

Name: _____

Date: _____

Introduction to Transformations

1. Define the following:

a. Transformation:

b. Translation:

c. Reflection:

d. Rotation:

e. Dilation

f. Congruent Figures:

g. Isometry:

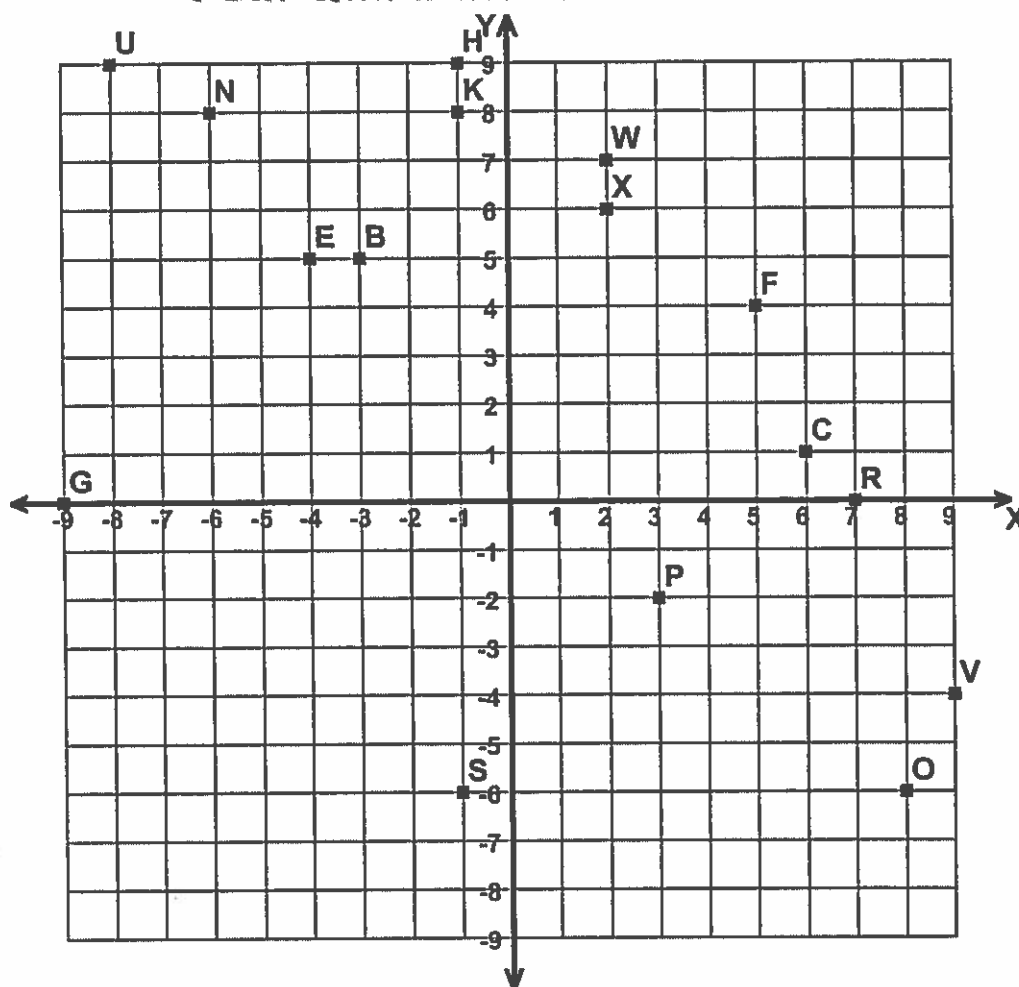
Name : _____

Score : _____

Teacher : _____

Date : _____

Four Quadrant Ordered Pairs



Tell what point is located at each ordered pair.

1) $(-3, +5)$ _____ 3) $(+3, -2)$ _____ 5) $(-1, +9)$ _____ 7) $(-1, -6)$ _____

2) $(-1, +8)$ _____ 4) $(+6, +1)$ _____ 6) $(+5, +4)$ _____ 8) $(-8, +9)$ _____

Write the ordered pair for each given point.

9) V _____ 11) N _____ 13) G _____ 15) X _____

10) E _____ 12) W _____ 14) R _____ 16) O _____

Plot the following points on the coordinate grid.

17) Y $(-9, +8)$ 19) A $(+5, +3)$ 21) Z $(-2, -6)$ 23) D $(-3, -3)$

18) I $(+4, -9)$ 20) J $(+6, -3)$ 22) L $(-6, -3)$ 24) Q $(+2, +8)$



Sch. Geometry Worksheet
Section 1-7

Name: _____

1. Given the transformation $\triangle XYZ \rightarrow \triangle X'Y'Z'$, name the preimage and the image of the transformation.

preimage: _____

image: _____

2. The types of transformations of geometric figures in the coordinate plane can be described as a slide, a flip or a turn. What are the more formal names used to identify these transformations?

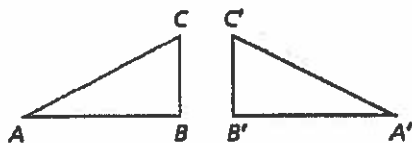
a slide: _____

a flip: _____

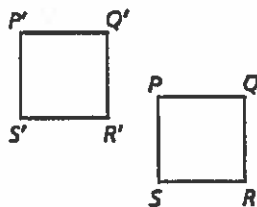
a turn: _____

For #3-6, identify each transformation.

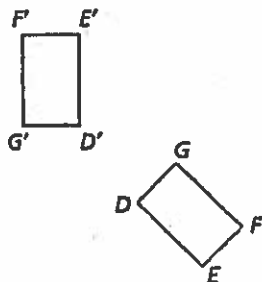
3.



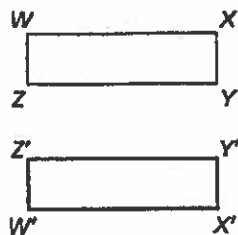
4.



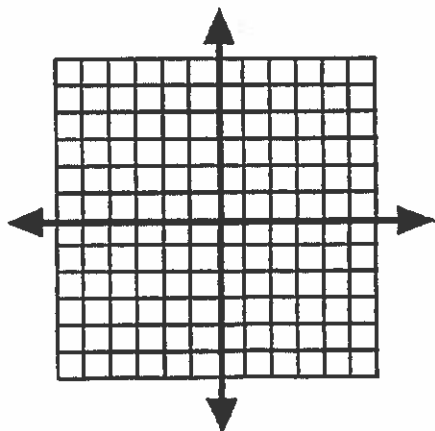
5.



6.

