

# Skills Practice

Name \_\_\_\_\_ Date \_\_\_\_\_

## I. Introduction to Congruent Figures

- A.** Consider the figures. Make a conjecture about which figures are congruent to the original figure, shown in the center. Then, use patty paper to investigate your conjecture. Finally, justify your conjecture by stating how you can move from the original figure to each congruent figure by sliding, flipping, or spinning the original figure.

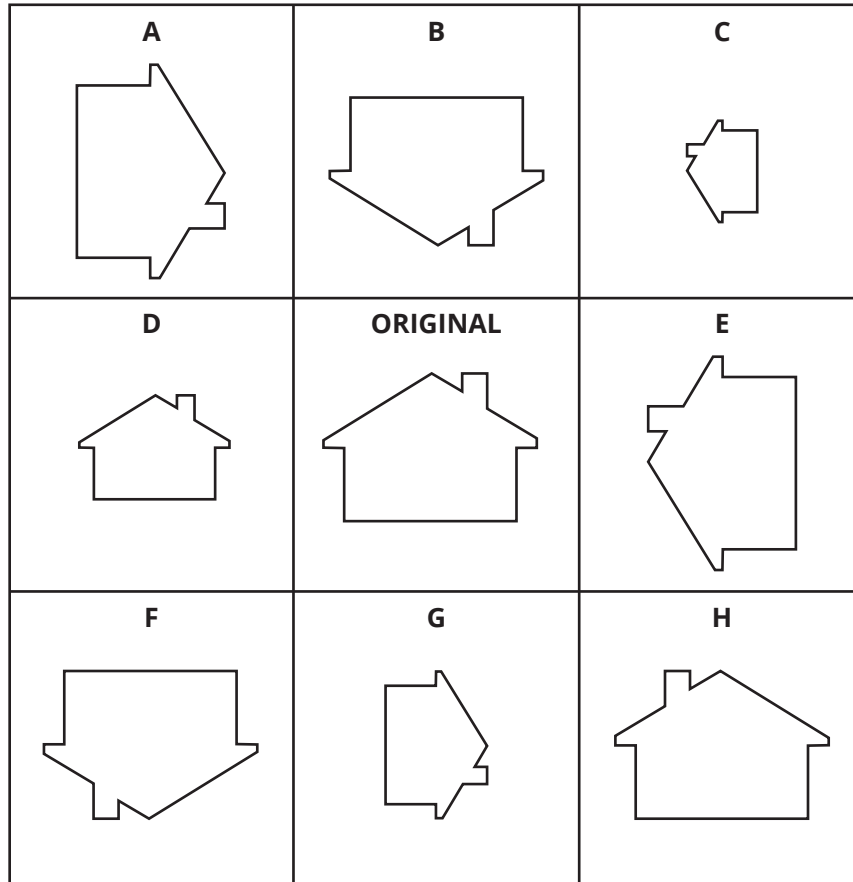


Figure	Congruent to the original figure?	How do you move the original figure onto the congruent figure?
1. A		
2. B		
3. C		
4. D		
5. E		
6. F		
7. G		
8. H		

## II. Introduction to Rigid Motions

A. Sketch each rigid motion transformation.

1. Translate the triangle down.

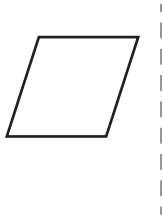


2. Translate the triangle to the right.

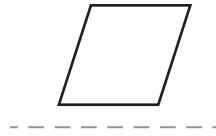


3. What changes about a figure after a translation? What stays the same?

4. Reflect the rhombus over the vertical line.



5. Reflect the rhombus over the horizontal line.



6. What changes about a figure after a reflection? What stays the same?

7. Rotate the rectangle 90 degrees clockwise.



8. Rotate the rectangle 90 degrees counterclockwise.

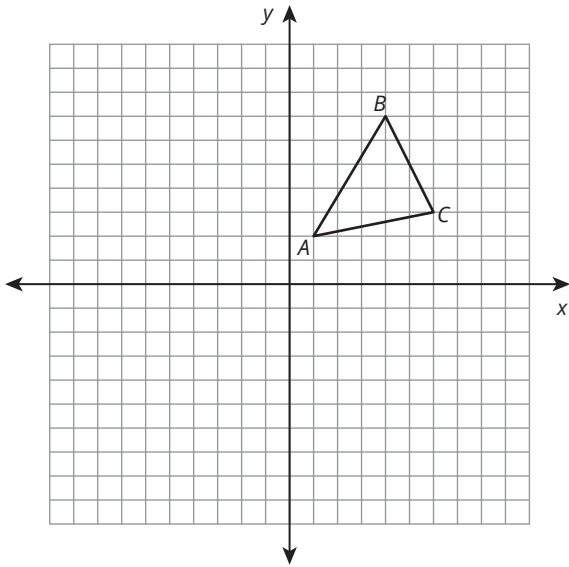


9. What changes about a figure after a rotation? What stays the same?

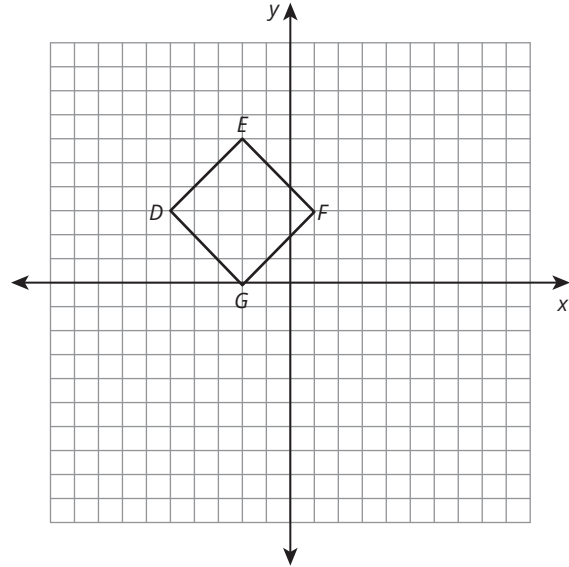
### III. Translations of Figures on the Coordinate Plane

**A.** Sketch the translation of each given figure in the coordinate plane.

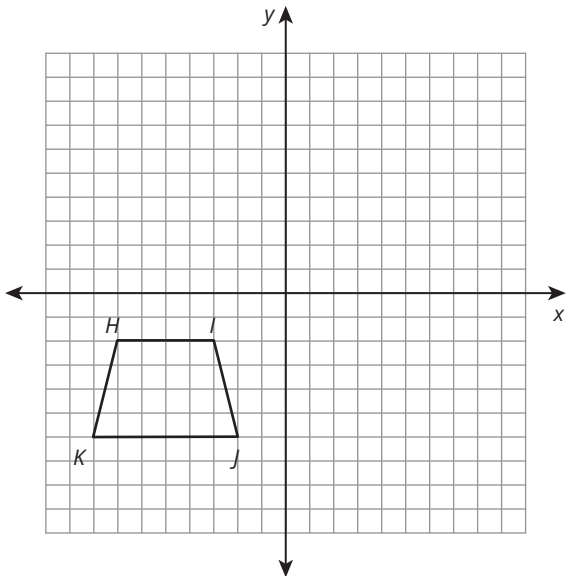
- 1.** Translate the given figure  
–7 units horizontally.



