9-1/9-2

Reflections/Translations

OBJECTIVEs

- To identify and draw reflections and translations
- To reflect and translate figures on the coordinate plane

VOCABULARY

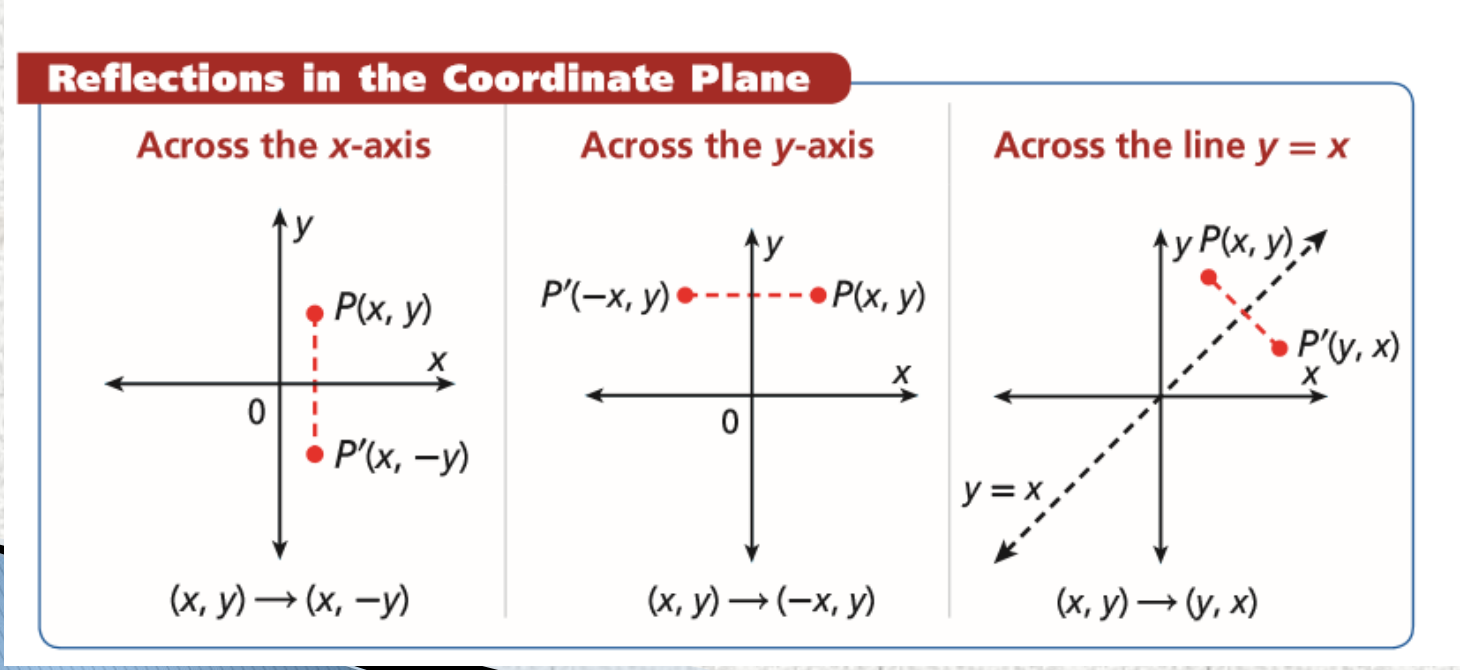
Transformation – new geometric figure that is a change in the position, shape, or size of the original figure. $\Delta ABC \longrightarrow \Delta A'B'C'$

Preimage "Image of"

Isometry (rigid motion) – transformation in which the preimage and image are congruent. $\Delta ABC \cong \Delta A'B'C'$

REFLECTION

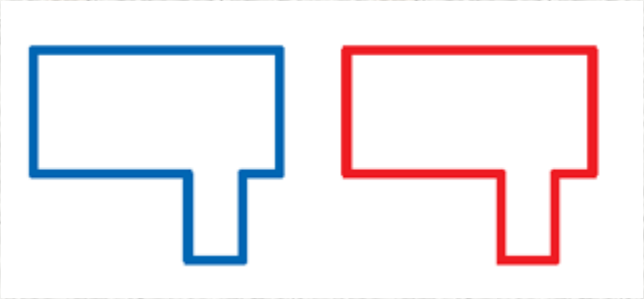
Reflection across a line (flip) – a transformation such that each point on the preimage is the same distance (represented by perpendicular segment) from the line of reflection as the corresponding point on the image. This is a rigid motion.