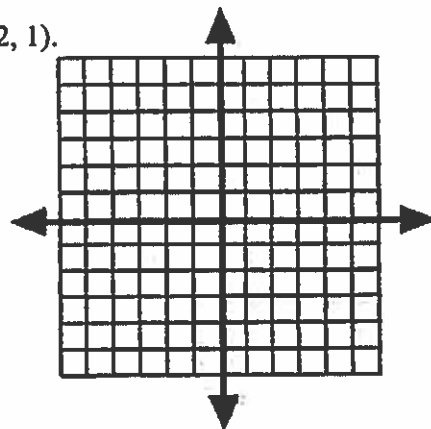


7. A figure has vertices at $A(-3, 2)$, $B(-1, -1)$ and $C(-4, -2)$. After a transformation, the image of the figure has vertices at $A'(3, 2)$, $B'(1, -1)$ and $C'(4, -2)$. Draw the preimage and image on the grid. Label the points. Then identify the transformation.

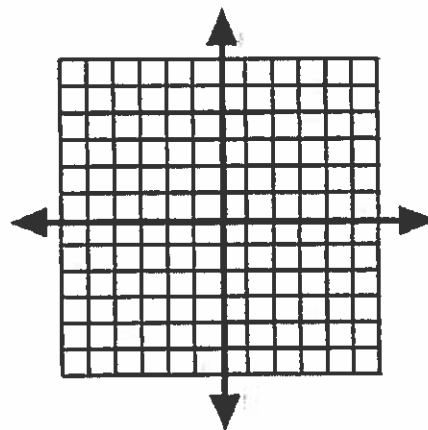


(over)

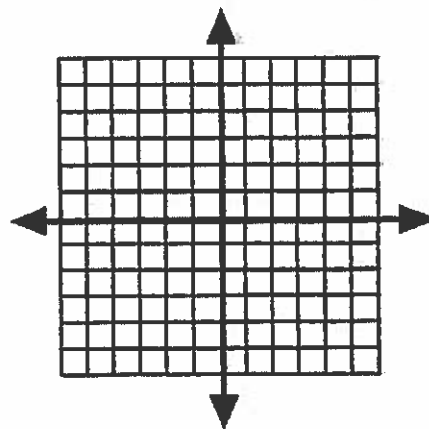
8. A figure has vertices at $J(-2, 3)$, $K(0, 3)$, $L(0, 1)$ and $M(-2, 1)$. After a transformation, the image of the figure has vertices at $J'(2, 1)$, $K'(4, 1)$, $L'(4, -1)$ and $M'(2, -1)$. Draw the preimage and image on the grid. Label the points. Then identify the transformation.



9. The coordinates of the vertices of $\triangle DEF$ are $D(2, 3)$, $E(1, 1)$ and $F(4, 0)$. Find the coordinates for the image of $\triangle DEF$ after the translation $(x, y) \rightarrow (x - 3, y - 2)$. Draw the preimage and the image on the grid. Label the points.



10. The coordinates of the vertices of rectangle $ABCD$ are $A(-4, 1)$, $B(1, 1)$, $C(1, -2)$ and $D(-4, -2)$. Find the coordinates for the image of rectangle $ABCD$ after the translation $(x, y) \rightarrow (x + 3, y - 2)$. Draw the preimage and the image on the grid. Label the points.



Which transformation is suggested by each of the following?

11. mountain range and its image on a lake
12. straight line path of a band marching down a street
13. wings of a butterfly

1.1 Translations

Vocabulary

Transformation: An operation that _____ or _____ a figure in some way to produce a new figure. The three transformations are _____, _____, and _____.

Translation:

Preimage (A)

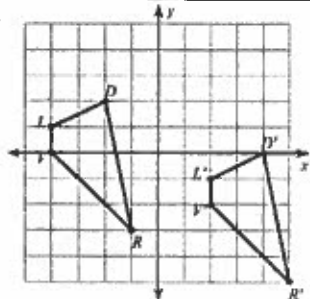
vs.

Image (A')



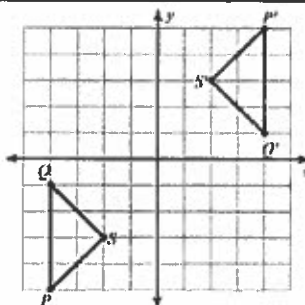
Example 1: Cross out the example that is NOT a translation. Then describe the remaining translations.

A.

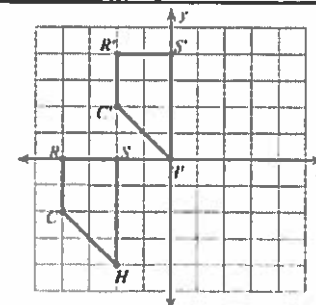


* Use one matching point to help you find the rule for the translation.

B.



C.



THE MATHEMATICAL WAY TO DESCRIBE TRANSLATIONS...

Coordinate Notation

$$(x, y) \rightarrow (x \pm a, y \pm b)$$

left/right up/down

Ex: left 3 units; up 7 units

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

Example 3: Rewrite the translation "mathematically"

1. left 15 units and up 24 units

$$(x, y) \rightarrow (x - 15, y + 24)$$

2. right 8 units and down 4 units.

$$(x, y) \rightarrow (x + 8, y - 4)$$

Example 4: Find the coordinates of the image without graphing.

1. Point $G(6, -3)$ is translated 5 units to the left and 6 units up to form the point G' . What are the coordinates of G' ?

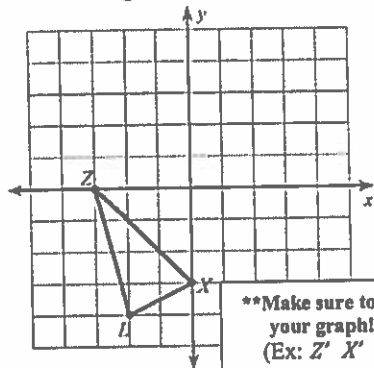
2. What is the image of $H(-2, 6)$ after the translation defined by $(x, y) \rightarrow (x + 2, y - 1)$?

3. Use the translation $(x, y) \rightarrow (x - 5, y + 1)$ to find what point $(-2, -10)$ translates to:

4. Use the translation $(x, y) \rightarrow (x - 3, y - 7)$ to find what point $(1, 4)$ translates to:

Example 5: Graph the translation using the rule given. Then list the coordinates of the image.

