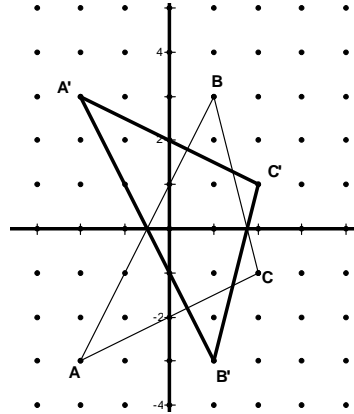
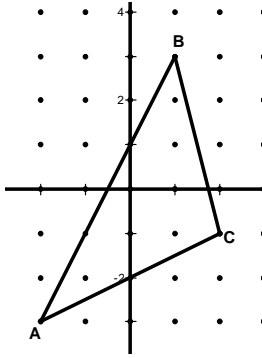


# Reflections

Draw the polygon by graphing the given vertices and connecting with segments.  
 Reflect the polygon appropriately and give the coordinates of the image.

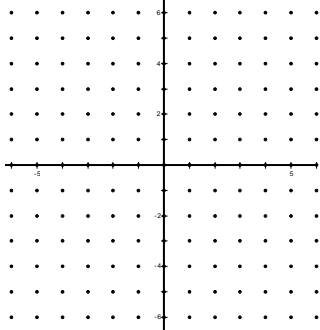
Example 1 A (-2, -3), B(1, 3) and C(2, -1) reflected over the x-axis



- A (-2, -3) → A' (-2, 3)
- B (1, 3) → B' (1, -3)
- C (2, -1) → C' (2, 1)

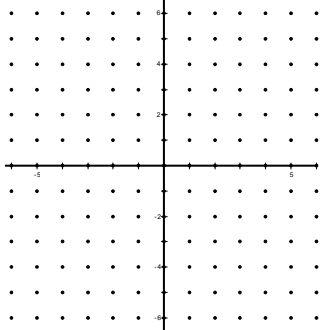
Describe the change in orientation:

1. A(2, 3), B(0, 0), and C(4, 0) reflected over the x-axis



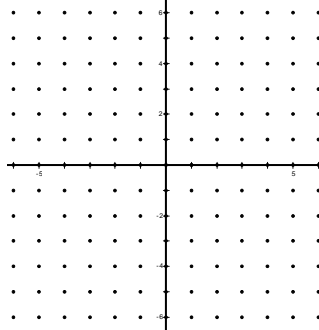
- A(2, 3) → A' (
- B(0, 0) → B'(
- C(4, 0) → C'(

2. D(-1, 3), E(5, 2), and F(3, -4) reflected over the x-axis



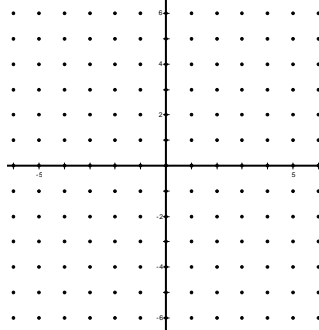
- D(-1, 3) → D' (
- E(5, 2) → E'(
- F(3, -4) → F'(

3. G(0, 2), H(-1, -2), and I(-3, 4) reflected over the y-axis



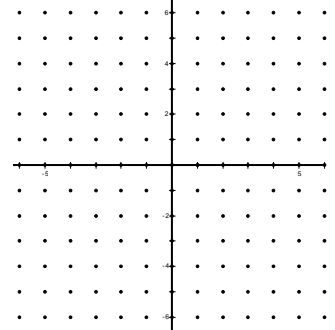
- G(0, 2) → G' (
- H(-1, -2) → H'(
- I(-3, 4) → I'(

4. J(-3, 0), K(2, 1), and L(1, -2) reflected over the y-axis



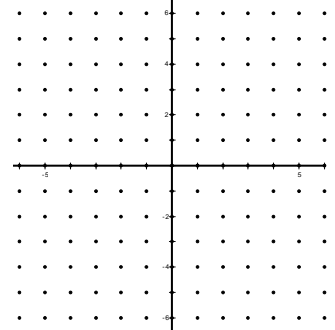
- J(-3, 0) → J' (
- K(2, 1) → K'(
- L(1, -2) → L'(

