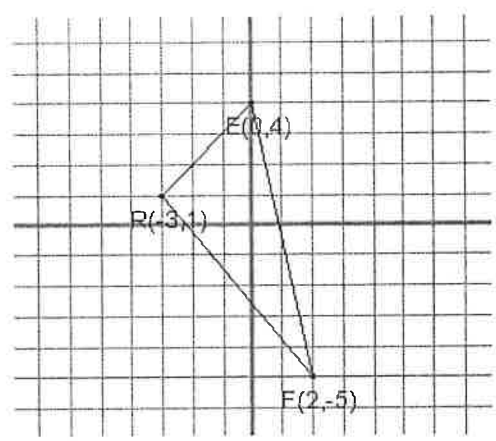
- A reflection is a transformation in which the image is a mirror image of the preimage.
- A point on the line of reflection maps to ______________________ .
- Other points map to the ___________________________ side of the reflection line so that the reflection line is the _________________________ 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'(____,____)

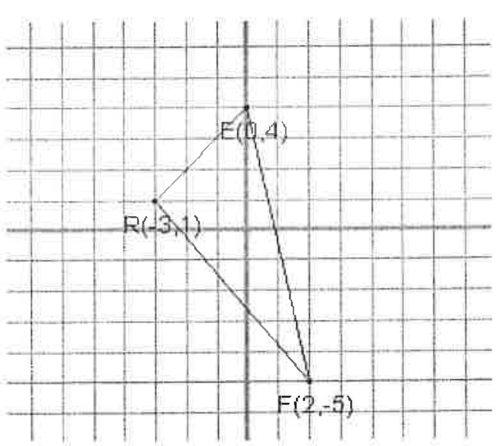
2) On the second grid, draw the reflection of ΔREF in the $y-axis$. Notation: ________________
Record the new coordinates: R'(____,____), E'(____,____), F'(____,____)

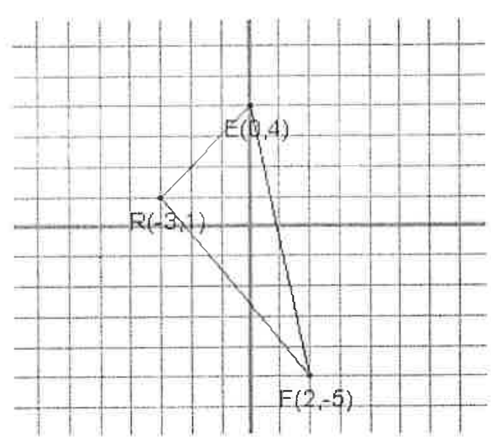




3) Graph the line $y = x$ on the third coordinate grid. Reflect the triangle in the line $y = x$.
Record the new coordinates: R'(____,____), E'(____,____), F'(____,____) Notation: ______________

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: ______________



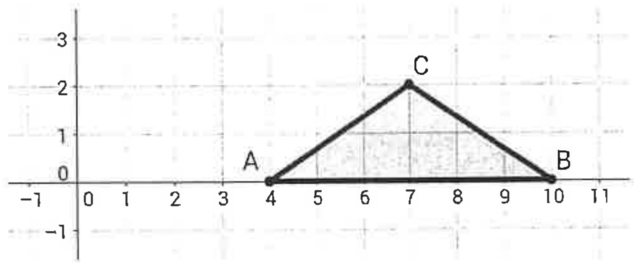


Look at the patterns and complete the rule. Then write the rule using proper notation.

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

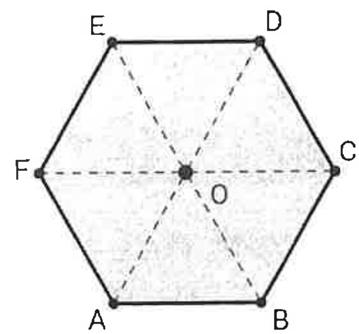


1. Given $Triangle\ ABC$.
   a. What is the equation of the line of reflection that maps $angle\ A$ onto $angle\ B$? _______________

   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 $\overline{BC}$?

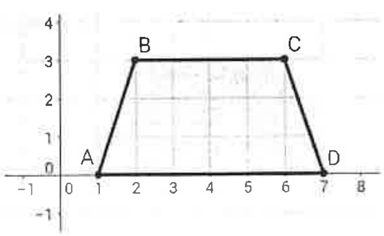
2. Given $Regular\ Hexagon\ ABCDEF$.
   a. List the three lines of symmetry drawn on the diagram at right: _________, _________, _________



   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?



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 __________

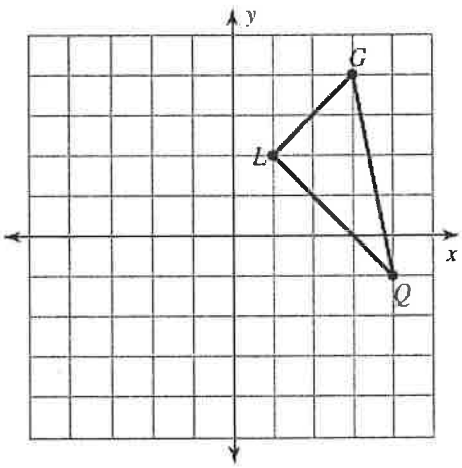
Math 2
Unit 1 – Geometric Transformations
Lesson 2 – Reflections

Name________________________
Date____________________Pd______

Lesson 2 – Reflections Classwork

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

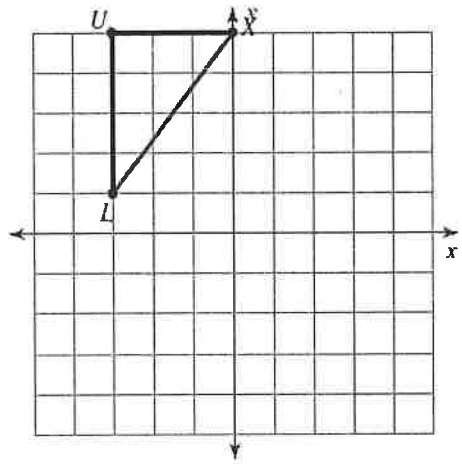
1) reflection across the $y - axis$



Notation:

Algebraic Rule:

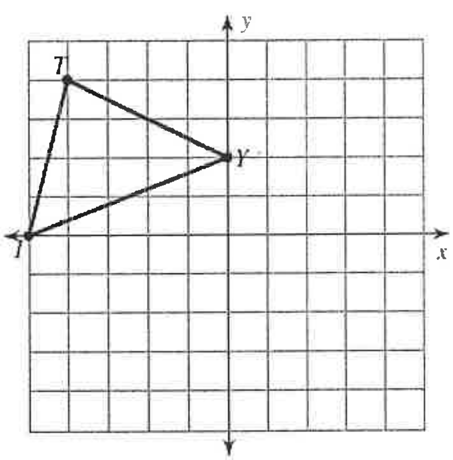
2) reflection across $y = x$



Notation:

Algebraic Rule:

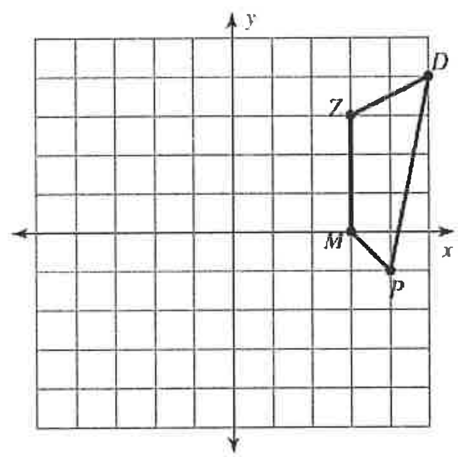
3) reflection across $y = x$



Notation:

Algebraic Rule:

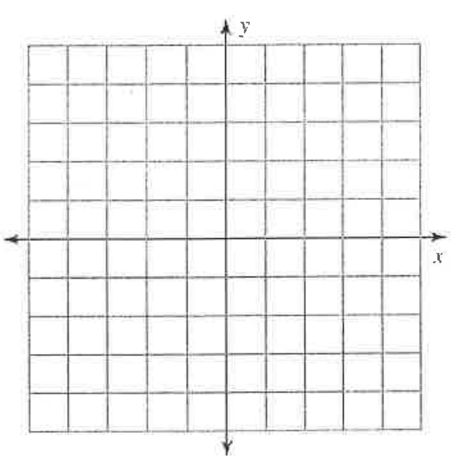
4) reflection across the x-axis



Notation:

Algebraic Rule:

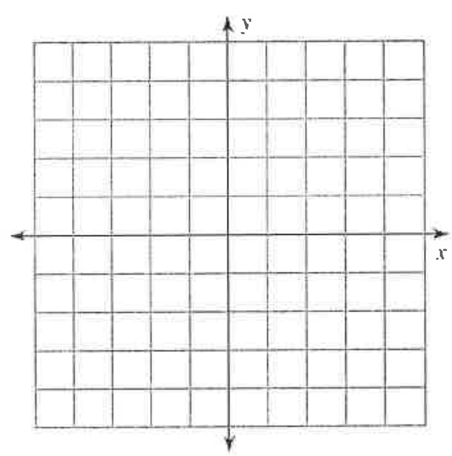
5) reflection across the x-axis
$T(2, 2)$, $C(2, 5)$, $Z(5, 4)$, $F(5, 0)$



Notation:

Algebraic Rule:

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



Notation:

Algebraic Rule:

❖ **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 $y = x$

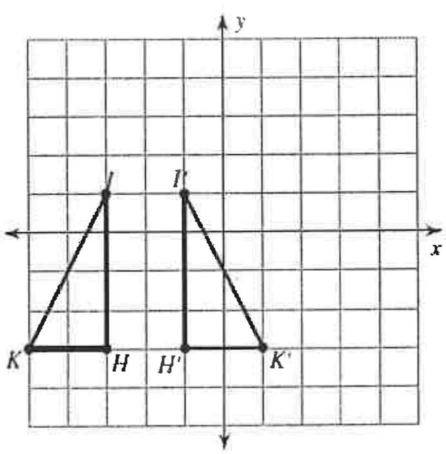
$V(-3,-1), Z(-3,2), G(-1,3), M(1,1)$

Algebraic Rule:

Notation:

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

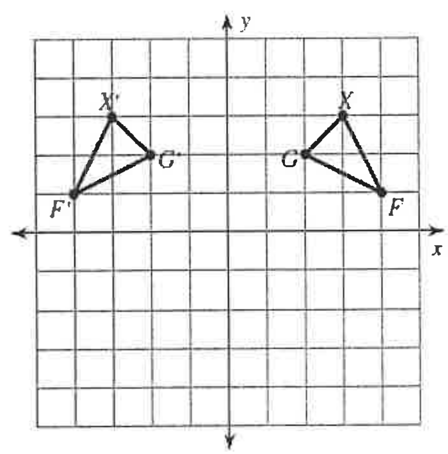
11)