1. 5 units right and 3 unit up



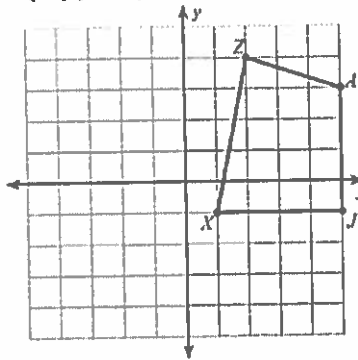
****Make sure to label your graph!**
(Ex: Z' X' L')**

Z' (,)

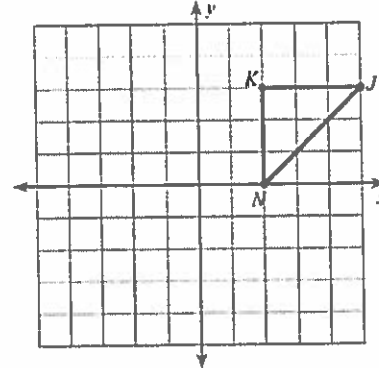
X' (,)

L' (,)

2. $(x, y) \rightarrow (x - 3, y - 2)$

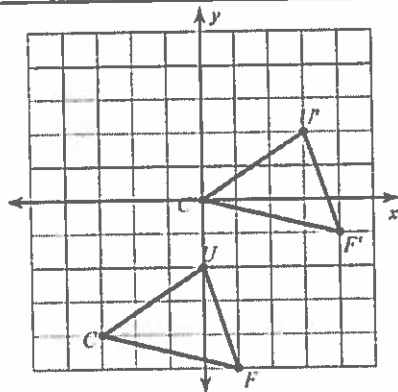


3. $(x, y) \rightarrow (x - 6, y)$

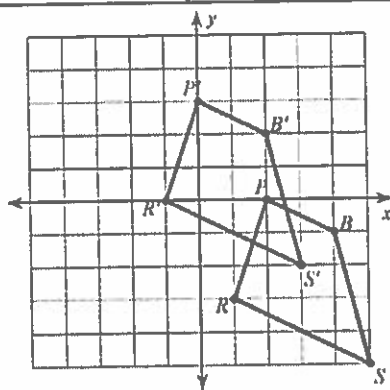


Example 6: Describe the transformation using coordinate notation.

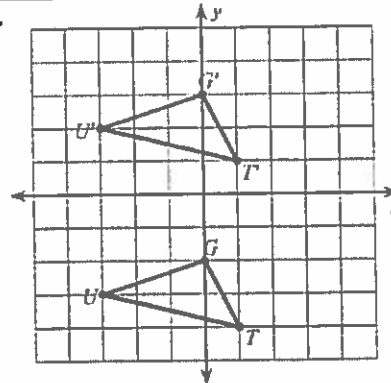
1.



2.

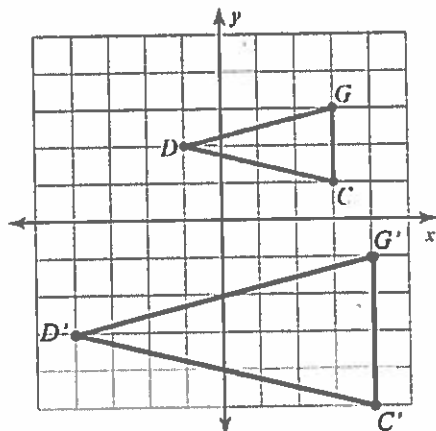


3.

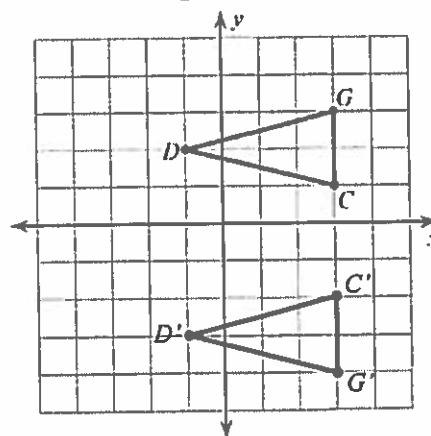


Critical thinking: Partner up and discuss!

1. Is the following a translation? Why or why not?



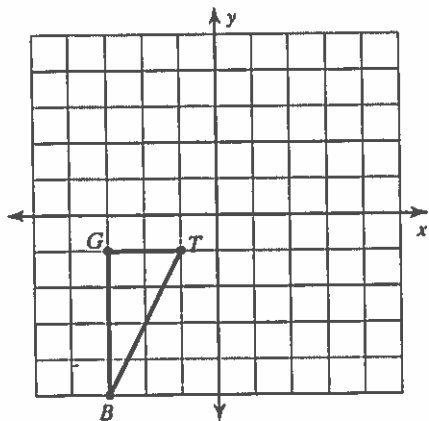
2. Is the following a translation? Why or why not?



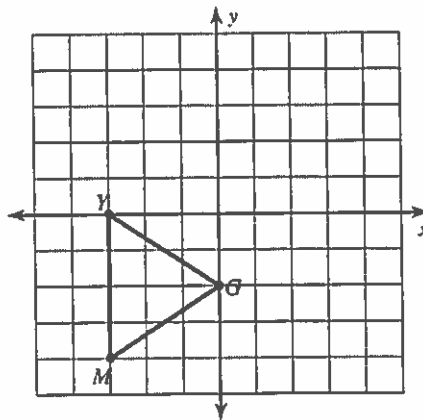
Translations

Graph the image of the figure using the transformation given.

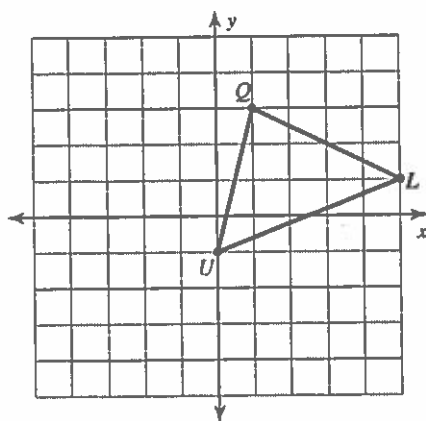
- 1) translation: 5 units right and 1 unit up



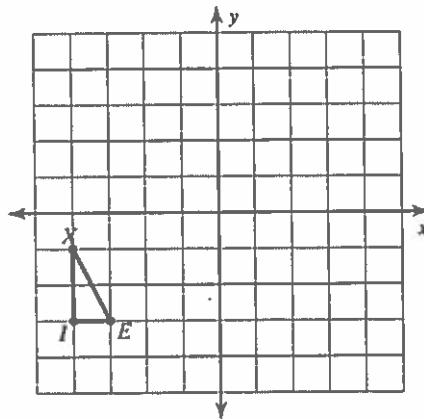
- 2) translation: 1 unit left and 2 units up



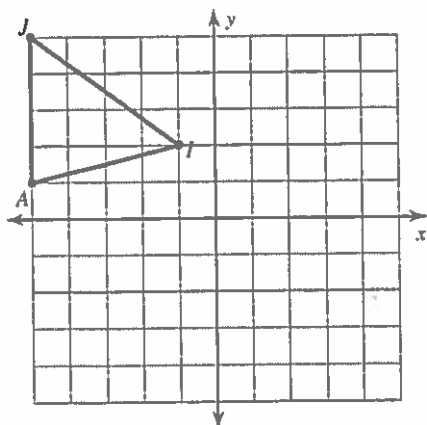
- 3) translation: 3 units down



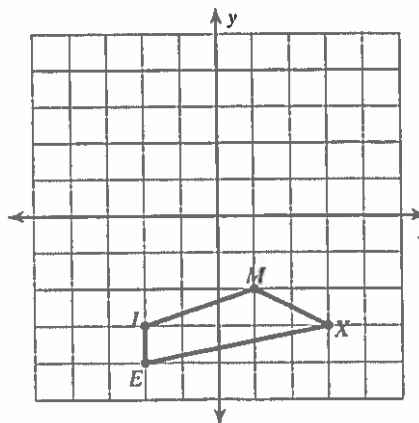
- 4) translation: 5 units right and 2 units up