5. M(2, -3), N(1, 2), and O(-4, -2) reflected over the line y = x



- M(2, -3) → M' (
- N(1, 2) → N'(
- O(-4, -2) → O'(

6. P(2, 3), Q(-3, 4), and R(5, 0) reflected over the line y = x



- P(2, 3) → P' (
- Q(-3, 4) → Q'(
- R(5, 0) → R'(

## The rules

Reflecting over the x-axis  $(a, b) \rightarrow$

Reflecting over the y-axis  $(a, b) \rightarrow$

Reflecting over the line  $y = x$   $(a, b) \rightarrow$

7. Give the coordinates of the vertices of pentagon PQRST after a reflection over the x-axis, y-axis, and the line  $y = x$

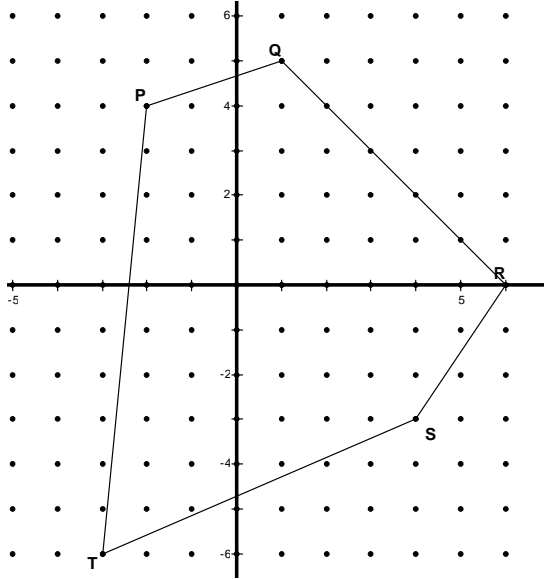
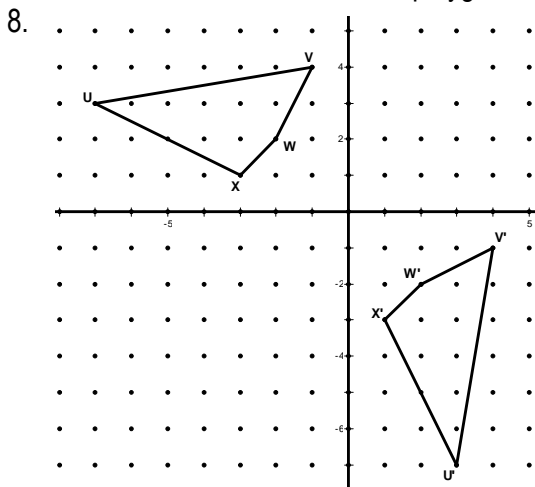


Image points after reflecting over the x-axis:

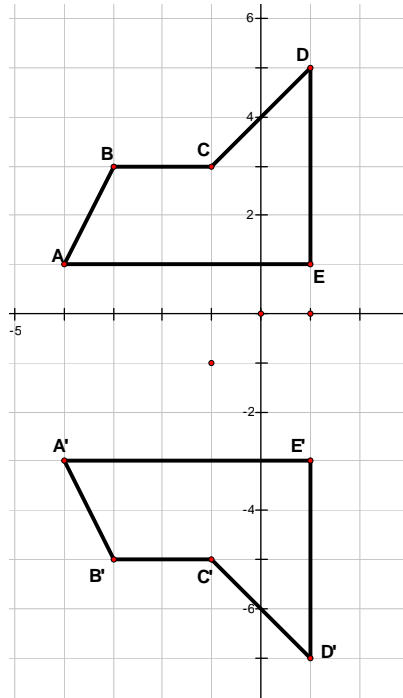
Image points after reflecting over the y-axis:

Image points after reflecting over the line  $y = x$ :

Draw the line of reflection for each polygon and its image.