Description:

Notation:

12)

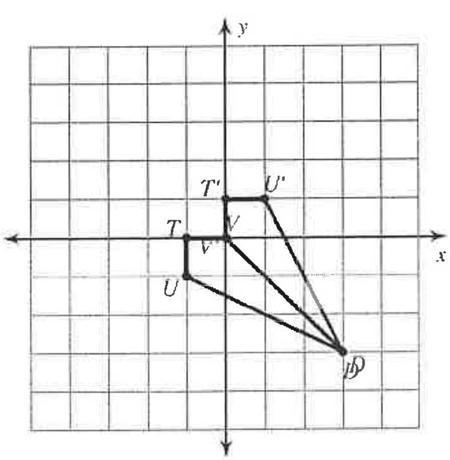


Description:

Algebraic Rule:

Notation:

13)

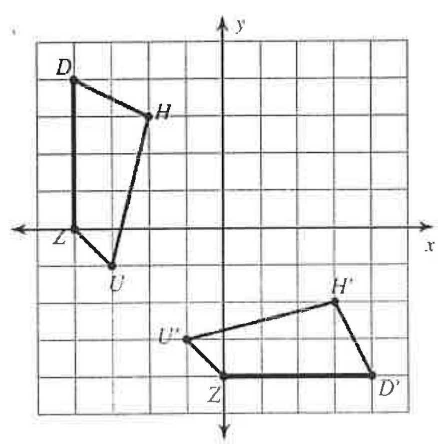


Description:

Algebraic Rule:

Notation:

14)



Description:

Algebraic Rule:

Notation:

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

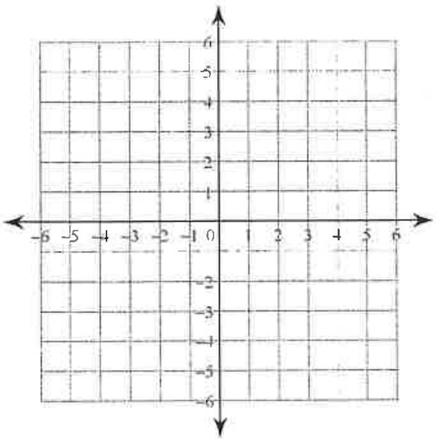
Name____________________________
Date________________________ Pd_______

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

E' ______

F' ______

G' ______



Notation:

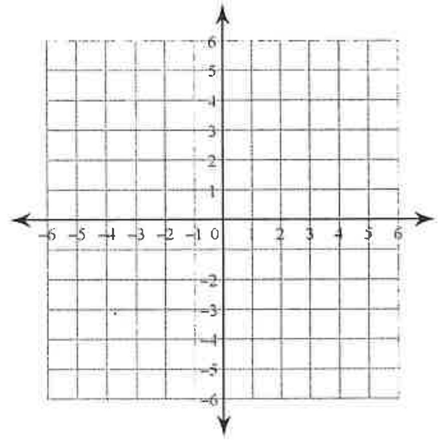
Rule:

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

P' ______

Q' ______

R' ______



Notation:

Rule:

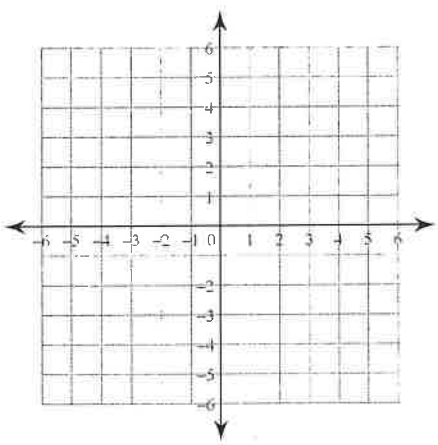
3. Quadrilateral $VWXY$ if $V(0,-1), W(1,1), X(4,-1)$, *and* $Y(1,-5)$ reflected over the line $y = x$.

V' ______

W' ______

X' ______

Y' ______



Notation:

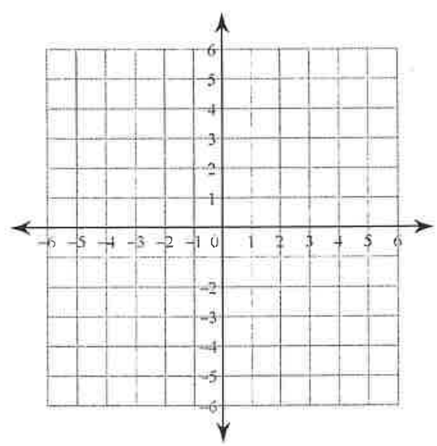
Rule:

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

B' ______

E' ______

L' ______



Notation:

Rule: y-axis

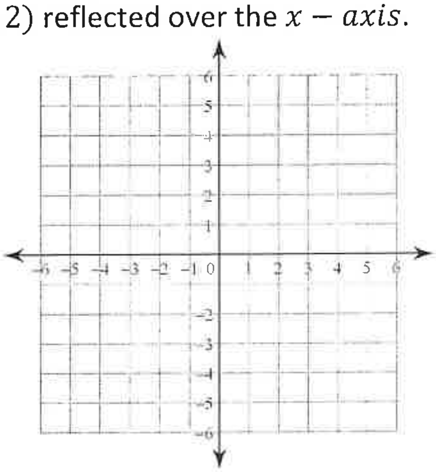
5. Square $SQUR$ if $S(2,4), Q(4,0), U(0,-4)$, *and* $R(-2,2)$ reflected over the $x-axis$.

S' ______

Q' ______

U' ______

R' ______



Notation:

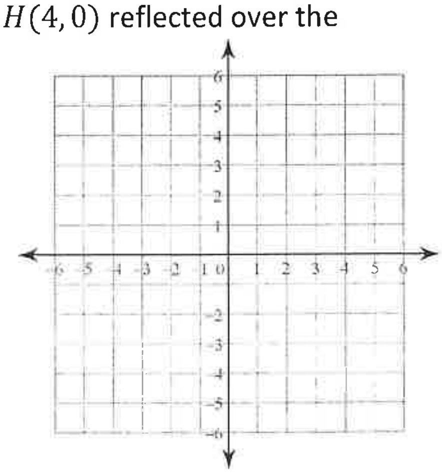
6. Quadrilateral $MATH$ *if* $M(1,4), A(-1,2), T(2,0)$ *and* $H(4,0)$ reflected over the $y-axis$.

M' ______

A' ______

T' ______

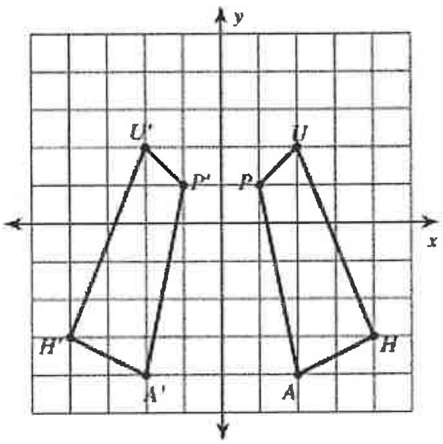
H' ______



Notation:

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

7.

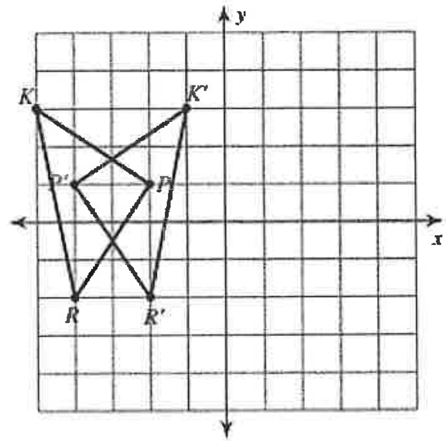


Description:

Algebraic Rule:

Notation:

8.

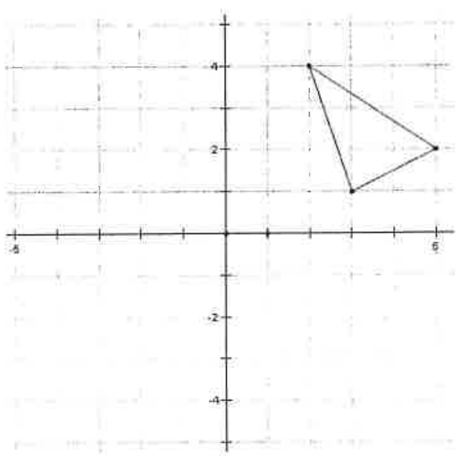


Description:

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. ☺

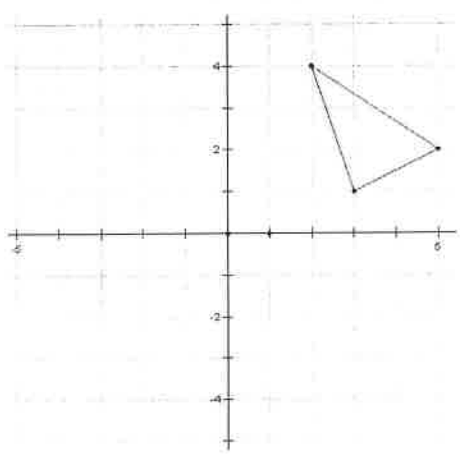
9. The points (2,4), (3,1), (5,2) are reflected with the rule $(x,y)\to(x,-y)$



Description:

Notation:

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



Description:

Notation:

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

Name________________________
Date__________________Pd_____

Rotations

Definition:

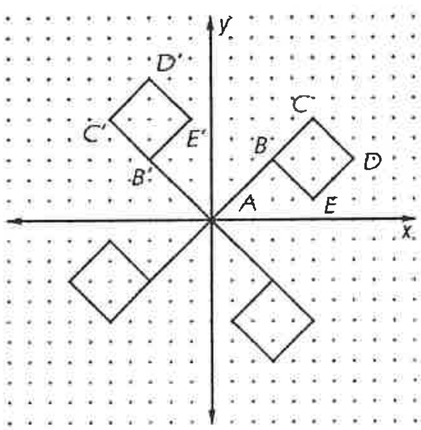
A rotation is a type of transformation which is a _______________ in a given direction for a given number of _____________ around a fixed ______________. To rotate an object, you must specify the ________________ of rotation, the _____________ around which the rotation is to occur, and the direction.

- Rotations can be completed in two directions: counter-clockwise & clockwise

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.



