When a figure is the original figure, it is called the **pre-image**. The prefix "pre" means before. In the above picture, we would label the points as A, B, and C.

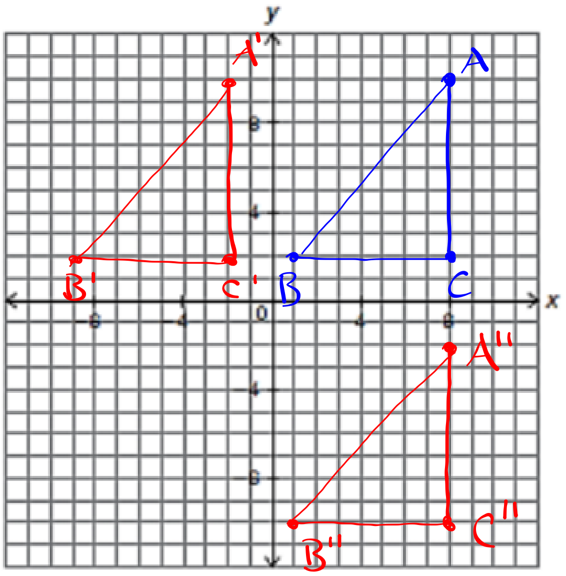
When a figure has been transformed, it is called the **image**. We would label the new points as A', B', and C'. We would say that points A, B, and C have been mapped to the new points A', B', and C'

Exploring Translations

A. Graph triangle ABC by plotting points A(8, 10), B(1, 2), and C(8, 2).

B. Translate triangle ABC 10 units to the left to form triangle A'B'C' and write new coordinates.

C. Translate triangle ABC 12 units down to form triangle A''B''C'' and write new coordinates.



Coordinates of Triangle ABC	Coordinates of Triangle A'B'C'	Coordinates of Triangle A"B"C"
A (8, 10)	A'(-2,10)	A''(8,-2)
B (1, 2)	B'(-9,2)	B''(1,-10)
C(8, 2))	C'(-2,2)	C''(8,-10)

Observation: Did the figures change size or shape after each transformation?

No! Because translations dont change size/shape

Rule for Translations: $(x, y) \rightarrow (x + a, y + b)$

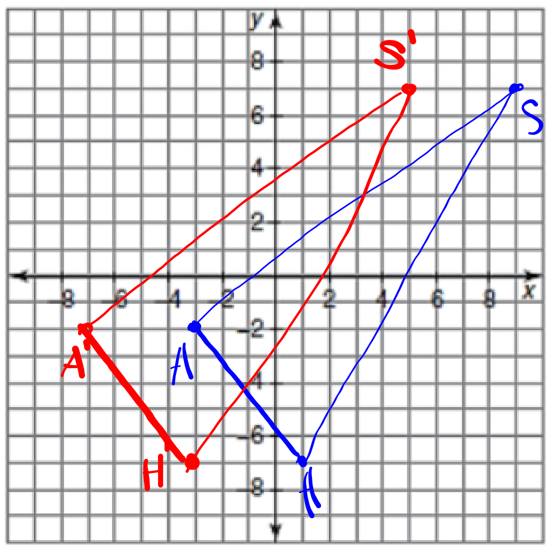
a → left or right translations (horizontally) left(−) right(+)

b → up or down translations (vertically) down(−) up(+)

What are the vertices after the triangle is translated 4 units left?

Rule: $(x, y) \rightarrow (x-4, y)$

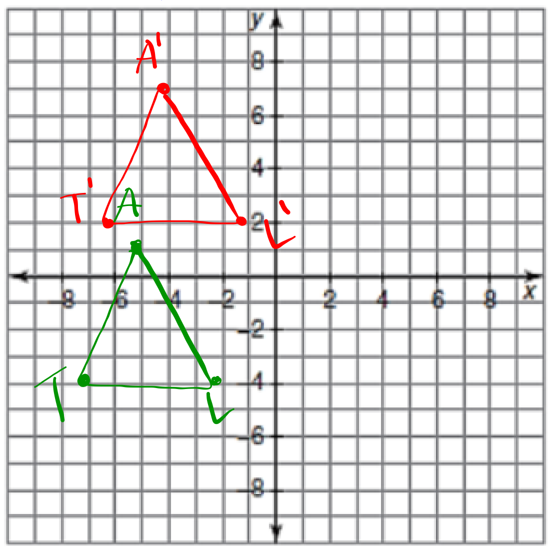
New Points: $(-7,-2)$ $(-3,-7)$ $(5,7)$

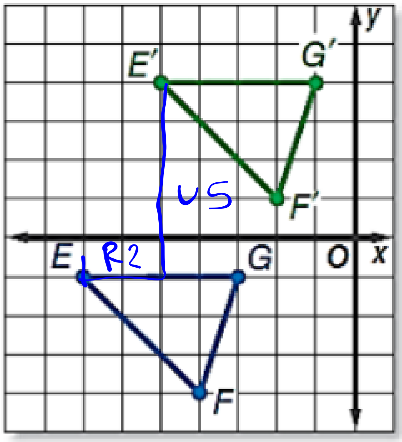


What are the vertices after the triangle is translated 1 unit right and 6 units up?