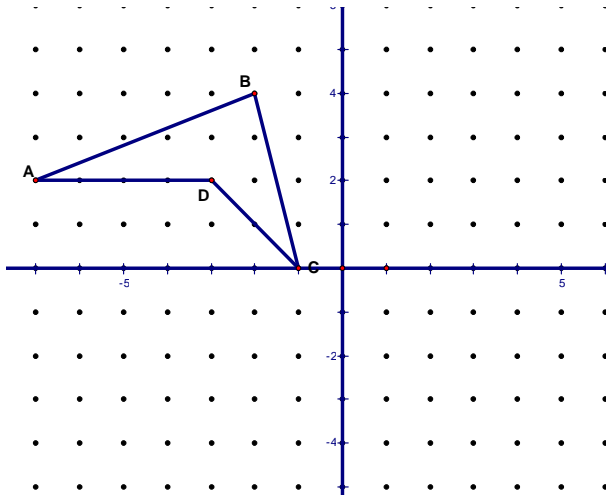


9.



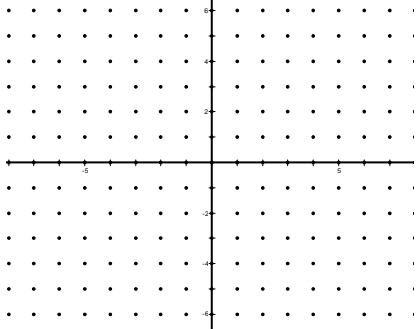
# Translations

Copy ABCD and draw its image after each translation.

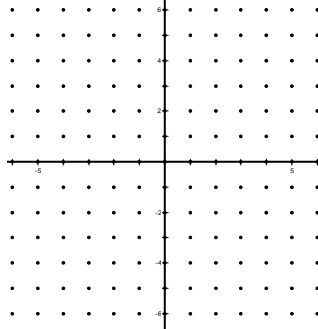


$(a, b) \rightarrow (a + h, b + k)$   
 slide to every point to the right  $h$  units  
 slide every point up  $k$  units

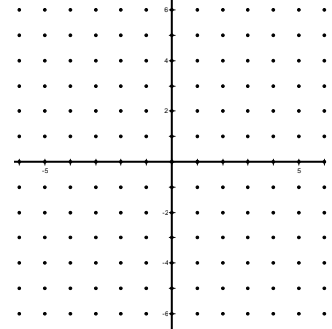
1.  $(a, b) \rightarrow (a - 1, b + 2)$



2.  $(a, b) \rightarrow (a + 3, b)$



3.  $(a, b) \rightarrow (a, b - 5)$

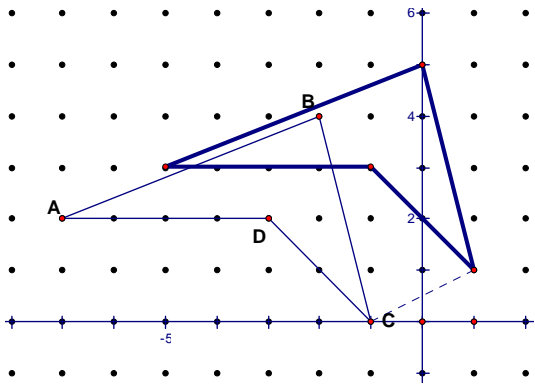


Describe each translation using coordinate notation.

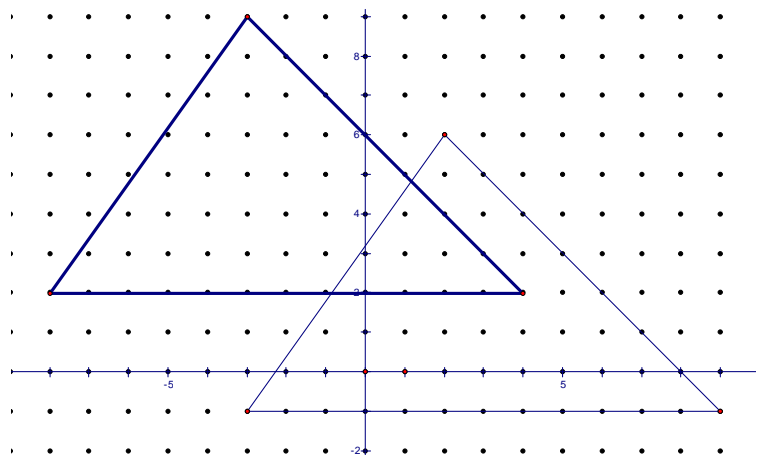
4. Every point moves to the left 2 units and up 6 units.
5. Every point moves to the right 7 units and up 3 units.
6. Every point moves to the left 8 units.
7. Every point moves up 9 units.
8. Every point moves to the left 10 units and down 4 units.