__________ - ____________

____

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

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

- **Examples:**

$\mathcal{R}_{90°}$ $\mathcal{R}_{270°CW}$

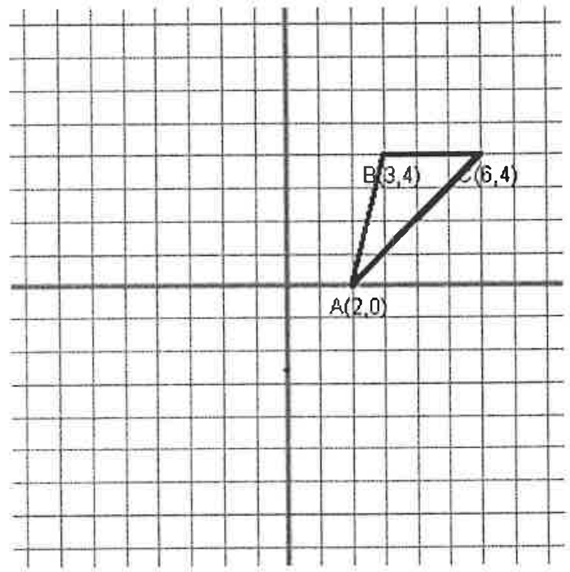
$\mathcal{R}_{180°}$ $\mathcal{R}_{180°CW}$

$\mathcal{R}_{270°}$ $\mathcal{R}_{90°CW}$

Math 2
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 proper notation for 1 – 3.**

1. A 90° counter-clockwise rotation maps $(x, y) \to$ (_______, _______). Notation: __________
2. A 270° counter-clockwise rotation maps $(x, y) \to$ (_______, _______). Notation: __________
3. A 180° rotation maps $(x, y) \to$ (_______, _______). Notation: __________

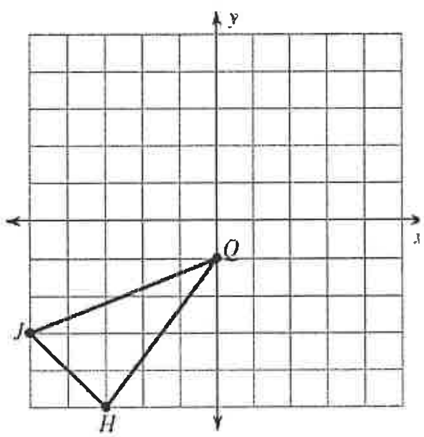
4. A rotation of 270° **clockwise** is equivalent to a rotation of ____________________.
5. A rotation of 270° **counterclockwise** is equivalent to a rotation of ____________________.
6. A rotation of 180° **counterclockwise** is equivalent to a rotation of ____________________.

Math 2
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

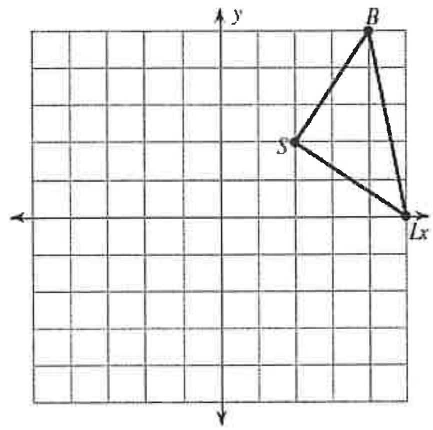


Coordinates:

Algebraic Rule:

Notation:

2) rotation 90° about the origin

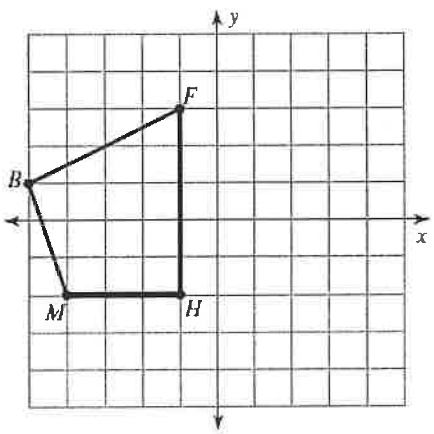


Coordinates:

Algebraic Rule:

Notation:

3) rotation 270° about the origin

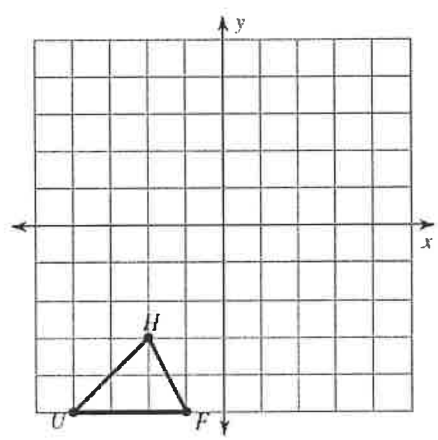


Coordinates:

Algebraic Rule:

Notation:

4) rotation 180° about the origin

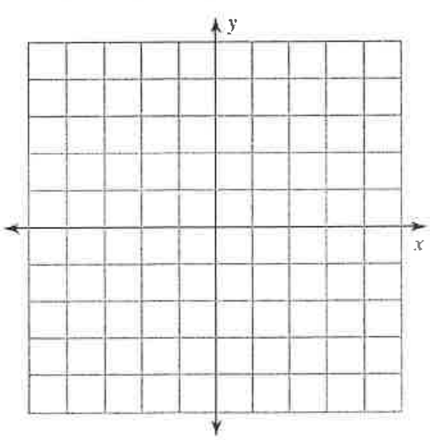


Coordinates:

Algebraic Rule:

Notation:

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

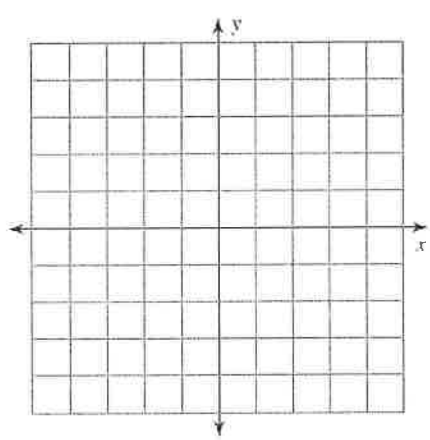


Coordinates:

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

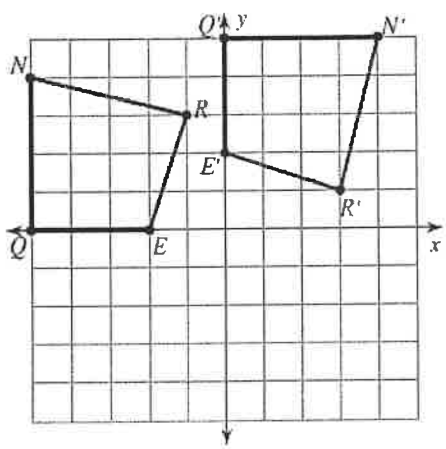
Vertices:

Algebraic Rule:

Notation:

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

11)

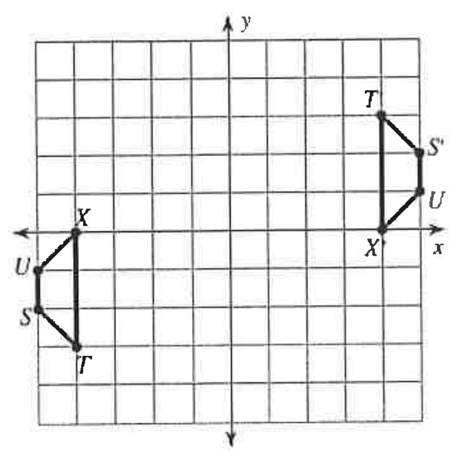


Description:

Algebraic Rule:

Notation:

12)

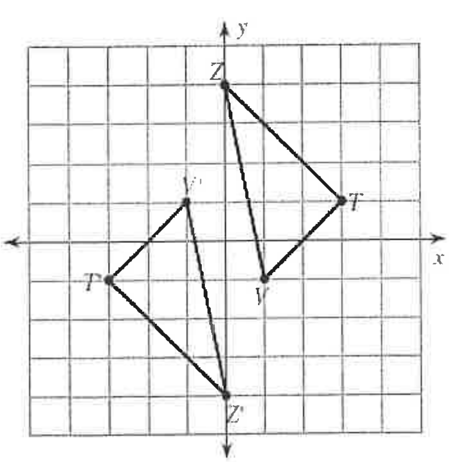


Description:

Algebraic Rule:

Notation:

13)

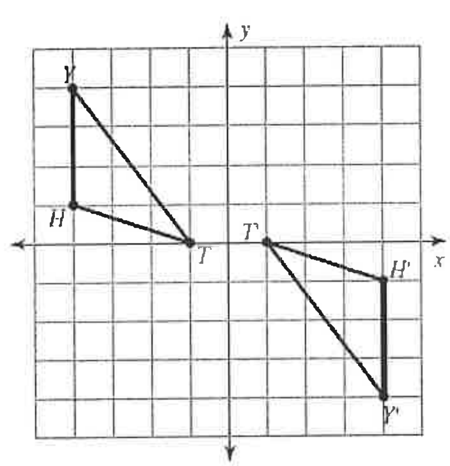


Description:

Algebraic Rule:

Notation:

14)



Description:

Algebraic Rule:

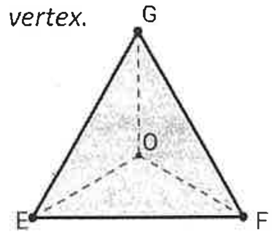
Notation:

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

Name______________________________
Date________________________Pd______

Part 1 – Regular Polygons and Rotational Symmetry

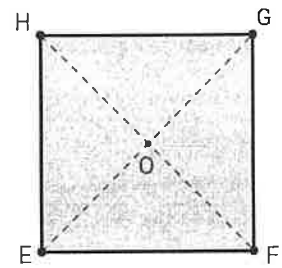
*A **regular polygon** is a **polygon** that is equiangular (all angles are equal in measure) and equilateral (all sides have the same length). In the case of **regular polygons** the **center** is the point that is equidistant from each vertex.*



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.

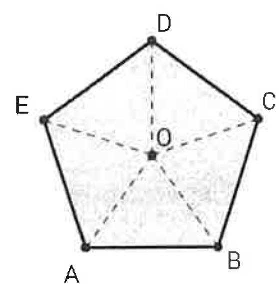


2. Given $Regular\ Quadrilateral\ EFGH$ with center O.
   a. F is rotated about O. If the image of F is G, what is the angle of rotation?
   b. F is rotated about O. If the image of F is H, what is the angle of rotation?
   c. $\overline{FG}$ is rotated 270° about O. What is the image of $\overline{FG}$?

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 _______________.

