COORDINATE GRAPHING

Graphing in the coordinate plane has lots of practical uses. We use a coordinate graphing system to map points on a map. We will first examine graphing points in the first quadrant of the coordinate plane where all numbers are positive. We will then extend our knowledge of graphing by graphing points in the second, third, and fourth quadrants of the coordinate plane where both positive and negative numbers are used.

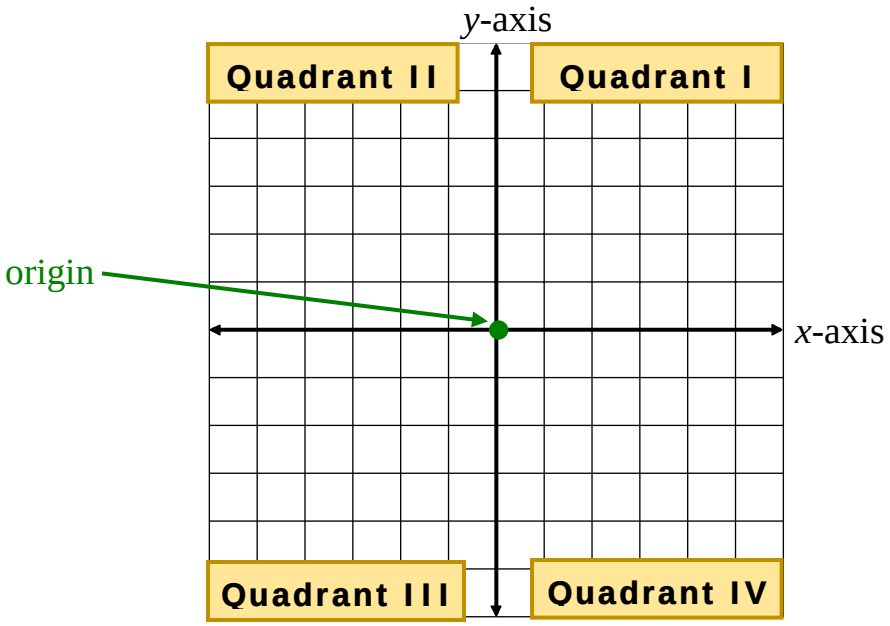
SYMMETRY AND TRANSLATIONS

When you fold a shape and both pieces are a reflection of each other, the shape has symmetry. When you turn a shape around a point and the shape maintains the original appearance, it has symmetry. Look around and find symmetrical objects. They are everywhere, both natural and manmade. We will examine line and rotational symmetry.

Many designs that occur naturally or that are man-made display properties of transformation. Properties of transformation are translation, reflection, rotation, and dilation.

Graphing in Quadrant I of the Coordinate Plane

In a **coordinate plane**, points may be located by **plotting** them. The coordinate plane is divided into **four quadrants** by the ***x*–axis** and the ***y*-axis**. The starting point, the **origin**, is the center, or point where the *x* and y axis intersect (cross).



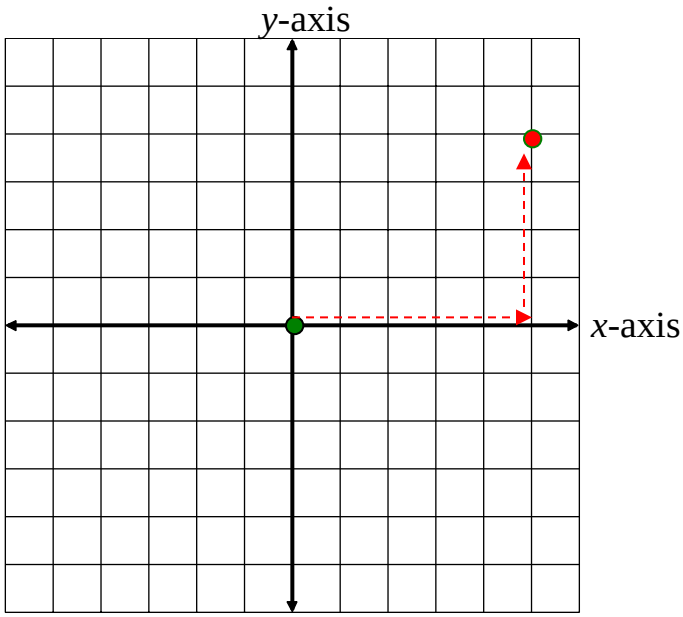
A point is designated by both an ***x*-coordinate** and a ***y*-coordinate.** The origin's coordinates would be (0, 0). The *x*-coordinate is the first number and the *y*-coordinate is the second number.