The image of each polygon after a translation is shown in bold lines. Describe each translation in coordinate notation.

9.



10.



11. Is congruency preserved when translating a polygon?

12. Is orientation preserved when translating a polygon?

Find the distance between a point and its image after the given translation.

13.  $(a, b) \rightarrow (a - 1, b + 2)$

14.  $(a, b) \rightarrow (a + 3, b + 4)$

15.  $(a, b) \rightarrow (a + 7, b - 5)$

Describe the translation

16.  $(4, 8) \rightarrow (7, 2)$

17.  $(5, 0) \rightarrow (8, 5)$

18.  $(-8, 10) \rightarrow (1, 0)$

# Applying Rotations

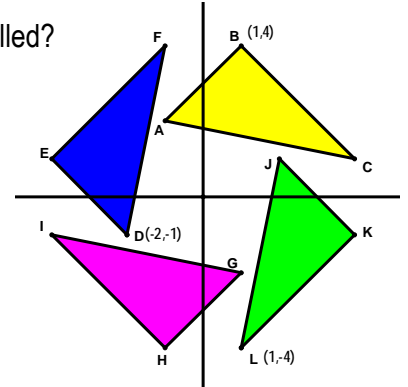
## The rules

- $90^\circ$  rotation             $(a, b) \rightarrow$   
 $180^\circ$  rotation            $(a, b) \rightarrow$   
 $270^\circ$  rotation            $(a, b) \rightarrow$   
 $360^\circ$  rotation            $(a, b) \rightarrow$

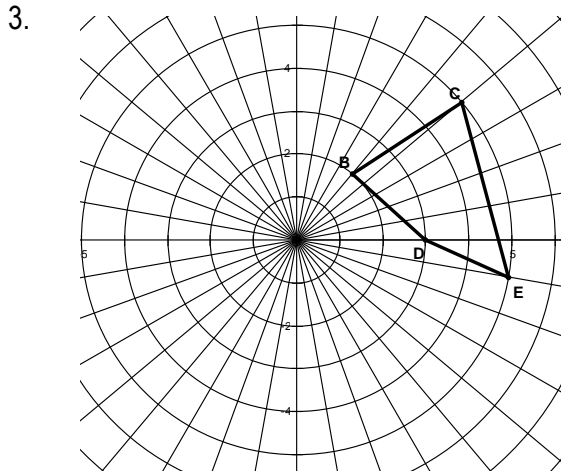
1. A rotation of  $180^\circ$  is sometimes called a half-turn. What could a  $90^\circ$  rotation be called?

2. Name the image of each triangle after the rotation around the origin.

- a) Rotate  $\triangle ABC$   $90^\circ$ .  
 b) Rotate  $\triangle DEF$   $180^\circ$ .  
 c) Rotate  $\triangle JKL$   $270^\circ$ .  
 d) Rotate  $\triangle GHI$   $180^\circ$ .



Quadrilateral BCED is shown on polar graph paper. Draw its image after a rotation of  $90^\circ$  and give the coordinates in polar form (the rays are in  $10^\circ$  increments).



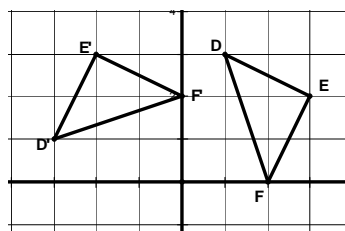
- $B(2, 50^\circ)$   
 $C($   
 $E($   
 $D($

4. Is congruency preserved when rotating a polygon?

5. Is orientation preserved when rotating a polygon?

### Example

$D(1,3), E(3,2), F(2,0)$  rotated  $90^\circ$



- $D(1,3) \rightarrow D'(-3, 1)$   
 $E(3,2) \rightarrow E'(-2, 3)$   
 $F(2,0) \rightarrow F'(0, 2)$

**\*\*Note\*\*** a rotation is counterclockwise (ccw) unless otherwise noted clockwise (cw)

Draw the polygon by graphing the given vertices and connecting with segments. Give the coordinates of the image.

