Warm-Up: Determine if the figures below have rotational symmetry. If they do, then list their order and magnitude.

Rotational Symmetry: (Yes) No

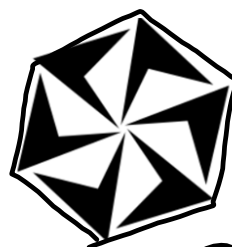Order: __2__

Magnitude: __180°__

Rotational Symmetry: (Yes) No

Order: __4__

Magnitude: __90°__

$$\frac{360}{4}$$

Rotational Symmetry: (Yes) No

Order: __6__

Magnitude: __60°__

Transformations

Objectives

- Learn about transformations

- Identify and create translations, rotations, and reflections of figures in the plane

TRANSFORMATION: Functions which map points of a pre-image onto its image.
- The original position of a point, a line, a line segment, or a figure **BEFORE** a transformation is called its **PRE-IMAGE**.
- The new position of a point, a line, a line segment, or a figure **AFTER** a transformation is called its **IMAGE**.

Today we will focus on identifying and creating translations of figures in the plane.

Image

Original
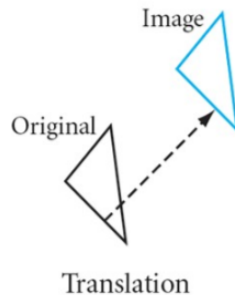
Translation

TRANSLATIONS: Any pre-image which is moved from one location to another location on the coordinate plane without changing its shape, size, or orientation.

On the coordinate plane below...

- Graph the coordinate pre-image (5, 1) and label it with the letter A.
- Translate point A 8 units to the left and 2 units up.
    Label that image A' (pronounced A prime).
- Translate point A 1 unit to the right and 4 units down.
    Label that image A'' (pronounced A double prime).
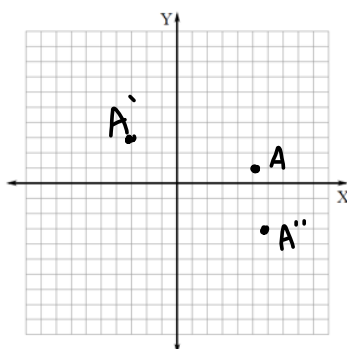
List the transformation rule and coordinates of each of the resulting images:

Transformation Rule for A': $(x-8, y+2)$

New coordinates of A': $(-3, 3)$

Transformation Rule for A'': $(x+1, y-4)$

New coordinates of A'': $(6, -3)$

In general, list the transformation rule for each of the following translations:

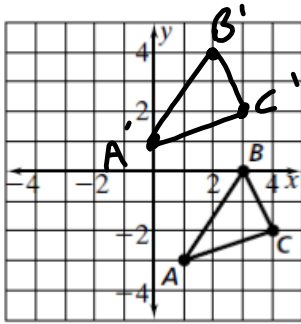Up $(x, y) \rightarrow (x, y+b)$ Down $(x, y) \rightarrow (x, y-b)$

Right $(x, y) \rightarrow (x+a, y)$ Left $(x, y) \rightarrow (x-a, y)$

$$(x \pm a, y \pm b)$$

Examples

1. △*ABC* is translated 1 unit left and 4 units up. Draw the image △*A'B'C'*.

    What are the coordinates of:

    A $(1,-3)$ → A' $(0,1)$

    B $(3,0)$ → B' $(2,4)$

    C $(4,-2)$ → C' $(3,2)$

    As a general rule this translation could be written as $(x, y) \rightarrow (x-1, y+4)$.