The ***x*-coordinate** is how far you count **right or left** of the origin. The ***y*-coordinate** is how far you then count **up or down**. A point's location is written as an **ordered pair (*x*, *y*)**.

Plot (5, 4)

When plotting points, start at the origin. Count right if the *x*-coordinate is positive; count left if it is negative. Then count up if the *y*-coordinate is positive; count down if it is negative.

Starting at the origin, count 5 units to the right, and then count 4 units up.



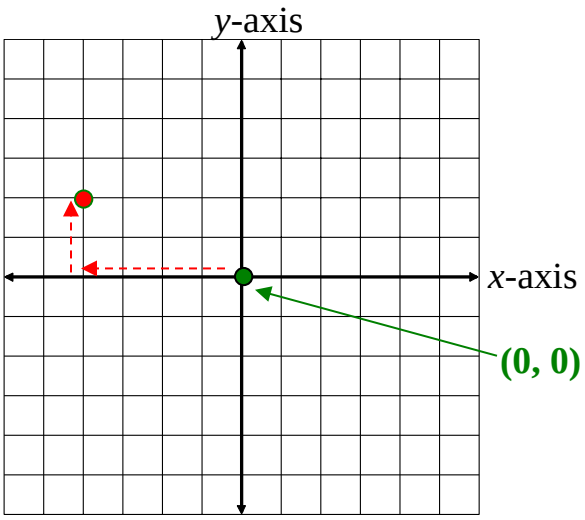
Graphing in Quadrants II, III, and IV

In these graphs, each space represents one unit. The starting point is the origin whose coordinates are (0, 0).

Plot (–4, 2)

When plotting points, start at the origin. Count right if the *x*-coordinate is positive; count left if it is negative. Then count up if the *y*-coordinate is positive; count down if it is negative.

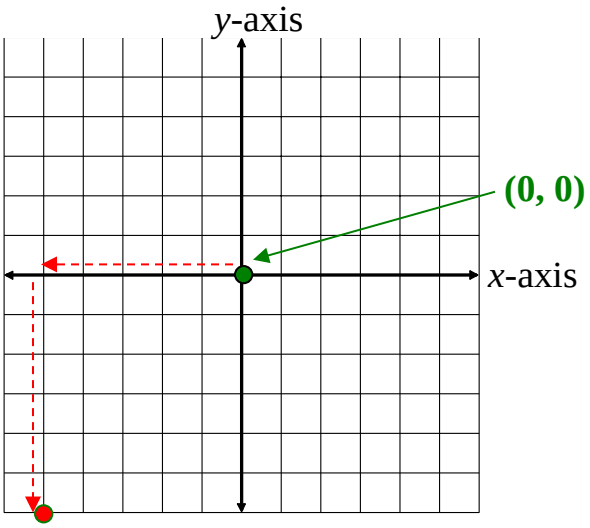
Starting at the origin, count 4 units to the left, and then count 2 units up.



Plot (–5, –6)

When plotting points, start at the origin. Count right if the *x*-coordinate is positive; count left if it is negative. Then count up if the *y*-coordinate is positive; count down if it is negative.