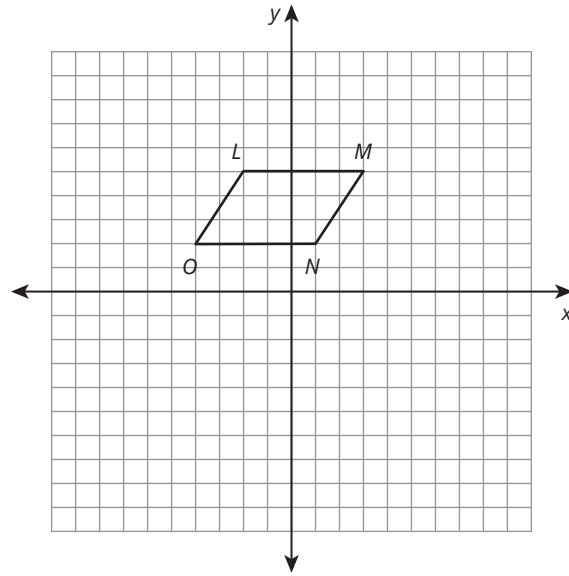
- 2.** Translate the given figure  
3 units horizontally.



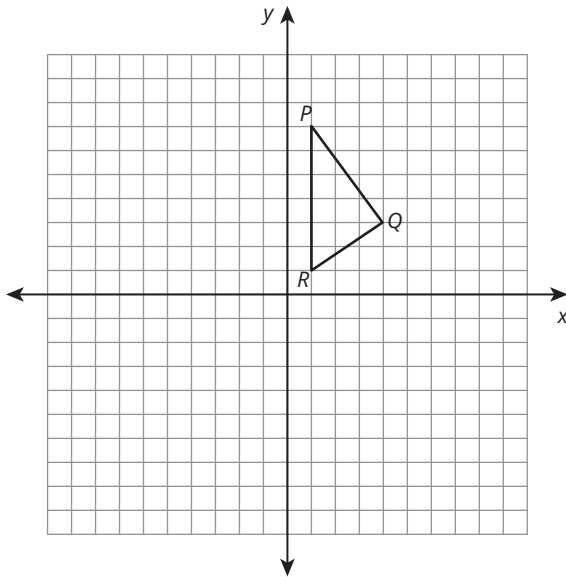
- 3.** Translate the given figure  
8 units vertically.



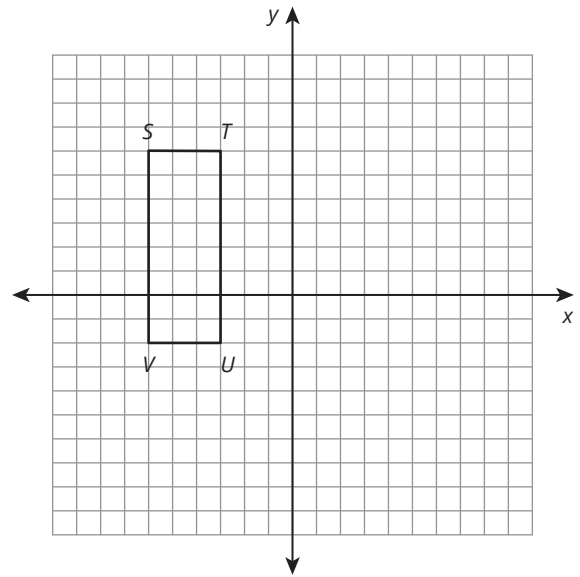
- 4.** Translate the given figure  
–7 units vertically.



5. Translate the given figure 3 units horizontally and  $-8$  units vertically.

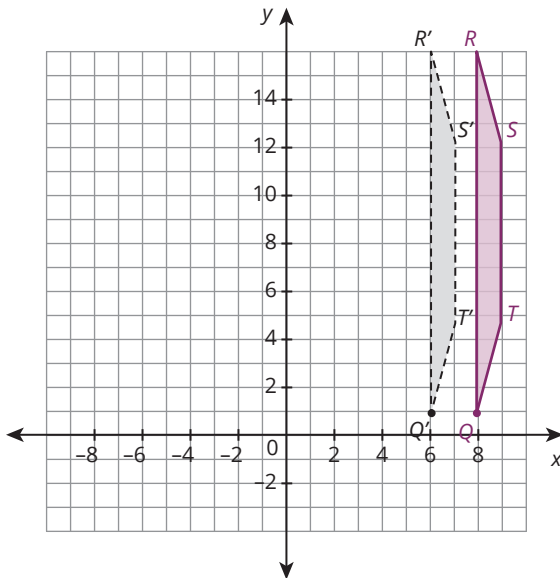


6. Translate the given figure 9 units horizontally and  $-4$  units vertically.

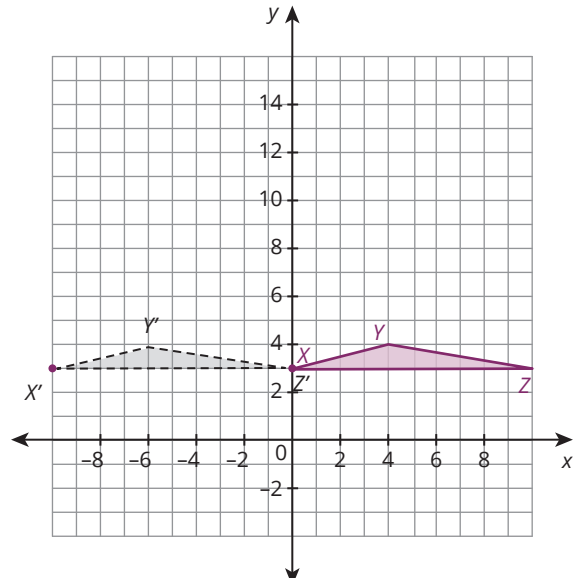


- B. Describe the translation needed to map each pre-image onto each congruent image. Write the algebraic rule for the given transformation.

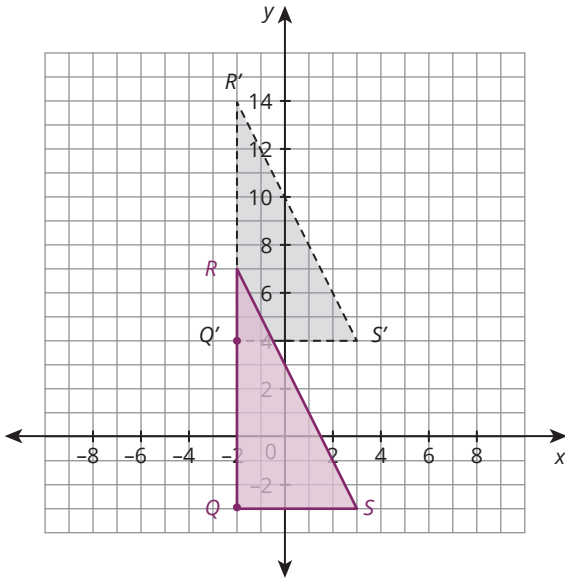
1. pre-image: Quadrilateral  $RSTQ$   
image: Quadrilateral  $R'S'T'Q'$



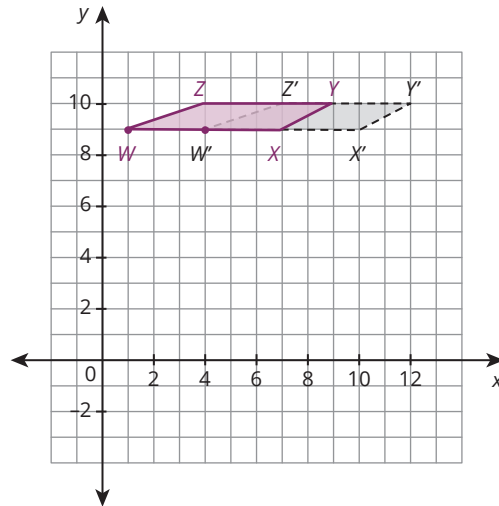
2. pre-image: Triangle  $XYZ$   
image: Triangle  $X'Y'Z'$



