Name: Answer Packet

Teacher: _____ Period: _____

Algebra I Part I
Geometry Unit

Transformations (pp. 1 - 24)
(Rotations, Reflections, Translations and Dilations)

Angle Pair Relationships (pp. 25 - 38)
(Complementary, Supplementary and Vertical Angles &
Angles formed by Parallel Lines with a Transversal)

Triangles (pp. 39 - 53)
(Interior Angle Sum, Exterior Angle Measures and The Pythagorean Theorem)

Volume (pp. 54 - 58)
(Cylinders, Cones and Spheres)

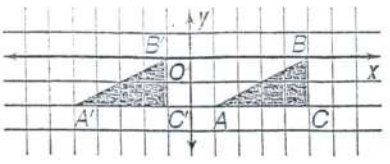
Unit Test Date: _____

NAME _____ DATE _____

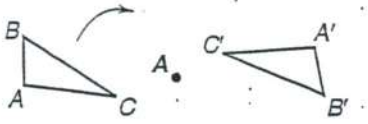
Transformations

Transformations are movements of geometric figures.

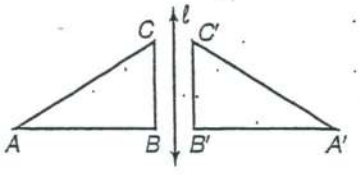
When a geometric figure is moved horizontally, vertically, or both, it is called a **translation**. The figure at the right is moved 6 units to the left.



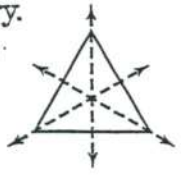
In a **rotation**, a figure is turned about a point.



When a figure is "flipped" over a line, it is called a **reflection**. At the right, $\triangle ABC$ is *reflected* about line ℓ. Since the figure can be folded over line ℓ so that the two halves correspond, the figure is **symmetric**. Line ℓ is called a *line of symmetry*. A line of symmetry separates a figure into two congruent parts.

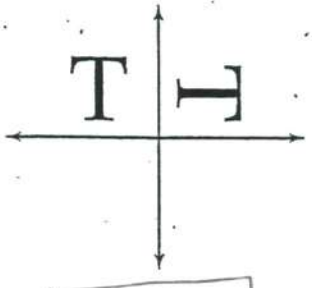


The figure at the right has three lines of symmetry.



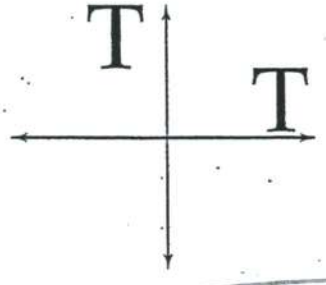
Tell whether each transformation is a translation, a rotation, or a reflection. Explain your answer.

1.



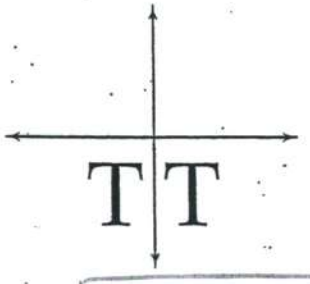
rotation

2.



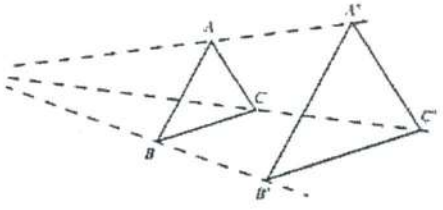
translation

3.



reflection or translation

In a **dilation**, a figure is enlarged or reduced. The shape stays the same. The original figure and the new figure are similar.

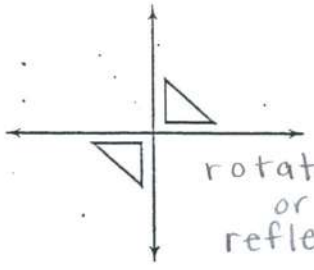


NAME _____ DATE _____

Transformations

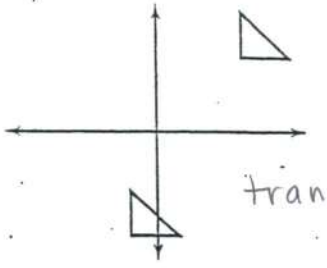
Determine whether each geometric transformation is a translation, a reflection, or a rotation. Explain your answer.

1.



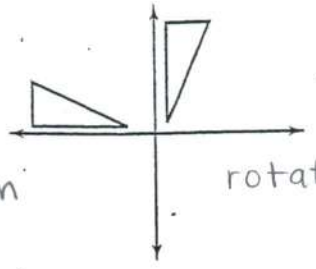
rotation or reflection

2.



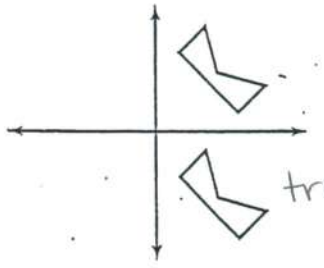
translation

3.



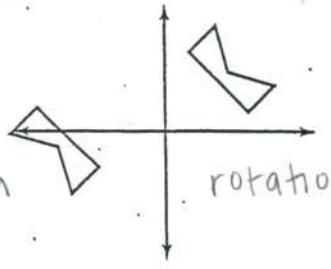
rotation

4.



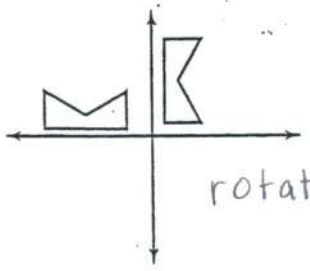
translation

5.



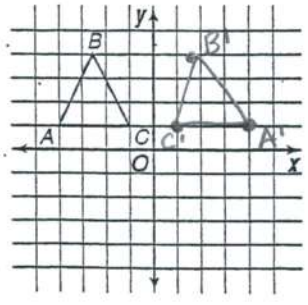
rotation

6.

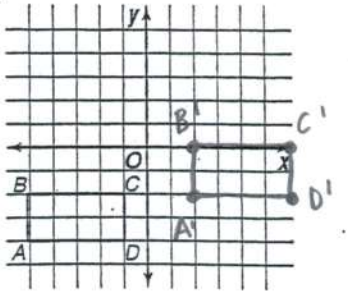


rotation

7. Graph the reflection of $\triangle ABC$ if the y-axis is the line of reflection.

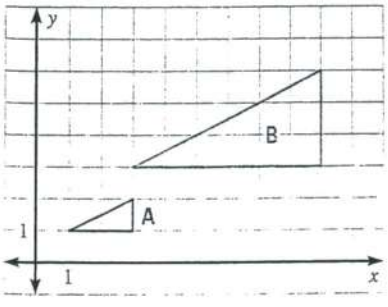


8. Translate $\square ABCD$ 7 units to the right and 2 units up.

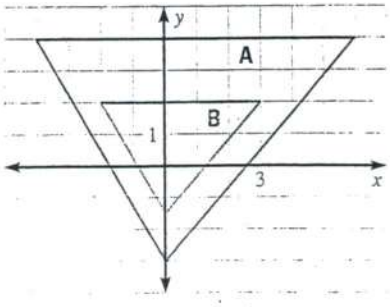


(8)

Determine whether the dilation from Figure A to Figure B is a *reduction* or an *enlargement*. Then find its scale factor.



enlargement
scale factor = 3



reduction
scale factor = $\frac{1}{2}$

(2)

answer key

TRANSFORMATIONS
Lessons 9 - 11

Geometry C

LT perform translations, reflections, rotations, and dilations to figures in a coordinate plane

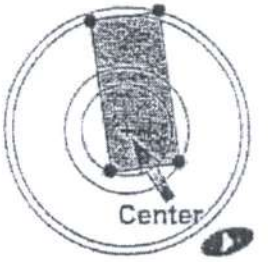
TRANSFORMATION: Moving a shape so that it is in a different position, but still has the same size, area, angles and line lengths.

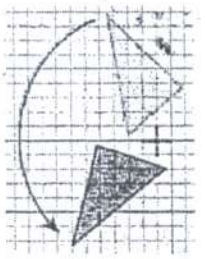
Rotation

"Rotation" means turning around a center:

The **distance** from the center to any point on the shape stays the same.

Every point makes a **circle** around the center.

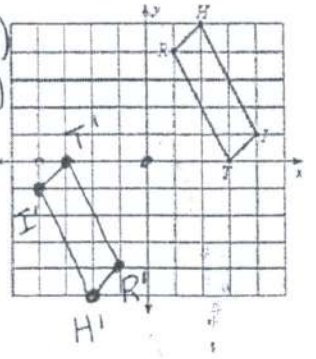




Here a triangle is rotated around the point marked with a "+"

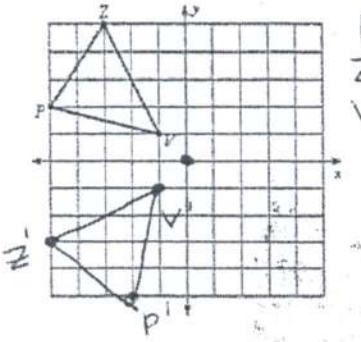
1) rotation 180° about the origin

H (2,5) H'(-2,-5)
R (1,4) R'(-1,-4)
I (4,1) I'(-4,-1)
T (3,0) T'(-3,0)



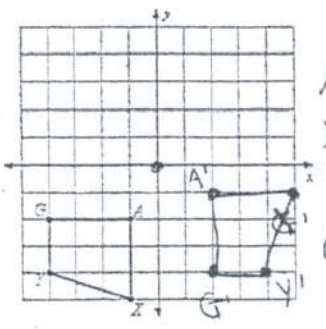
2) rotation 90° counterclockwise about the origin

P (-5,2) P'(-2,-5)
Z (-3,5) Z'(-5,-3)
V (-1,1) V'(-1,-1)



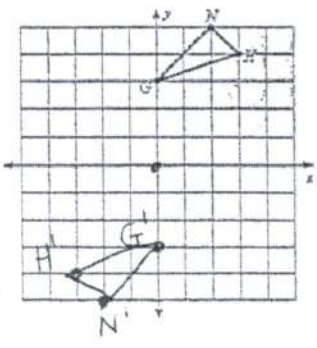
3) rotation 90° counterclockwise about the origin

A (-1,-2) A' (2,-1)
X (-1,-5) X' (5,-1)
Y (-4,-4) Y' (4,-4)
G (-4,-2) G'(2,-4)



4) rotation 180° about the origin

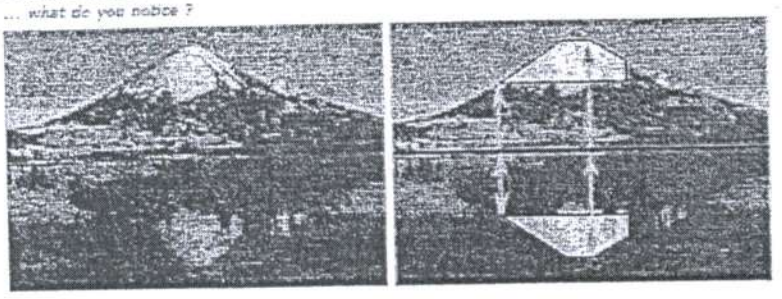
G (0,3) G' (0,-3)
N (2,5) N' (-2,-5)
H (3,4) H' (-3,-4)



Reflection

Reflections are everywhere ... in mirrors, glass, and here in a lake.

... what do you notice ?

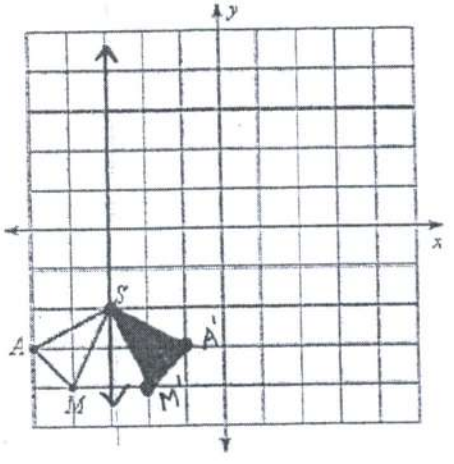


Every point is the same distance from the central line !

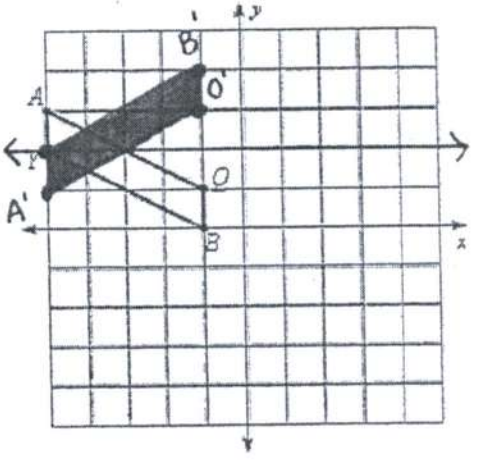
... and ...

