Topic Page: Cartesian coordinates

Definition: **Cartesian coordinates** from *Collins English Dictionary*

pl n

1 a system of representing points in space in terms of their distance from a given origin measured along a set of mutually perpendicular axes. Written (*x,y,z*) with reference to three axes

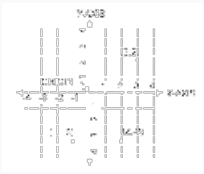


Image from: **Cartesian coordinates** in *Hargrave's Communications Dictionary, Wiley*

Summary Article: **Cartesian coordinate system**
From *The Penguin Dictionary of Mathematics*

A coordinate system in which the position of a point is determined by its relation to reference lines (*axes*). In two dimensions, two lines are used; commonly the lines are at right angles, forming a *rectangular coordinate system* (*see* diagram (a)). The horizontal axis is the x-axis and the vertical axis is the *y*-axis. The point of intersection O is the *origin* of the coordinate system. Distances along the *x*-axis to the right of the origin are usually taken as positive, distances to the left negative. Distances along the *y*-axis above the origin are positive; distances below are negative. The position of a point anywhere in the plane can then be specified by two numbers, the *coordinates* of the point, written as (*x,y*). The x-coordinate (or *abscissa*) is the distance of the point from the *y*-axis in a direction parallel to the *x*-axis (i.e. horizontally). The *y*-coordinate (or *ordinate*) is the distance from the *x*-axis in a direction parallel to the *y*-axis (vertically). The origin O is the point (0, 0). The two axes divide the plane into four *quadrants*, numbered anticlockwise starting from the top right (positive) quadrant: *the first quadrant*.

Cartesian coordinates were first introduced in the 17th century by Rene Descartes. Their discovery allowed the application of algebraic methods to geometry and the study of hitherto unknown curves. As a point in Cartesian coordinates is represented by an ordered pair of numbers, so is a line represented by an equation. Thus, y = *x* represents a set of points for which the *x*-coordinate equals the *y*-coordinate; i.e. *y* = *x* is a straight line through the origin at 45° to the axes. Equations of higher degree represent curves; for example,

$x^2 + y^2=4$

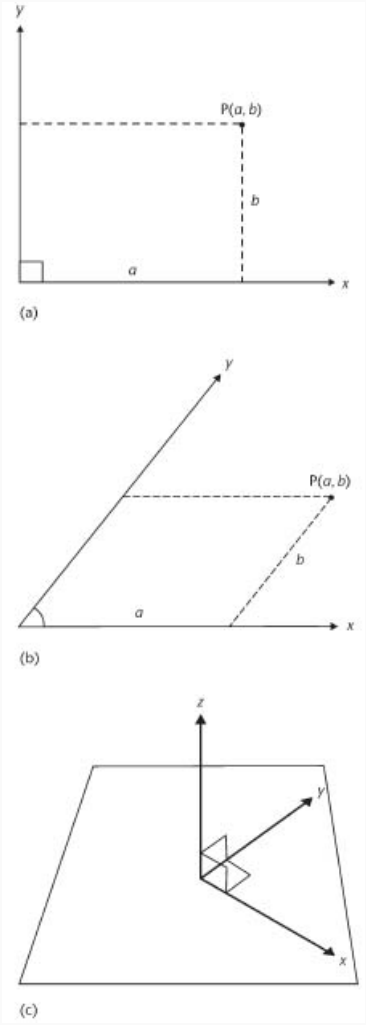
is a circle of radius 2 with its centre at the origin. A curve drawn in a Cartesian coordinate system for a particular equation or function is a *graph* of the equation or function.

The axes in a planar Cartesian coordinate system need not necessarily be at right angles to each other. If the *x*- and y-axes make an angle other than 90° the system is said to be an *oblique coordinate system* (*see* diagram (b)). Distances from the axes are then measured along lines parallel to the axes.

Cartesian coordinate systems can also be used for three dimensions by including a third axis - the z-axis - through the origin perpendicular to the other two. The position of a point is then given by three coordinates (*x, y, z*). The coordinate axes may be left-handed or right-handed, depending on the way positive directions are given to the axes. In a right-handed system (*see* diagram (c)), if the thumb of the right hand points in the positive direction of the *x*-axis, the first and second fingers can be pointed in the positive directions of the *y*- and z-axes respectively. The axes are said to form a *right-handed*

triad. A left-handed system is the mirror image of this (i.e. determined using the left hand), the axes being said to form a *left-handed triad*.

See also rotation of axes; translation of axes.



Cartesian coordinate system *(a) Rectangular and (b) oblique coordinate systems; (c) a righthanded system of axes.*

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Cartesian coordinate system. (2008). In D. Nelson (Ed.), *The Penguin dictionary of mathematics* (4th ed.). London, UK: Penguin. Retrieved from https://search.credoreference.com/content/topic/cartesian_coordinates

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