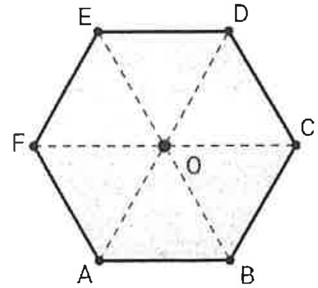
3. Given $Regular\ Pentagon\ ABCDE$ with center O.



   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 $\overline{DC}$?

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?

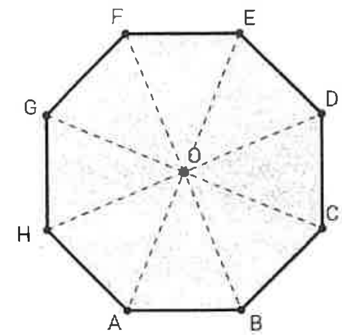
b. C is rotated 120° about O, what is the image of C?

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 $\overline{DC}$?

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).

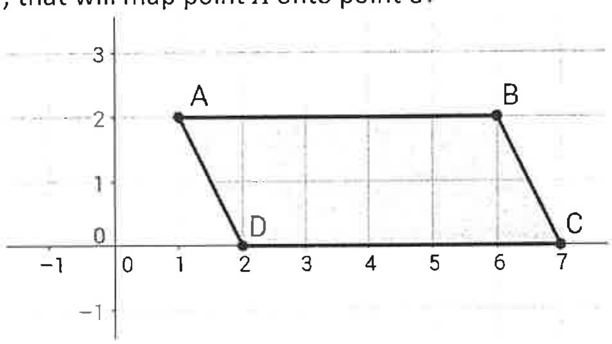
b. When point C is rotated about O, the image of point C is point F. Describe the rotation (be sure to include degree).

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 __________.

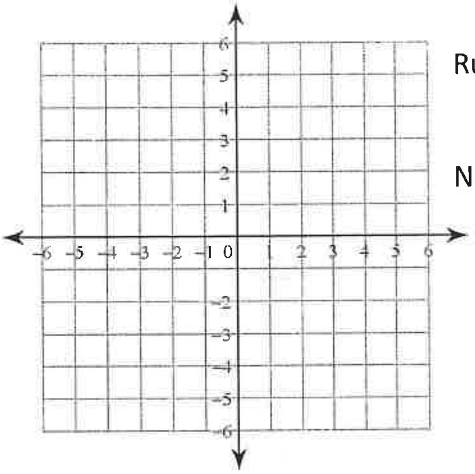
e. If $\angle D$ maps to ________, then $\angle D$ and ________ are ___________.

Math 2
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.

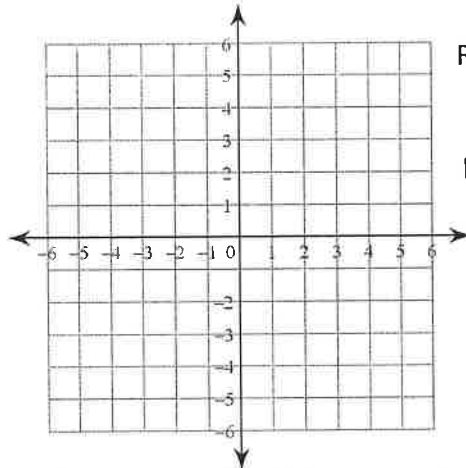


Rule:

Notation:

R' (____, ____) S' (____, ____) T' (____, ____)

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

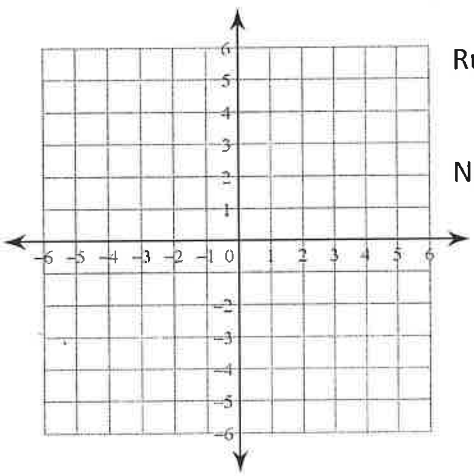


Rule:

Notation:

F' (____, ____) U' (____, ____) N'(____, ____)

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

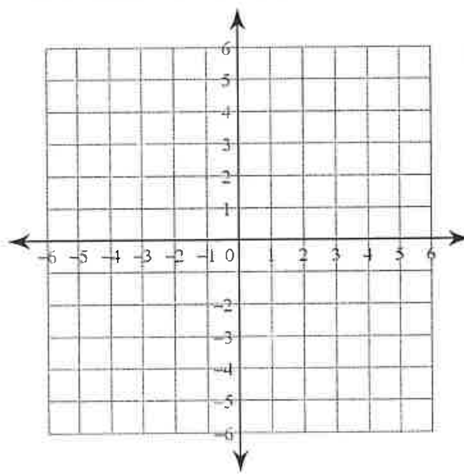


Rule:

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' (____, ____)

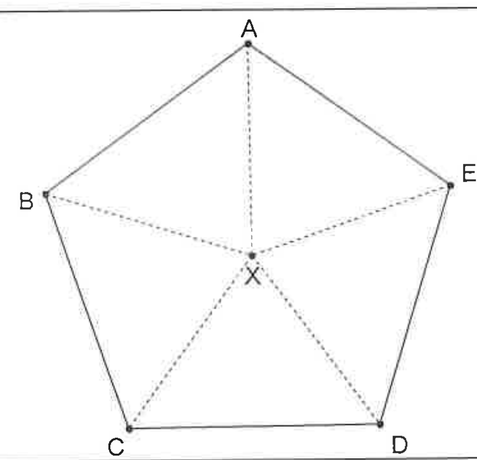
5) Application

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

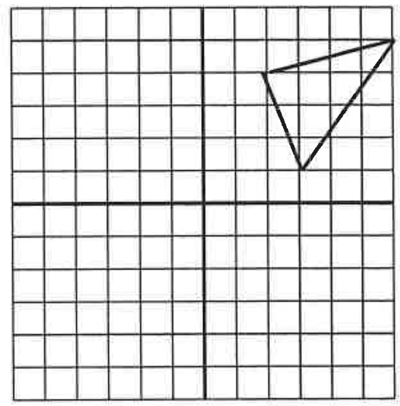
For each problem graph the image points. Specifically describe in words the rotation that occurred. Then, write the Algebraic Rule and the proper notation for the rotation.

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:

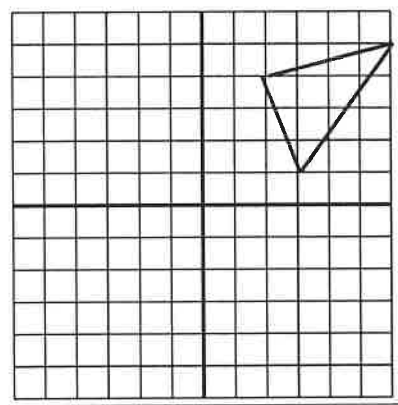


2) The coordinates of ΔABC are $A(3,1)$, $B(6,5)\ and\ C(2,4)$. The coordinates of A'B'C' are $A'(1,-3), B'(5,-6), and\ C'(4,-2)$.

Description:

Algebraic Rule:

Notation:

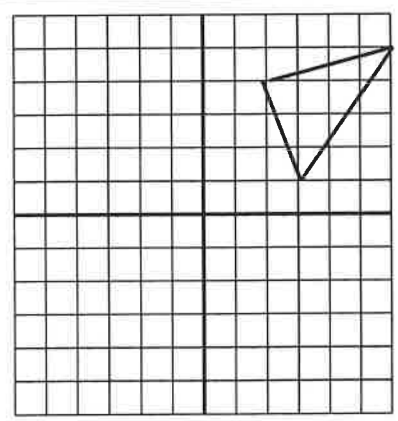


3) The coordinates of ΔABCABC are $A(3,1)$, $B(6,5)\ and\ C(2,4)$. The coordinates of A'B'C' are $A'(-3,-1), B'(-6,-5), and\ C'(-2,-4)$.

Description:

Algebraic Rule:

Notation:

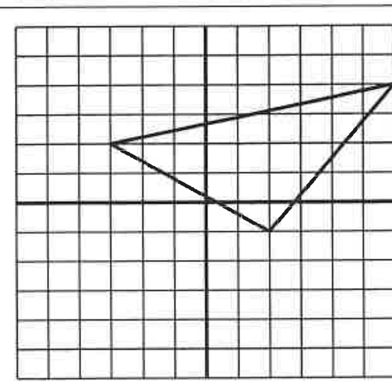


4) The coordinates of ΔABC are $A(2,-1)$, $B(6,4)\ and\ C(-3,2)$. The coordinates of A'B'C' are $A'(-1,-2), B'(4,-6), and\ C'(2,3)$.

Description:

Algebraic Rule:

Notation:



Math 2
Unit 1 – Geometric Transformations
Review of Lessons 1-4

Name_______________________
Date: ___________________ PD: ___

1. Pre-image: $A(0,0),\ B(8,1),\ C(5,5)$

Rotate the figure 180°	
Reflect the figure over the $x - axis$	
Translate the figure according to $(x, y) \rightarrow (x + 6, y - 1)$	

2. Pre-image: $D(-12,6),\ E(-4,6),\ F(-6,9)$

Translate the figure according to $(x, y) \rightarrow (x + 1, y - 6)$	
Reflect the figure over the $x - axis$	
Reflect the figure over the $y - axis$	

3. Pre-image: $G(2,2),\ H(-2,2),\ I(-2,-2)$

Rotate the figure 90° clockwise	
Translate the figure according to $(x, y) \rightarrow (x + 2, y + 2)$	
Reflect the figure over the line $y = x$	

4. Pre-image: $J(7,2)$, $K(0,9)$, $L(-6,-5)$

Reflect the figure over the $y - axis$	
Reflect the figure over the $x - axis$	
Rotate the figure 90° counbter-clockwise about the origin	

5. Pre-image: $M(0,0)$, $N(-13,0)$, $O(0,12)$

Rotate the figure 180° about the origin	
Translate the figure according to $(x,y) \rightarrow (x+5, y+5)$	
Reflect the figure over the line $y = x$	

6. Pre-image: $P(6,-3)$, $Q(8,-5)$, $R(7,-7)$

Translate the figure according to $(x,y) \rightarrow (x-4, y+3)$	
Reflect the figure over the line $y = -x$	
Rotate the figure 180°	

