

# Geometry Info Sheet #19

## Transformations in Coordinate Planes; Rotations and Symmetry

### Definitions

**Transformation:** A function that moves or changes a figure in some way to produce a new figure

**Pre-Image:** An object or figure before it is transformed

**Image:** An object or figure after undergoing a transformation

**Rigid Transformation:** A transformation that does not change the size or the shape of a figure

**Dilation:** A transformation that changes the size, but not the shape, of a figure; the size of the transformed image may be larger or smaller than the original image

**Rotation:** A rigid transformation which involves rotating or turning a figure a certain number of degrees around a point

In a rotation, every point in a figure moves around a given point (called the center of rotation), and all of the points move the same angle measure (called the angle of rotation).

Rotational Symmetry occurs when an image or figure can be mapped onto itself by a rotation of 180 degrees or less about the center of the figure (called the center of symmetry).

### Transformation Rules for Coordinate Planes

Translation  $a$  units horizontally and  $b$  units vertically:  $T(x, y) \rightarrow (x+a, y+b)$

Reflection across  $x$ -axis:  $T(x, y) \rightarrow (x, -y)$       Reflection across  $y = x$ :  $T(x, y) \rightarrow (y, x)$

Reflection across  $y$ -axis:  $T(x, y) \rightarrow (-x, y)$       Reflection across  $y = -x$ :  $T(x, y) \rightarrow (-y, -x)$

Rotation clockwise  $90^\circ$ :  $T(x, y) \rightarrow (y, -x)$       Rotation 180 degrees:  $T(x, y) \rightarrow (-x, -y)$

Rotation counter-clockwise  $90^\circ$ :  $T(x, y) \rightarrow (-y, x)$       Dilation by a factor of  $k$ :  $D(x, y) \rightarrow (kx, ky)$