EXAMPLES

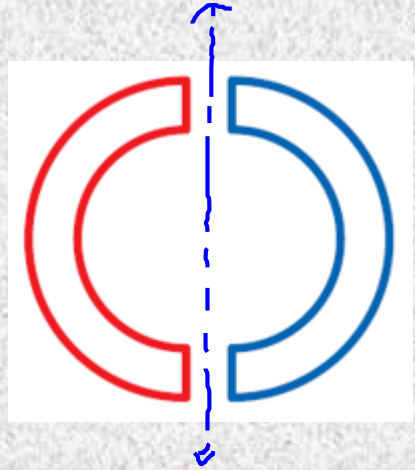
Tell whether each transformation appears to be a reflection. Explain.

1.



No. The image does not appear to be flipped.

2.

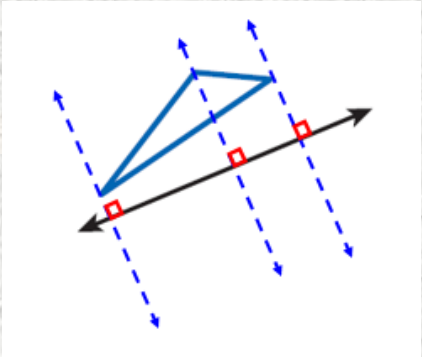


Yes. The image appears to be flipped across a vertical line.

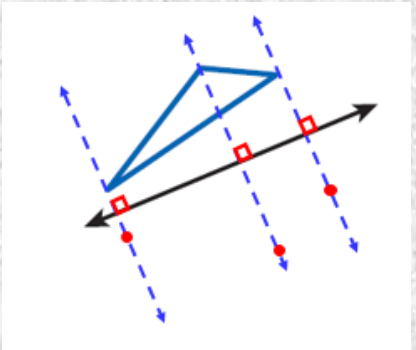
EXAMPLES

To draw a reflection:

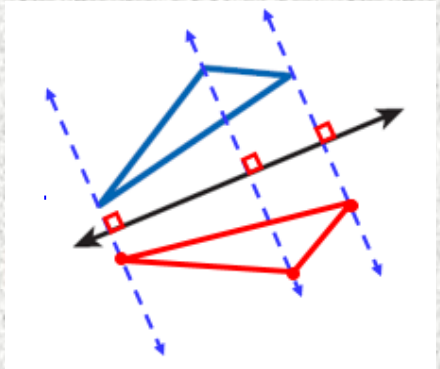
Step 1. Through each vertex, draw a line perpendicular to the line of reflection.



Step 2. Measure or approximate the distance from each vertex to the line of reflection. Locate the image of each vertex on the opposite side of the line of reflection and the same distance from it.



Step 3. Connect the images of the vertices.