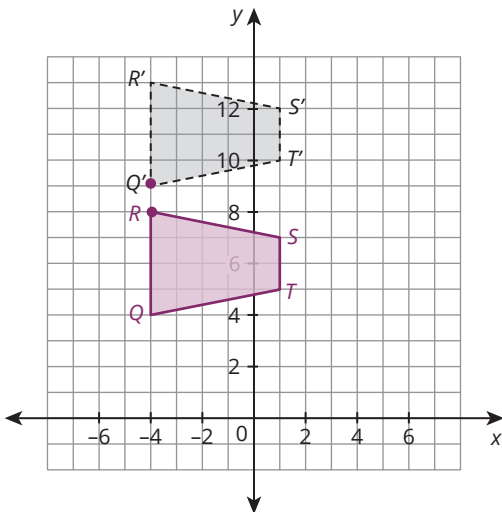
3. pre-image: Triangle  $QRS$   
image: Triangle  $Q'R'S'$



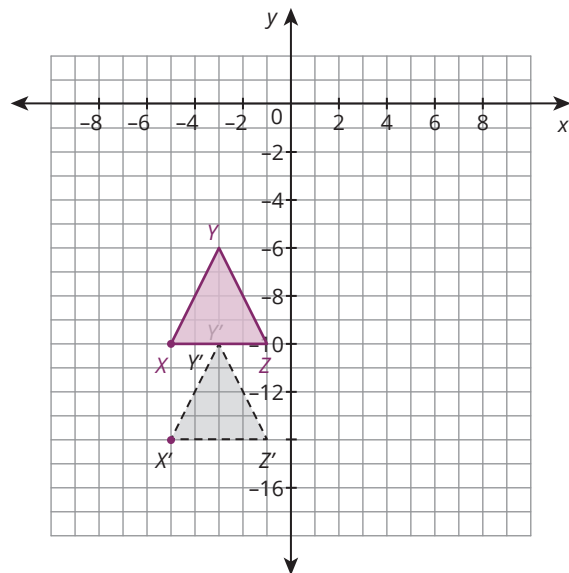
4. pre-image: Quadrilateral  $WXYZ$   
image: Quadrilateral  $W'X'Y'Z'$



5. pre-image: Quadrilateral  $QRST$   
image: Quadrilateral  $Q'R'S'T'$



6. pre-image: Triangle  $XYZ$   
image: Triangle  $X'Y'Z'$



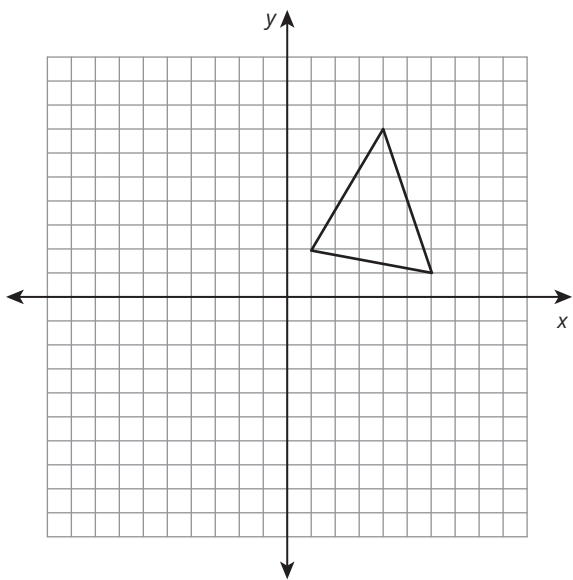
**C.** Use an algebraic rule to determine the coordinates of the image following each given translation.

1. Triangle  $ABC$  with coordinates  $A(2, 4)$ ,  $B(3, 6)$ , and  $C(5, 1)$  is translated 4 units horizontally.
2. Parallelogram  $DEFG$  with coordinates  $D(0, 2)$ ,  $E(1, 5)$ ,  $F(6, 5)$ , and  $G(5, 2)$  is translated  $-7$  units horizontally.
3. Trapezoid  $HJK$  with coordinates  $H(-1, 3)$ ,  $I(-1, -3)$ ,  $J(-4, -1)$ , and  $K(-4, 1)$  is translated 3 units vertically.
4. Square  $LMNO$  with coordinates  $L(-1, 7)$ ,  $M(3, 7)$ ,  $N(3, 3)$ , and  $O(-1, 3)$  is translated  $-5$  units vertically.
5. Rectangle  $WXYZ$  with coordinates  $W(-8, -1)$ ,  $X(-2, -1)$ ,  $Y(-2, -3)$ , and  $Z(-8, -3)$  is translated 13 units horizontally.
6. Rhombus  $ABCD$  with coordinates  $A(7, 8)$ ,  $B(9, 5)$ ,  $C(7, 2)$ , and  $D(5, 5)$  is translated  $-9$  units vertically.
7. Triangle  $PQR$  with coordinates  $P(3, -4)$ ,  $Q(6, -1)$ , and  $R(6, -6)$  is translated  $-3$  units horizontally and 6 units vertically.
8. Triangle  $STU$  with coordinates  $S(0, 0)$ ,  $T(4, 4)$ , and  $U(5, 0)$  is translated 10 units horizontally and  $-2$  units vertically.
9. Triangle  $DEF$  with coordinates  $D(0, 12)$ ,  $E(-3, -7)$ , and  $F(-5, 1)$  is translated  $-12$  units horizontally and  $-8$  units vertically.
10. Parallelogram  $GHIJ$  with coordinates  $G(0, 0)$ ,  $H(2, 8)$ ,  $I(8, 8)$ , and  $J(6, 0)$  is translated  $-8$  units horizontally and  $-8$  units vertically.

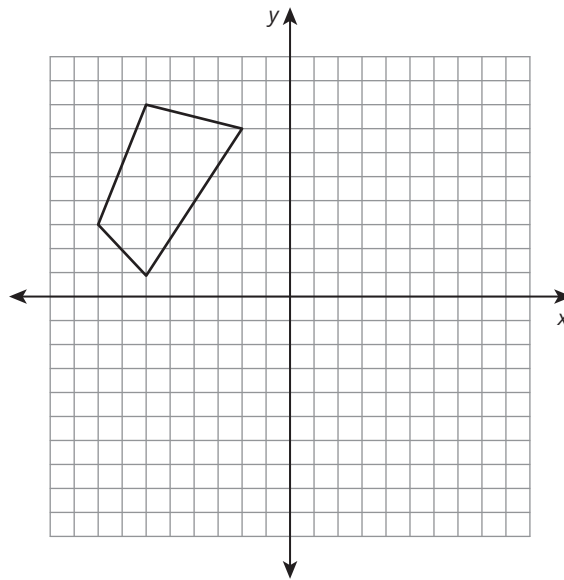
## IV. Reflections of Figures on the Coordinate Plane

A. Sketch the reflection of the figure in each given coordinate plane over the specified axis or line.

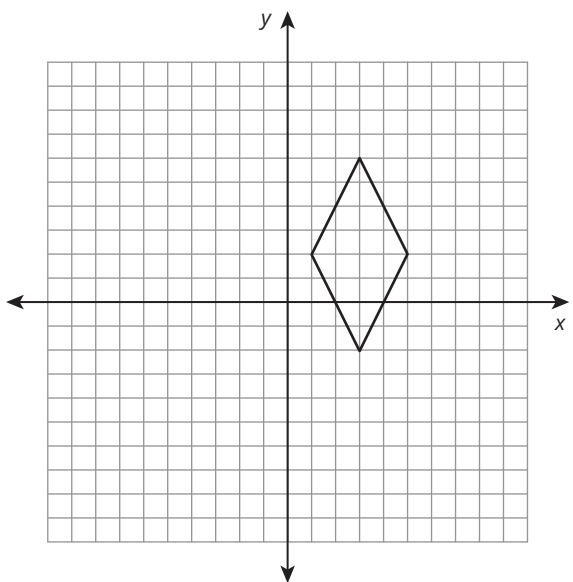
1. Reflect the triangle over the  $x$ -axis.