The reflection has the same size as the original image

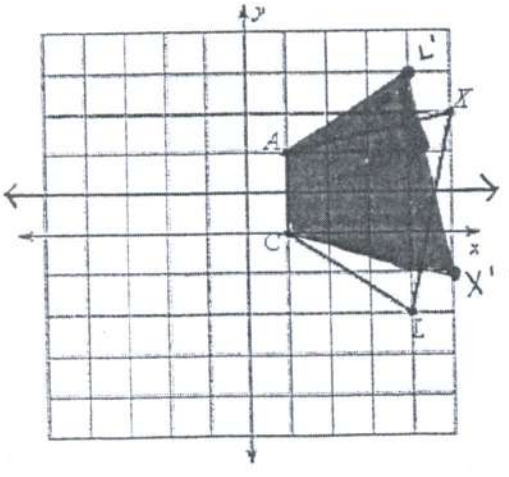
1) reflection across $x = -3$



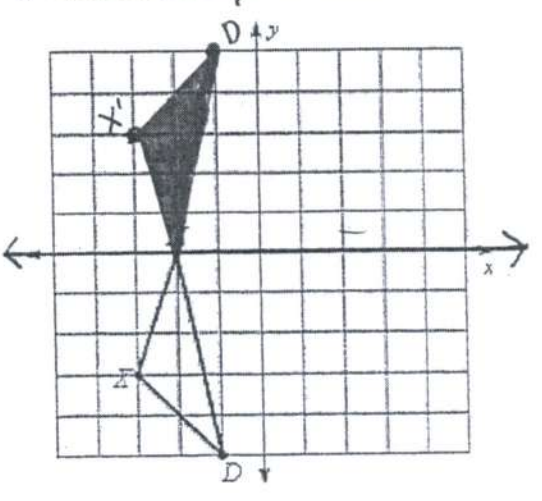
2) reflection across $y = 2$



3) reflection across $y = 1$



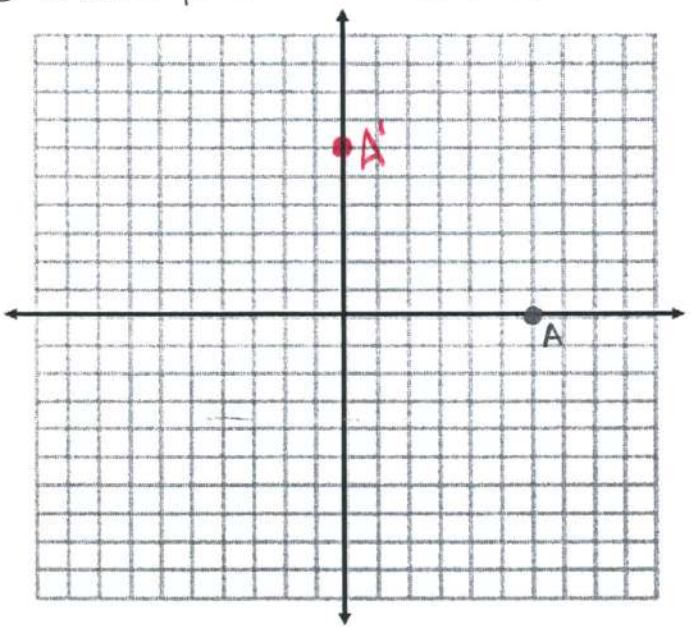
4) reflection across the x-axis



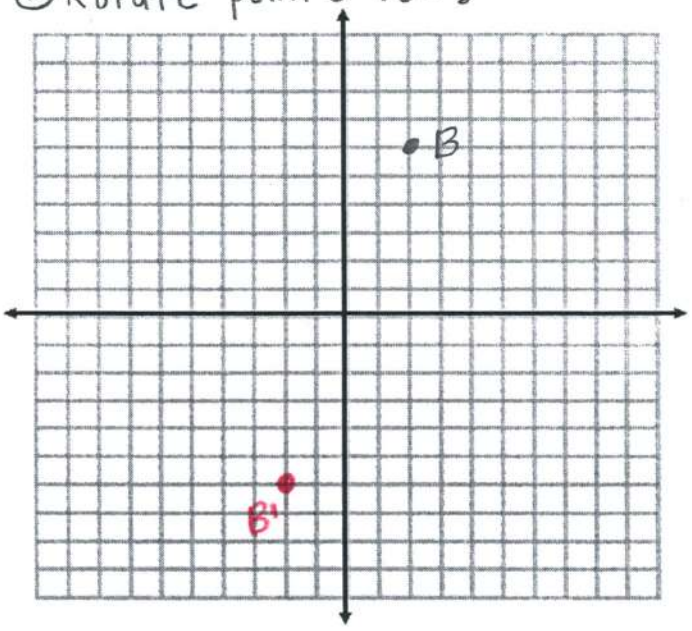
Alg 1: Rotations + Reflections

Name: _____

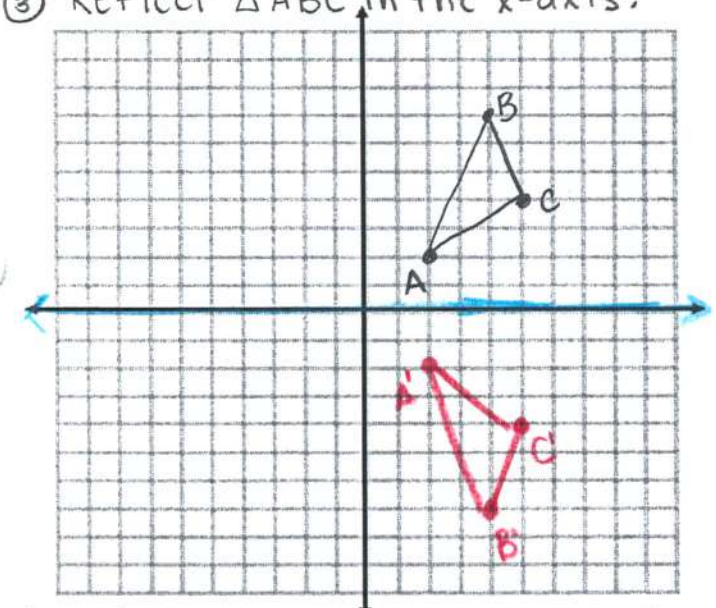
① Rotate point A 90° counter-clockwise.



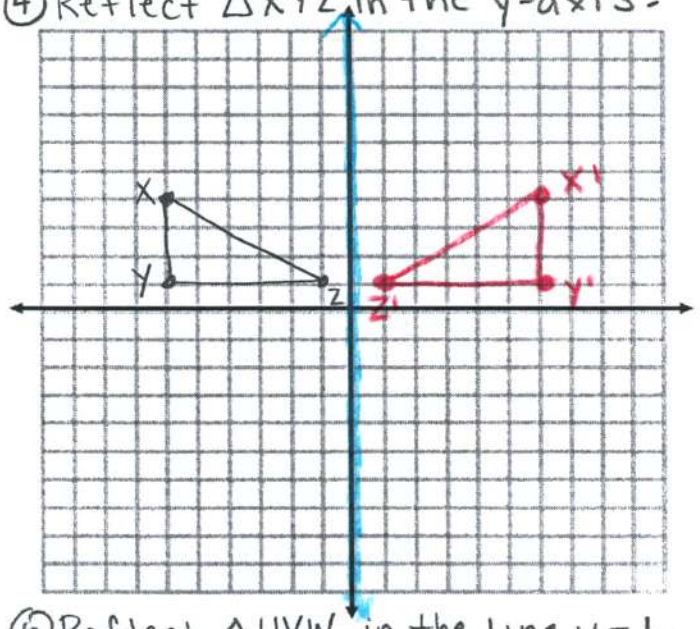
② Rotate point B 180°.



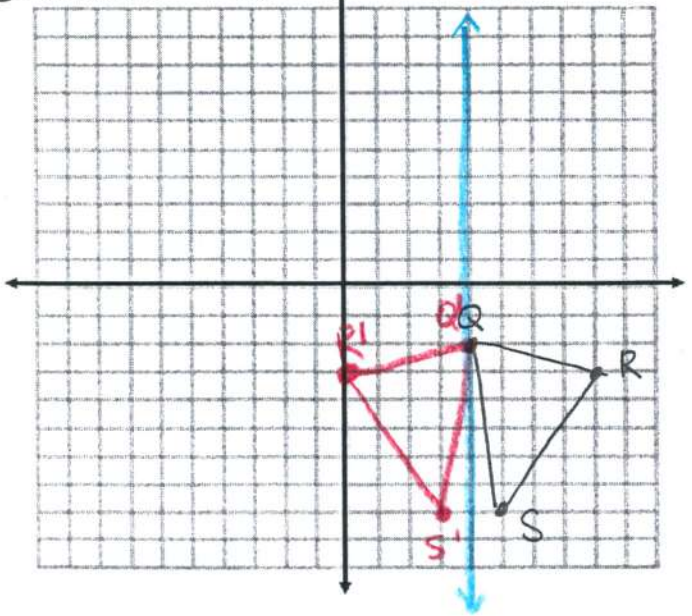
③ Reflect △ABC in the x-axis.



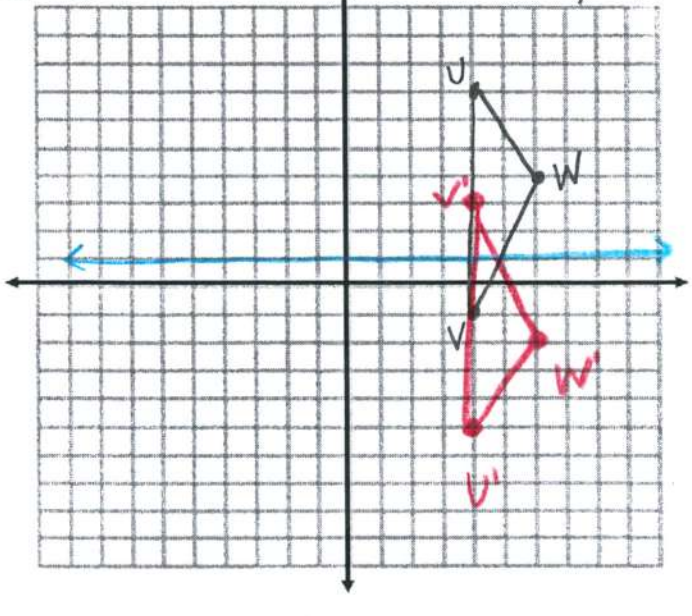
④ Reflect △XYZ in the y-axis.



⑤ Reflect △QRS in the line x=4.



⑥ Reflect △UVW in the line y=1.



Translation

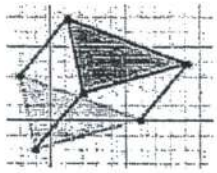
In Geometry, "Translation" simply means **Moving** ...

... without rotating, resizing or anything else, just moving.

To Translate a shape:

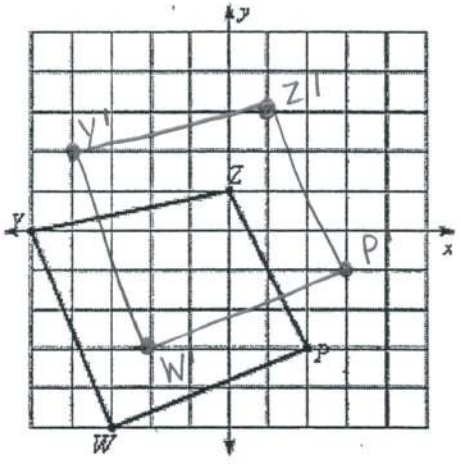
Every point of the shape must move:

- the **same distance**
- in the **same direction.**

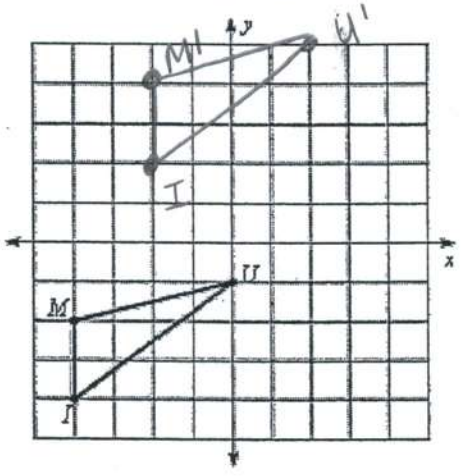


rent

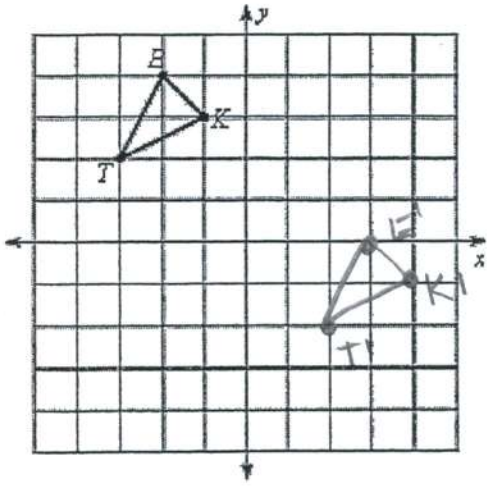
1) translation: 1 unit right and 2 units up



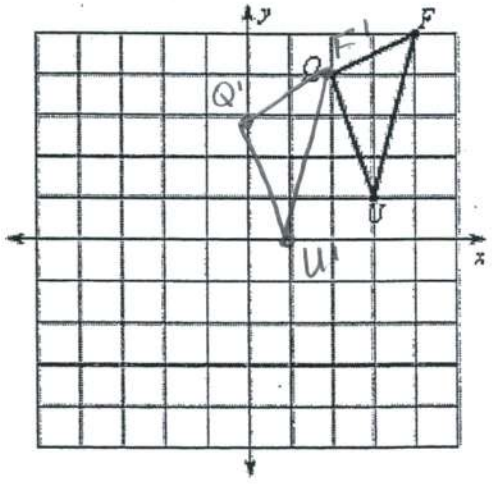
2) translation: 2 units right and 6 units up



3) translation: 5 units right and 4 units down

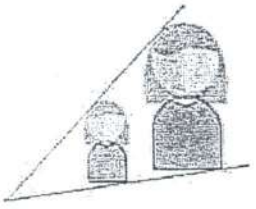


4) translation: 2 units left and 1 unit down



DILATION

When you resize a shape it gets **bigger** or **smaller**.