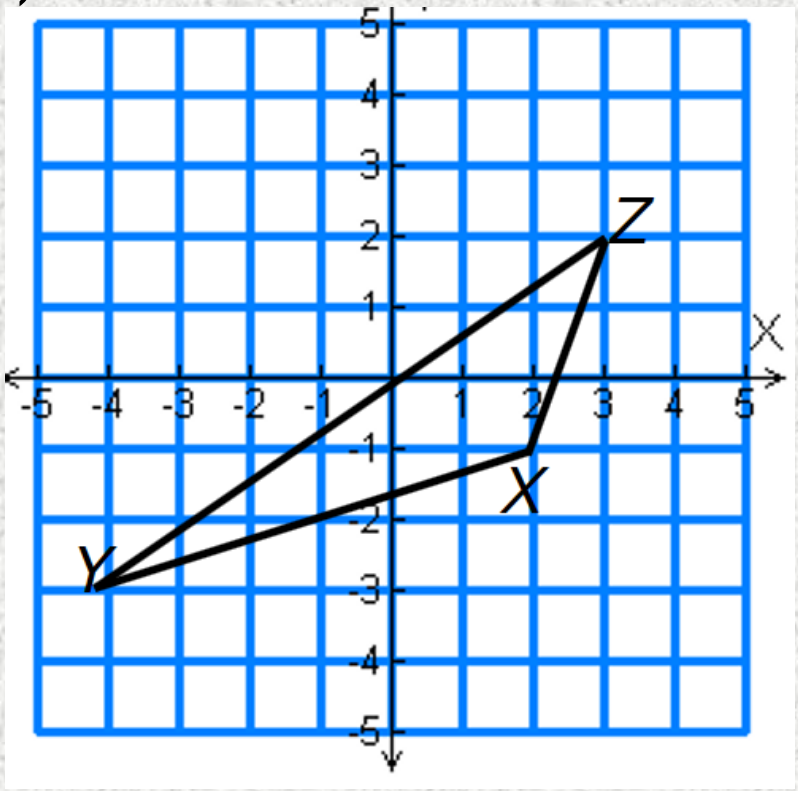
EXAMPLES

3. Reflect the figure with the given vertices across the x-axis.

X(2, –1); y(–4, –3); Z(3, 2)

The rule is:

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



EXAMPLES

3. Reflect the figure with the given vertices across the x-axis.

X(2, –1); y(–4, –3); Z(3, 2)

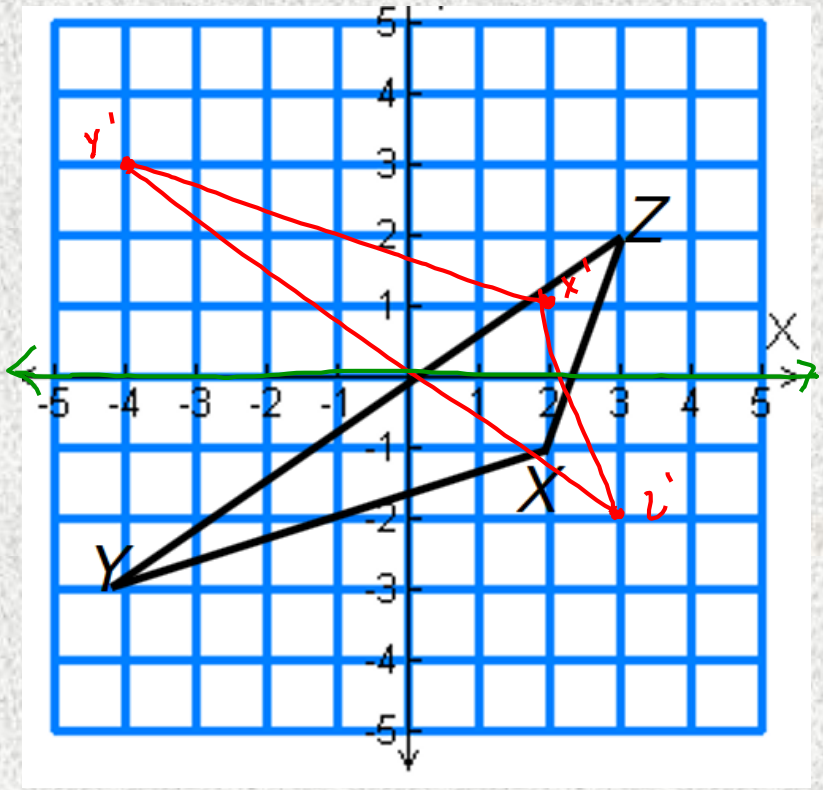
The rule is:

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

$X(2,-1) \rightarrow X'(2,1)$

$y(-4,-3) \rightarrow y'(-4,3)$

$Z(3,2) \rightarrow Z'(3,-2)$



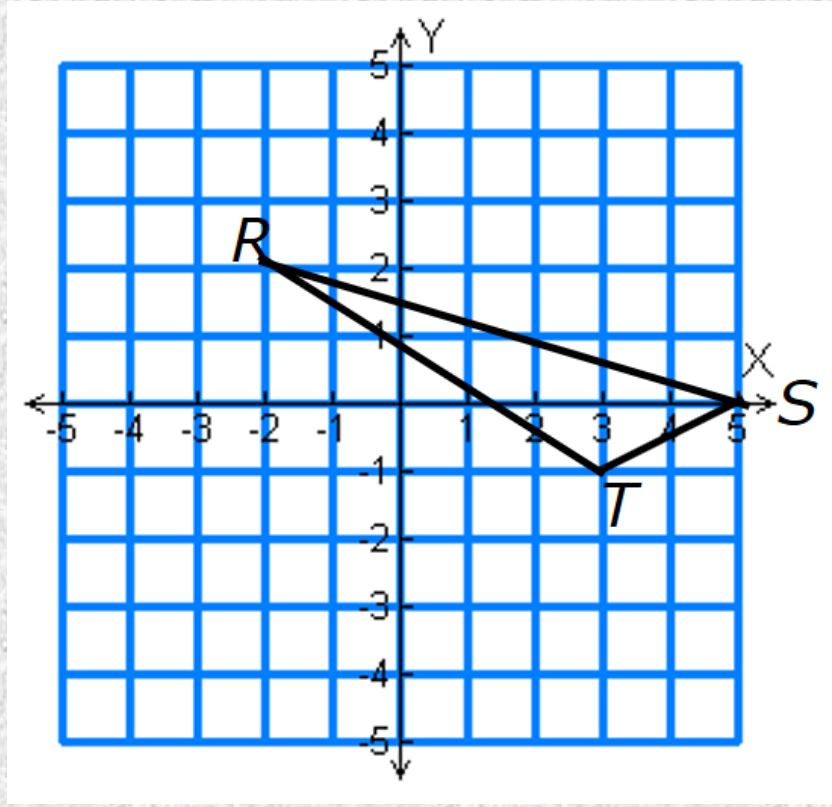
EXAMPLES

4. Reflect the figure with the given vertices across the line y=x.

R(−2, 2); S(5, 0); T(3, −1)

The rule is:

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



EXAMPLES

4. Reflect the figure with the given vertices across the line y=x.

R(−2, 2); S(5, 0); T(3, −1)

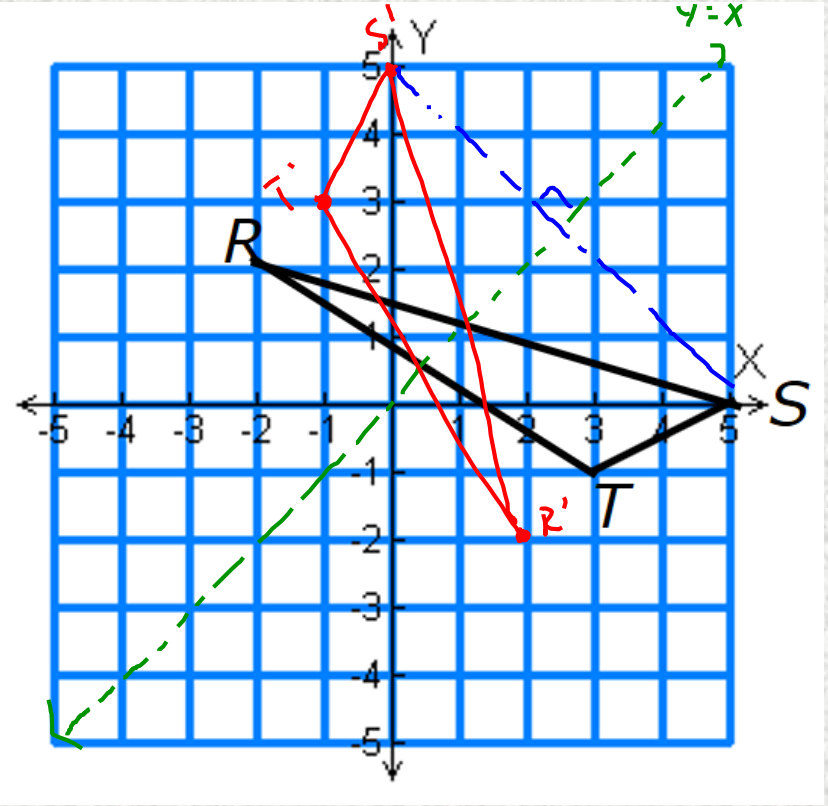
The rule is:

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

$R(-2,2) \rightarrow R'(2,-2)$

$S(5,0) \rightarrow S'(0,5)$

$T(3,-1) \rightarrow T'(-1,3)$

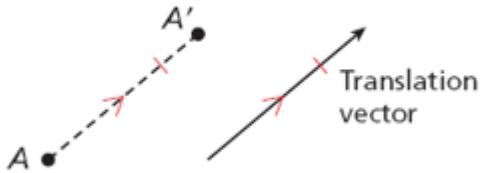


TRANSLATION

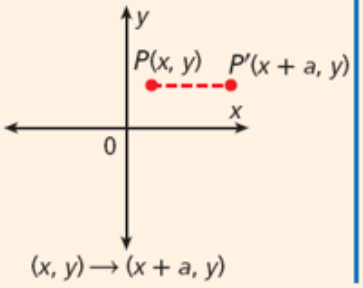
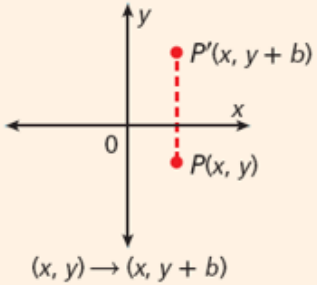
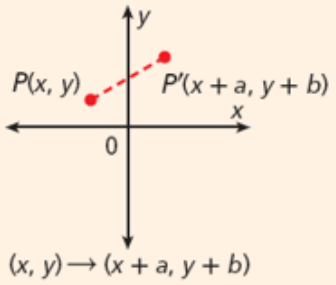
Translation (slide) – transformation that maps all points of a figure the same distance in the same direction. This is a rigid motion.

Translations

A translation is a transformation along a vector such that each segment joining a point and its image has the same length as the vector and is parallel to the vector.



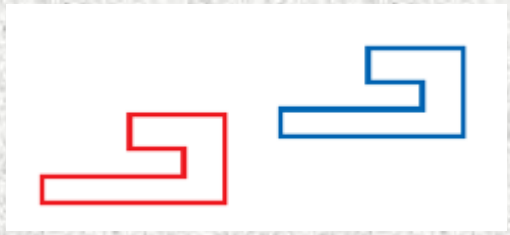
Translations in the Coordinate Plane

HORIZONTAL TRANSLATION ALONG VECTOR ⟨a, 0⟩	VERTICAL TRANSLATION ALONG VECTOR ⟨0, b⟩	GENERAL TRANSLATION ALONG VECTOR ⟨a, b⟩
		
$(x, y) \rightarrow (x + a, y)$	$(x, y) \rightarrow (x, y + b)$	$(x, y) \rightarrow (x + a, y + b)$

EXAMPLES

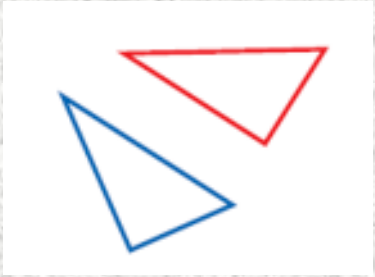
Tell whether each transformation appears to be a translation. Explain.

5.



Yes. all of the points have moved the same distance in the same direction.