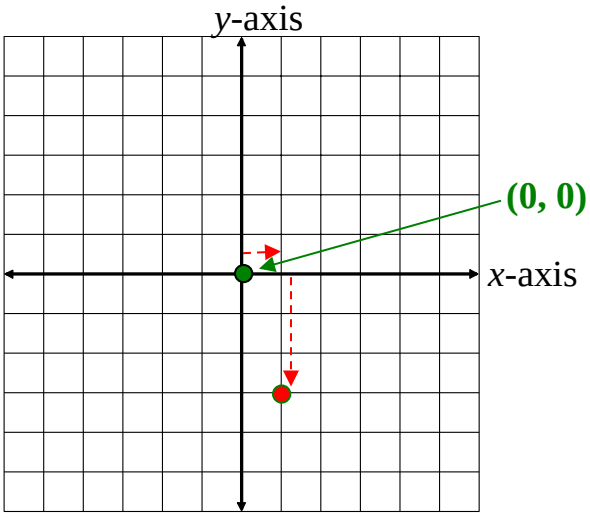
Starting at the origin, count 5 units to the left, and then count 6 units down.



Plot (1, –3)

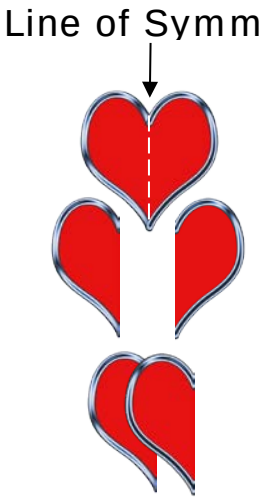
When plotting points, start at the origin. Count right if the *x*-coordinate is positive; count left if it is negative. Then count up if the *y*-coordinate is positive; count down if it is negative.

Starting at the origin, count 1 unit to the right, and then count 3 units down.



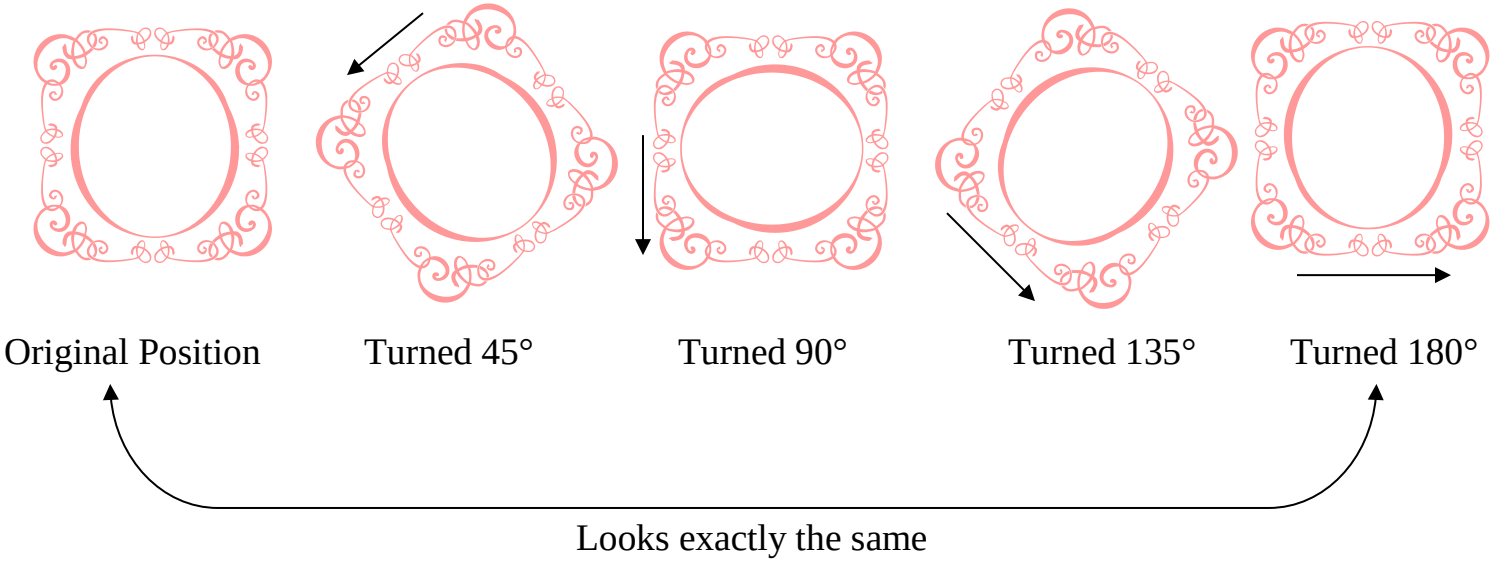
Symmetry

A figure has **line symmetry** if it can be folded over a line so that one half of the figure matches the other half. The fold line is called the line of symmetry.