Rule: $(x, y) \rightarrow (x+1, y+6)$

New Points: $(-4,7)$ $(-6,2)$ $(-1,2)$

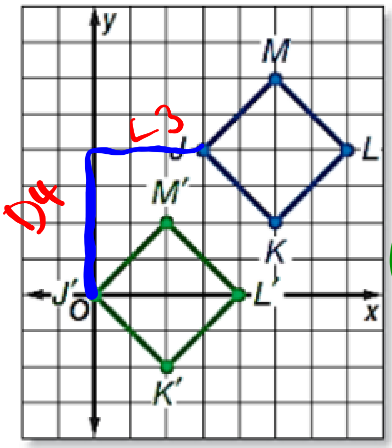




(x, y)

$\downarrow$

$(x+2, y+5)$

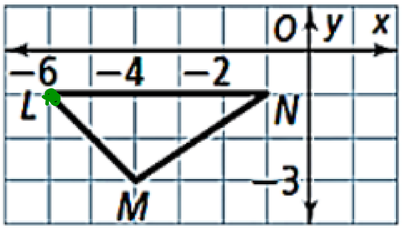


(x, y)

$\downarrow$

$(x-3, y-4)$

d. The pre-image of ΔLMN is shown below. The image of ΔLMN is $\Delta L'M'N'$ with L'(1, -2), M'(3, -4), and N'(6, -2). What is a rule that describes the translation?



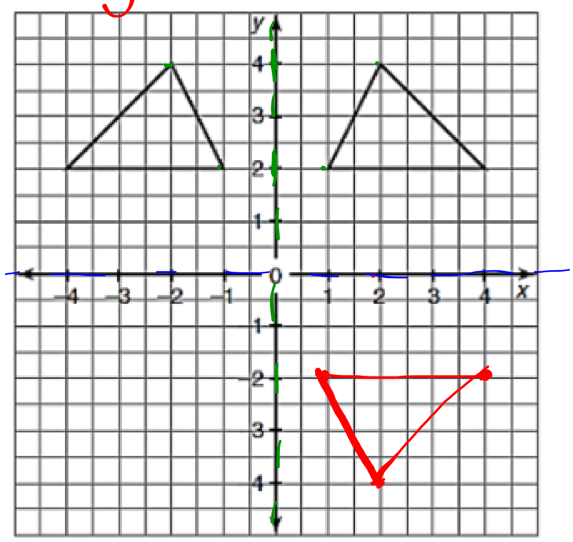
$L(-6, -1)$

$L'(1, -2)$

$(x+7, y-1)$

1. Look at the two triangles in the figure. . Do you think they are congruent?

y-axis, x=0



Figures that are mirror images of each other are called reflections. A **reflection** is a transformation that "flips" a figure over a reflection line. A **reflection line** is a line that acts as a mirror so that corresponding points are the same distance from the mirror. Reflections maintain shape and size; they are our second type of rigid transformation.

2. What do you think the reflection line is in the diagram?

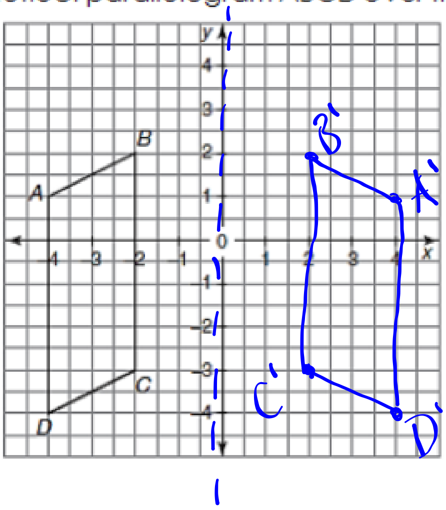
y-axis
x=0

3. Draw a triangle that would be a reflection over the x-axis.

4. What do you notice about the reflected triangles' points in relation to the pre-image?

Reflection over y-axis

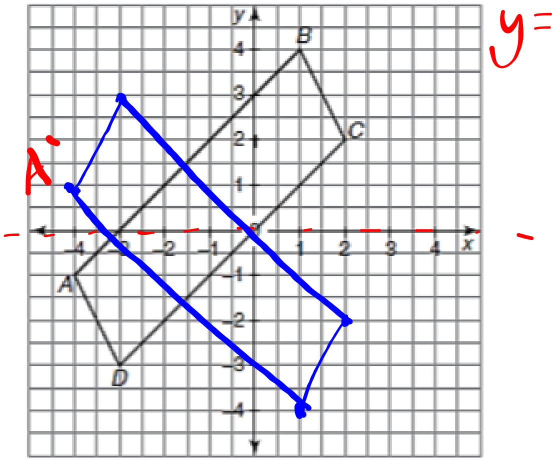
Reflect parallelogram ABCD over the y-axis using reflection lines. Record the points in the table.