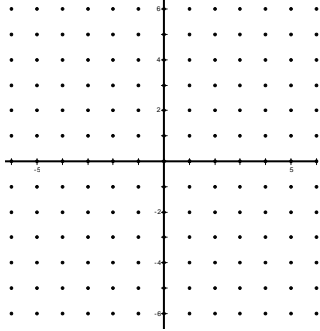
Geometry

Name \_\_\_\_\_ per \_\_\_\_\_

Date \_\_\_\_\_

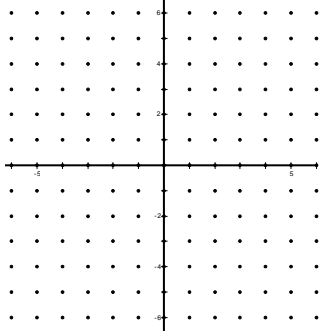
90° rotations

6. A(2, 3), B(0, 0), and C(4, 0)



A(2, 3) → A' ( )  
 B(0, 0) → B' ( )  
 C(4, 0) → C' ( )

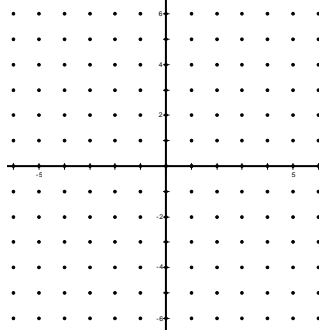
7. D(-1, 3), E(5, 2), and F(3, -4)



D(-1, 3) → D' ( )  
 E(5, 2) → E' ( )  
 F(3, -4) → F' ( )

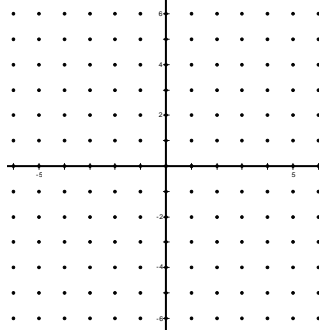
180° rotations

8. G(0, 2), H(-1, -2), and I(-3, 4)



G(0, 2) → G' ( )  
 H(-1, -2) → H' ( )  
 I(-3, 4) → I' ( )

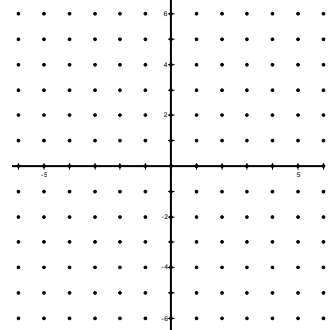
9. J(-3, 0), K(2, 1), and L(1, -2)



J(-3, 0) → J' ( )  
 K(2, 1) → K' ( )  
 L(1, -2) → L' ( )

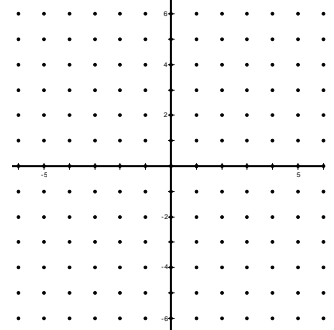
270° rotations

10. M(2, -3), N(1, 2), and O(-4, -2)



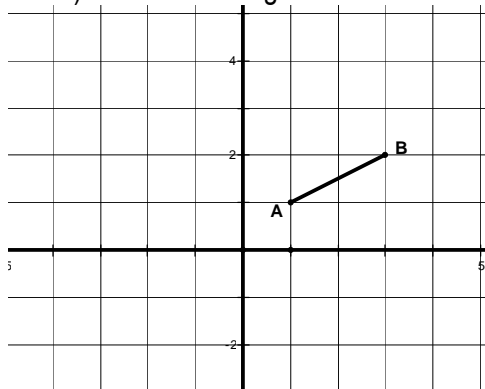
M(2, -3) → M' ( )  
 N(1, 2) → N' ( )  
 O(-4, -2) → O' ( )

11. P(2, 3), Q(-3, 4), and R(5, 0)



P(2, 3) → P' ( )  
 Q(-3, 4) → Q' ( )  
 R(5, 0) → R' ( )

12. a) Sketch the image of  $\overline{AB}$  after a 180° rotation around the origin.



b) Use slopes to show that quadrilateral  $ABA'B'$  is a parallelogram.

# Dilations

Key words

Scale factor:

Enlargement:

Reduction:

Use the coordinates of the vertices in the given figures to complete the tables.