... but it still looks *similar*:

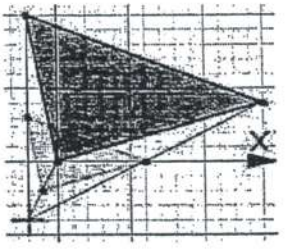
- all angles stay the same
- relative sizes are the same (for example the face and body are still in proportion)

Note: here we call it **resizing**, but other people call it **dilation, contraction, compression, enlargement** or even **expansion**! Same idea, just different names.)

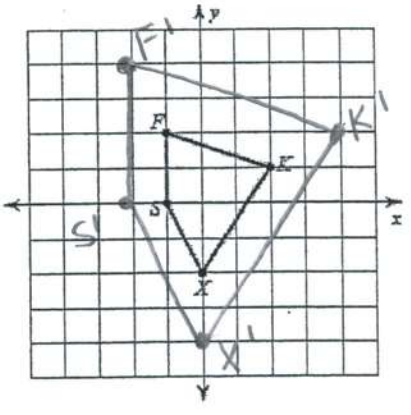
To resize, just do this for *every* corner:

- draw a line from the central point to the corner
- increase (or decrease) the length of that line
- put a dot at the new point

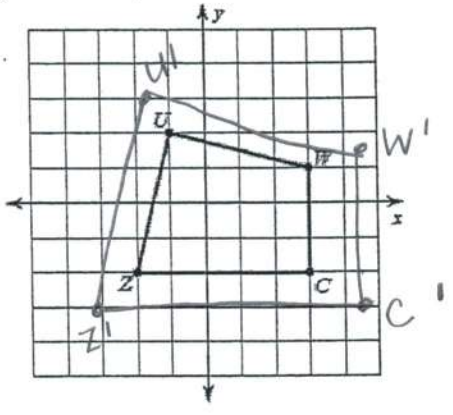
Then just connect the dots for the resized shape!



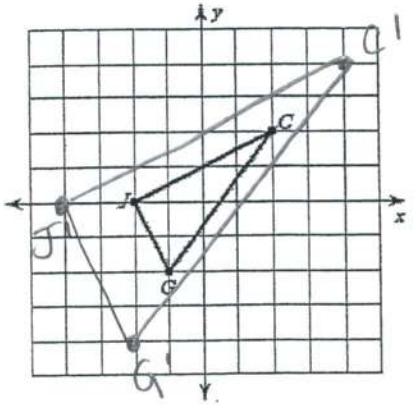
1) dilation of 2



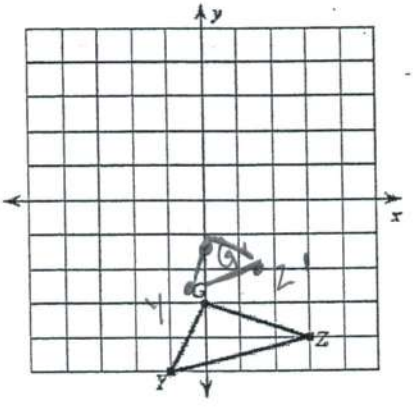
2) dilation of 1.5



3) dilation of 2

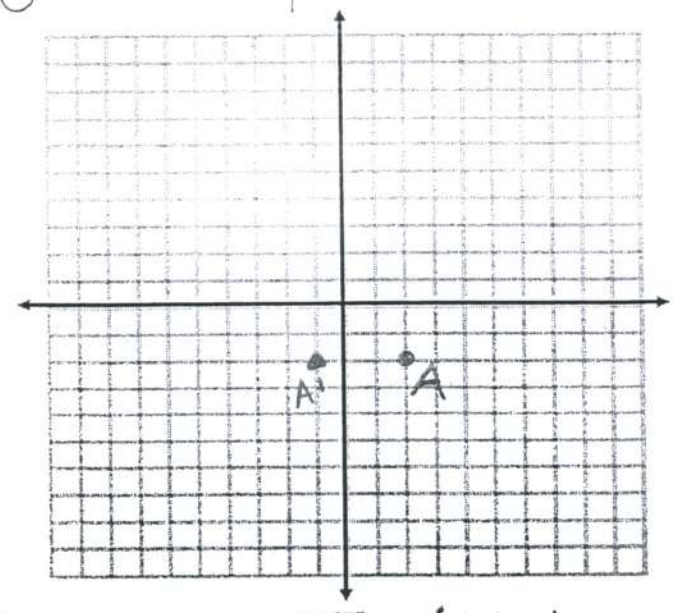


4) dilation of $\frac{1}{2}$

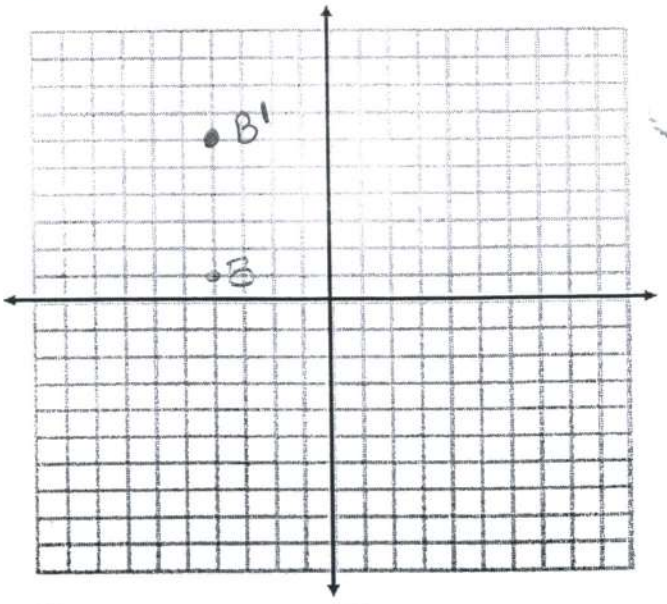


4|P| Translations

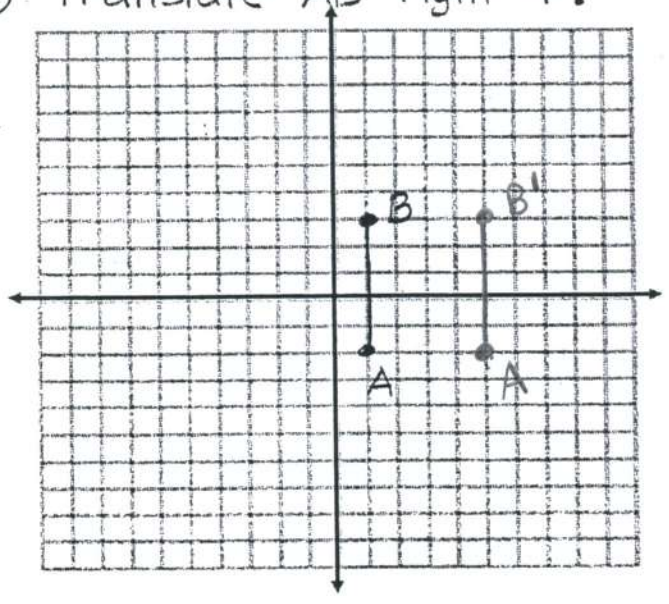
① Translate point A left 3.



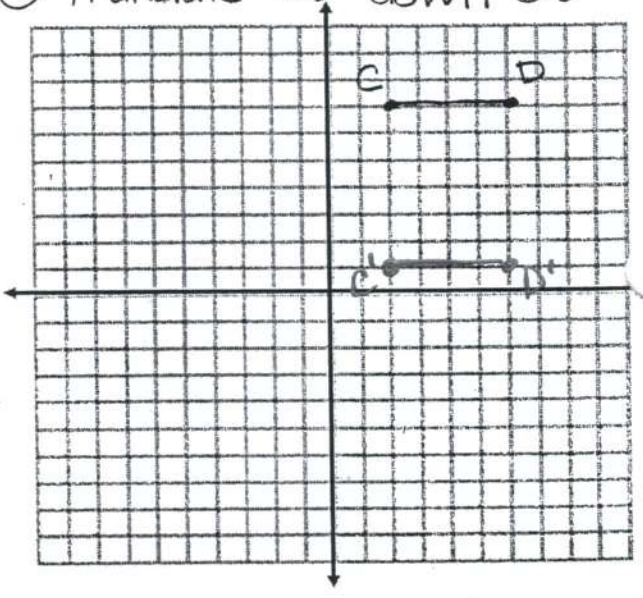
② Translate point B up 5.



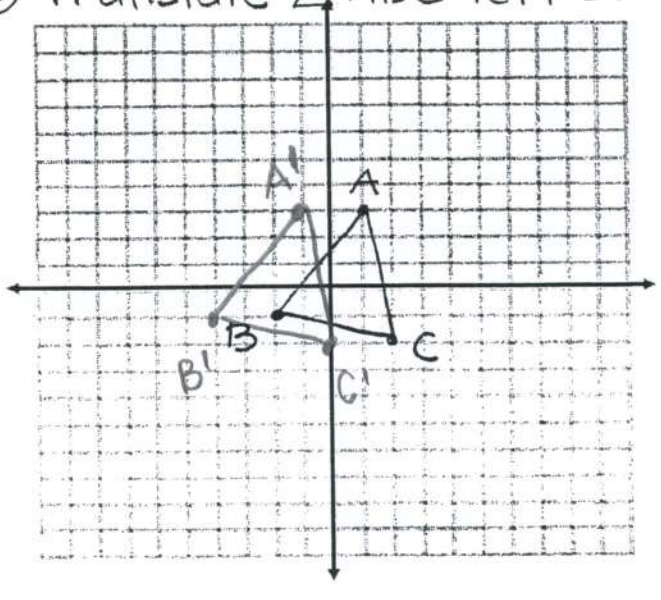
③ Translate $\overline{AB}$ right 4.



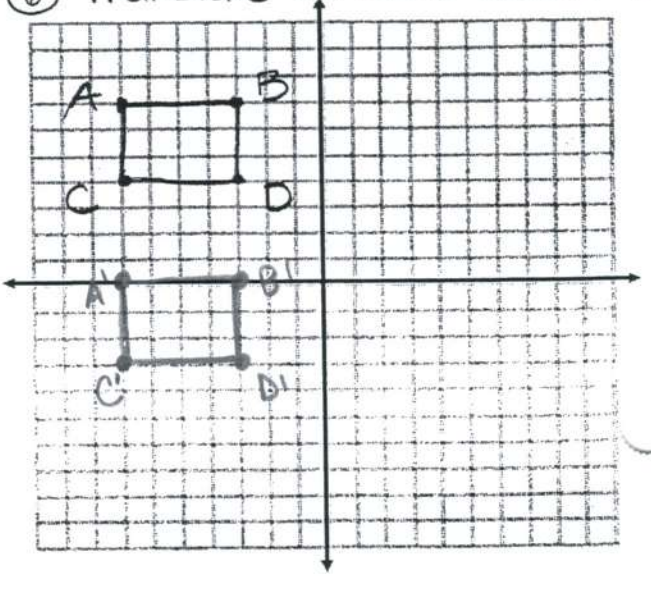
④ Translate $\overline{CD}$ down 6.



⑤ Translate △ ABC left 2.

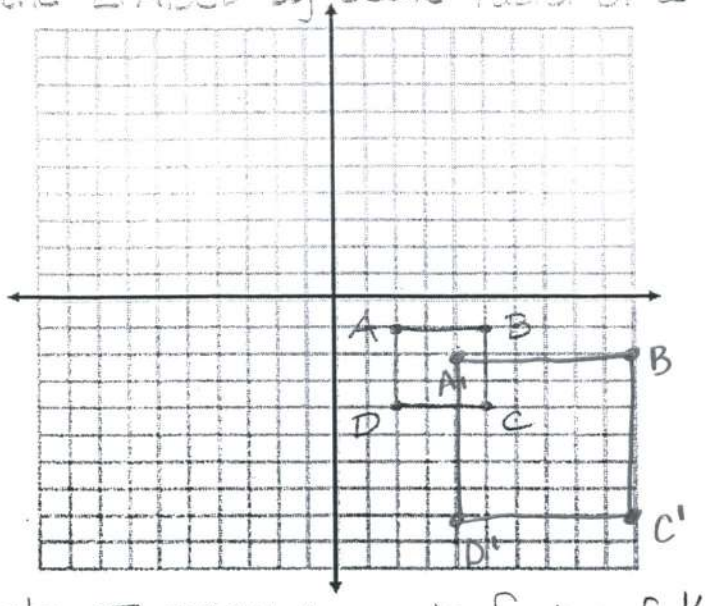


⑥ Translate □ ABCD down 7.