- 5) translation: 4 units right and 4 units down

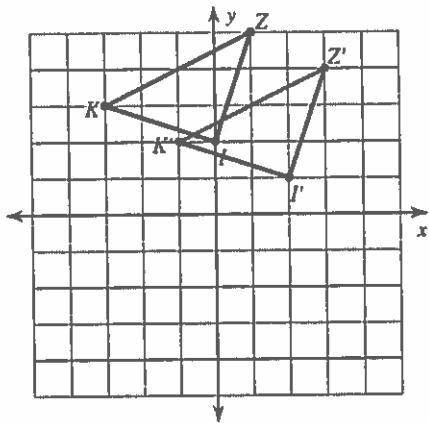


- 6) translation: 2 units right and 3 units up

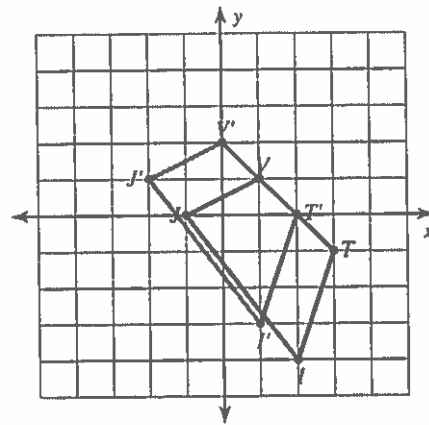


Write a rule to describe each transformation.

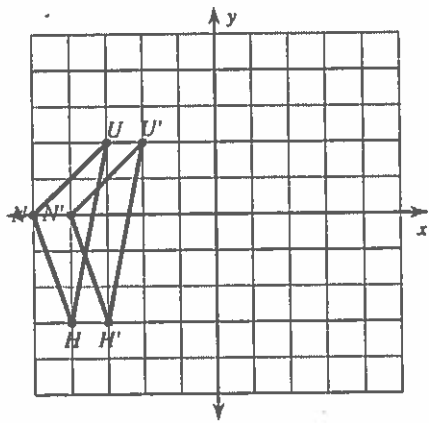
7)



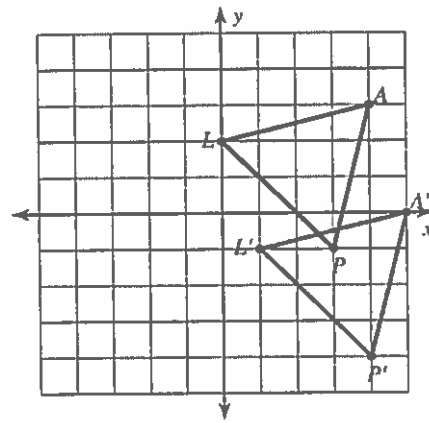
8)



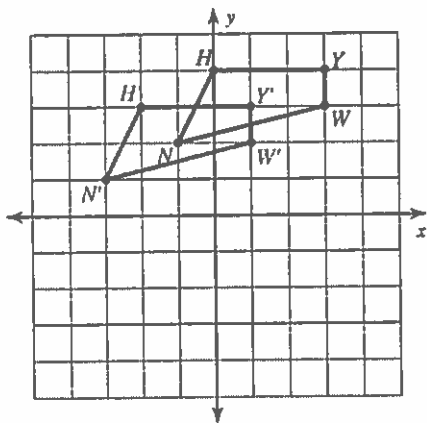
9)



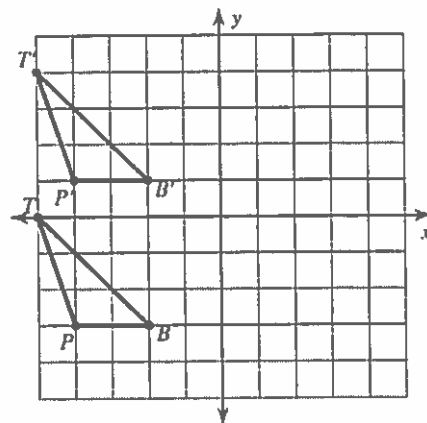
10)



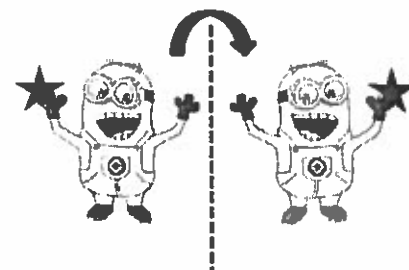
11)



12)



1.2 Reflections ↕



Reflection:	Line of Symmetry:
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Example 1: How many lines of symmetry does each figure have? Draw all lines of symmetry.

1.	2.	3.	4.
5.	6.	7.	8.

Example 2

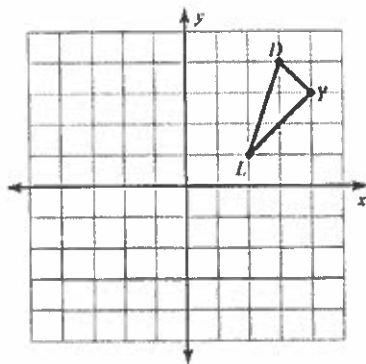
1. Triangle QOS is reflected across the y -axis. 	2. The letter W is reflected across the y -axis. 	
3. Reflect point K across the x -axis. 	4. Reflect point $P(2, -3)$ across the y -axis. 	5. Reflect point $D(-4, -4)$ across the x -axis.

Error Analysis

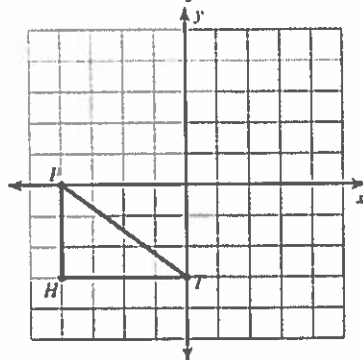
1. On a quiz Charlie reflected the triangle below across the y -axis, but it was marked wrong. Describe his error. 	2. Jenna reflected the triangle below across the x -axis. Describe her error.
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Example 3: Graph the reflection described. Then list the coordinates of the image.