Example

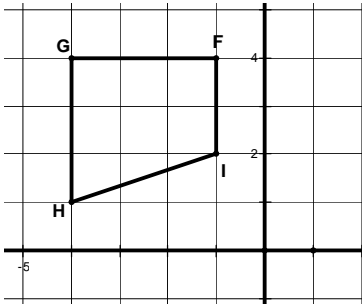


Figure	Scale	Image
(?, ?)	2	(?, ?)
F (-1, 4)	2	F' (-2, 8)
G (-4, 4)	2	G' (-8, 8)
H (-4, 1)	2	H' (-8, 2)
I (-1, 2)	2	I' (-2, 4)

How does the image relate to the original polygon?

1.

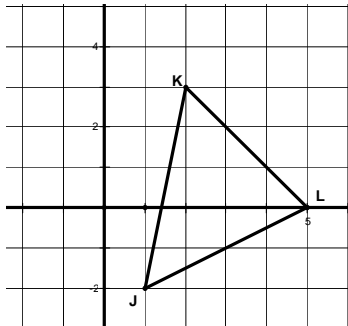


Figure	Scale	Image
(?, ?)	3	(?, ?)

original polygon?

How does the image relate to the

2.

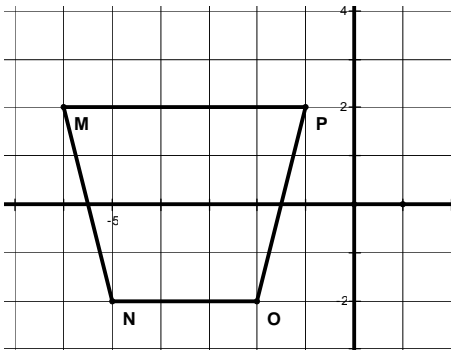
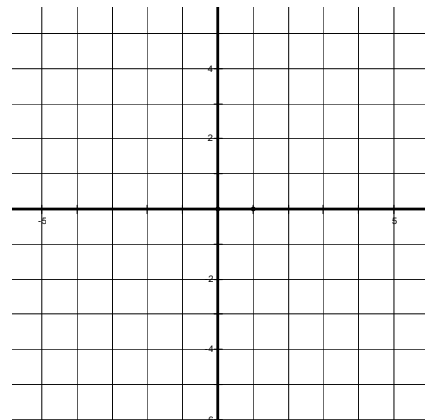


Figure	Scale	Image
(?, ?)	1/2	(?, ?)

How does the image relate to the original polygon?

Graph the image quadrilateral:

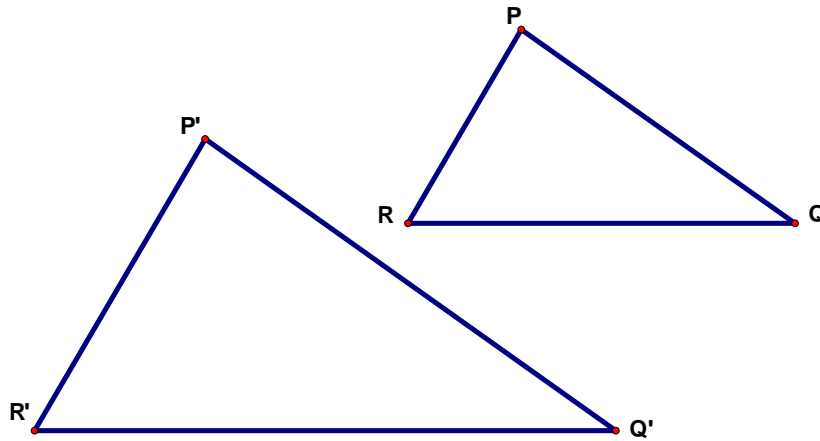


Do dilations preserve orientation?

Do dilations preserve congruence?

What is true for corresponding angle measures? Why?

$\triangle P'Q'R'$  is the image of  $\triangle PQR$ . Find the center of dilation and the scale factor.



Graph trapezoid  $ABCD$  with vertices  $A(4, 2)$ ,  $B(2, -4)$ ,  $C(-6, -2)$ , and  $D(-5, 1)$ . To make trapezoid  $WXYZ$  with  $W(6, 3)$  and  $X(3, -6)$  similar to trapezoid  $ABCD$ , what must be the coordinates of point  $Y$ ?