	Pre-Image	Image
A	(-4, 1)	(4, 1)
B	(-2, 2)	(2, 2)
C	(-2, -3)	(2, -3)
D	(-4, -4)	(4, -4)
Rule	(x, y)	(-x, y)

Reflection over x-axis

Reflect parallelogram ABCD over the x-axis using reflection lines. Record the points in the table

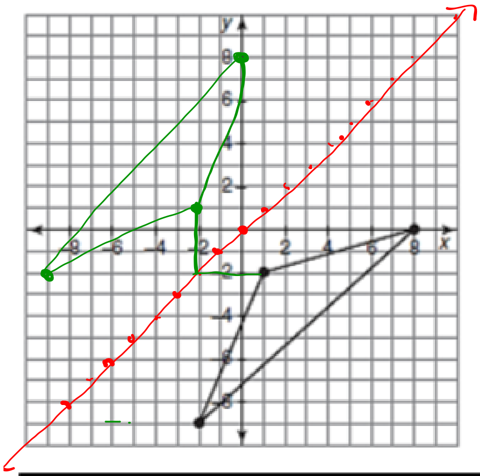


y=0

	Pre-Image	Image
A	(-4,-1)	(-4,1)
B	(1,4)	(1,-4)
C	(2,2)	(2,-2)
D	(-3,-3)	(-3,3)
Rule	(x, y)	(x,-y)

Reflection over y = x

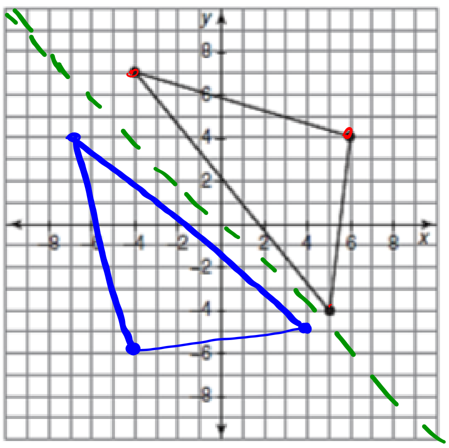
Reflect the triangle over the y = x using reflection lines. Record the points in the table



	Pre-Image	Image
A	(1,-2)	(-2,1)
B	(8,0)	(0,8)
C	(-2,-9)	(-9,-2)
Rule	(x, y)	(y,x)

Reflection over y = -x

Reflect triangle ABC over the y = -x using reflection lines. Record the points in the table



	Pre-Image	Image
A	(-4,7)	(-7,4)
B	(6,4)	(-4,-6)
C	(5,-4)	(4,-5)
Rule	(x, y)	(-y,-x)

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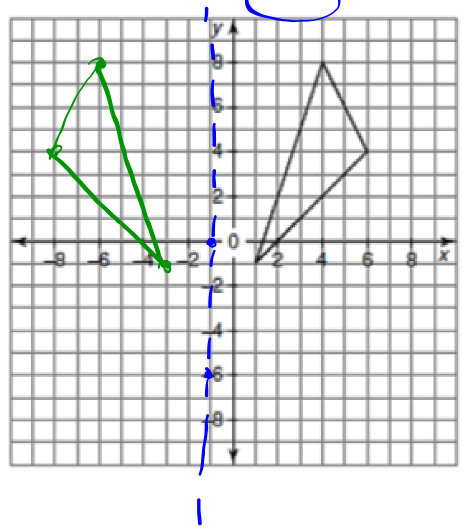
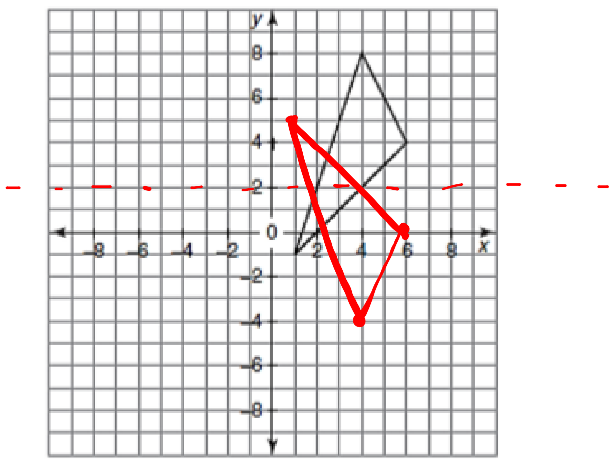
Reflect over x = -1



Reflect over y = 2



Practice with Reflections

Given triangle MNP with vertices of M(1, 2), N(1, 4), and P(3, 3), reflect across the following lines of reflection:

x-axis	y-axis	y = x	y = -x
(x, y)→ (x, -y)	(x, y)→ (-x, y)	(x, y)→ (y, x)	(x, y)→ (-y, -x)
M(1, 2) → (1, -2)	M(1, 2) → (-1, 2)	M(1, 2) → (2, 1)	M(1, 2) → (-2, -1)
N(1, 4)→ (1, -4)	N(1, 4)→ (-1, 4)	N(1, 4)→ (4, 1)	N(1, 4)→ (-4, -1)
P(3, 3)→ (3, -3)	P(3, 3)→ (-3, 3)	P(3, 3)→ (3, 3)	P(3, 3)→ (-3, -3)