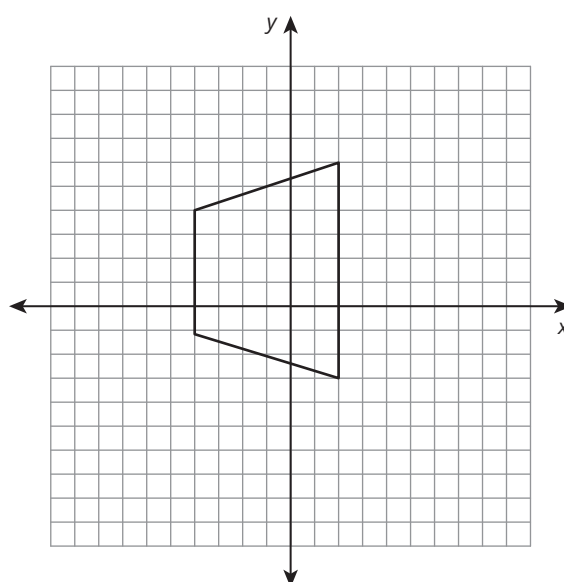
2. Reflect the quadrilateral over the  $y$ -axis.



3. Reflect the rhombus over the  $x$ -axis.

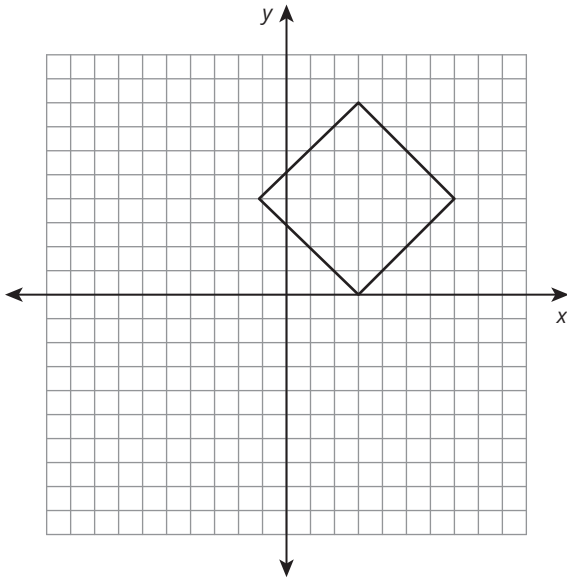


4. Reflect the trapezoid over the  $y$ -axis.

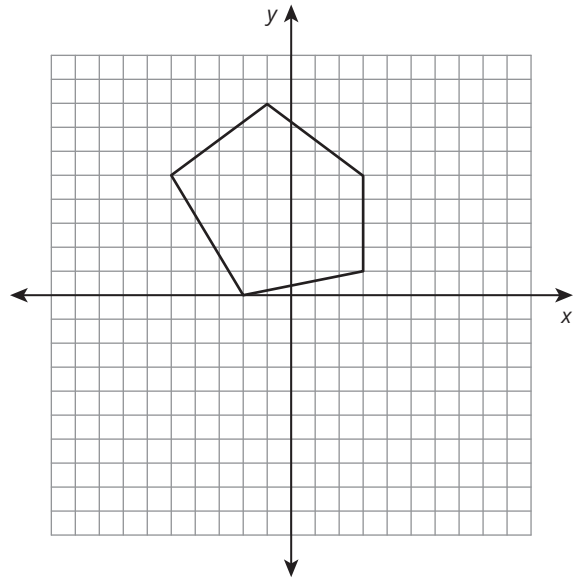




5. Reflect the square over the  $x$ -axis.

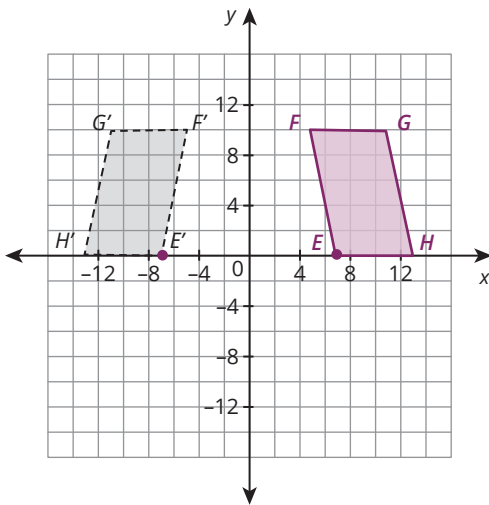


6. Reflect the pentagon over the  $y$ -axis.

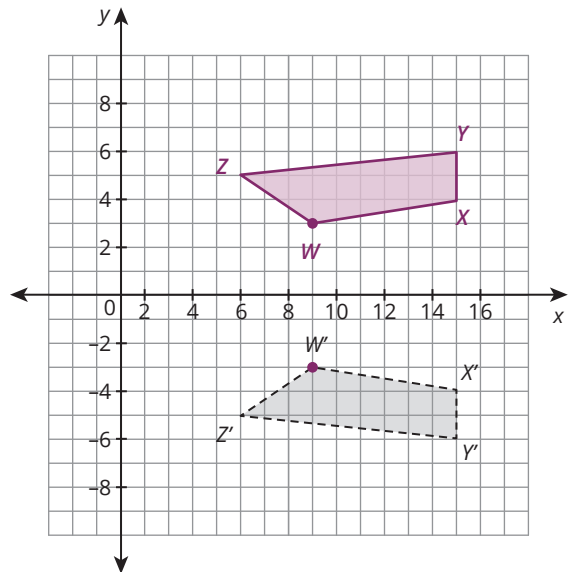


- B. Describe the reflection needed to map each pre-image onto each congruent image. Write the algebraic rule for the given transformation.

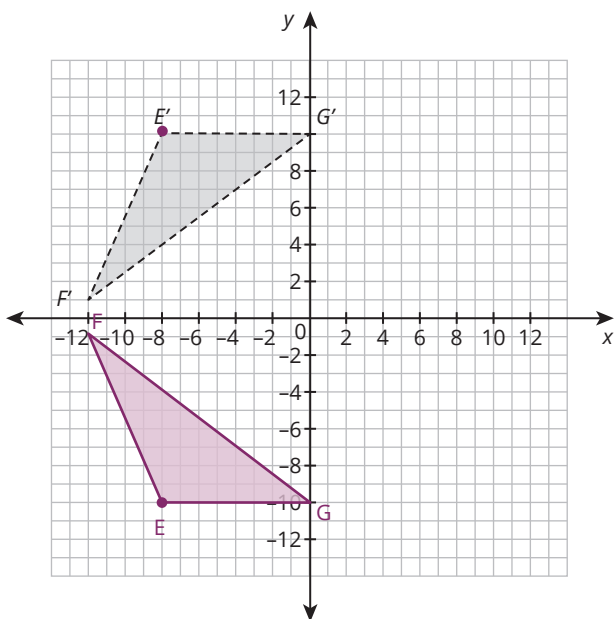
1. pre-image: Quadrilateral  $EFGH$   
 image: Quadrilateral  $E'F'G'H'$



