Transformations Organizer

Translation- moves every point of a figure by the same distance in a given direction. We can **"slide"** a point or a figure left, right, up or down.

- Right: $(x,y) \rightarrow (x+a, y)$ This will shift the point "a" units **right**
- Left: $(x,y) \rightarrow (x-a, y)$ This will shift a point "a" units **left**.
- Up: $(x,y) \rightarrow (x, y+b)$ This will shift a point "b" units **up**
- Down: $(x,y) \rightarrow (x, y-b)$ This will shift a point "b" units **down**.

Reflections: A reflection **"flips"** a point or a figure over a given line. All the points of the image will be the same distance away from the line of reflection as the pre-image, just on the opposite side of the line.

- Reflect over x-axis: Change the sign of y. $(x,y) \rightarrow (x,-y)$
- Reflect over y-axis: Change the sign of x. $(x,y) \rightarrow (-x, y)$
- Reflect over the line y = x: Change the order. $(x,y) \rightarrow (y,x)$
- Reflect over the line y = -x: Change the order and the signs. $(x,y) \rightarrow (-y,-x)$

Rotations: When we rotate a point or figure, we are "**turning**" it about a fixed point called the **center of rotation.** We will assume that the center of rotation is the origin unless otherwise specified. Direction is assumed to be CCW unless otherwise specified.

- **90 Degrees CCW is the same as 270 CW**

  $(x,y) \rightarrow (-y,x)$
- **270 Degrees CCW is the same as 90 CW**

  $(x,y) \rightarrow (y,-x)$
- **180 Degrees is the same in both directions**

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

❖ These three transformations are called "**isometries**" which means the pre-image and image are always congruent.