Math 2
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

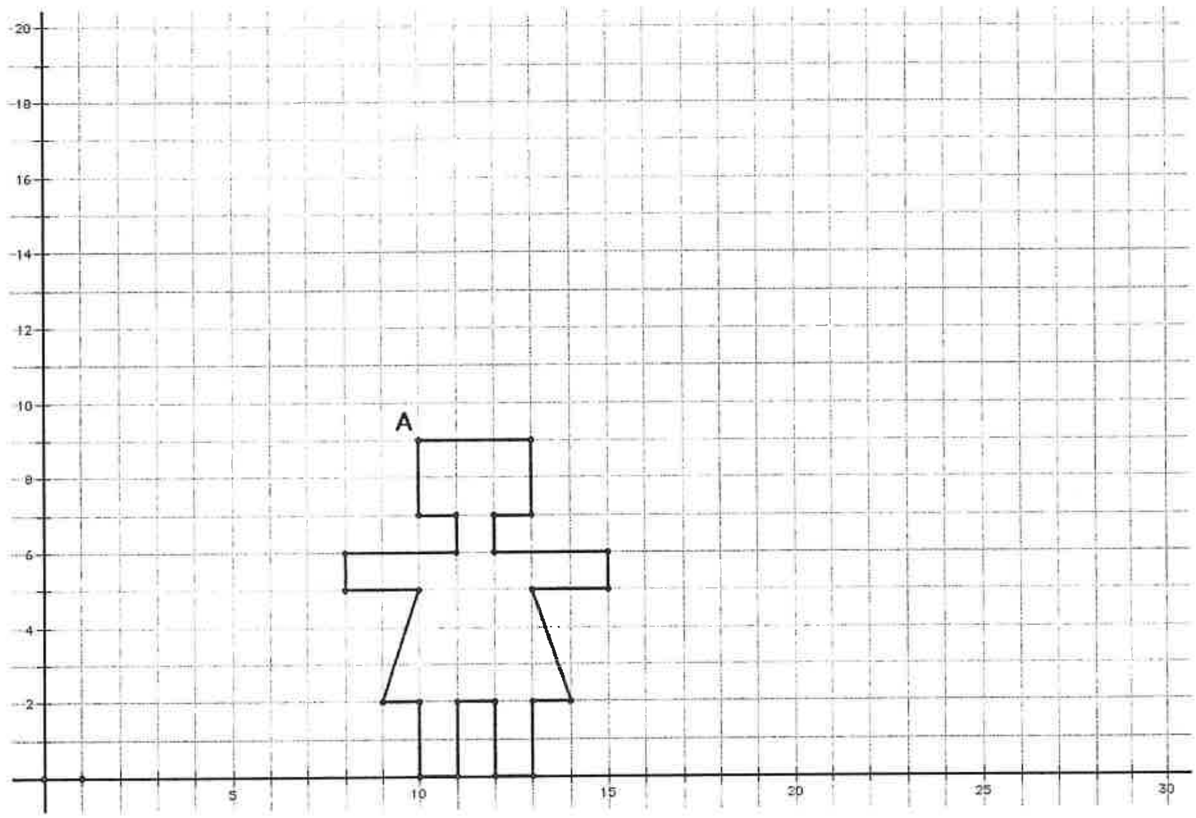
Find Alice's height after she drinks each potion or eats each bite of cake. **If everything goes correctly, Alice will return to her normal height by the end.**

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?

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

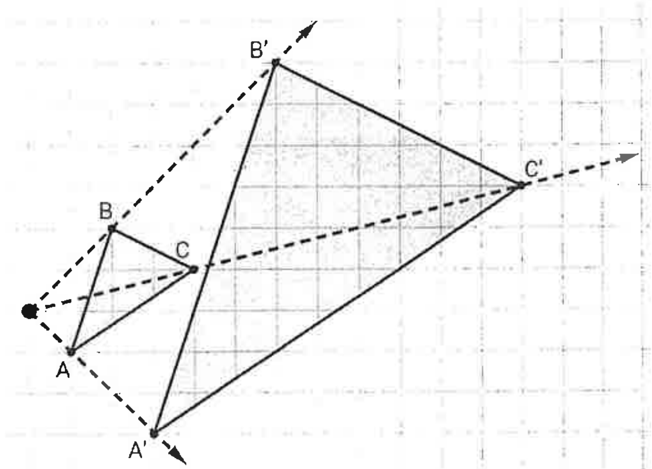
- The description of a dilation should include the __________ ______________, the ______________ of the dilation, and whether the dilation is an ______________________ or a ____________________.
- The amount by which the image grows or shrinks is called the "_____________ _______________."
- The ______________ 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)**

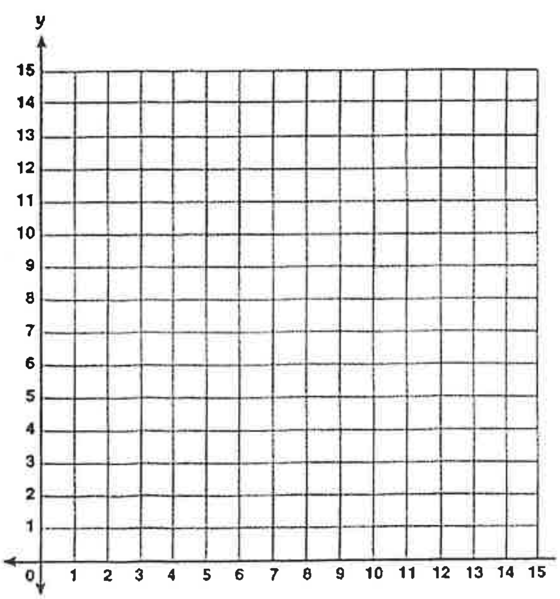
If a > 1 then the dilation is __ ________________

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.



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: ______________________________

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

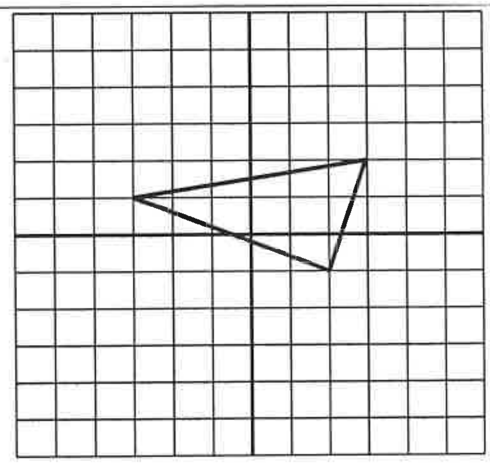
Name______________________________
Date_______________________Pd_______

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:

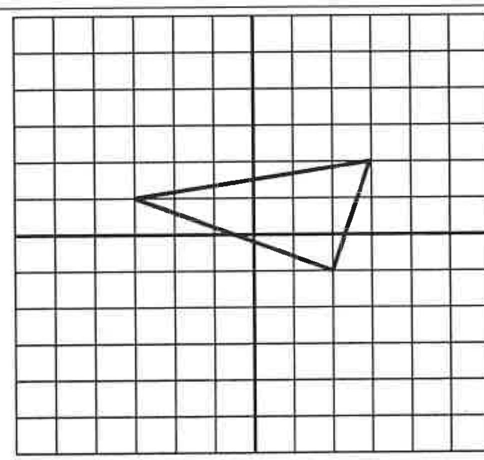
Algebraic Rule:



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:

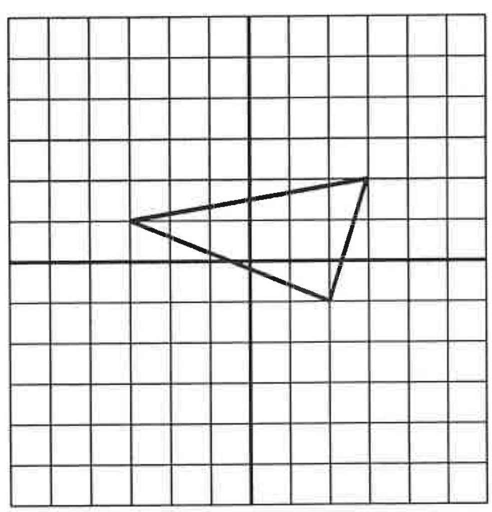
Algebraic Rule:



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:



Name________________________________
Date___________________________Pd________

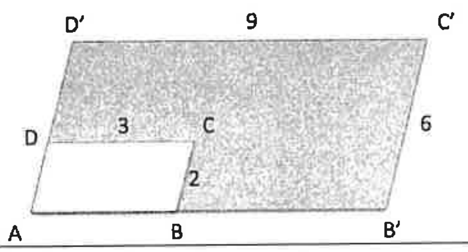
1. Describe the transformation given by rule $(x, y) \rightarrow (3x, 3y)$. Is it an "Isometry"? Why or why not?

2. Write an algebraic rule for the dilation:

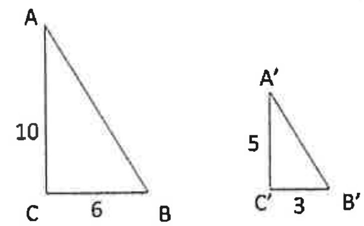
   A. by a factor of 3

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

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

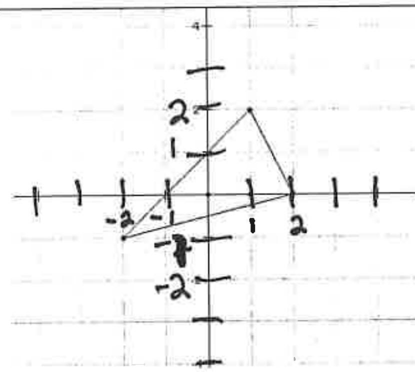


4. Find the scale factor of the dilation that maps ABC to A'B'C'.



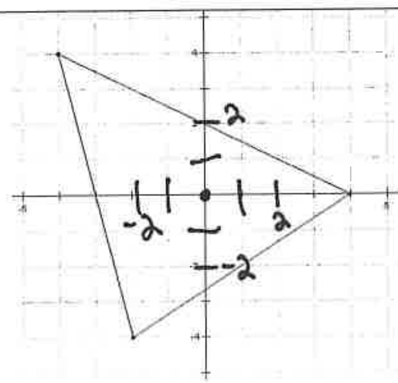
5. Graph the dilation of the object shown using a scale factor of 2.

Algebraic Rule:



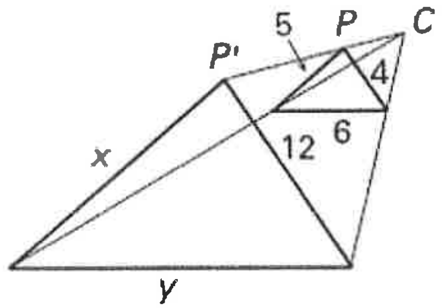
6. Graph the dilation of the object shown using a scale factor of ½.

Algebraic Rule:



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

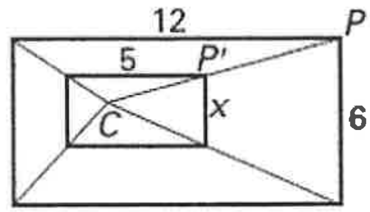
7.