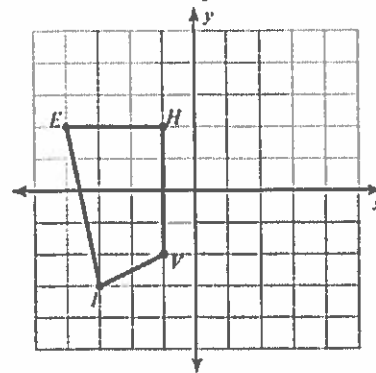
1. Reflection in the x -axis



2. Reflection in the y -axis

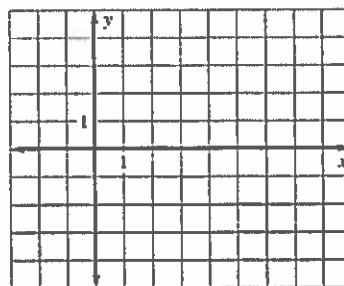


3. Reflection in the y -axis

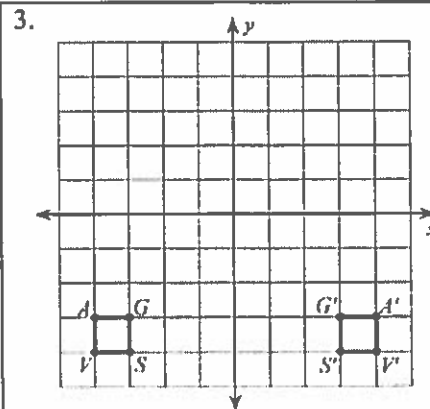
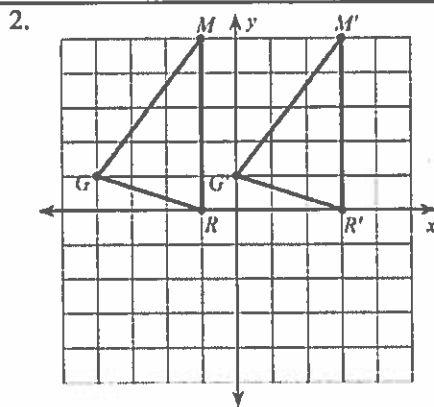
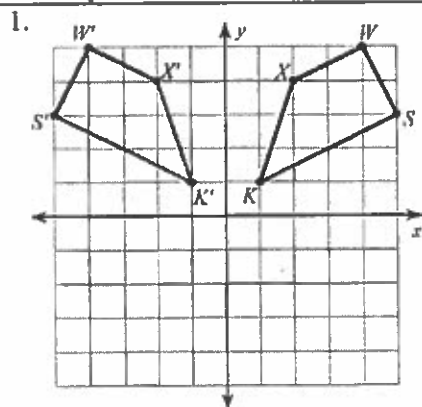


4. Graph $\triangle PET$ with vertices $P(2, 4)$, $E(4, 1)$, and $T(7, 4)$. Then reflect $\triangle PET$ across the x -axis and graph $\triangle P'E'T'$. Label the coordinates on the side.

$P(2, 4)$	→
$E(4, 1)$	→
$T(7, 4)$	→

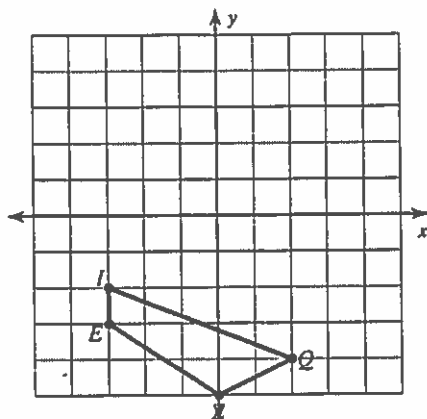


Example 4: Describe the transformation

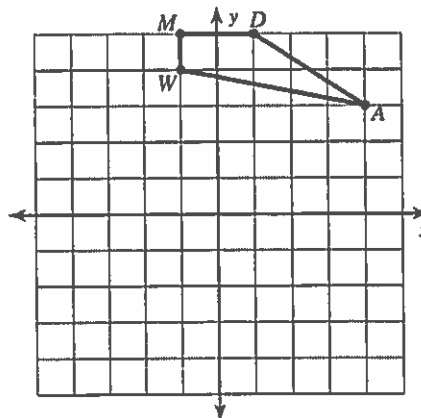
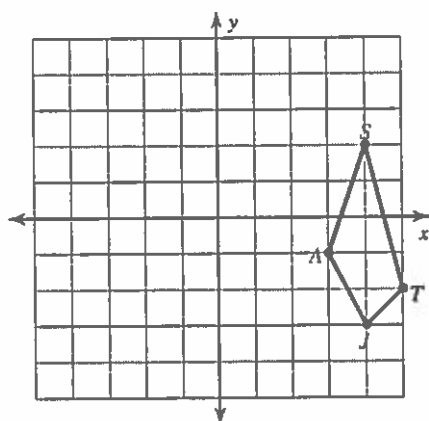
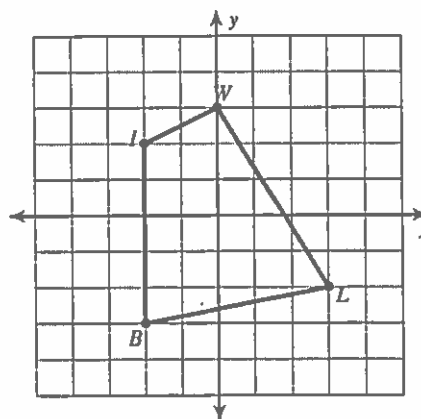
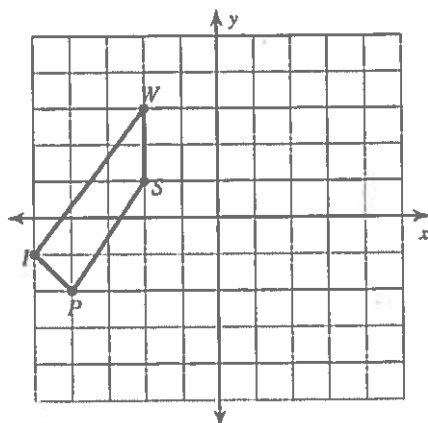
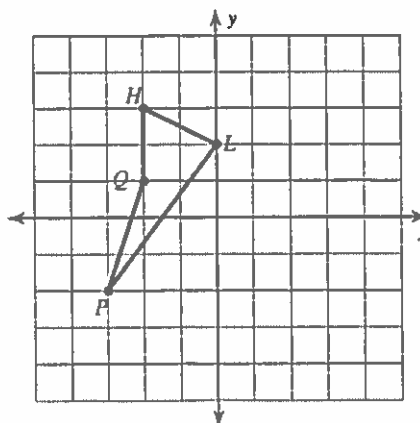


Reflections

Graph the image of the figure using the transformation given.

