

### Rotations

Counter Clockwise:

90 degrees:  $(x,y) \rightarrow (-y,x)$

180 degrees:  $(x,y) \rightarrow (-x,-y)$

270 degrees:  $(x,y) \rightarrow (y,-x)$

360 degrees:  $(x,y) \rightarrow (x,y)$ , no changes

Clockwise:

270 degrees:  $(x,y) \rightarrow (-x,y)$

180 degrees:  $(x,y) \rightarrow (-x,-y)$

90 degrees:  $(x,y) \rightarrow (y,-x)$

360 degrees:  $(x,y) \rightarrow (x,y)$ , no changes

### Translations

Translations are **isometry**, meaning the image and pre-image (the original image) are congruent, or the same. Translations in the coordinate plane can be described by the mapping notation  $(x,y) \rightarrow (x+a, y+b)$ , if you have negative numbers you would switch the signs.

Because 'a' corresponds to the x-axis, you would move 'a' units horizontally, 'b' corresponds to the y-axis, so you would move 'b' units vertically.

Example:  $(3,7) \rightarrow (3+8, 7-6) \rightarrow (11,1)$ .  $(3,7)$  would be a point on your pre-image/original point, and  $(11,1)$  would be your image.

### Reflections

A reflection is when you reflect something across the y-axis or the x-axis. When you reflect a point or figure over the x-axis the new point will go from  $(x,y) \rightarrow (x,-y)$  the sign of the y-coordinate will change to its opposite. When you reflect a point over the y-axis, the point will change from  $(x,y) \rightarrow (-x,y)$ . The sign of the x coordinate will change to its opposite.

### Dilations

A dilation is when a figure shrinks or is enlarged by something called a **scale factor**. A scale factor is the number of times a figure is enlarged or shrunk. A scale factor can be a whole number or a fraction/decimal, but *cannot* be a negative number. A scale factor greater than 1 is an enlargement, and a scale factor *less* than 1 shrinks it.

Ex: a figure (the pre-image) has points A(7,8), B(6,2), C(10,12), D(16,20) with a scale factor of 2.

This means you will multiply every point by 2. The image would now be A'(14,16), B'(12,4), C'(20,24), D'(32,40).

The ' means prime, and is used to show that this is not the pre-image, and is instead the new image.