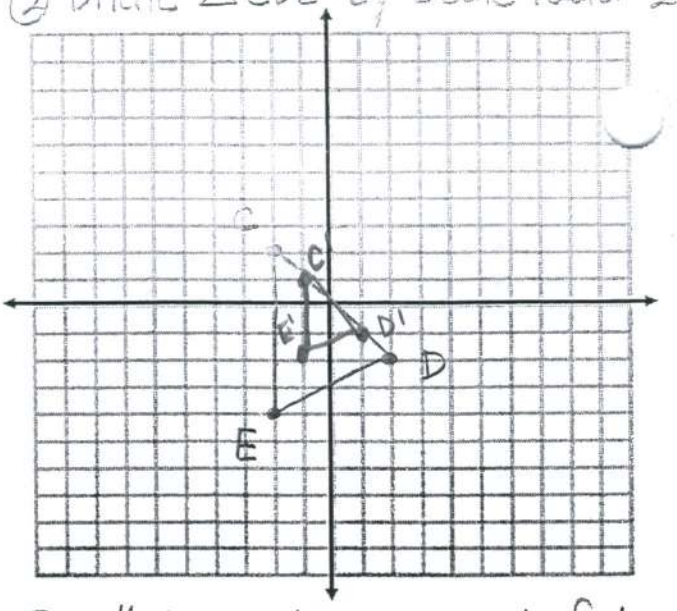


Dilations

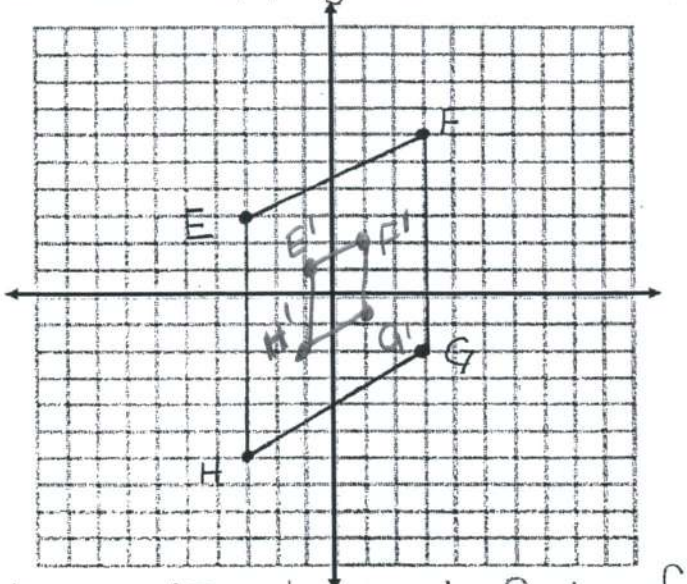
① Dilate □ ABCD by scale factor of 2



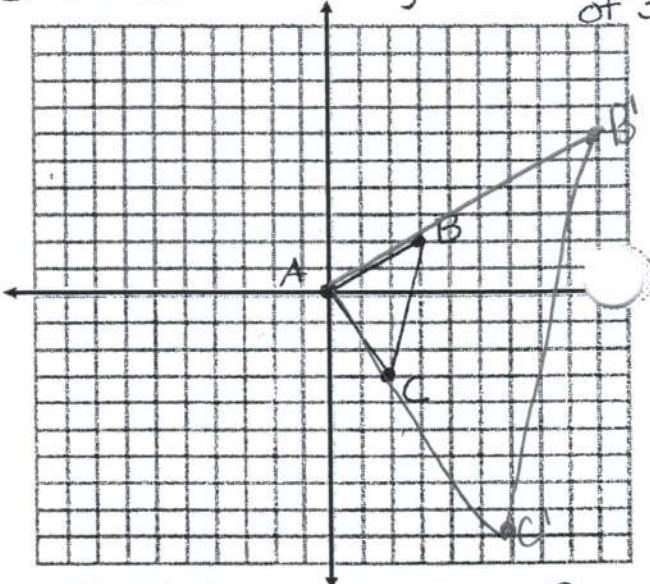
② Dilate △ CDE by scale factor ½



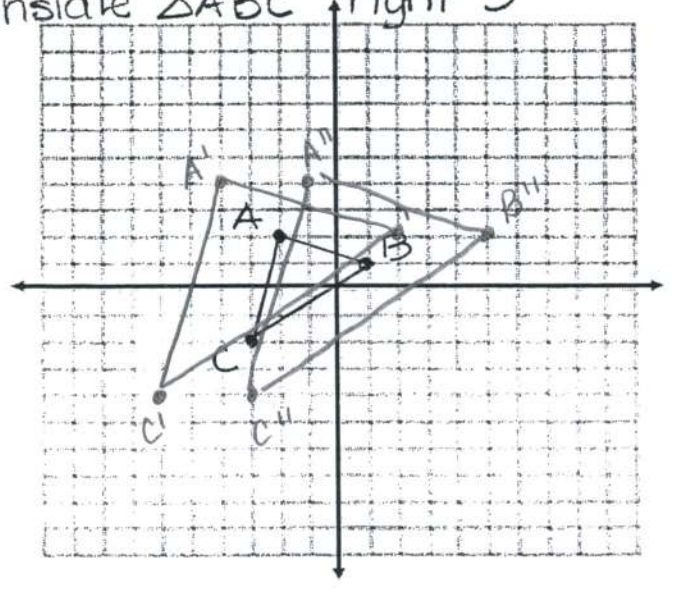
③ Dilate □ EFGH by scale factor of ⅓



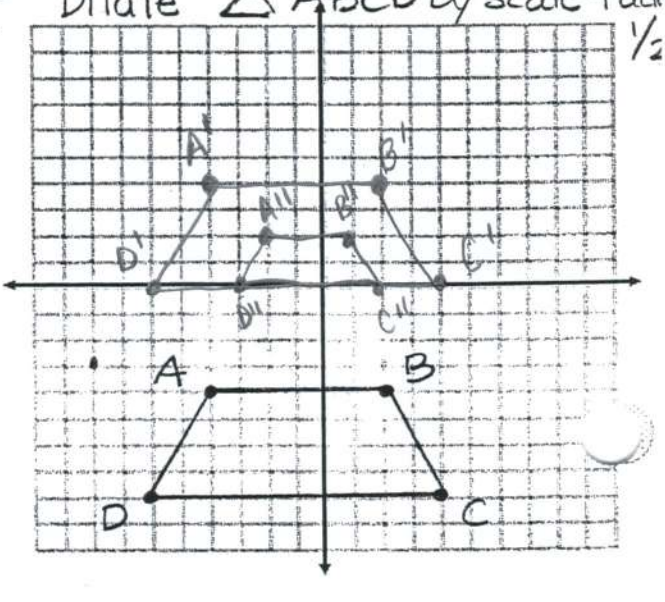
④ Dilate △ ABC by scale factor of 3



⑤ Dilate △ ABC by scale factor of 2
Translate △ABC right 3



⑥ Translate ⏢ ABCD up 8
Dilate ⏢ ABCD by scale fact
½

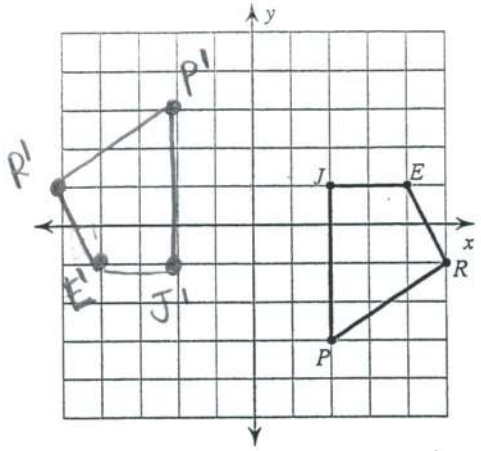


A1P1 Geometry Name_____

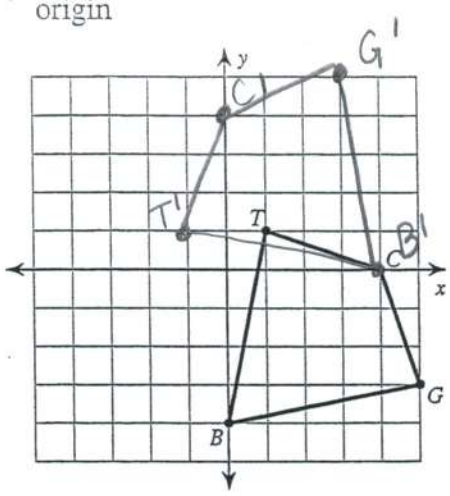
Transformations

Graph the image of the figure using the transformation given.

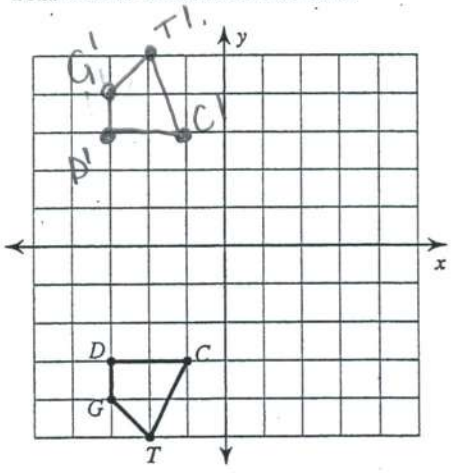
1) rotation 180° about the origin



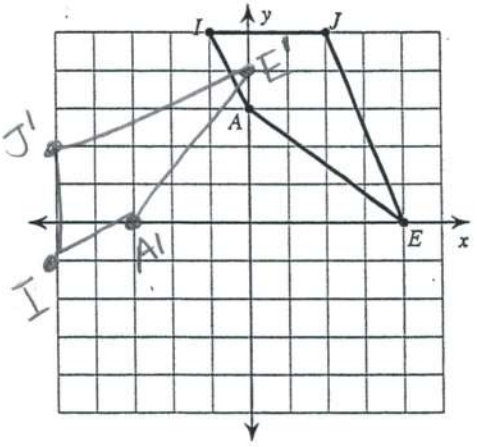
2) rotation 90° counterclockwise about the origin



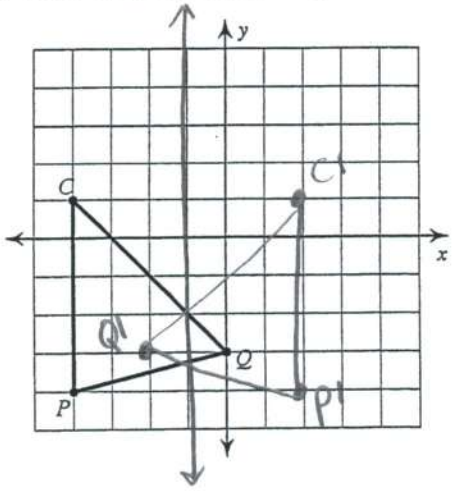
3) reflection across the x-axis



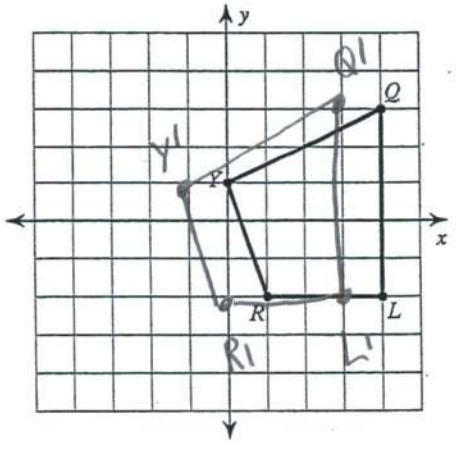
4) rotation 90° counterclockwise about the origin



5) reflection across $x = -1$

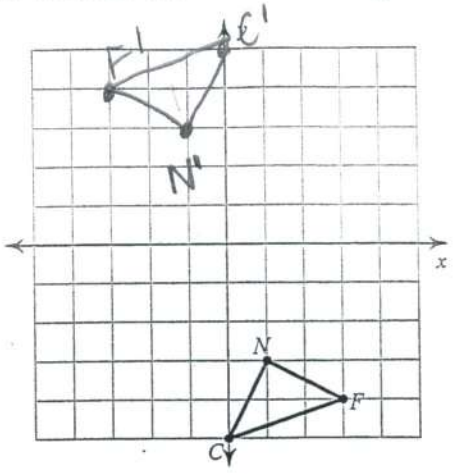


6) translation: 1 unit left

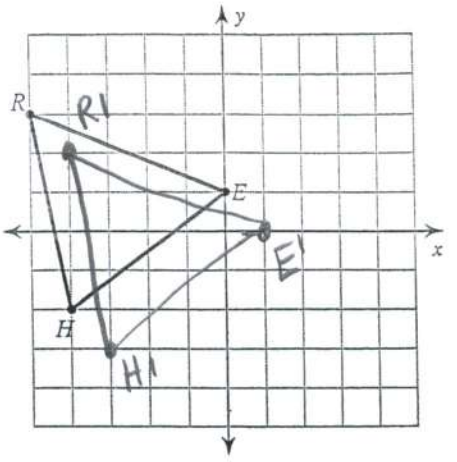


(10)

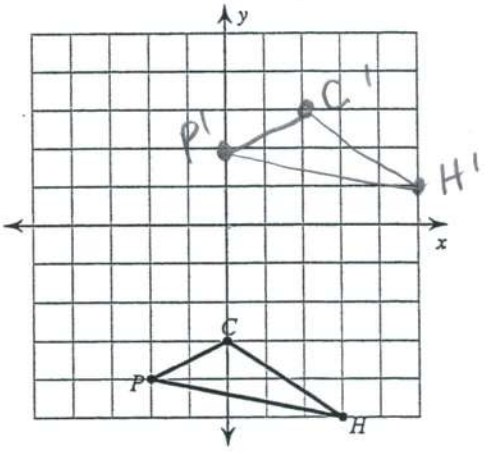
7) rotation 180° about the origin



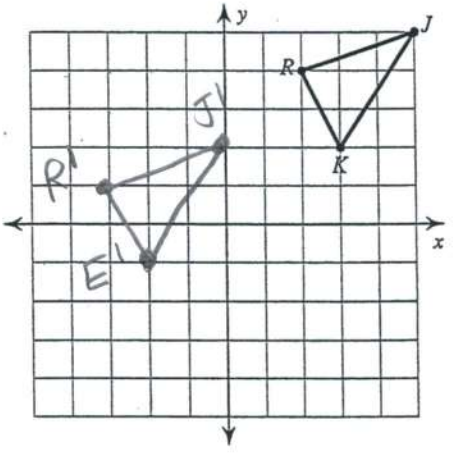
8) translation: 1 unit right and 1 unit down



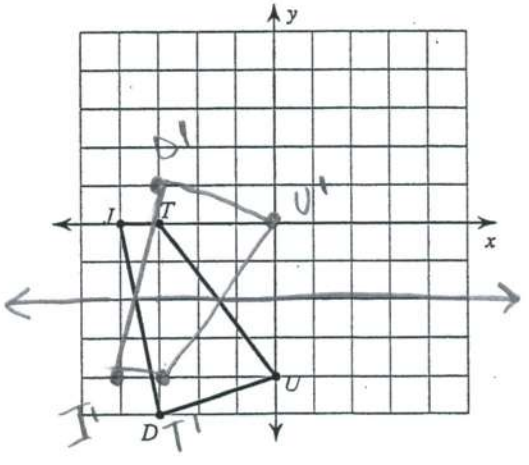
9) translation: 2 units right and 6 units up