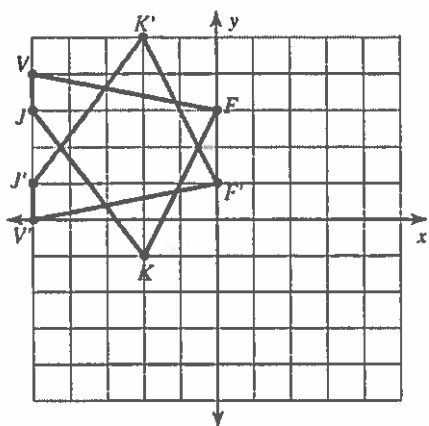
1) reflection across $y = -2$ 

2) reflection across the x-axis

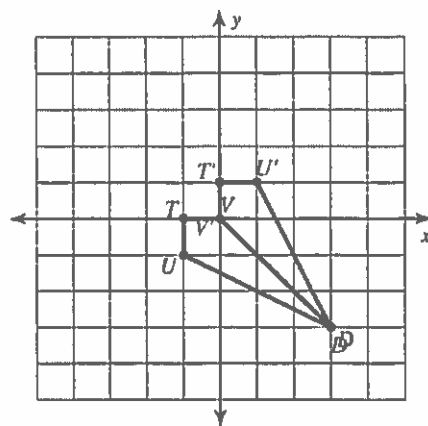
3) reflection across $y = \text{axis}$ 4) reflection across $y = -1$ 5) reflection across $x = -3$ 6) reflection across $y = \text{axis}$ 

Write a rule to describe each transformation.

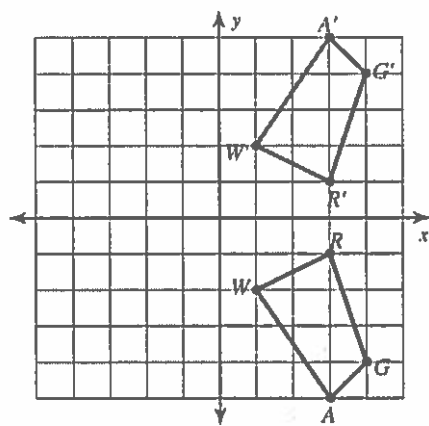
7)



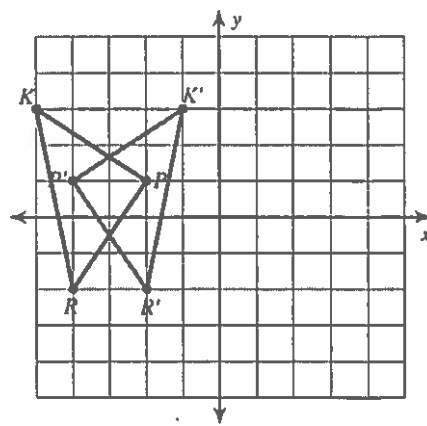
8)



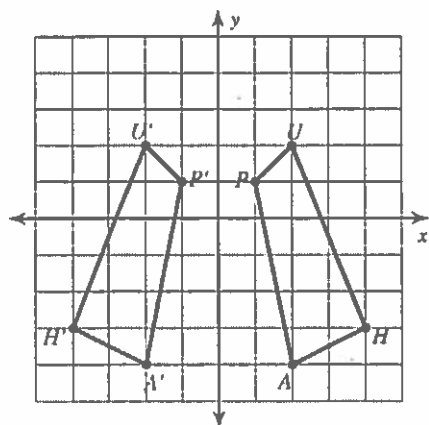
9)



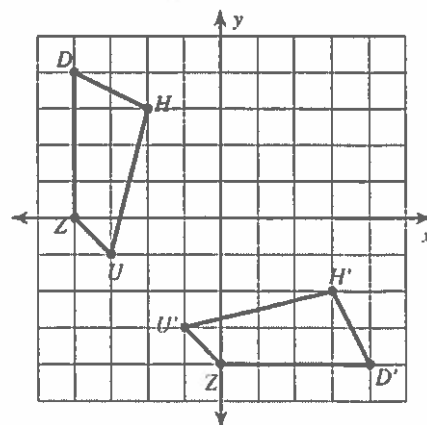
10)



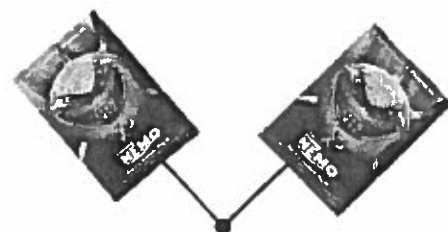
11)



12)



1.3 Rotations

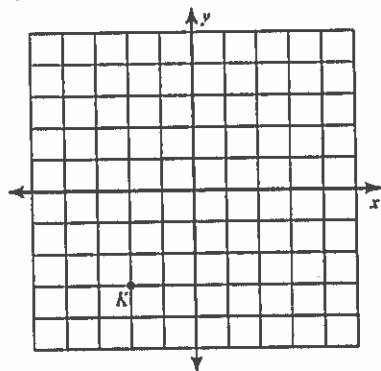


Rotation:	Center of Rotation:
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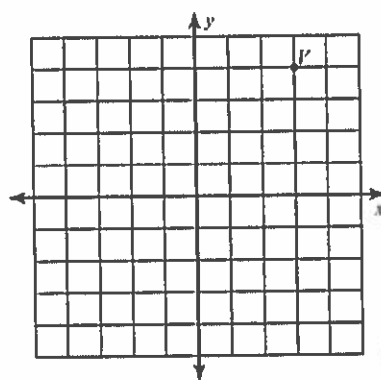
Direction Clockwise Counterclockwise 	Degree <ul style="list-style-type: none"> A full rotation is 360° every 90° rotation \Rightarrow one quadrant over \Rightarrow order switches $(a, b) \rightarrow (b, a)$ $180^\circ =$ two 90° rotations 	
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Example 1: Graph the rotation and list the coordinates of the image.

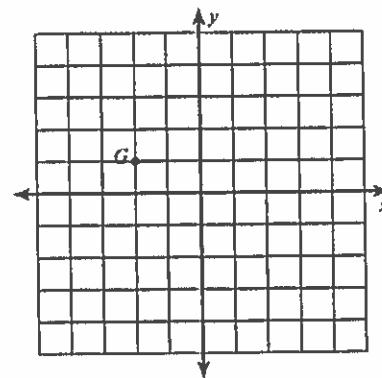
1. 90° clockwise



2. 180° counterclockwise



3. 90° counterclockwise



4. Find the coordinates of the image of the triangle shown below after a 90° clockwise rotation. Then graph it.

1st : List the coordinates of the preimage

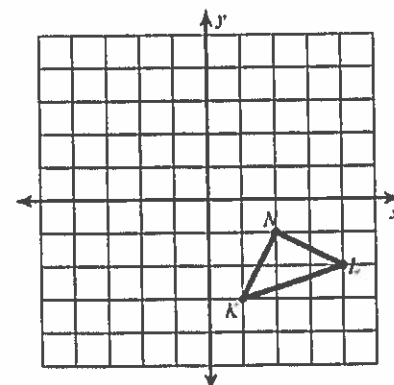
2nd : Use the coordinate rule:

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

3rd : Apply the rule to each vertex.

