

ellipse

ellipse, a closed curve, the intersection of a right circular cone (*see* cone) and a plane that is not parallel to the base, the axis, or an element of the cone. It may be defined as the path of a point moving in a plane so that the ratio of its distances from a fixed point (the focus) and a fixed straight line (the directrix) is a constant less than one. Any such path has this same property with respect to a second fixed point and a second fixed line, and ellipses often are regarded as having two foci and two directrices. The ratio of distances, called the eccentricity, is the discriminant (*q.v.*; of a general equation that represents all the conic sections [*see* conic section]). Another definition of an ellipse is that it is the locus of points for which the sum of their distances from two fixed points (the foci) is constant. The smaller the distance between the foci, the smaller is the eccentricity and the more closely the ellipse resembles a circle.

A straight line drawn through the foci and extended to the curve in either direction is the major diameter (or major axis) of the ellipse. Perpendicular to the major axis through the centre, at the point on the major axis equidistant from the foci, is the minor axis. A line drawn through either focus parallel to the minor axis is a latus rectum (literally, "straight side").

The ellipse is symmetrical about both its axes. The curve when rotated about either axis forms the surface called the ellipsoid (*q.v.*) of revolution, or a spheroid.

The path of a heavenly body moving around another in a closed orbit in accordance with Newton's gravitational law is an ellipse (*see* Kepler's laws of planetary motion). In the solar system one focus of such a path about the Sun is the Sun itself.

For an ellipse the centre of which is at the origin and the axes of which are coincident with the x and y axes, the equation is $x^2/a^2 + y^2/b^2 = 1$. The length of the major diameter is $2a$; the length of the minor diameter is $2b$. If c is taken as the distance from the origin to the focus, then $c^2 = a^2 - b^2$, and the foci of the curve may be located when the major and minor diameters are known. The problem of finding an exact expression for the perimeter of an ellipse led to the development of elliptic functions, an important topic in mathematics and physics.

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