SF = ______________ ______________

x = ______________ y = ______________

8.



SF = ______________ ______________

x = ______________

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

9. 3.5

10. $^2/_5$

11. 0.6

12. 1

13. $^4/_3$

14. $^5/_8$

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

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

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

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

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

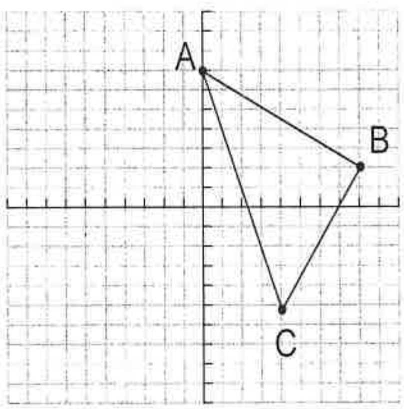
Determine if the triangles are similar. If so, what is the ratio of corresponding sides?

Math 2
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.**

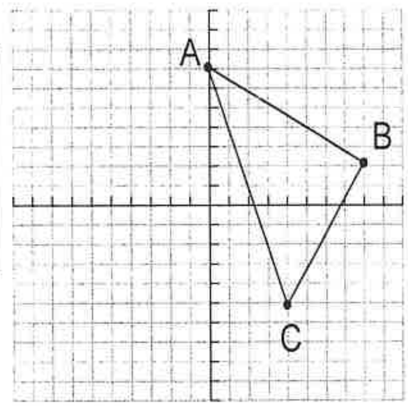
1. Reflect over the $y - axis$



Algebraic Rule:

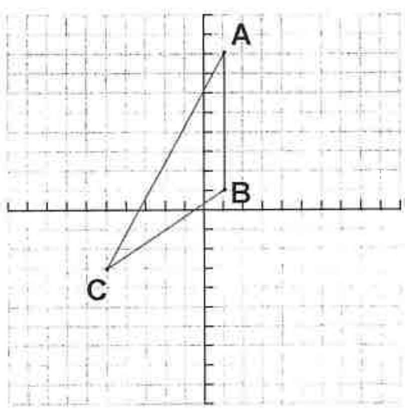
Notation:

2. Dilate with a scale factor $r = ½$



Algebraic Rule:

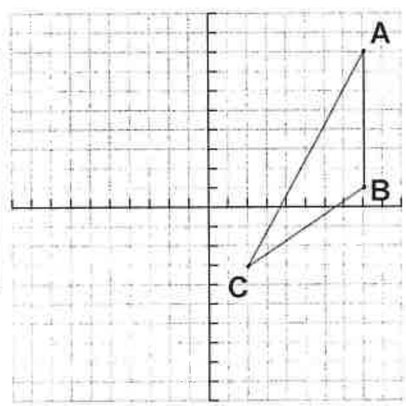
3. Rotate about the origin 90°



Algebraic Rule:

Notation:

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



Words:

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

$\mathbf{(1, -5), (-2, 4), (3, 0)}$

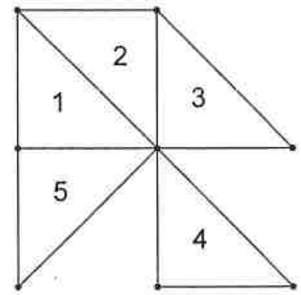
5. Reflect over the $x - axis$	6. Reflect over the line $y = x$	7. Rotate 90°
8. Rotate 180°	9. Dilate with a scale factor of 3	10. $T: (x, y) \rightarrow (x + 3, y - 4)$

Math 2
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:**____________________

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

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

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

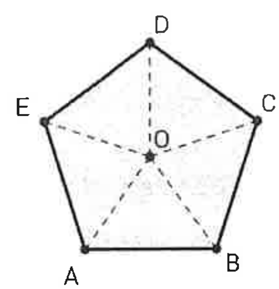
20. M is dilated with a scale factor $r\ = \frac{3}{4}$. If M is $(9, -3)$, find M'. ______________

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 $\overline{BC}$?



Math 2
Unit 1 – Geometric Transformations
Lesson 6 – 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 $^1/_3$.

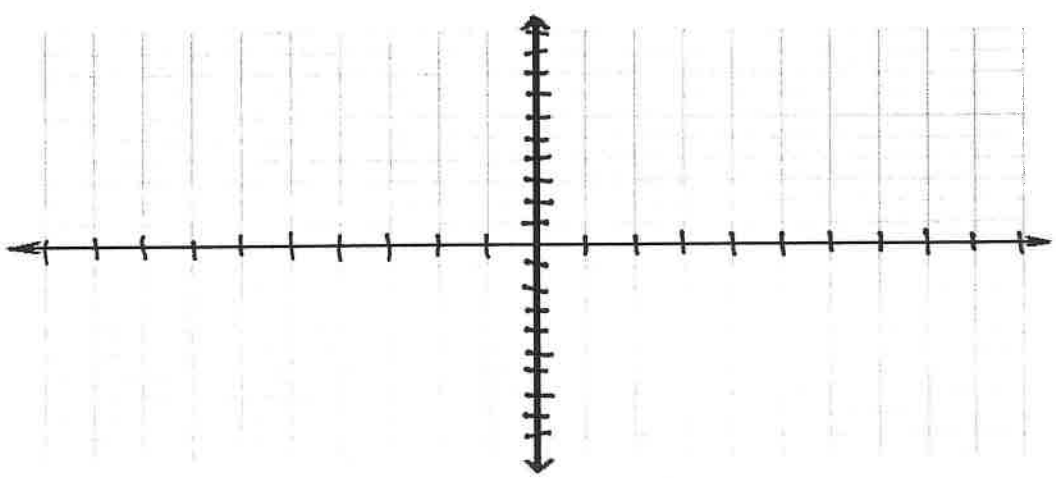
5) Translate a triangle 4 units right and 2 units down, and then reflect the triangle over the $x - axis$.

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.

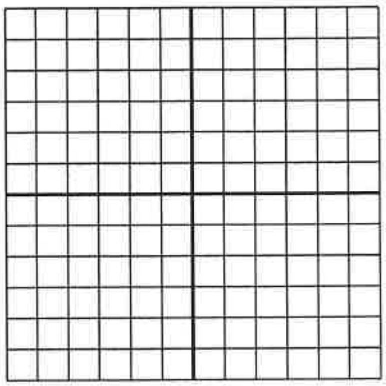
d. Now apply the coordinate rule you gave in Part c two more times to $\Delta A'B'C'$.

Math 2
Unit 1 – Geometric Transformations
Lesson 6 – Compositions of Transformations – CLASSWORK

Name________________________
Date____________________Pd_____

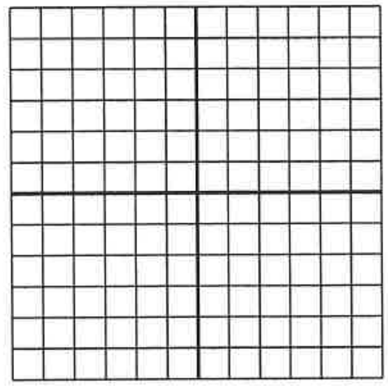
Part 1: **Given the description, write an algebraic rule to represent the transformation. Then graph the pre-image and image on the graph below. Use ΔABC with $A(2,-2), B(3,1), and\ C(1,2)$.**

1) ΔABC is dilated by 2.



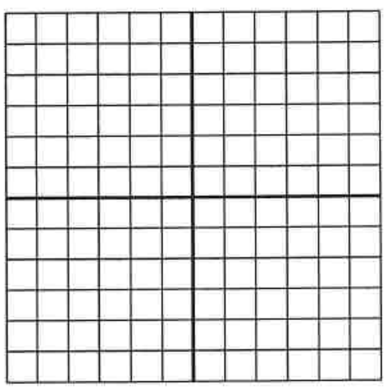
Algebraic Rule: ________________

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



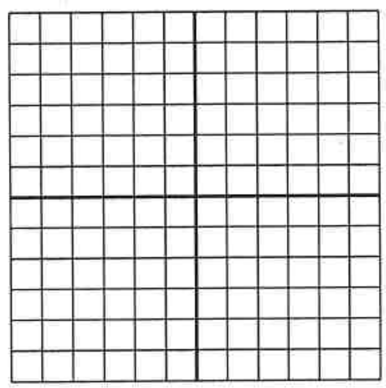
Algebraic Rule: ________________

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



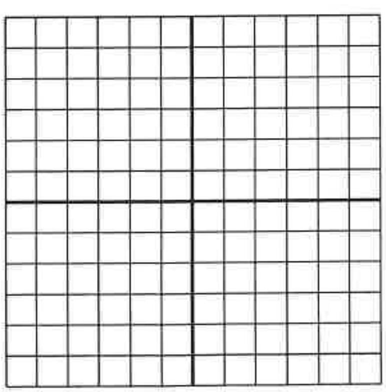
Algebraic Rule: ________________

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



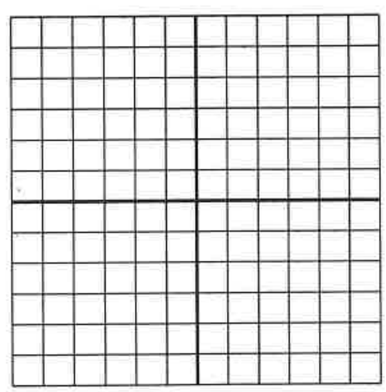
Algebraic Rule: ________________

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



Algebraic Rule: ________________

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



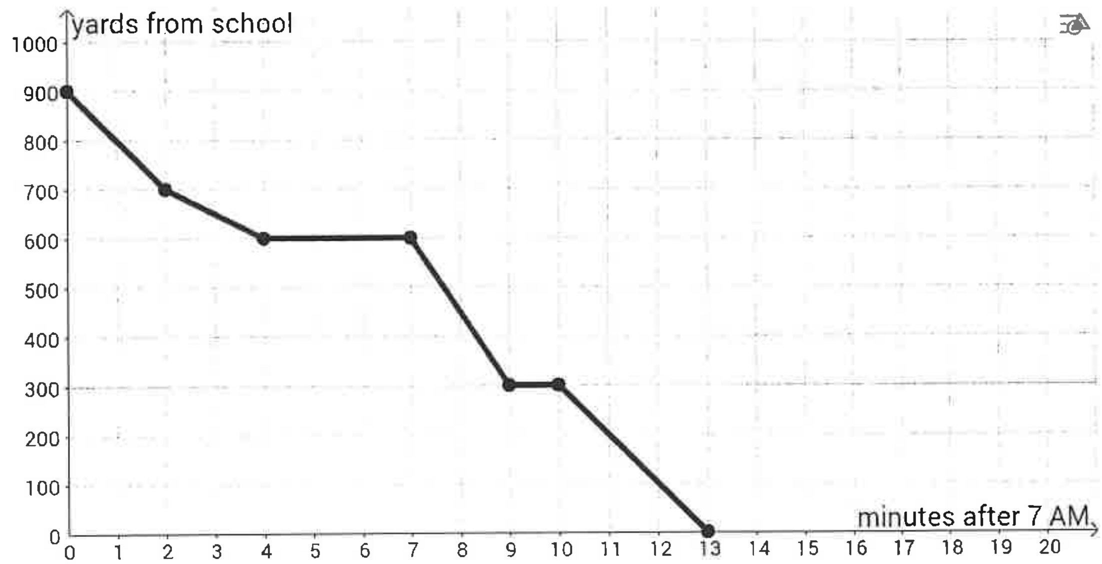
Algebraic Rule: ________________

Math 2
Unit 1 – Geometric Transformations
Lesson 7 – 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)