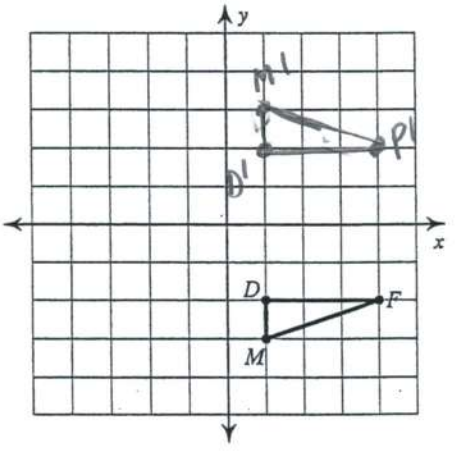
10) translation: 5 units left and 3 units down



11) reflection across $y = -2$



12) reflection across the x-axis



(11)

ID: 2

Geometry

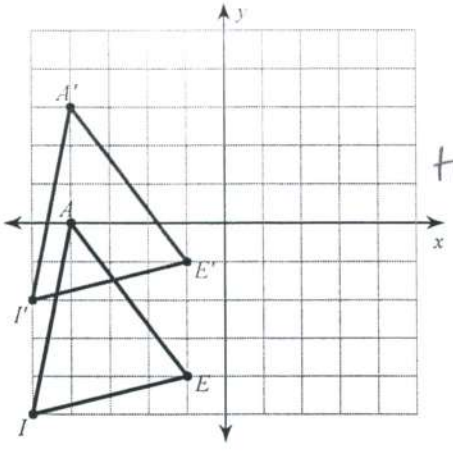
Name _____

Transformations

Date _____ Period ____

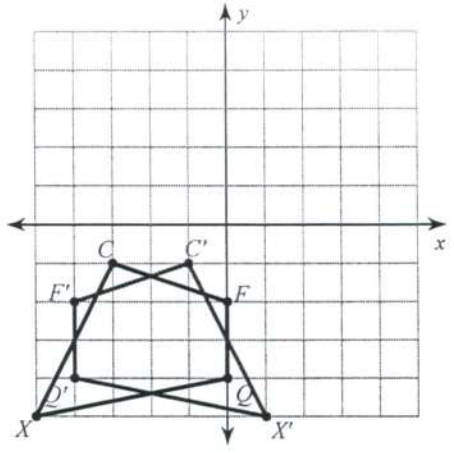
Write a rule to describe each transformation.

1)



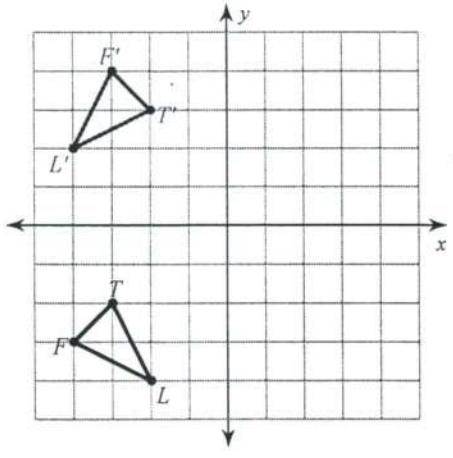
translate 3 units up

2)



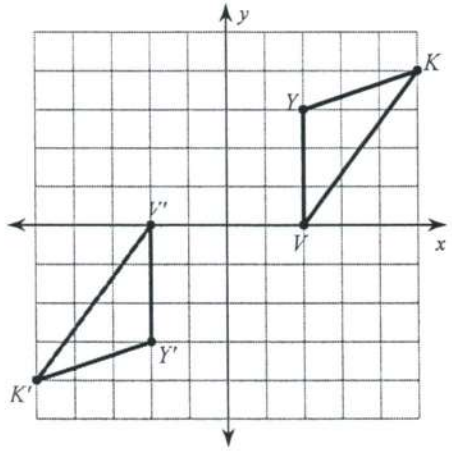
reflection across $x = -2$

3)



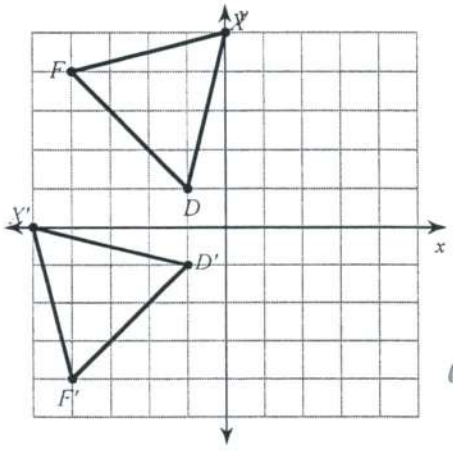
rotation 90° counter-clockwise about the origin

4)



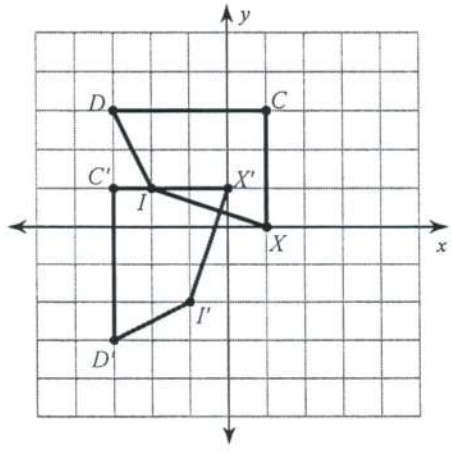
rotation 180° about the origin

5)



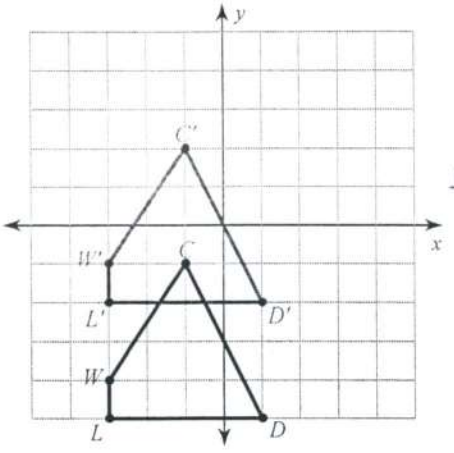
rotation 90° counter-clockwise about the origin

6)



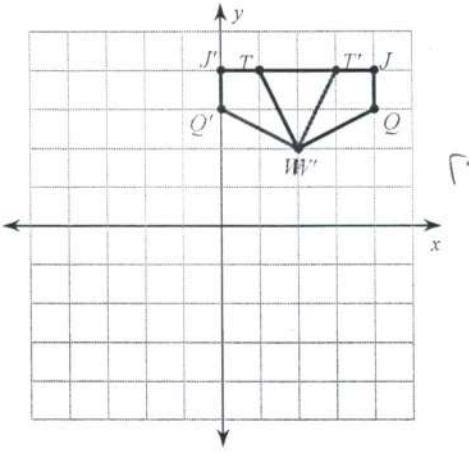
rotation 90° counter-clockwise about the origin

7)



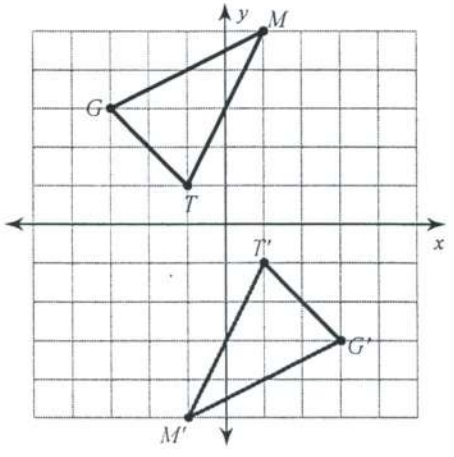
translate 3 units up

8)



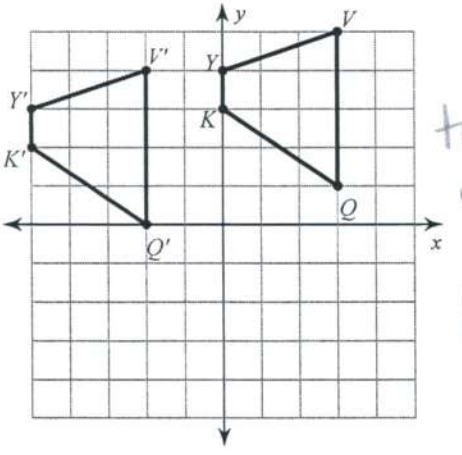
reflection across $x = 2$

9)



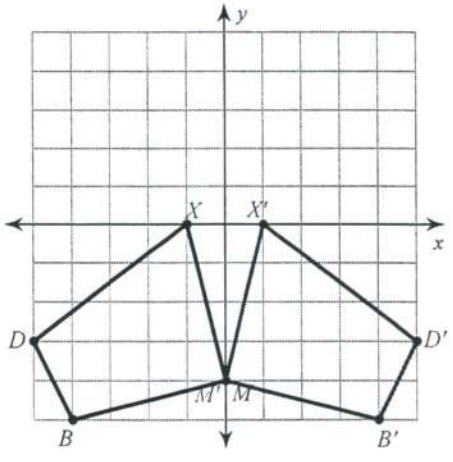
rotation 180° about the origin

10)



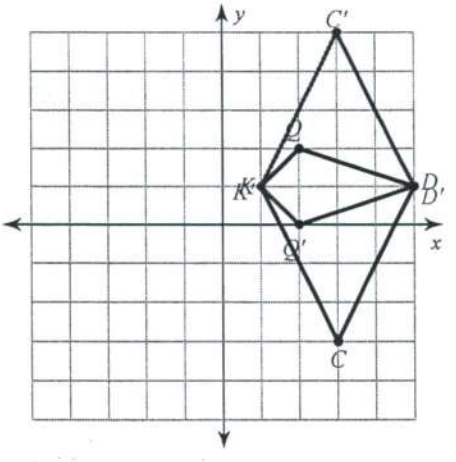
translate down 1 and left 5

11)



reflection across y-axis

12)



reflection across $y = 1$

Geometry

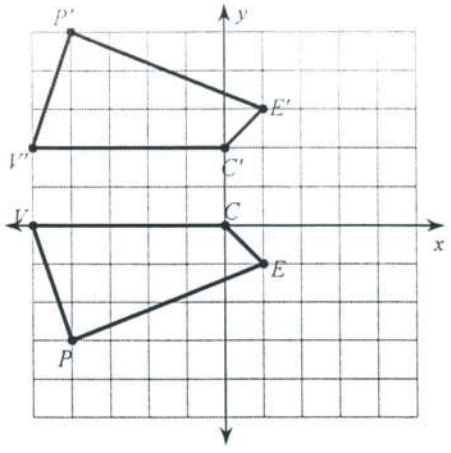
Name _____

Transformations

Date _____ Period ____

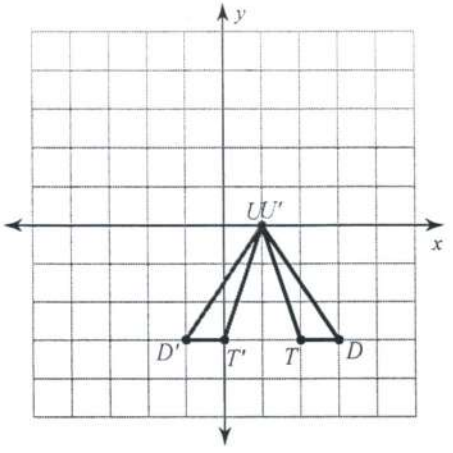
Write a rule to describe each transformation.