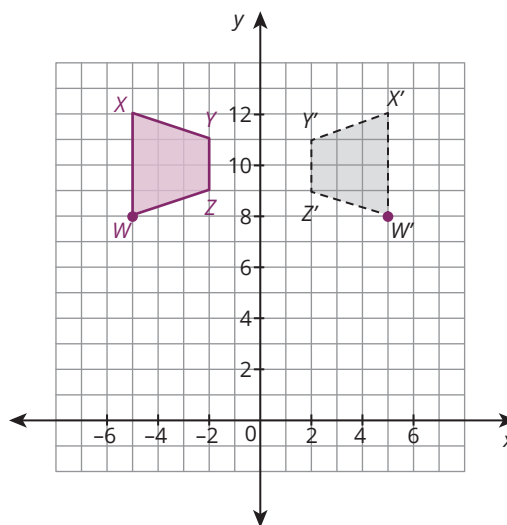
2. pre-image: Quadrilateral  $WXYZ$   
 image: Quadrilateral  $W'X'Y'Z'$



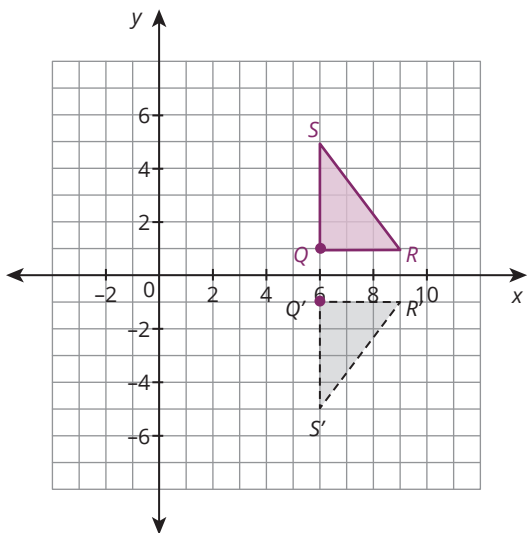
3. pre-image: Triangle  $EFG$   
image: Triangle  $E'F'G'$



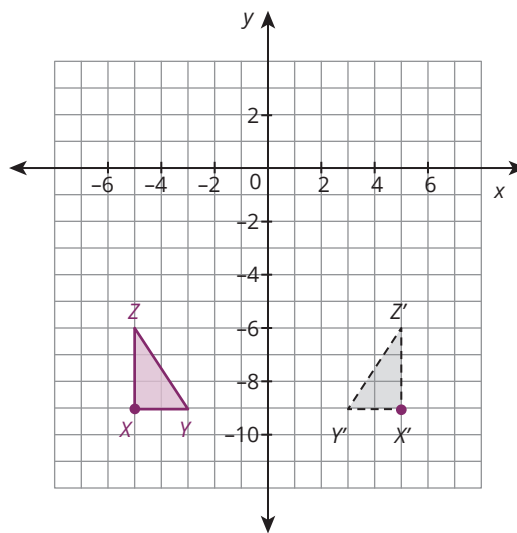
4. pre-image: Quadrilateral  $WXYZ$   
image: Quadrilateral  $W'X'Y'Z'$



5. pre-image: Triangle  $QRS$   
image: Triangle  $Q'R'S'$



6. pre-image: Triangle  $XYZ$   
image: Triangle  $X'Y'Z'$



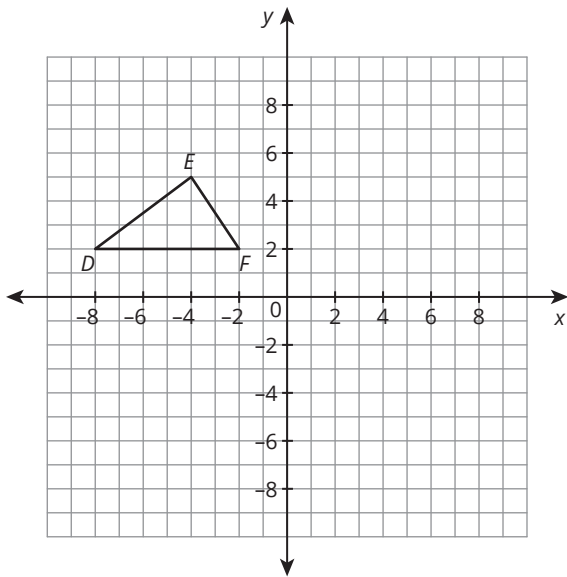
**C.** Use an algebraic rule to determine the vertices of each reflected image.

- 1.** A triangle with vertices  $A(1, 3)$ ,  $B(4, 8)$ , and  $C(5, 2)$  is reflected over the  $x$ -axis.
- 2.** A triangle with vertices  $A(1, 3)$ ,  $B(4, 8)$ , and  $C(5, 2)$  is reflected over the  $y$ -axis.
- 3.** A triangle with vertices  $D(-2, 5)$ ,  $E(-1, 1)$ , and  $F(3, 6)$  is reflected over the  $x$ -axis.
- 4.** A triangle with vertices  $D(-2, 5)$ ,  $E(-1, 1)$ , and  $F(3, 6)$  is reflected over the  $y$ -axis.
- 5.** A square with vertices  $G(0, 2)$ ,  $H(-2, 4)$ ,  $J(0, 6)$ , and  $K(2, 4)$  is reflected over the  $x$ -axis.
- 6.** A square with vertices  $G(0, 2)$ ,  $H(-2, 4)$ ,  $J(0, 6)$ , and  $K(2, 4)$  is reflected over the  $y$ -axis.
- 7.** A trapezoid with vertices  $L(-4, 0)$ ,  $M(-4, -8)$ ,  $N(-6, -5)$ , and  $O(-6, -3)$  is reflected over the  $x$ -axis.
- 8.** A triangle with vertices  $P(0, 0)$ ,  $Q(-5, 0)$ , and  $R(0, 5)$  is reflected over the  $y$ -axis.
- 9.** A pentagon with vertices  $S(-4, 2)$ ,  $T(0, 5)$ ,  $U(4, 2)$ ,  $V(2, -3)$ , and  $W(-2, -3)$  is reflected over the  $x$ -axis.
- 10.** A triangle with vertices  $X(2, 5)$ ,  $Y(4, 1)$ , and  $Z(6, 8)$  is reflected over the  $x$ -axis and then reflected over the  $y$ -axis.

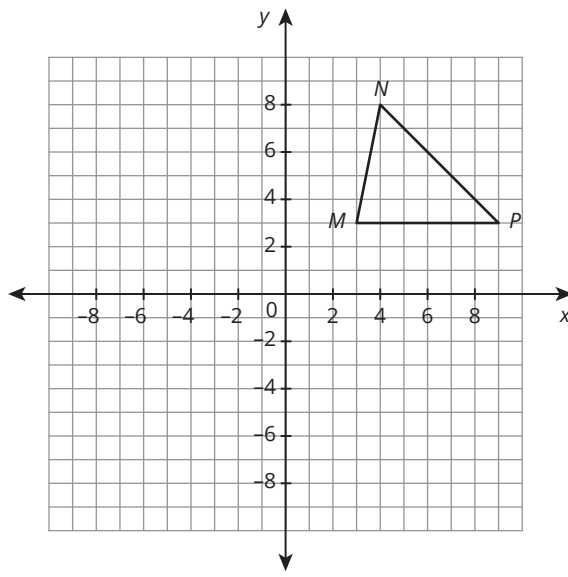
## V. Rotations of Figures on the Coordinate Plane

A. Sketch the rotation of each given figure in the coordinate plane.

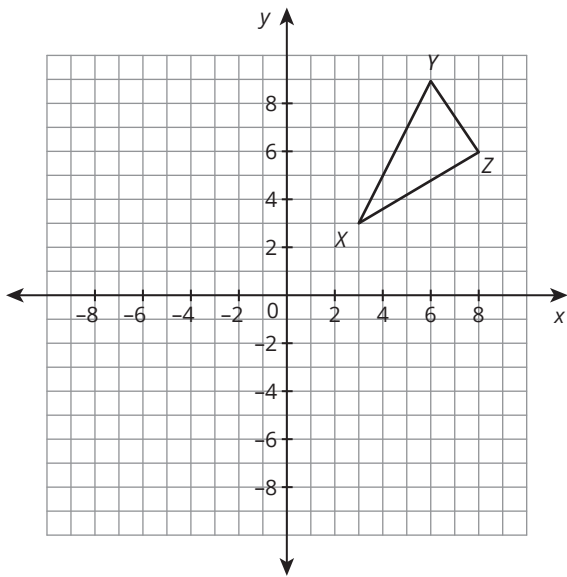
1. Rotate  $\triangle DEF$   $90^\circ$  counterclockwise about the origin.