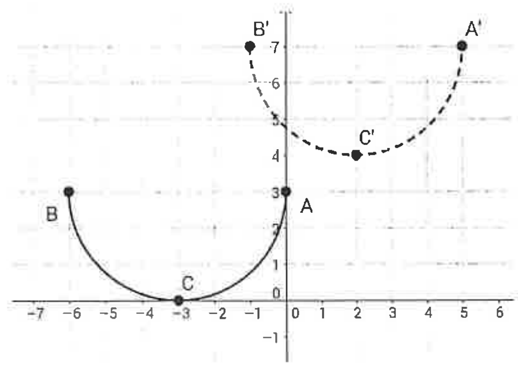
13. Kim's range: _______ $\leq y \leq$ ________
(where y represents distance from school)

➢ 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.



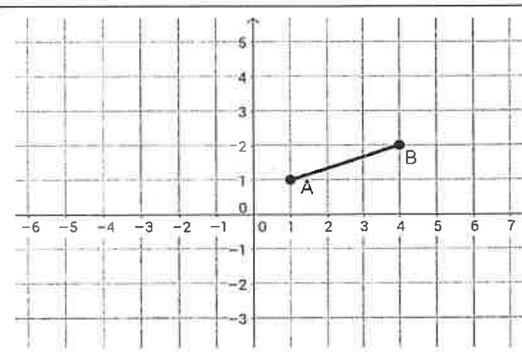
a. Given the following graph, state the domain and range of the pre-image in interval notation:

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.



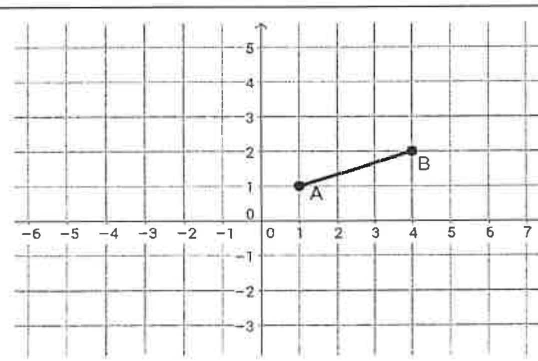
a. State the domain and range of the pre-image:

Domain: ________________Range: _________________.

b. State the domain and range of the image:

Domain: ________________Range: _________________.

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



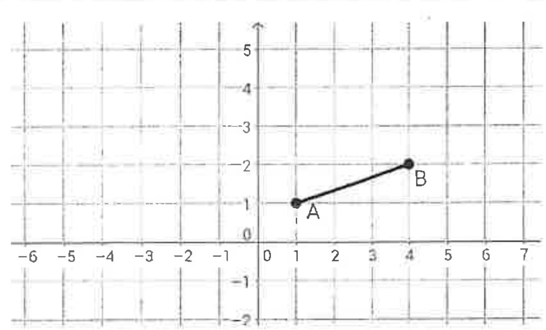
a. State the domain and range of the pre-image:

Domain: ________________Range: _________________.

b. State the domain and range of the image:

Domain: ________________Range: _________________.

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



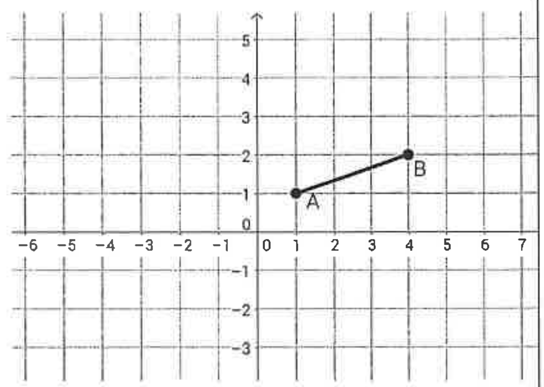
a. State the domain and range of the pre-image:

Domain: ________________Range: _________________.

b. State the domain and range of the image:

Domain: ________________Range: _________________.

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



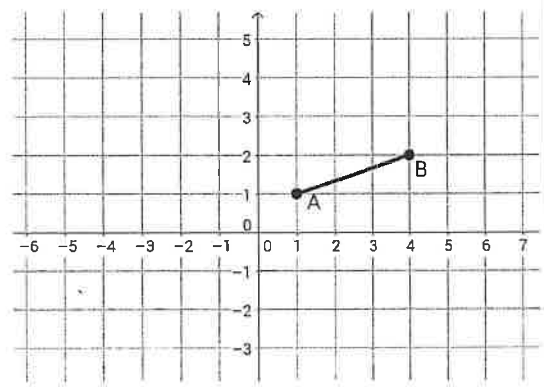
a. State the domain and range of the pre-image:

Domain: ________________Range: _________________.

b. State the domain and range of the image:

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: _________________.

b. State the domain and range of the image:

Domain: ________________Range: _________________.

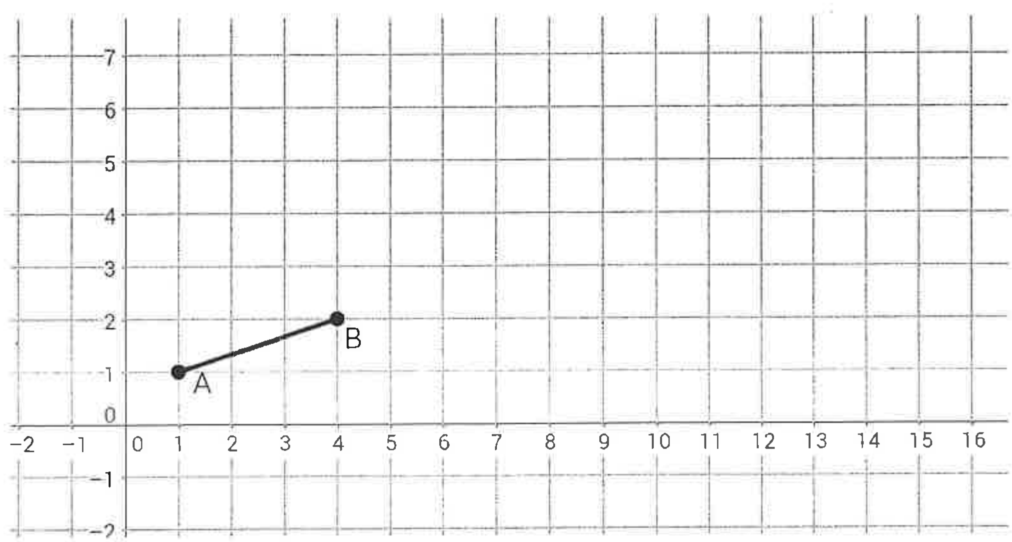
7. **Draw and label the image of $\overline{AB}$ dilated by a scale factor of 3 with a center of (0,0).**

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

Domain: ________________Range: _________________.

b. State the domain and range of the image:

Domain: ________________Range: _________________.

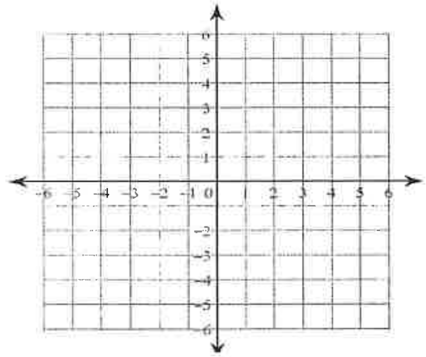


Math 2
Unit 1 – Geometric Transformations
Lesson 7 – Functions CLASSWORK/HOMEWORK

Name______________________________
Date__________________________Pd_______

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$(1,-1)$, and C$(4,2)$.**



   A) State the domain and range of the relation as an interval:

   D: ______________ R: ______________

   B) State the domain and range of the image.

   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: ____$\leq x \leq$_____ R: _____$\leq y \leq$_____

   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 with a center of $(0,0)$:**

   D: ______________

   R: ______________

KNOW FOR TEST!!!!!

Transformation Rules:

Translation: $T: (x, y) \to (x \pm a, y \pm b)$		Remember translations can also be described in words.
Reflection: $(x, y) \to (x, -y)$ $(x, y) \to (-x, y)$ $(x, y) \to (y, x)$ $(x, y) \to (-y, -x)$	**Reflection Notation:** R_{x-axis} R_{y-axis} $\mathrm{R}_{y=x}$ $\mathrm{R}_{y=-x}$	Remember reflection can occur over other lines on the coordinate plane.
Rotation: $(x, y) \to (-y, x)$ $(x, y) \to (y, -x)$ $(x, y) \to (-x, -y)$	**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: $(x, y) \to (ax, ay)$		Remember a dilation can be an enlargement or a reduction

Math 2
Unit 1 – Geometric Transformations
Unit Test Review

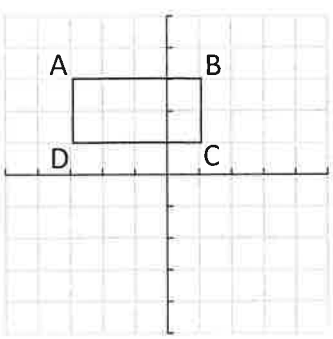
Name______________________________
Date________________________ Pd_____

- 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			

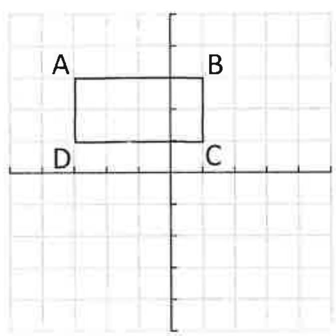
- For each of the following, graph and label the image for each transformation described.
- Then write using the correct notation.