4th : Graph the image

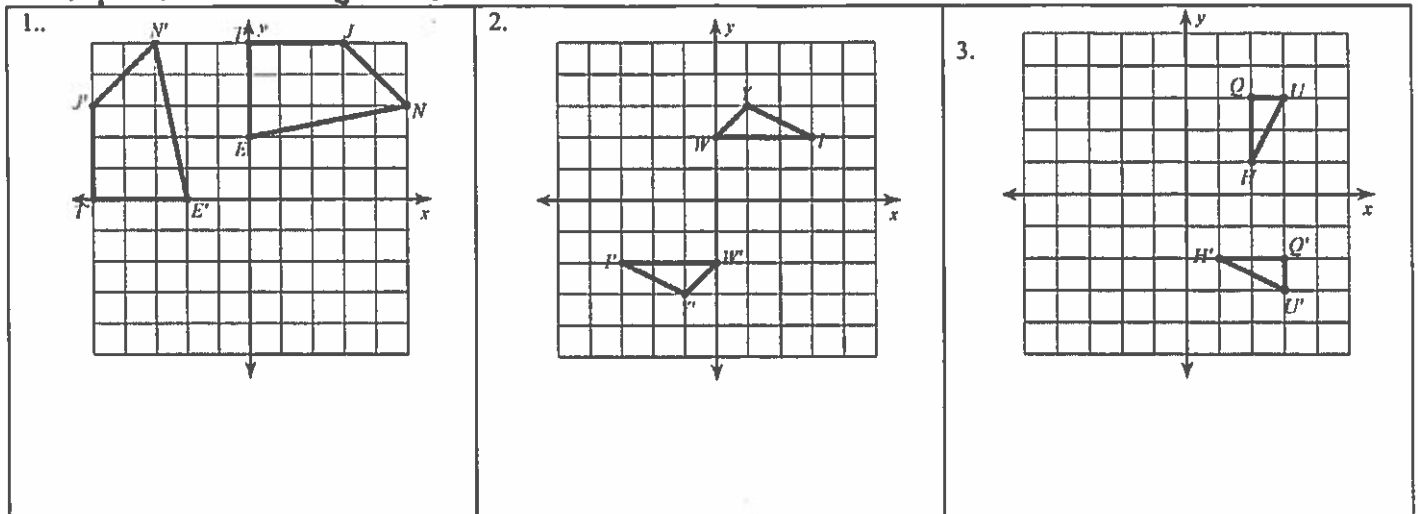
Preimage	Image



5. If $F(17, -31)$ is rotated 90° counterclockwise about the origin, what are the coordinates of F' ?

6. If $J(-22, -87)$ is rotated 180° clockwise about the origin, what are the coordinates of J' ?

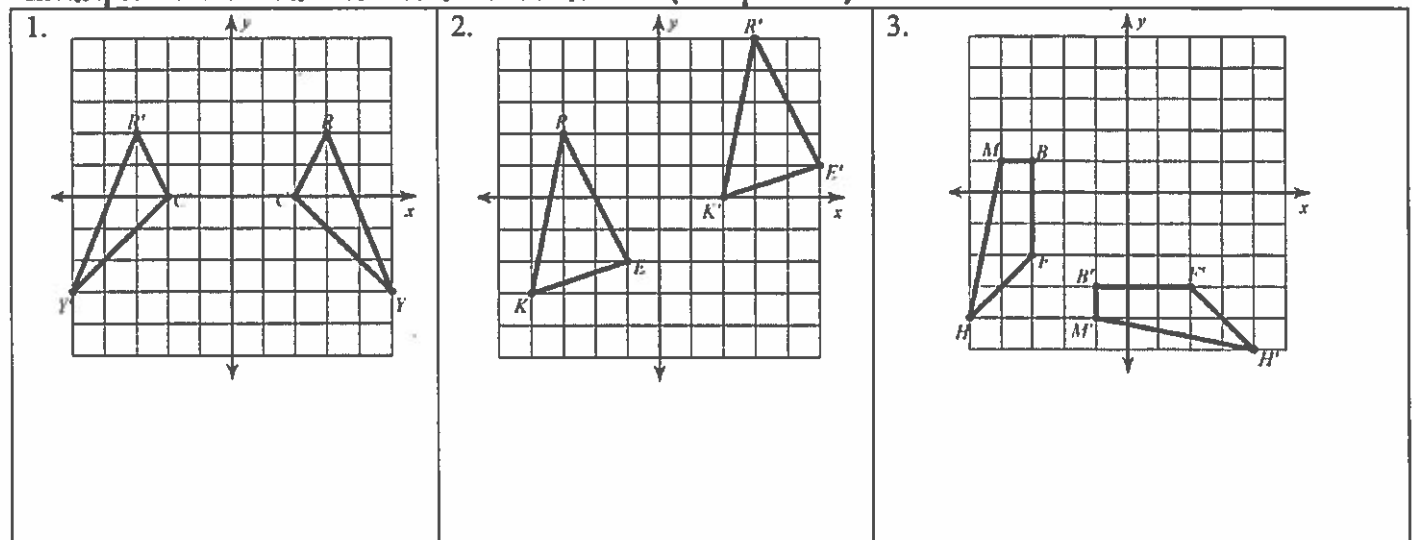
Example 4: Describing Rotations



DESCRIBING TRANSFORMATIONS (What you need!!!)

	Translations	Reflections	Rotations
What to look for	<ul style="list-style-type: none"> Shapes face the same direction, points are in corresponding spots 	<ul style="list-style-type: none"> Points are directly across from each other, equidistant 	<ul style="list-style-type: none"> Points are on crack....
What to write	<ul style="list-style-type: none"> Coordinate notation 	<ul style="list-style-type: none"> Line of reflection 	<ul style="list-style-type: none"> Degree Direction
Example	<p>Ex: translation</p> $(x, y) \rightarrow (x - 2, y + 8)$	<p>Ex: reflection in the x-axis</p>	<p>Ex: rotation 90° counter-clockwise about the origin</p>
Hint!	HINT! count the spaces horizontally then vertically from the preimage to the image	HINT! Fold your paper to help you find the reflection line	HINT! Count the # of quadrants the figure moves across

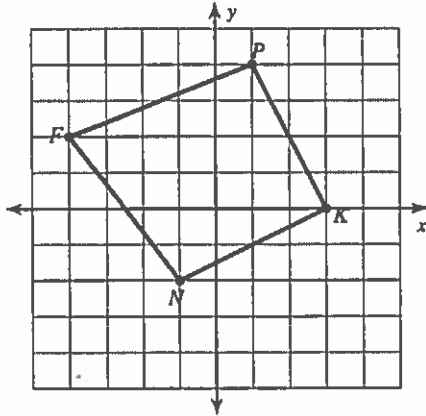
Example 5: Describe the transformations. (Be specific)



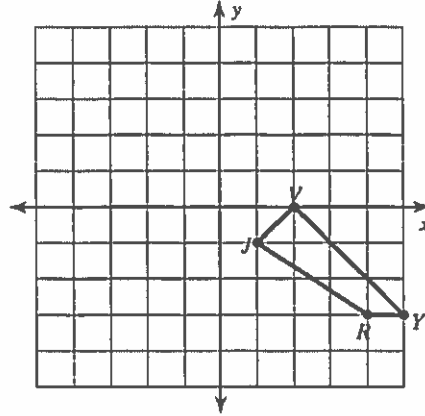
Rotations

Graph the image of the figure using the transformation given.