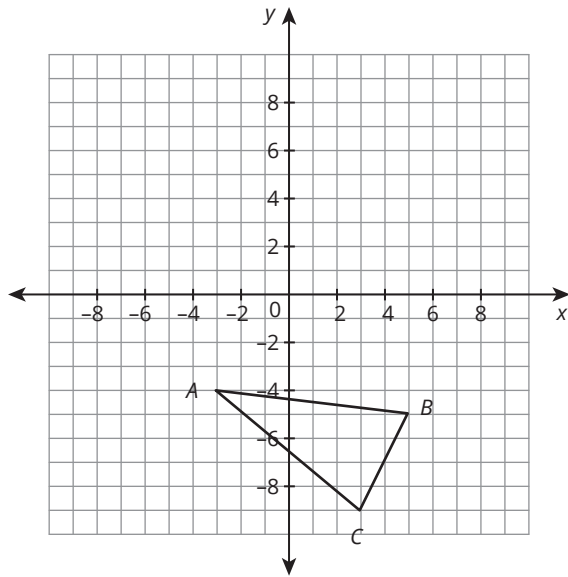
2. Rotate  $\triangle MNP$   $90^\circ$  clockwise about the origin.



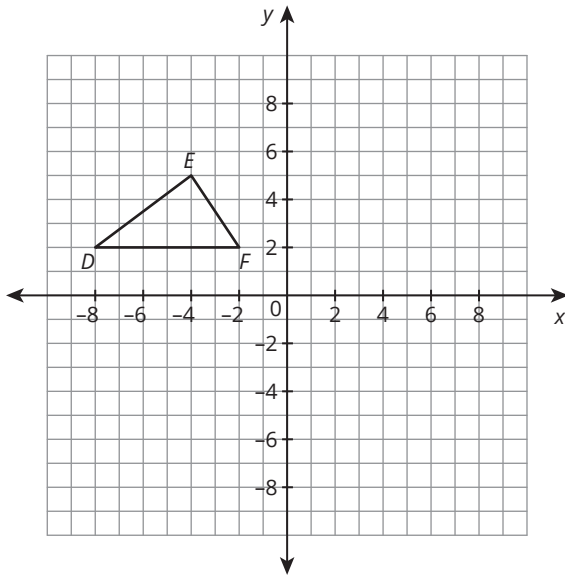
3. Rotate  $\triangle XYZ$   $180^\circ$  about the origin.



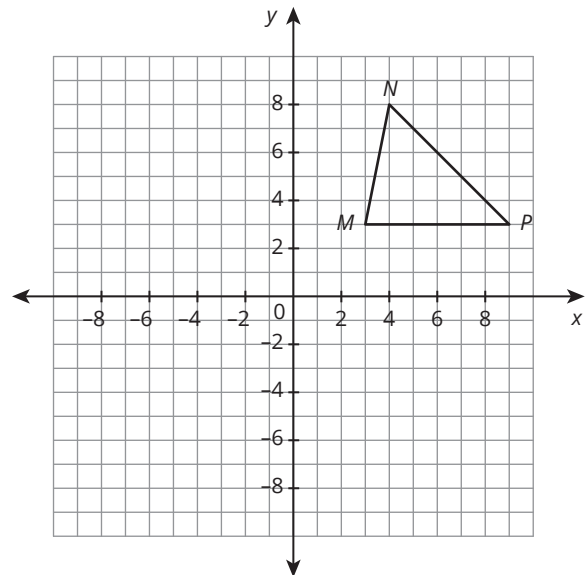
4. Rotate  $\triangle ABC$   $360^\circ$  counterclockwise about the origin.



5. Rotate  $\triangle DEF$   $270^\circ$  clockwise about the origin.

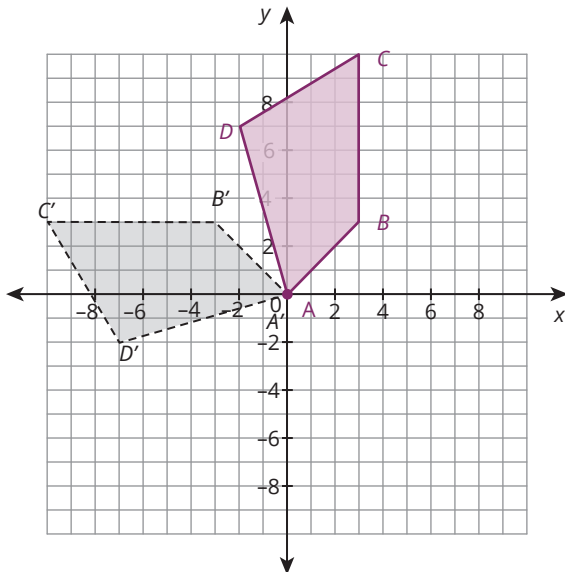


6. Rotate  $\triangle MNP$   $270^\circ$  counterclockwise about the origin.

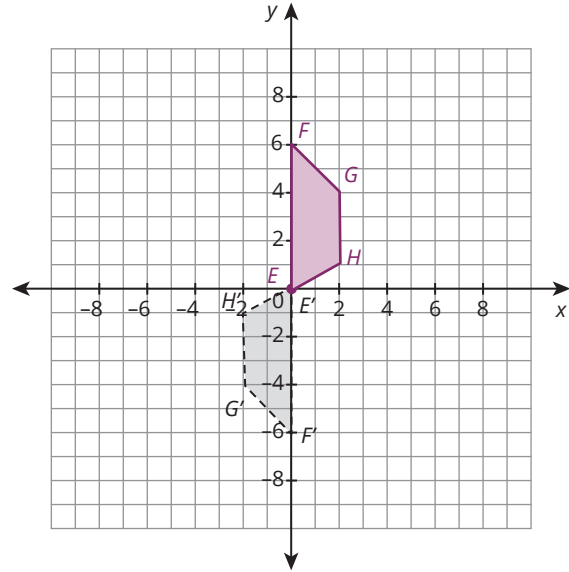


- B. Describe the rotation needed to map each pre-image onto each congruent image. Write the algebraic rule for the given transformation.