9. Reflect over the $x - axis$



____

10. Rotate 180° about the origin



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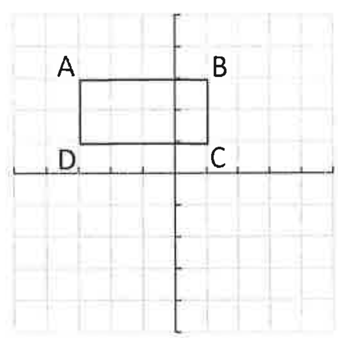
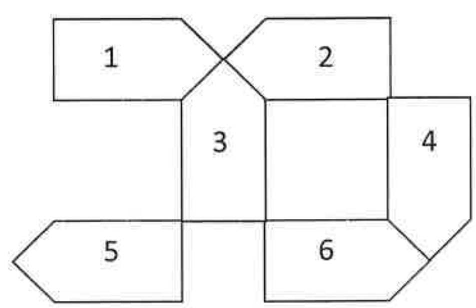
11. Translate right 4 units & down 3 units



____

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

12. Pentagon 1 to Pentagon 3 _________________________
13. Pentagon 5 to Pentagon 6 _________________________
14. Pentagon 2 to Pentagon 5 _________________________
15. Pentagon 1 to Pentagon 2 _________________________
16. Pentagon 4 to Pentagon 6 _________________________



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

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

17. Reflect over the $y-axis$	19. Rotate 90° counter-clockwise
18. Reflect over the line $y = -x$	20. Dilate by a scale factor r = ½

- Answer each of the following.

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

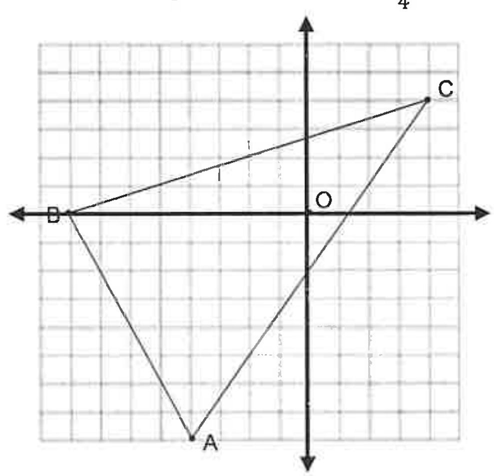
Find the coordinates of the image of the triangle if it is dilated by a scale factor r = 3.

A'(_____, _____)

B'(_____, _____)

C'(_____, _____)

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



22. 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. ** ***Don't forget to distribute the*** (−)

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

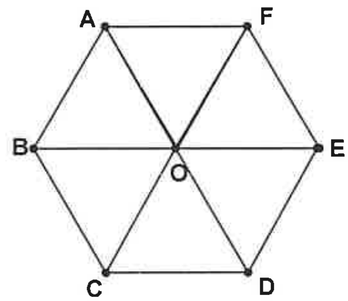
b. Translate a triangle 2 units right and 7 units down, and then rotate 90° clockwise.

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.

23. 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 300° counter-clockwise: $E \rightarrow$ ______

e. Rotate 60° clockwise: ______ $\rightarrow B$

24. Given a **line segment** with endpoints $(1, -2)$ and $(4, 5)$

A) State the **domain and range** of the pre – image segment. D: _[________]_ R: _[________]_

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

a) **Translated right 1 and up 4:**

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 5 with a center of $(0, 0)$:**

D: ______________

R: ______________

Math 2
Unit 1 – Geometric Transformations
Unit TEST Review - Classwork

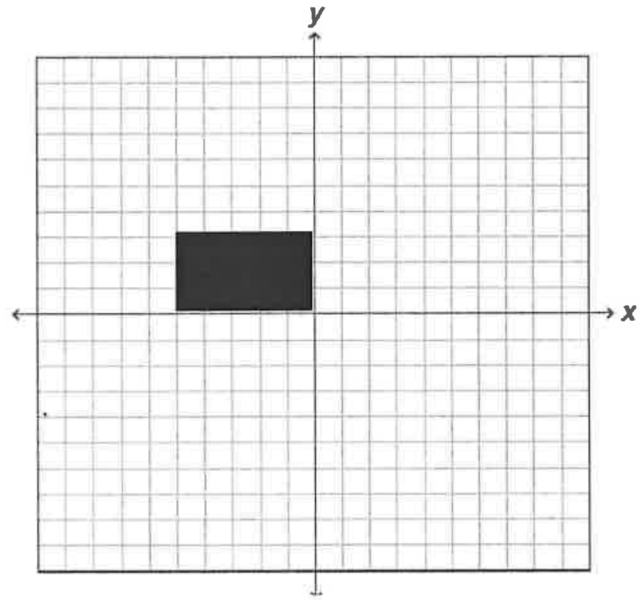
Name________________________________
Date_________________________Pd_____

1. Rotate the rectangle about the origin through angles of:

    a. 90 degrees

    b. 180 degrees

    c. 270 degrees

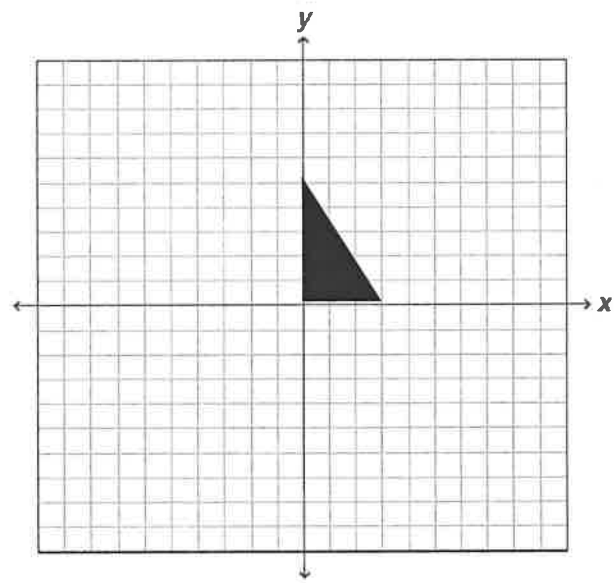


2. Rotate the triangle about the origin, using these angles:

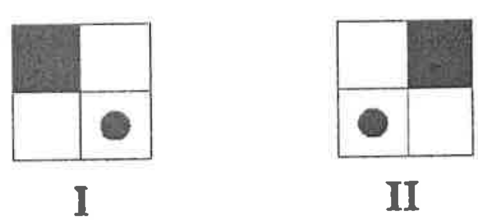
    a. 90 degrees

    b. 180 degrees

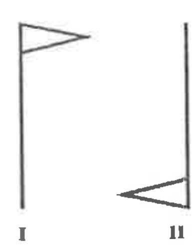
    c. 270 degrees



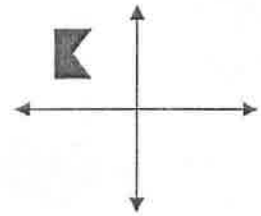
3. Study Figures I and II.
Which transformation of Figure I is shown in Figure II?

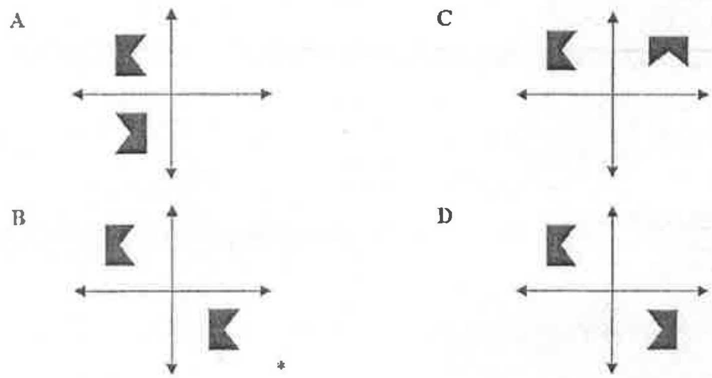


4. Study figures I and II.
Which transformation, if any, of Figure I is shown in Figure II?

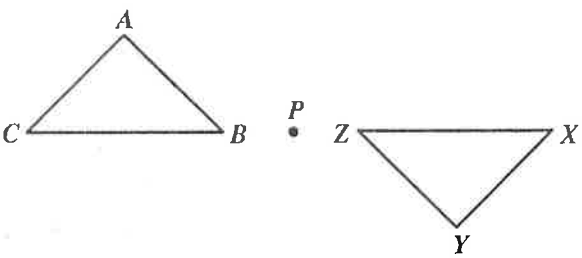


5. Which represents a translation of the figure →



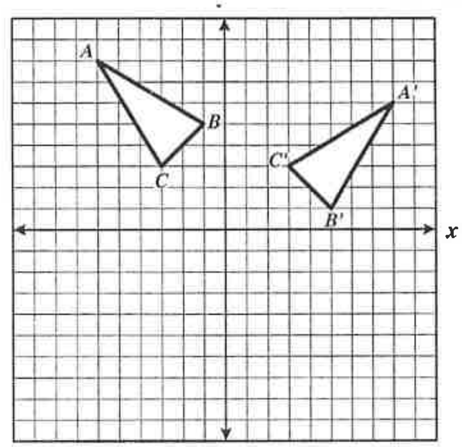


6. ΔXYZ was obtained from ΔABC by a rotation about the point P.



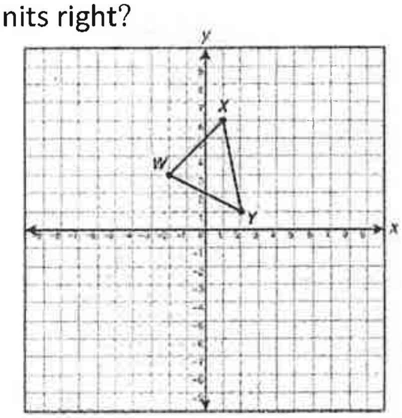
Write the correspondence of the vertices:
$A \rightarrow$ ______ $B \rightarrow$ ______ $C \rightarrow$ ______

7. Triangle $A'B'C'$ is apparently →

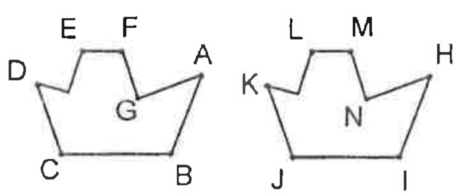


O A. A translation of triangle *ABC* across the *x*-axis
O B. A 90° clockwise rotation of triangle *ABC* about the origin
O C. A reflection of triangle *ABC* across the *y*-axis
O D. A reflection of triangle *ABC* across the *x*-axis

8. Name the image of ***X*** when triangle *WXY* is translated 2 units down and 5 units right?



9. Which point is a horizontal translation of E?



10. Write a rule for the composition if a point is

A. Rotated 270°, then reflected across $y = -x$ and finally translated 5 left and 7 up.

B. Rotated 270°, then translated 5 left and 7 up and finally reflected across $y = -x$.