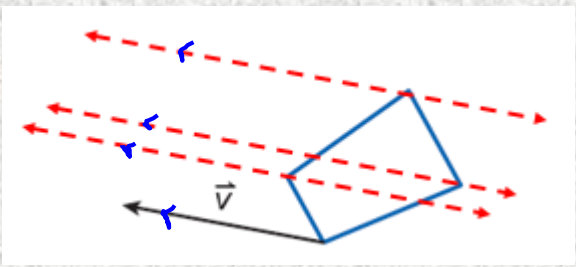
6.



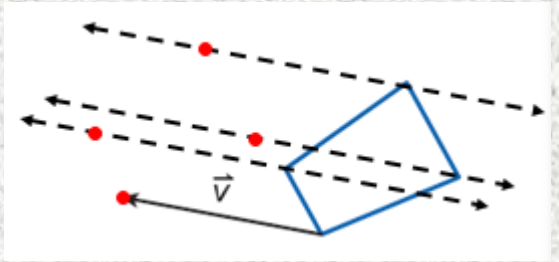
No. Not all of the points have moved the same distance.

EXAMPLES

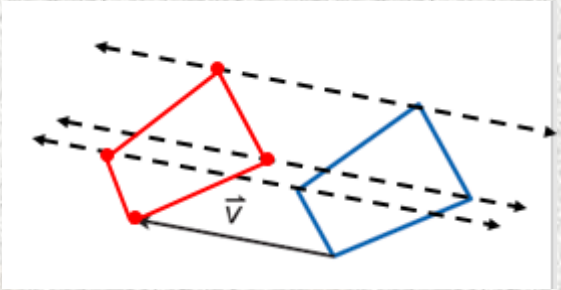
To draw a translation:
Step 1. Draw a line parallel to the vector through each vertex of the angle.



Step 2. Measure or approximate the length of the vector. Then, from each vertex mark off the distance in the same direction as the vector, on each of the parallel lines.



Step 3. Connect the images of the vertices.



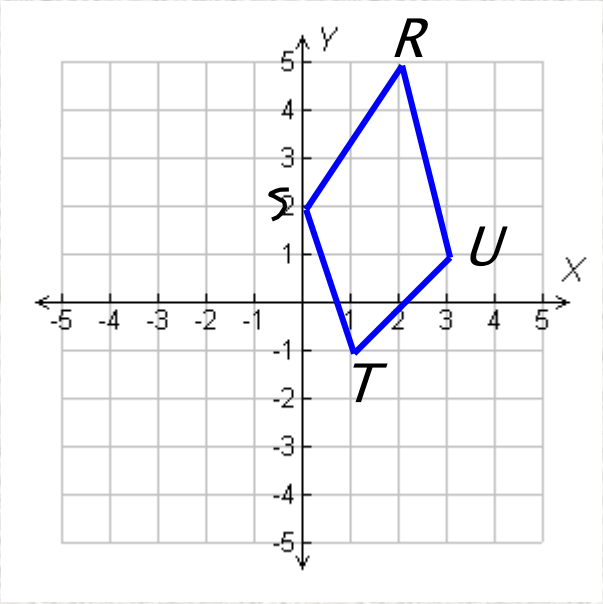
EXAMPLES

7. Translate the figure with the given vertices along the vector $< -3, -3 >$.

R(2, 5); S(0, 2); T(1, –1); U(3, 1)

The rule is:

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



EXAMPLES

7. Translate the figure with the given vertices along the vector $< -3, -3 >$.

R(2, 5); S(0, 2); T(1, –1); U(3, 1)

The rule is:

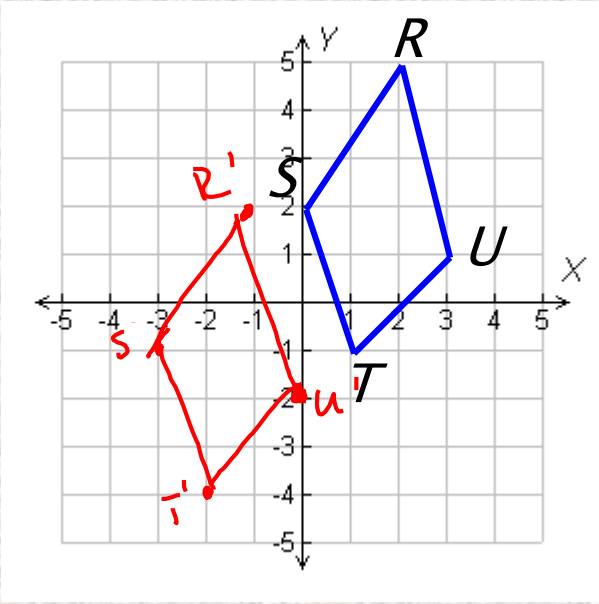
$(x, y) \rightarrow (x - 3, y - 3)$

$R(2,5) \rightarrow R'(-1,2)$

$S(0,2) \rightarrow S'(-3,-1)$

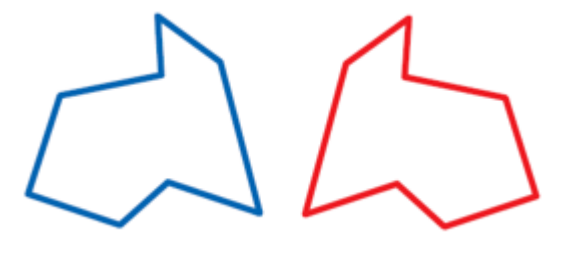
$T(1,-1) \rightarrow T'(-2,-4)$

$U(3,1) \rightarrow U'(0,-2)$

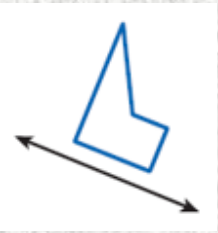


PRACTICE PROBLEMS

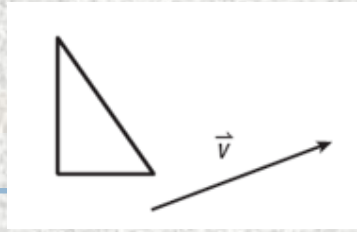
1) Is the following transformation a reflection, translation, or neither?



2) Copy the figure and the line of reflection. Draw the reflection of the figure across the line.

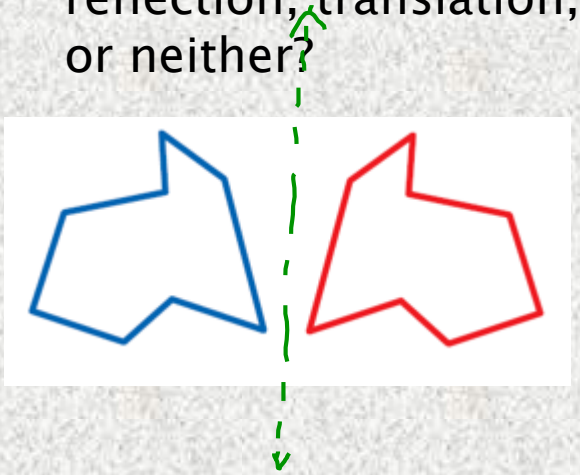


3) Copy the triangle and the translation vector. Draw the translation of the triangle along vector v.



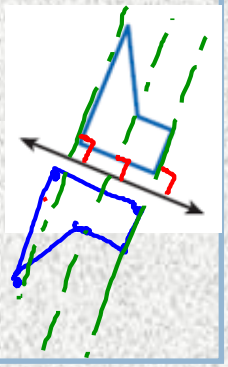
PRACTICE PROBLEMS

1) Is the following transformation a reflection, translation, or neither?

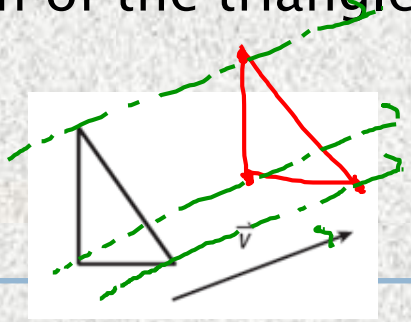


reflection

2) Copy the figure and the line of reflection. Draw the reflection of the figure across the line.