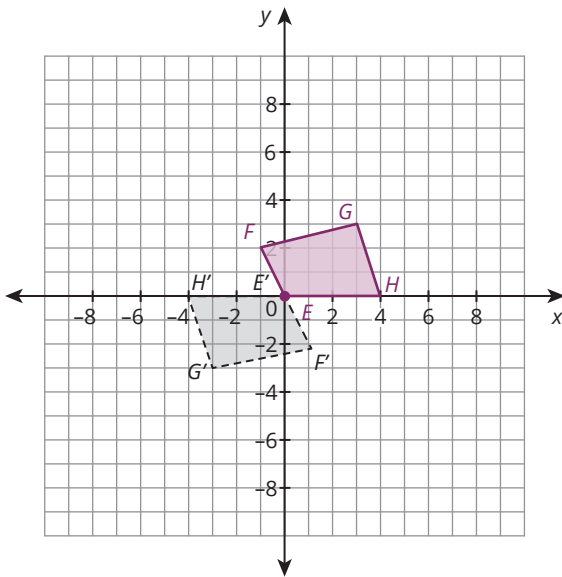
1. pre-image: Quadrilateral  $ABCD$   
image: Quadrilateral  $A'B'C'D'$



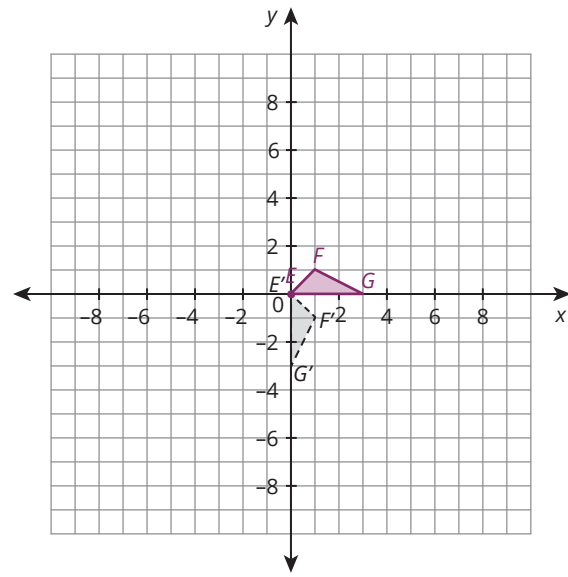
2. pre-image: Quadrilateral  $EFGH$   
image: Quadrilateral  $E'F'G'H'$



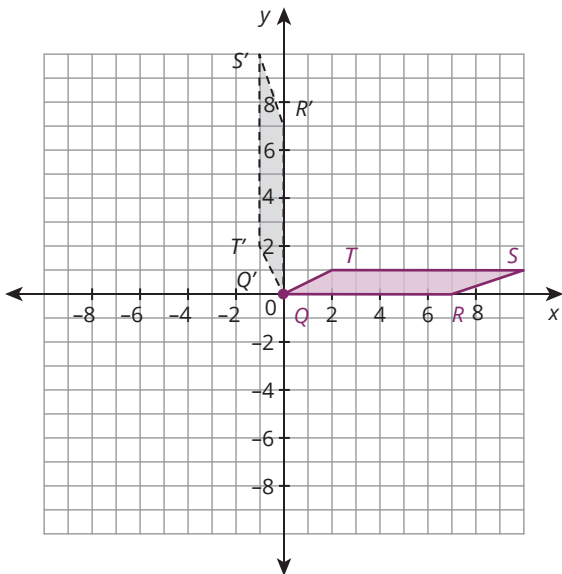
3. pre-image: Quadrilateral  $EFGH$   
image: Quadrilateral  $E'F'G'H'$



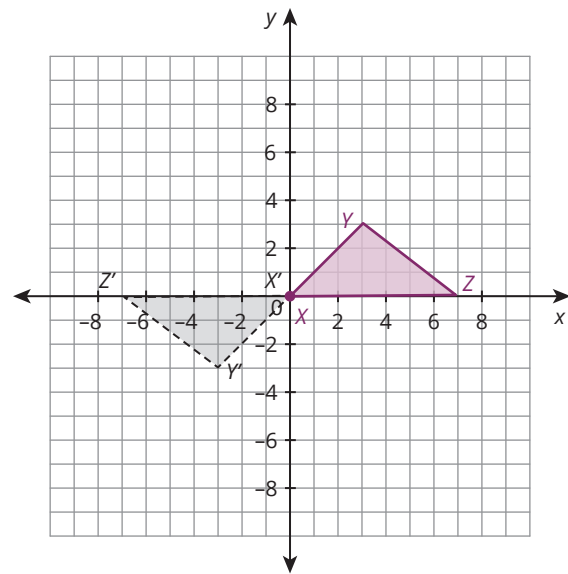
4. pre-image: Triangle  $EFG$   
image: Triangle  $E'F'G'$



5. pre-image: Quadrilateral  $QRST$   
image: Quadrilateral  $Q'R'S'T'$



6. pre-image: Triangle  $XYZ$   
image: Triangle  $X'Y'Z'$



**C.** Use an algebraic rule to determine the coordinates of the triangle's image after each given rotation.

1. Triangle  $DEF$  with coordinates  $D(-2, 2)$ ,  $E(1, 5)$ , and  $F(4, -1)$  is rotated  $90^\circ$  counterclockwise about the origin.
2. Triangle  $NPQ$  with coordinates  $N(12, -3)$ ,  $P(1, 2)$ , and  $Q(9, 0)$  is rotated  $180^\circ$  about the origin.
3. Triangle  $ABC$  with coordinates  $A(-2, 2)$ ,  $B(1, 5)$ , and  $C(4, -1)$  is rotated  $90^\circ$  clockwise about the origin.
4. Triangle  $XYZ$  with coordinates  $X(10, -10)$ ,  $Y(8, 4)$ , and  $Z(1, 9)$  is rotated  $270^\circ$  clockwise about the origin.
5. Triangle  $GHJ$  with coordinates  $G(2, -9)$ ,  $H(3, 8)$ , and  $J(1, 6)$  is rotated  $270^\circ$  counterclockwise about the origin.
6. Triangle  $KLM$  with coordinates  $K(-4, 2)$ ,  $L(-8, 7)$ , and  $M(3, -3)$  is rotated  $360^\circ$  about the origin.

## VI. Combining Rigid Motions

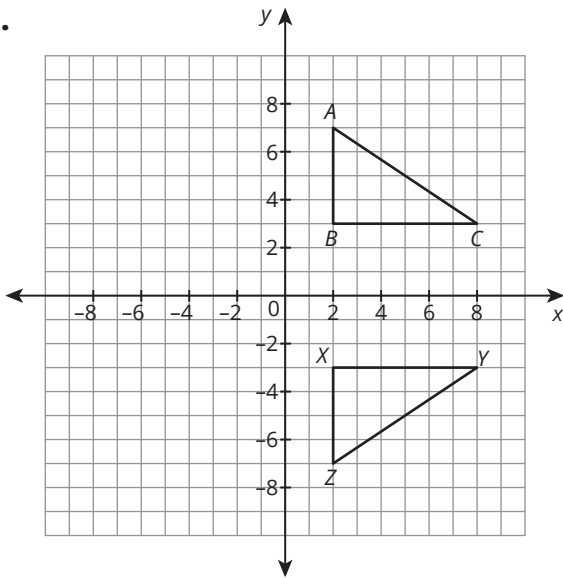
**A.** Answer each question related to congruency.