1)



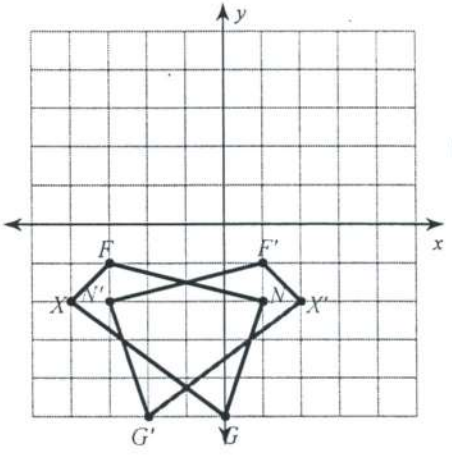
reflection across $y = 1$

2)



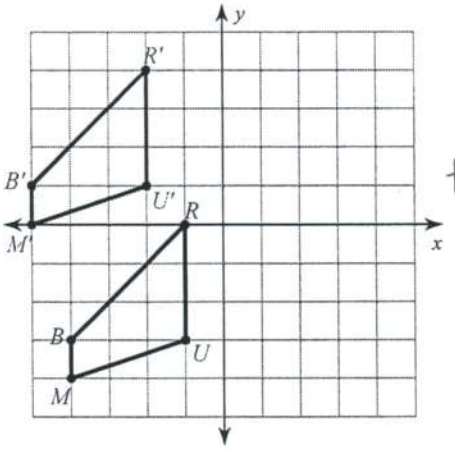
reflection across $x = 1$

3)



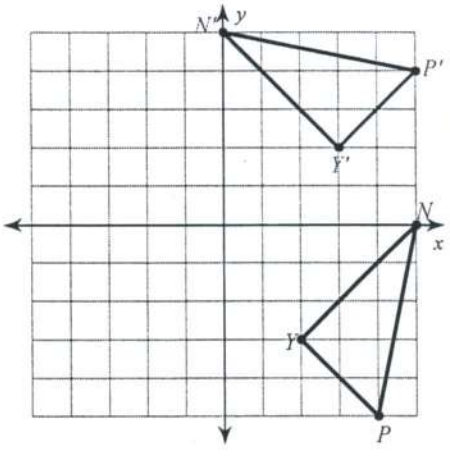
reflection across $x = -1$

4)



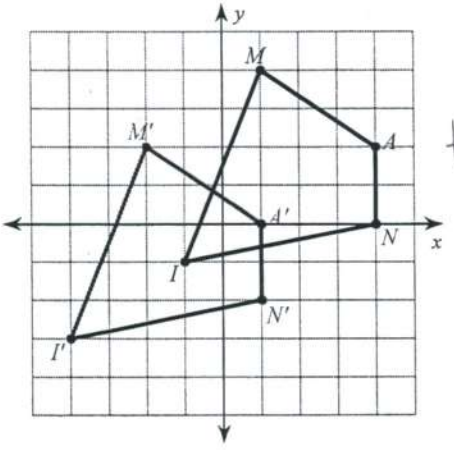
translate left 1, up 4

5)



rotation 90° counter-clockwise about the origin

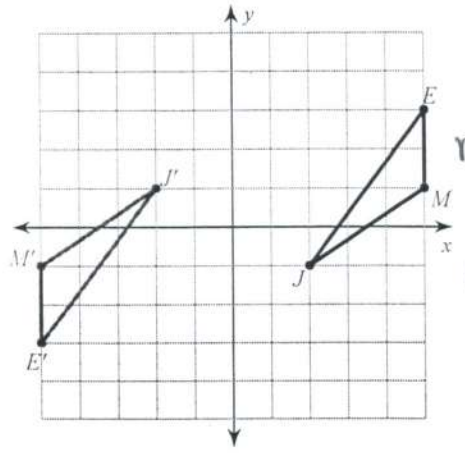
6)



translate left 3, down 2

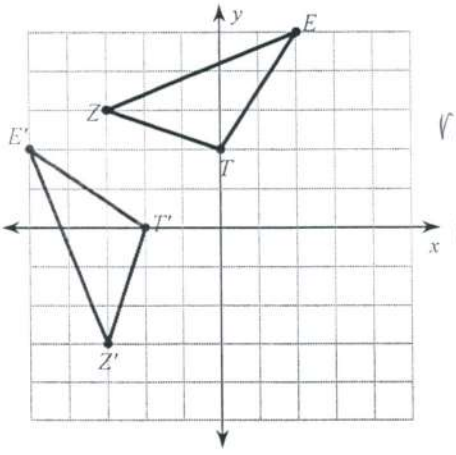
(14)

7)



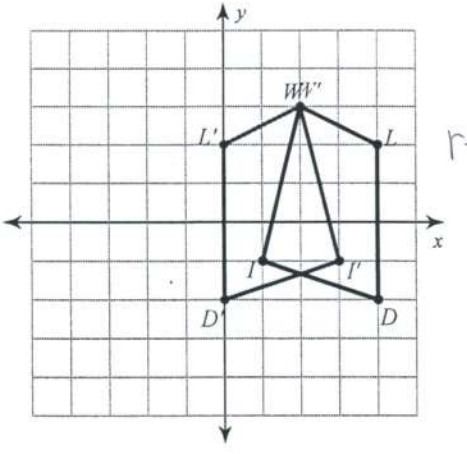
rotation 180° about the origin

8)



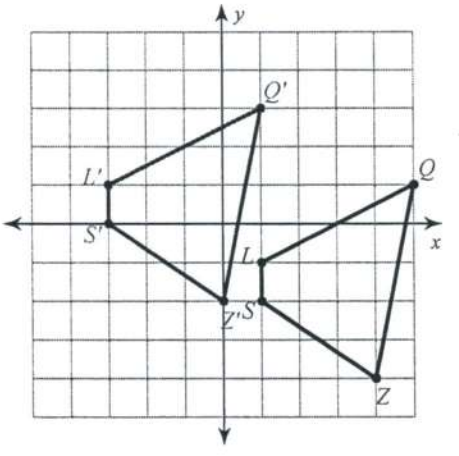
rotation 90° counter-clockwise about the origin

9)



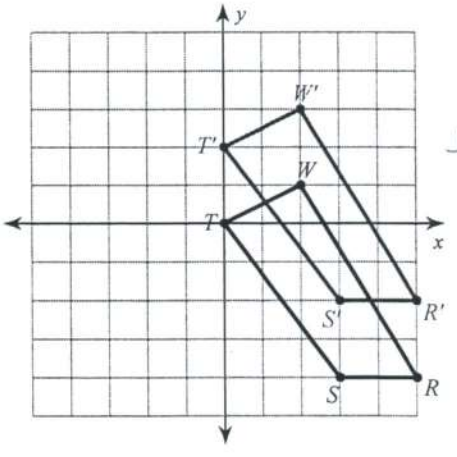
reflection across $x = 2$

10)



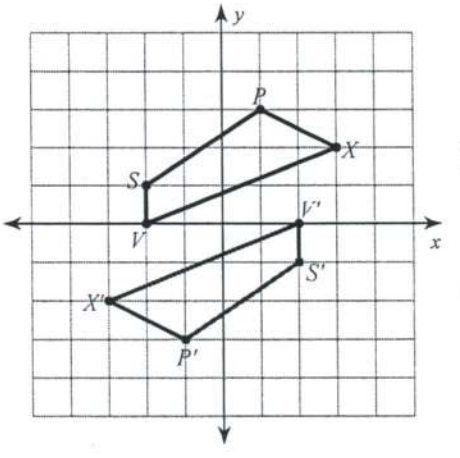
translate left 4, up 2

11)



translate up 2

12)



rotation 180° about the origin

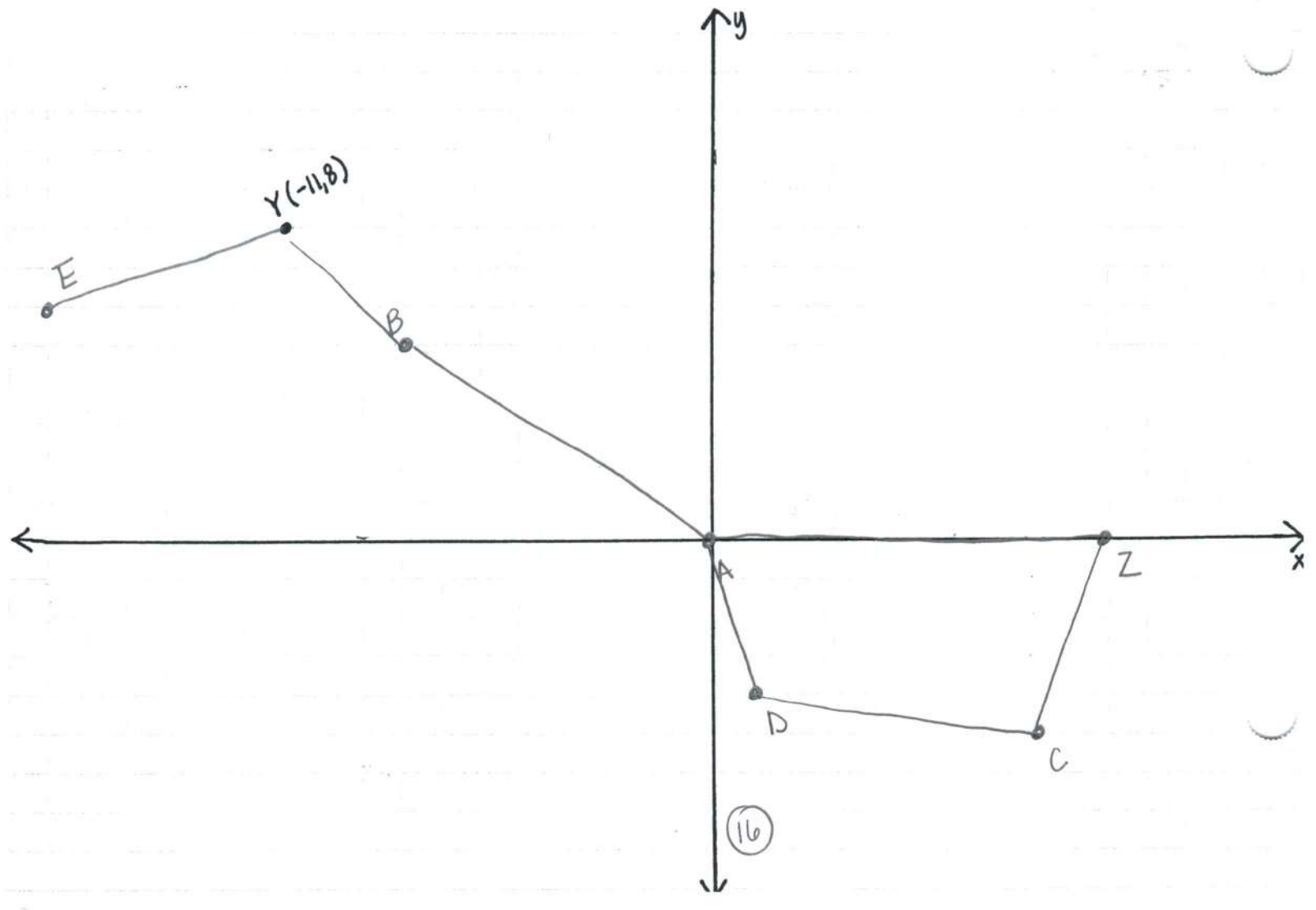
(15)

A1PI Transformation Activity **Name** _____

I've done so many rotations... I'm seeing stars!

Directions: Perform the following transformations on the coordinate plane below. Be sure to label each point and write in its coordinates.

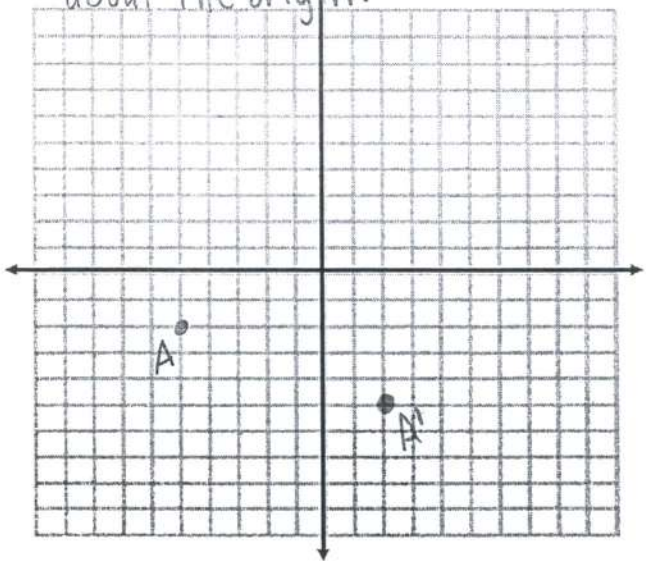
1. Plot point A at (0, 0).
2. Translate point A: 8 units left and 5 units up. Label the new point B.
3. Rotate point B 180 degrees. Label the new point C.
4. Translate point C: 7units left and 1 unit up. Label the new point D.
5. Reflect point A in the line $x = 5$. Label the new point Z.
6. Translate point B: 9 units left and 1 unit up. Label the new point E.
7. Draw in the quadrilateral AZCD.
8. Draw in segment AB, segment BY and segment YE.
9. What kind of stars are you seeing? The Big Dipper



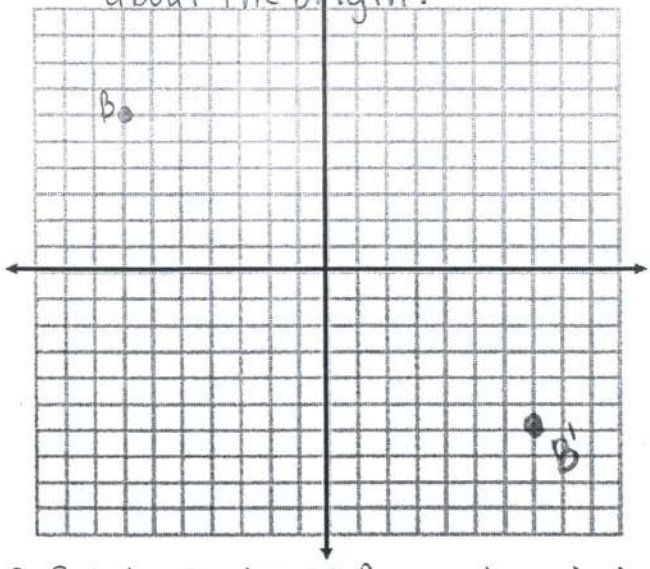
Algebra I Part I – Transformations Review

Name: Answer Key

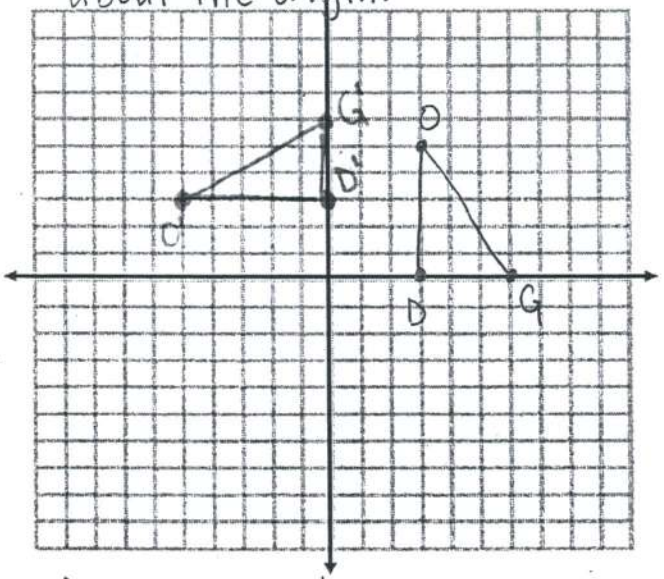
① Rotate point A 90° counter-clockwise about the origin.