3) Copy the triangle and the translation vector. Draw the translation of the triangle along vector v.

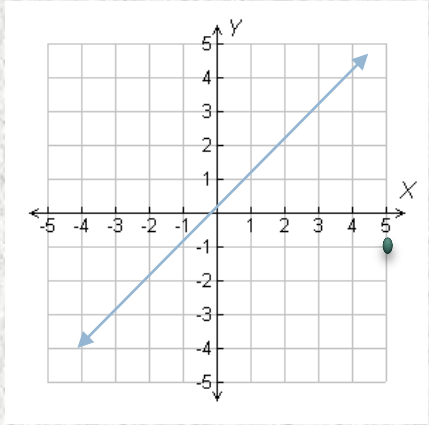


PRACTICE PROBLEMS

4) Reflect the figure with the given vertices across the line y = x.

A(2, 3); B(–1, 5); C(4, –1)

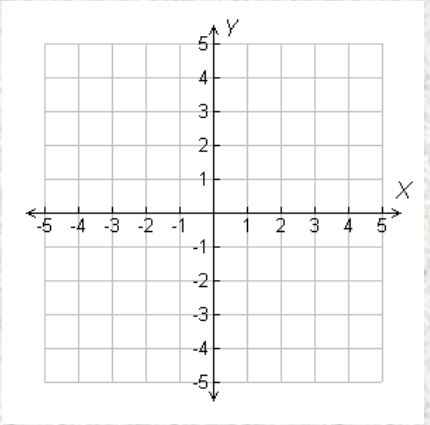
$A'(3,2)$
$B'(5,-1)$
$C'(-1,4)$



5) Translate the figure with the given vertices along vector $< -2, 0 >$.

G(2, 2); H(–1, 5); I(3, 4)

$G'(0,2)$
$H'(-3,5)$
$I'(1,4)$



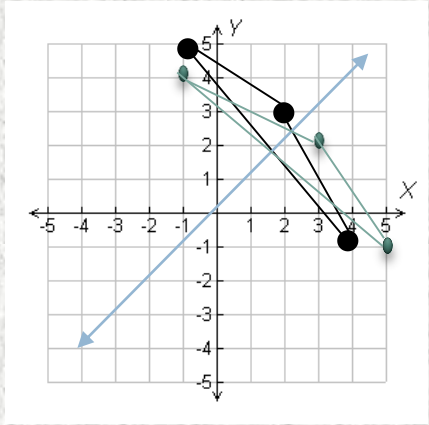
PRACTICE PROBLEMS

4) Reflect the figure with the given vertices across the line y = x.

A(2, 3); B(–1, 5); C(4, –1)

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

$A'(3, 2)$
$B'(5, -1)$
$C'(-1, 4)$

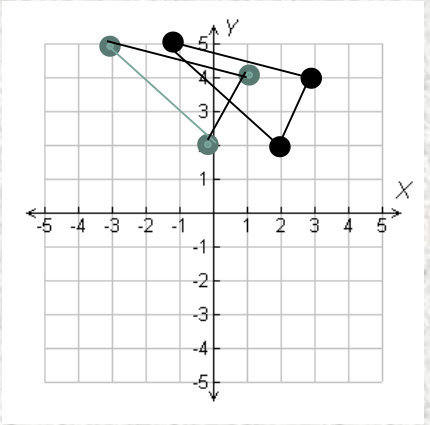


5) Translate the figure with the given vertices along vector $< -2, 0 >$.

G(2, 2); H(–1, 5); I(3, 4)

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

$G'(0, 2)$
$H'(-3, 5)$
$I'(1, 4)$



LEARNING RUBRIC

- Got It: Represents and applies to complex/real world situations
- Almost There: Reflect/translate figures on the coordinate plane
- Moving Forward: Sketch reflections and translations
- Getting Started: Identify reflections and translations

HOMEWORK

- 9-1 Pages 607-609: 14, 18, 20, 22, 32, 36, 46
- 9-2 Pages 614-616: 12, 16, 18, 20, 30, 32, 40