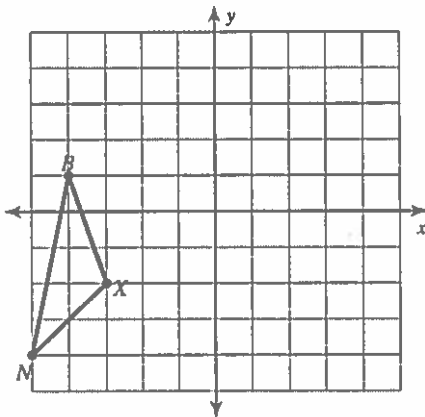
- 1) rotation
- 180°
- about the origin



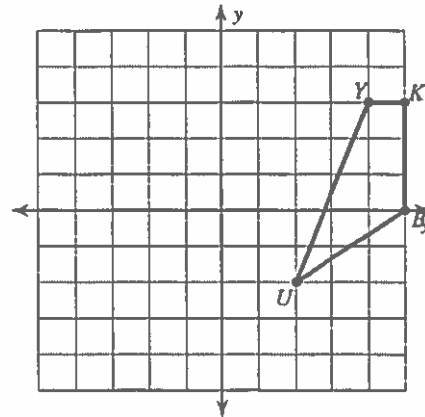
- 2) rotation
- 180°
- about the origin



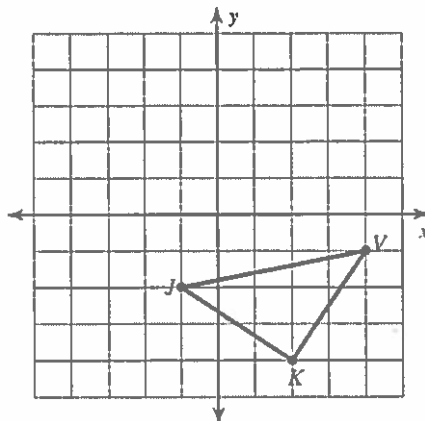
- 3) rotation
- 90°
- counterclockwise about the origin



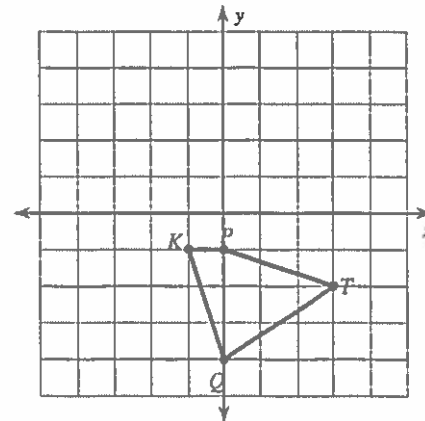
- 4) rotation
- 90°
- clockwise about the origin



- 5) rotation
- 90°
- clockwise about the origin

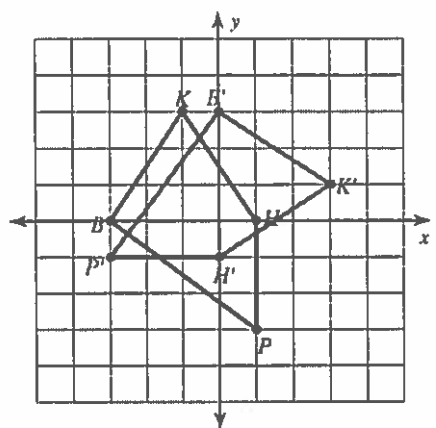


- 6) rotation
- 180°
- about the origin

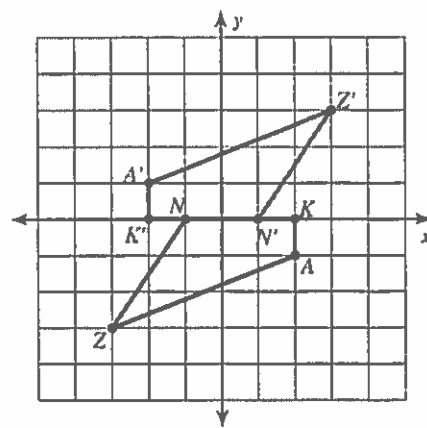


Write a rule to describe each transformation.

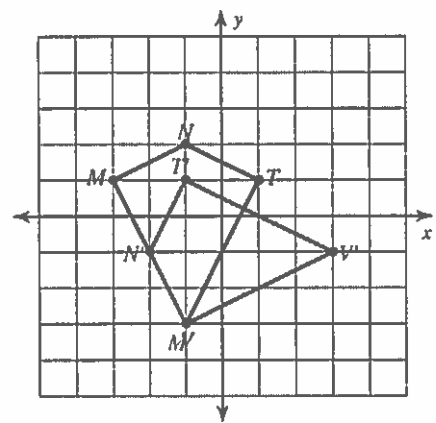
7)



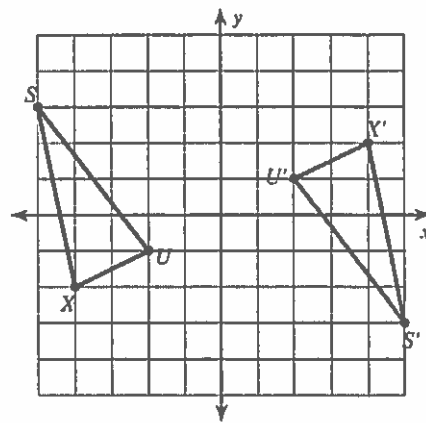
8)



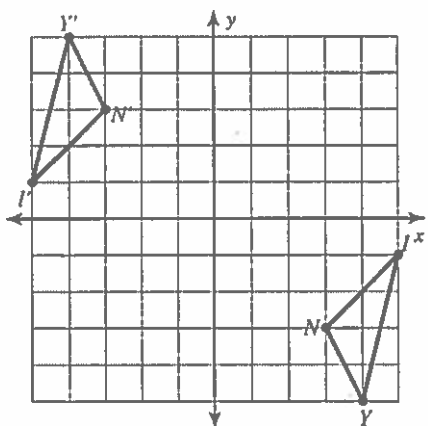
9)



10)



11)



12)