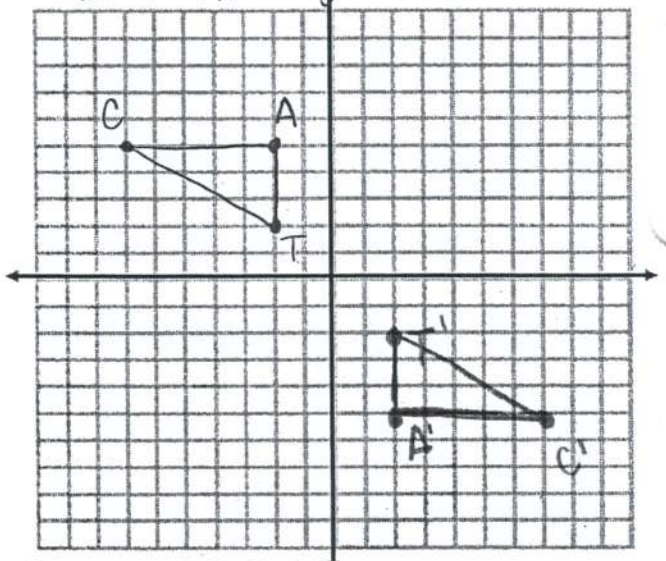
② Rotate point B 180° clockwise about the origin.



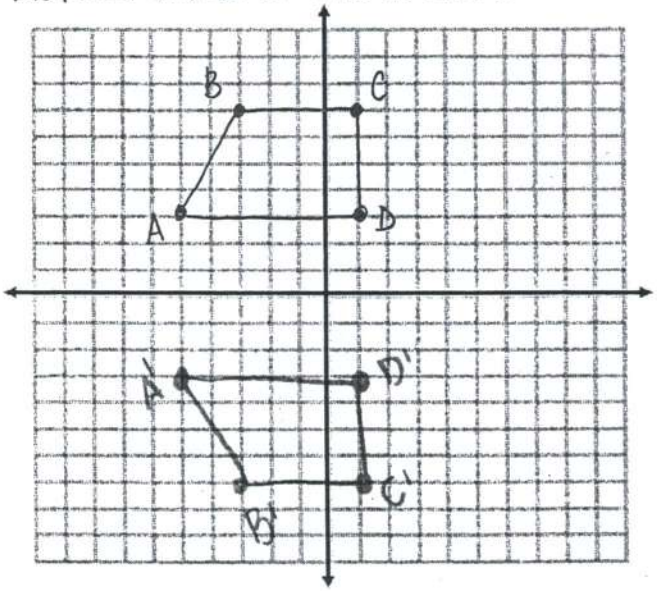
③ Rotate △DOG 90° counter-clockwise about the origin.



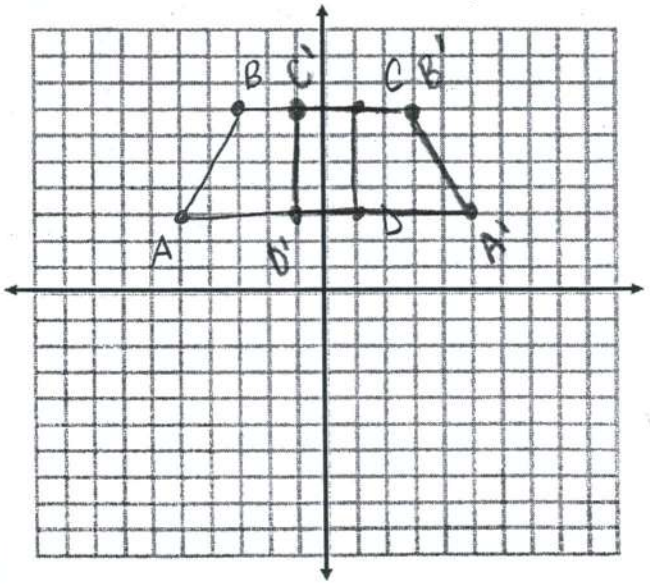
④ Rotate △CAT 180° counter-clockwise about the origin.



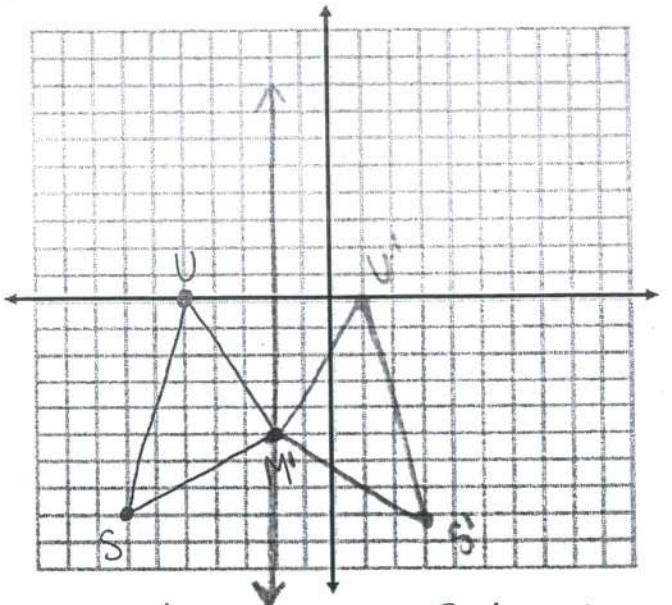
⑤ Reflect ABCD in the x-axis.



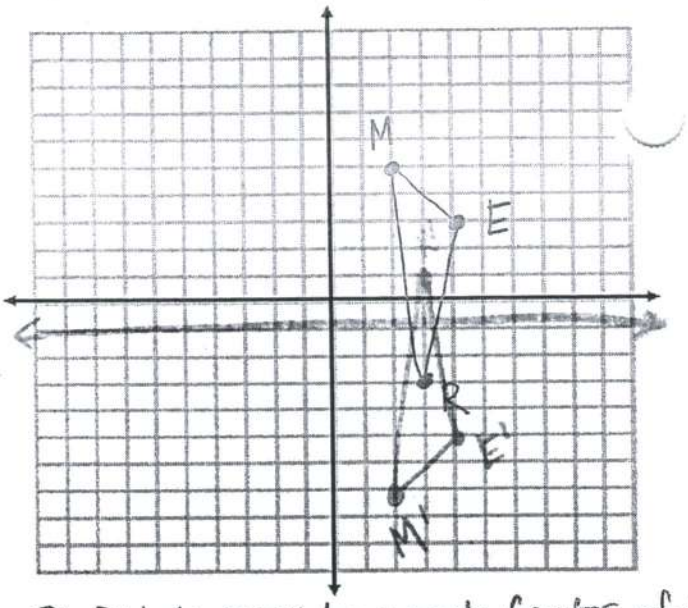
⑥ Reflect ABCD in the y-axis.



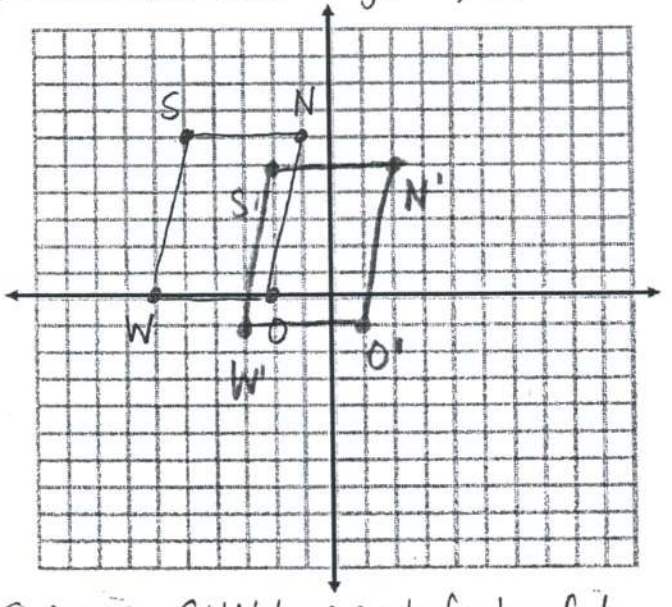
(7) Reflect $\triangle SUM$ in $x = -2$.



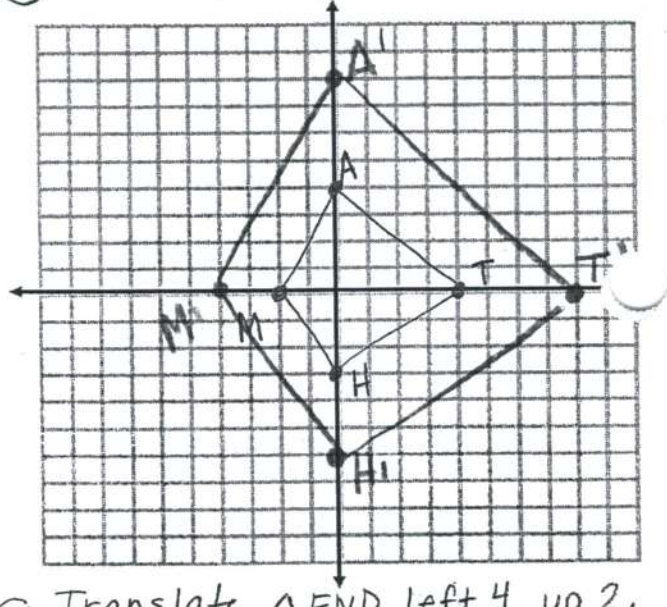
(8) Reflect $\triangle MER$ in $y = -1$



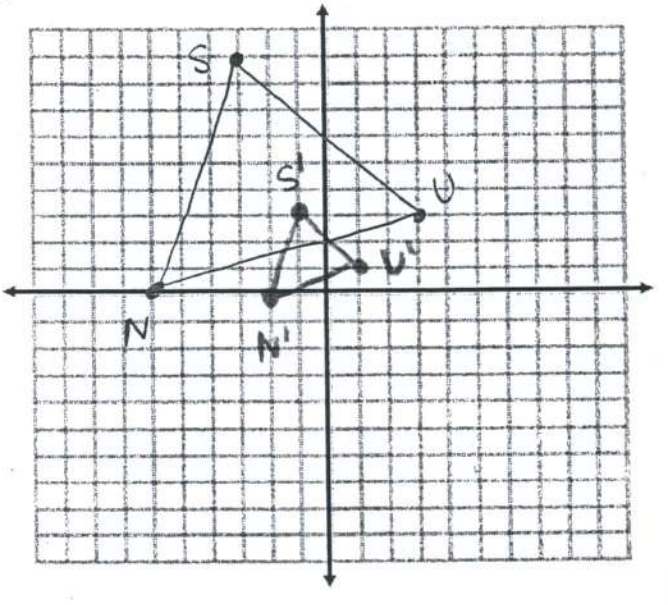
(9) Translate SNOW right 3, down 1.



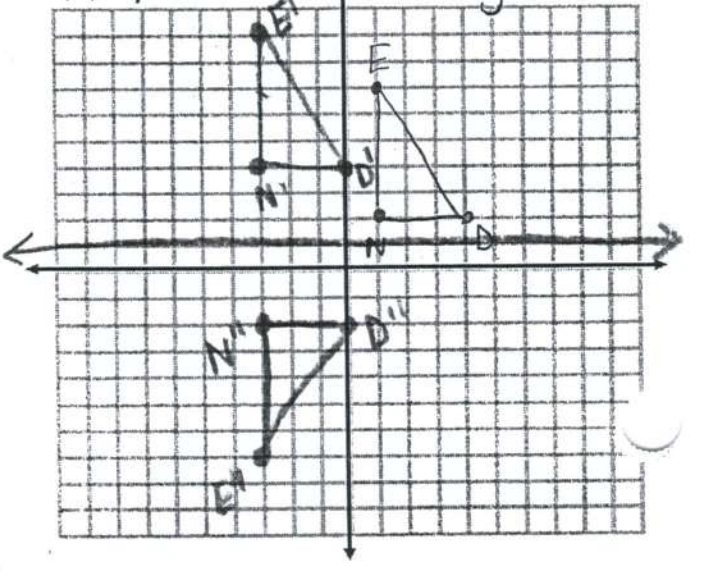
(10) Dilate MATH by a scale factor of 2



(11) Dilate SUN by a scale factor of $\frac{1}{3}$.



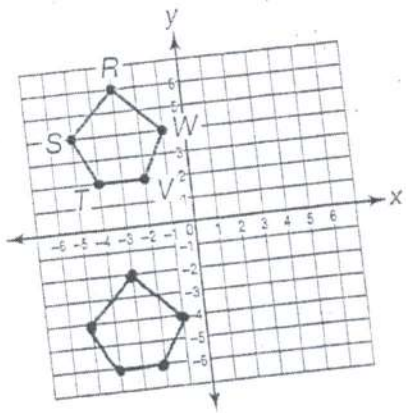
(12) Translate $\triangle END$ left 4, up 2. Then, reflect $\triangle E'N'D'$ in $y = 1$.



Lesson Practice

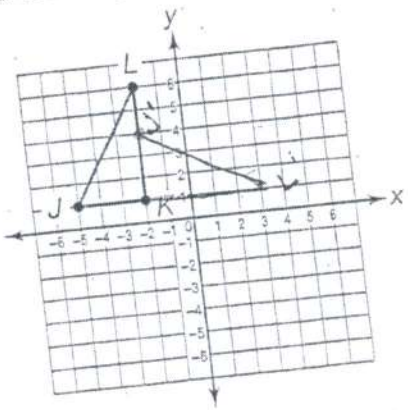
Choose the correct answer.

