

## Exploring anamorphosis: revealing hidden images with mirrors

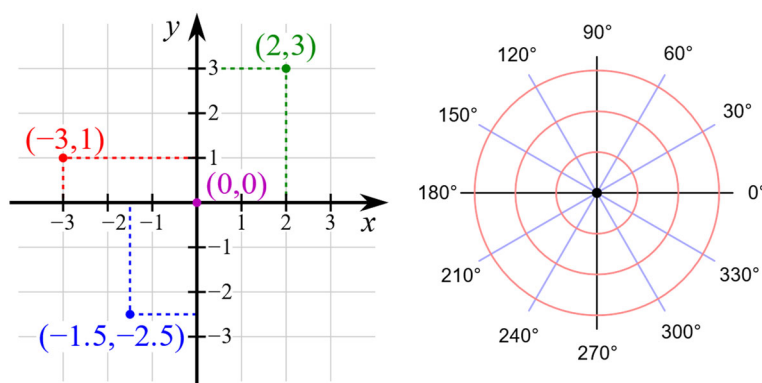
# Coordinate systems infosheet

A coordinate system is a method for identifying the location of a point. On a two-dimensional surface, coordinate systems use two numbers, a coordinate, to identify the location of a point. Each of these numbers indicates the distance between the point and some fixed reference point, called the origin.

A known example is the geographic coordinate system, which is the spherical coordinates of latitude and longitude.

The Cartesian, or rectangular, coordinate system consists of an origin, a horizontal  $x$  axis, and a vertical  $y$  axis. The point where the axes cross is the origin. Any point can be described by the horizontal distance from the  $y$  axis ( $x$ ), and the vertical distance from the  $x$  axis ( $y$ ); together these are written as  $(x, y)$ . The origin is written as  $(0, 0)$ . The coordinates can be read more conveniently with the help of a grid, where lines are drawn parallel to the axes.

For the polar system, only one axis and an origin are needed to define the measurement of distance and the reference direction. The coordinates are given by the distance from the origin ( $r$ ), and the angle from the positive  $x$  axis ( $\theta$ ).



Cartesian coordinate (left) and polar coordinate (right)

Images: Cartesian coordinate: K. Bolino/[Wikipedia](#), [Public domain](#). Polar coordinate: Mets501/[Wikipedia](#), [CC BY SA 3.0](#)

To convert from polar to Cartesian coordinates:

$$x = r \cos \theta, y = r \sin \theta$$

To convert from Cartesian to polar coordinates:

$$r = \sqrt{x^2 + y^2}, \theta = \arctan \left| \frac{y}{x} \right|$$