- 1.** Draw and label a pair of congruent triangles. Write a congruence statement for the triangles.
- 2.** Identify each pair of congruent line segments in the drawing you made for Problem 1.
- 3.** Identify each pair of congruent angles in the drawing you made for Problem 1.
- 4.** Identify each pair of corresponding sides in the drawing you made for Problem 1.
- 5.** Identify each pair of corresponding angles in the drawing you made for Problem 1.
- 6.** List the corresponding sides and angles using congruence symbols for each of the triangles represented by the given congruence statement.
  - a.**  $\triangle JPM \cong \triangle TRW$
  - b.**  $\triangle AEU \cong \triangle BCD$
  - c.**  $\triangle LUV \cong \triangle MTH$

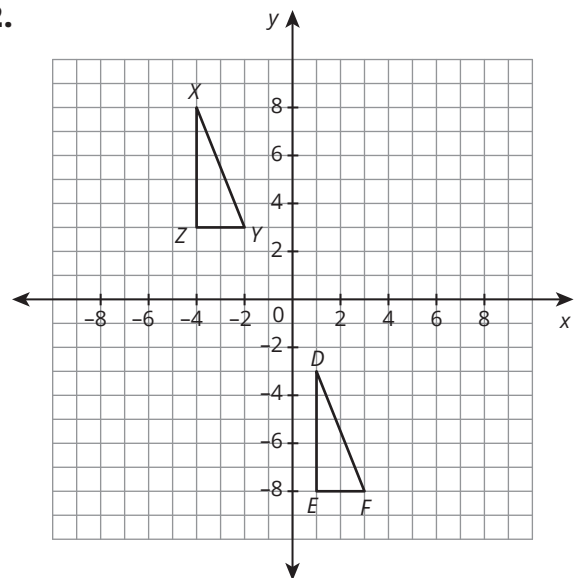


- B.** Identify the transformation used to create  $\triangle XYZ$  in each. List the corresponding sides and angles of the congruent triangles using congruence symbols and write a congruence statement.

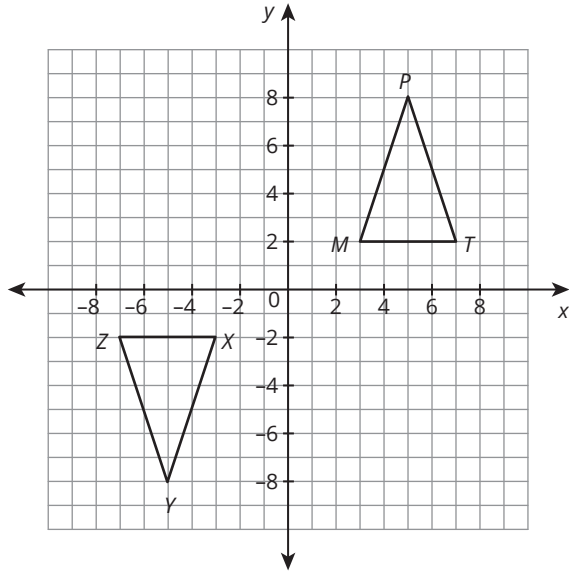
**1.**



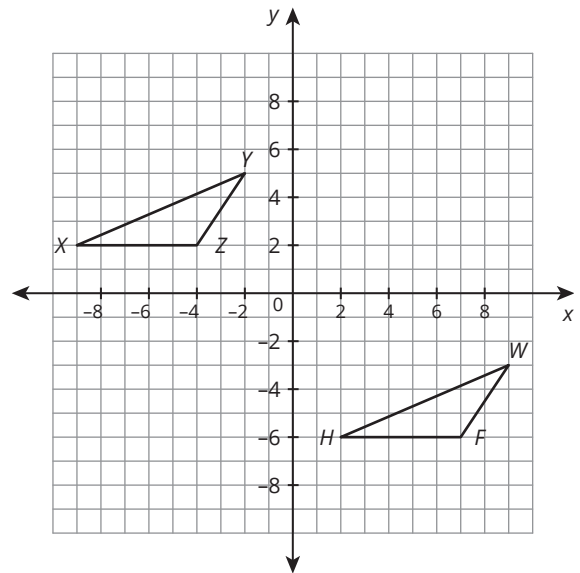
**2.**



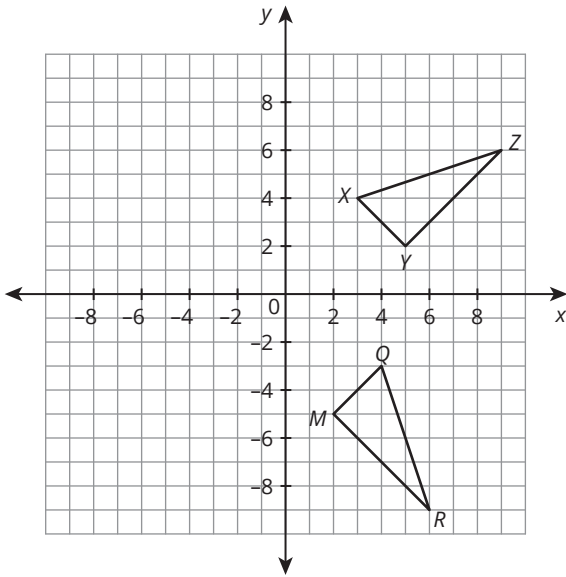
3.



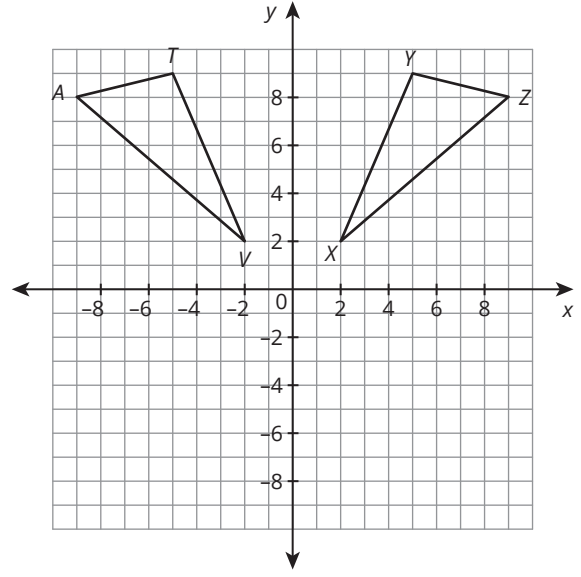
4.



5.



6.



**C.** Describe the transformation used to form each triangle in words and with an algebraic rule.

- 1.** The vertices of triangle  $ABC$  are  $A(2, 4)$ ,  $B(5, 7)$ , and  $C(3, 1)$ . Describe the translation used to form triangle  $A'B'C'$  for  $A'(-5, 4)$ ,  $B'(-2, 7)$ , and  $C'(-4, 1)$ .
- 2.** The vertices of triangle  $DEF$  are  $D(0, 3)$ ,  $E(1, 8)$ , and  $F(-3, 4)$ . Describe the rotation used to form triangle  $D'E'F'$  for  $D'(3, 0)$ ,  $E'(8, -1)$ , and  $F'(4, 3)$ .
- 3.** The vertices of triangle  $GHI$  are  $G(-5, 3)$ ,  $H(2, 6)$ , and  $I(-6, 2)$ . Describe the reflection used to form triangle  $G'H'I'$  for  $G'(5, 3)$ ,  $H'(-2, 6)$ , and  $I'(6, 2)$ .
- 4.** The vertices of triangle  $KMN$  are  $K(12, 3)$ ,  $M(-5, 2)$ , and  $N(8, -4)$ . Describe the translation used to form triangle  $K'M'N'$  for  $K'(18, 0)$ ,  $M'(1, -1)$ , and  $N'(14, -7)$ .
- 5.** The vertices of triangle  $PQR$  are  $P(9, -2)$ ,  $Q(1, 0)$ , and  $R(-7, 3)$ . Describe the rotation used to form triangle  $P'Q'R'$  for  $P'(-9, 2)$ ,  $Q'(-1, 0)$ , and  $R'(7, -3)$ .
- 6.** The vertices of triangle  $STW$  are  $S(15, -6)$ ,  $T(-2, 3)$ , and  $W(-8, -8)$ . Describe the reflection used to form triangle  $S'T'W'$  for  $S'(15, 6)$ ,  $T'(-2, -3)$ , and  $W'(-8, 8)$ .