1. Pentagon $RSTVW$ is translated 8 units down to form its image, pentagon $R'S'T'V'W'$. What will be the coordinates of point T'?



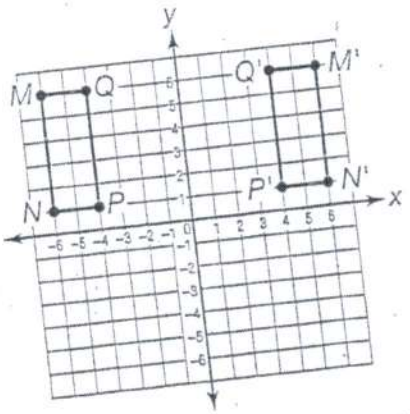
A. $(-4, -6)$
B. $(-4, -2)$
C. $(-4, 6)$
D. $(4, -2)$

2. What set of coordinates will provide the vertices for a 90° clockwise rotation of $\triangle JKL$ around point K?



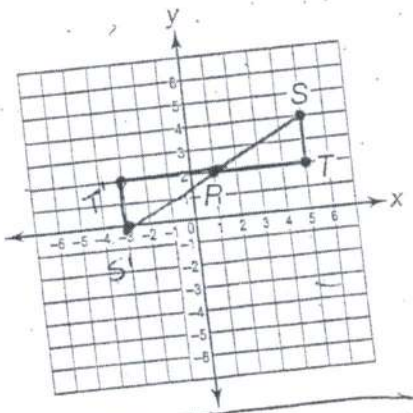
A. $J'(-2, 5), K(-2, 1), L'(4, 1)$
B. $J'(-2, 4), K(-2, 1), L'(3, 1)$
C. $J'(-2, 5), K(-2, 1), L'(3, 1)$
D. $J'(-1, 4), K(-2, 1), L'(3, 1)$

3. Which describes how rectangle $MNPQ$ could be transformed into its image, rectangle $M'N'P'Q'$, in one step?



A. Translate it 8 units to the right.
B. Translate it 12 units to the right.
C. Reflect it across the x-axis.
D. Reflect it across the y-axis.

4. Which set of coordinates will provide the vertices for a 180° clockwise rotation of $\triangle RST$ around point R?



A. $R(1, 2), S'(-3, 0), T'(-3, 2)$
B. $R(1, 2), S'(-3, 2), T'(-3, 4)$
C. $R(1, 2), S'(4, 5), T'(2, 5)$
D. $R(1, 2), S'(-5, 2), T'(-5, 4)$

Quadrilateral $PQRS$ is reflected across the x-axis. How does the length of side $P'Q'$ of the image, quadrilateral $P'Q'R'S'$, compare with the length of side PQ of the pre-image?

A. The length of side $\overline{P'Q'}$ is less than the length of side PQ.

B. The length of side $P'Q'$ is equal to the length of side PQ.

C. The length of side $P'Q'$ is more than the length of side PQ.

D. The length of side $P'Q'$ is $\frac{1}{2}$ the length of side PQ.

6. Point Z has the coordinates $(1, -5)$. What are the coordinates of its image point if it is translated 4 units to the right?

A. $(1, -9)$

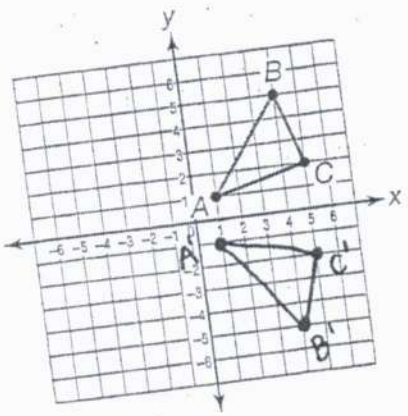
B. $(1, -1)$

C. $(5, -1)$

D. $(5, -5)$

OPEN-ENDED QUESTION

7. Triangle ABC is shown below.



- On the grid above, draw the reflection of triangle ABC across the x-axis. Label the appropriate vertices A', B', and C'.
- Identify the coordinates of each point of the image. Label each set of coordinates with the appropriate letter, either A', B', or C'.

A' (1, -1)

B' (4, -5)

C' (5, -2)

6

5. A rectangle labeled Figure A is dilated by a scale factor between 0 and 1 to form Figure A'. Which of the following must be true?

A. Figure A' has the same shape and the same size as Figure A.

B. Figure A' has the same shape as, but is smaller than Figure A.

C. Figure A' has the same shape as, but is larger than Figure A.

D. Figure A' has a different shape than Figure A.

6. Triangle DEF has point D with coordinates (8, 12). If triangle DEF is dilated by a scale factor of $\frac{3}{4}$ to form $\triangle D'E'F'$, what will be the coordinates of point D'?

A. (2, 3)

B. $(2\frac{2}{3}, 4)$

C. (6, 9)

D. (24, 36)

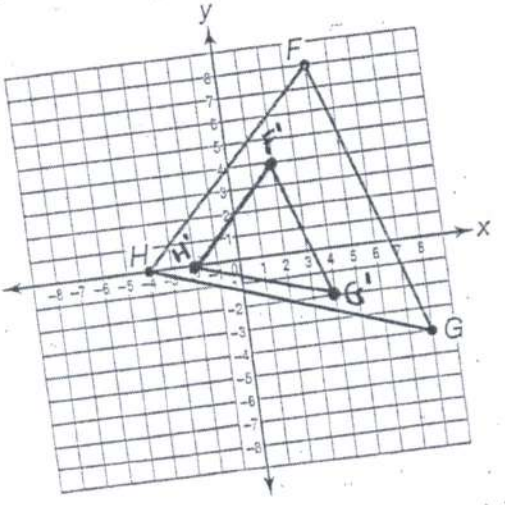
OPEN-ENDED QUESTION

F (4,8) $\xrightarrow{\times\frac{1}{2}}$ F'(2,4)

G (8,-4) $\xrightarrow{\times\frac{1}{2}}$ G'(4,-2)

H (-4,0) H'(-2,0)

7. On the grid below is $\triangle FGH$.

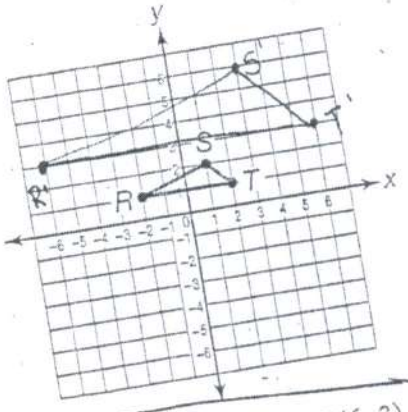


- Triangle FGH will be dilated by a scale factor of $\frac{1}{2}$ to form $\triangle F'G'H'$. Find the coordinates of $\triangle F'G'H'$. Show your work.
- On the grid above, plot points for the dilated image, $\triangle F'G'H'$.

esson Practice

hoose the correct answer.

1. If $\triangle RST$ is dilated by a scale factor of 3, what will be the coordinates of the vertices of the image?



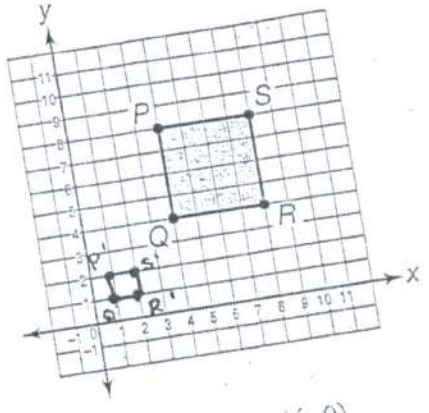
A. $R'(-6, 3), S'(3, 6), T'(6, 3)$

B. $R'(-6, 3), S'(6, 3), T'(3, 6)$

C. $R'(-\frac{2}{3}, 1), S'(\frac{1}{3}, \frac{2}{3}), T'(3, 1)$

D. $R'(6, 3), S'(3, 6), T'(6, 3)$

2. If square $PQRS$ is dilated by a scale factor of $\frac{1}{4}$ to form square $P'Q'R'S'$, what will be the coordinates of point R?



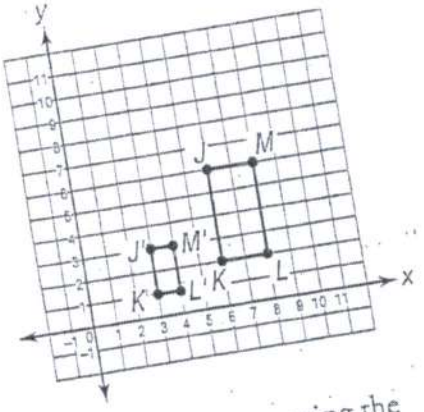
A. $(2, 0)$

B. $(2, 1)$

C. $(4, 0)$

D. $(4, 2)$

Rectangle $JKLM$ below was dilated according to a scale factor of $\frac{1}{2}$ to form rectangle $J'K'L'M'$. Use this coordinate grid for questions 3 and 4.



3. Which statement comparing the perimeters of the two rectangles is true?

A. The perimeter of the dilated image is 4 times the perimeter of the pre-image.

B. The perimeter of the dilated image is 2 times the perimeter of the pre-image.

C. The perimeter of the dilated image is $\frac{1}{2}$ the perimeter of the pre-image.

D. The perimeter of the dilated image is $\frac{1}{4}$ the perimeter of the pre-image.

4. Which statement comparing the areas of the two rectangles is true?

A. The area of the dilated image is 4 times the area of the pre-image.

B. The area of the dilated image is 2 times the area of the pre-image.

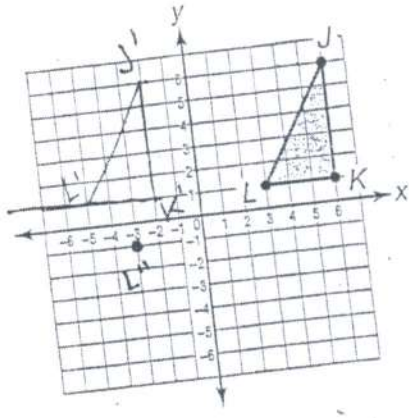
C. The area of the dilated image is $\frac{1}{2}$ the area of the pre-image.

D. The area of the dilated image is $\frac{1}{4}$ the area of the pre-image.

Lesson Practice

Choose the correct answer.

Use this coordinate grid for questions 1 and 2.



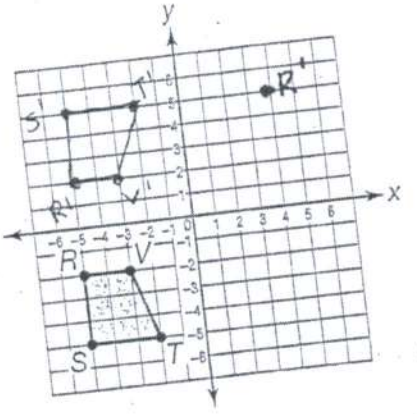
1. Point L is at $(3, 1)$. What are the coordinates of the image point L'' if $\triangle JKL$ is reflected over the x-axis and then that image is reflected over the y-axis?

   A. $(-3, -2)$
   B. $(-3, -1)$
   C. $(-3, 1)$
   D. $(3, -1)$

2. Triangle JKL is translated 8 units to the left to form $\triangle J'K'L'$. Then, $\triangle J'K'L'$ is rotated 90° clockwise around point L' to form $\triangle J''K''L'$. What are the coordinates of point J''?

   A. $(-2, -4)$
   B. $(0, -2)$
   C. $(-5, 1)$
   D. $(-5, 2)$

Use this coordinate grid for questions 3 and 4.



3. Point R is at $(-5, -2)$. What are the coordinates of its image point R'' if trapezoid $RSTV$ is translated 7 units up and then translated 9 units to the right?

   A. $(-5, 5)$
   B. $(2, 6)$
   C. $(2, 7)$
   D. $(4, 5)$

4. Trapezoid $RSTV$ is reflected over the x-axis to form trapezoid $R'S'T'V'$. Then, trapezoid $R'S'T'V'$ is rotated 180° around point V' to form trapezoid $R''S''T''V'$. What are the coordinates of point S''?

   A. $(0, -1)$
   B. $(0, 0)$
   C. $(1, -1)$
   D. $(-1, -1)$

5. Point Z has the coordinates $(-4, 1)$. What are the coordinates of its image point if it is translated 3 units down and then reflected over the x-axis?

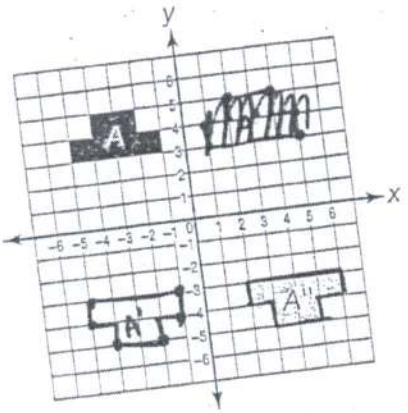
A. $(-4, -1)$
B. $(-4, -2)$
C. $(-4, 2)$
D. $(4, 3)$

6. Point N has the coordinates $(1, 3)$. What are the coordinates of its image point if it is reflected over the y-axis and then translated 1 unit to the right?

A. $(0, -3)$
B. $(0, 3)$
C. $(1, -3)$
D. $(1, 3)$

OPEN-ENDED QUESTION

7. Figure A'' below is the result of a sequence of two transformations of figure A. The first transformation was a reflection. The second was a translation.



- The first transformation was a reflection of figure A across the x-axis. Draw the reflected image and label it Figure A'.
- The second transformation was a translation. Describe the translation needed to move Figure A' so that it completely covers Figure A''.

Translate right 7 units