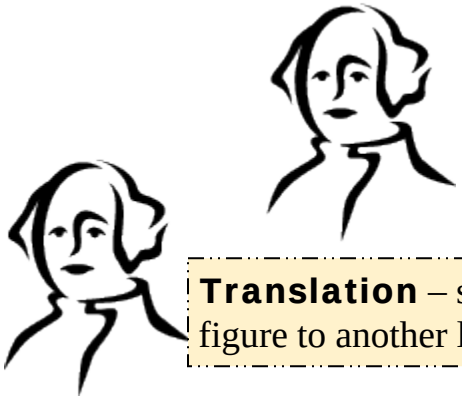
The left side of the heart is symmetrical with the right side because they are congruent.

A figure has **rotational symmetry** if it can be rotated or turned *less than 360°* about its center so that the figure looks exactly as it does in its original position.



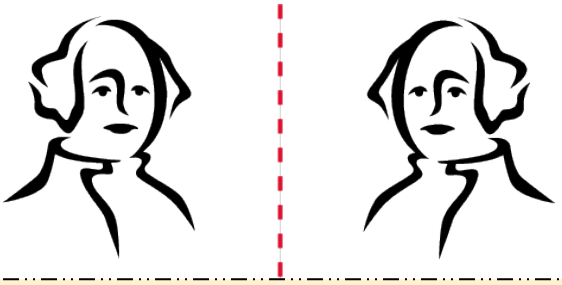
Transformations of Two-Dimensional Shapes

Many designs occur naturally or man-made and display properties of translation, reflection, rotation, and dilation.

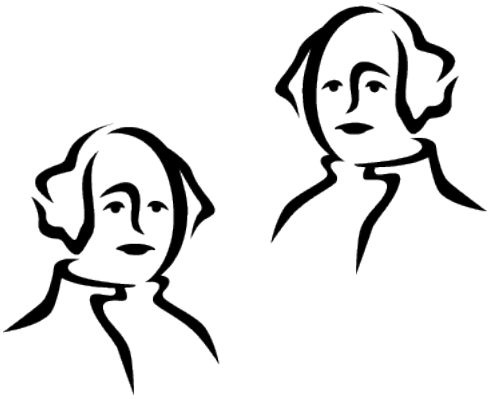


Translation – sliding a figure to another location.

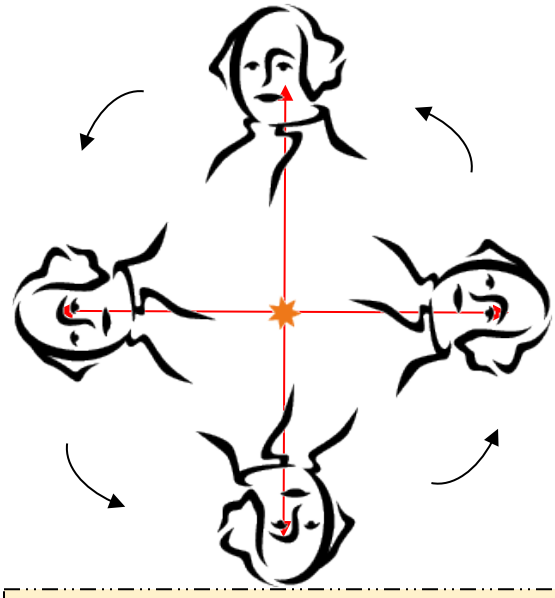
Dilation – enlarging or reducing a figure.



Reflection – flipping a figure over a line of reference creating a mirror image.



Translation and Reflection – two transformations have been made. The figure has both been slid to another location and also flipped horizontally.



Rotation – turning a figure around a specified point call the center of rotation.

In this example the picture has been rotated 90° each time around the center point, or origin of the graph.