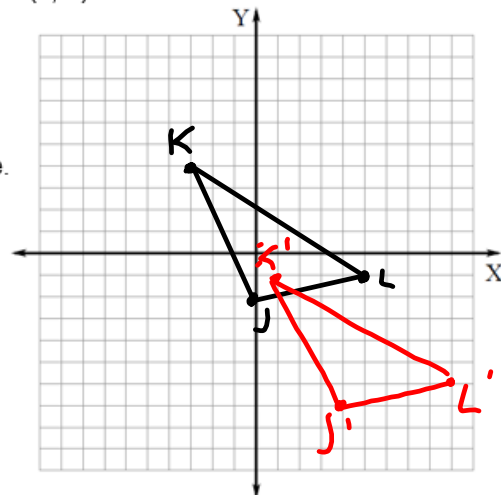2. △*JKL* has coordinates *J* (0,-2), *K* (-3, 4), and *L* (5,-1).

    a) Draw △*JKL*.

    b) Draw the image △*J'K'L'* after a translation of 4 units to the right and 5 units down. Label the triangle.

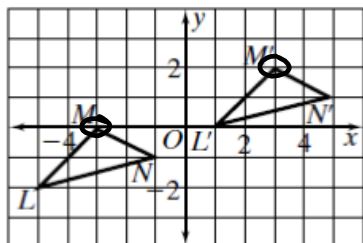   c) What are the coordinates of:

    J (0, -2) → J' $(4,-7)$

    K (-3, 4) → K' $(1,-1)$

    L (5, -1) → L' $(9,-6)$

    d) Rule: $(x, y) \rightarrow (x+4, y-5)$

3.   Write a general rule which describes the translation shown below. Δ*LMN* is the original triangle.
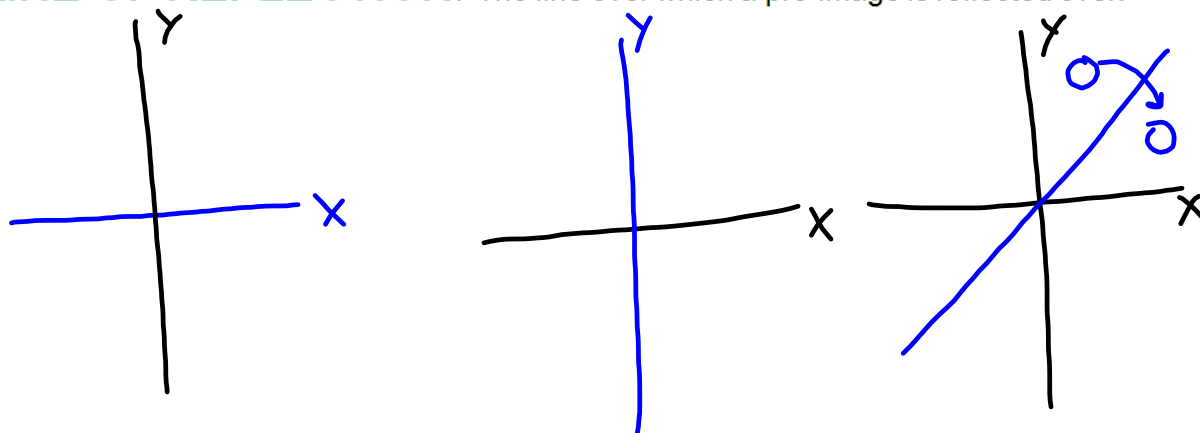
$(x, y) \rightarrow (x + 6 , y + 2)$

Definitions:

REFLECTIONS: A transformation which creates a mirror image of a given pre-image over a given line.
LINE OF REFLECTION: The line over which a pre-image is reflected over.

On the coordinate plane below…

- Graph the coordinate pre-image (5, 1) and label it with the letter A.
- Reflect point A over the x-axis and label that image B.
- Reflect point A over the y-axis and label that image C.
- Graph the line $y = x$. Then, reflect point A over the line $y = x$ and label that image D.
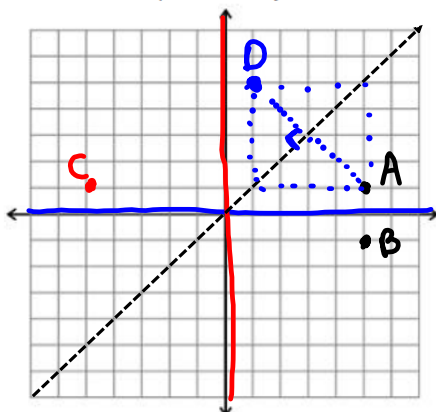
List the coordinates of each of the resulting images:

Coordinates of image of B: (5 , -1)

Coordinates of image of C: (-5 , 1)

Coordinates of image of D: (1 , 5)

Reflection Transformation Rules:

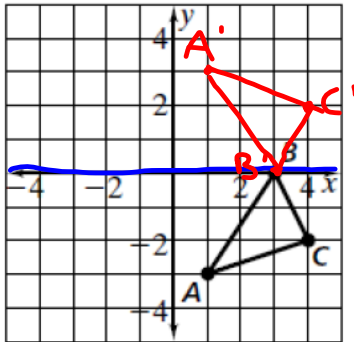In general, list the transformation rule for each of the following reflections:

Over the x-axis: $(x, y) \rightarrow$ (x , - y)   Over the y-axis: $(x, y) \rightarrow$ (-x , y)
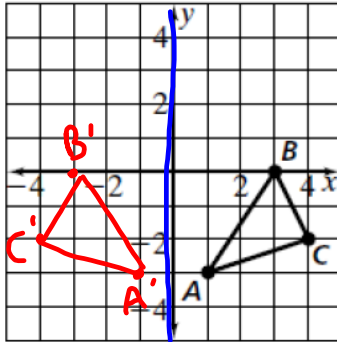
Over the line $y = x$: $(x, y) \rightarrow$ (y , x)

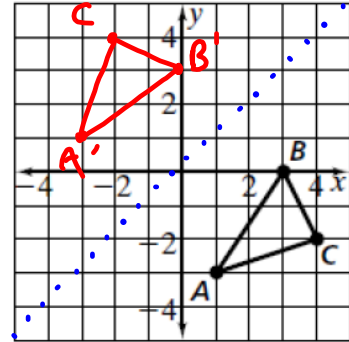1.　　Reflect the triangle below over each of the following lines. Label the images ΔA'B'C'

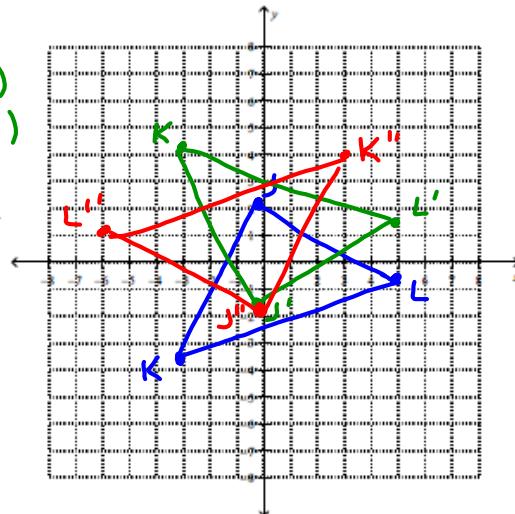a)　　Over the x-axis.　　　　b)　　Over the y-axis.　　　　c)　　Over the line $y = x$.

2.　　a)　Draw ΔJKL which has coordinates J (0,2), K (-3,-4), and L (5,-1).

　　　b)　Draw the image ΔJ'K'L' after a reflection of ΔJKL over the x-axis.

　　　c)　List the coordinates of J'K'L'.

J　　(0, 2)　　→　J'　(0,-2)

K　　(-3, -4)　→　K'　(-3,4)

L　　(5, -1)　　→　L'　(5,1)

　　　d)　Draw the image ΔJ"K"L" after a reflection of ΔJ'K'L' over the y-axis.

　　　e)　List the coordinates of J"K"L".

J'　(0,-2)　→　J"　(0,2)

K'　(-3,4)　→　K"　(3,4)

L'　(5,1)　→　L"　(-5,1)

Homework:

-Reflection Worksheet