

= Pi =

The number π is a mathematical constant, the ratio of a circle's circumference to its diameter, commonly approximated as 3.14159. It has been represented by the Greek letter " π " since the mid-18th century, though it is also sometimes spelled out as "pi" (/paɪ/).

Being an irrational number, π cannot be expressed exactly as a fraction (equivalently, its decimal representation never ends and never settles into a permanent repeating pattern). Still, fractions such as $22/7$ and other rational numbers are commonly used to approximate π . The digits appear to be randomly distributed. In particular, the digit sequence of π is conjectured to satisfy a specific kind of statistical randomness, but to date no proof of this has been discovered. Also, π is a transcendental number—a number that is not the root of any non-zero polynomial having rational coefficients. This transcendence of π implies that it is impossible to solve the ancient challenge of squaring the circle with a compass and straightedge.

Ancient civilizations needed the value of π to be computed accurately for practical reasons. It was calculated to seven digits, using geometrical techniques, in Chinese mathematics and to about five in Indian mathematics in the 5th century AD. The historically first exact formula for π , based on infinite series, was not available until a millennium later, when in the 14th century the Madhava–Leibniz series was discovered in Indian mathematics. In the 20th and 21st centuries, mathematicians and computer scientists discovered new approaches that, when combined with increasing computational power, extended the decimal representation of π to, as of 2015, over 13 trillion (10¹³) digits. Practically all scientific applications require no more than a few hundred digits of π , and many substantially fewer, so the primary motivation for these computations is the human desire to break records. However, the extensive calculations involved have been used to test supercomputers and high-precision multiplication algorithms.

Because its definition relates to the circle, π is found in many formulae in trigonometry and geometry, especially those concerning circles, ellipses or spheres. Because of its special role as an eigenvalue, π appears in areas of mathematics and the sciences having little to do with the geometry of circles, such as number theory and statistics. It is also found in cosmology, thermodynamics, mechanics and electromagnetism. The ubiquity of π makes it one of the most widely known mathematical constants both inside and outside the scientific community: Several books devoted to it have been published, the number is celebrated on Pi Day and record-setting calculations of the digits of π often result in news headlines. Attempts to memorize the value of π with increasing precision have led to records of over 70,000 digits.

= Fundamentals =

= Name =

The symbol used by mathematicians to represent the ratio of a circle's circumference to its diameter is the lowercase Greek letter π , sometimes spelled out as pi, and derived from the first letter of the Greek word *perimetros*, meaning circumference. In English, π is pronounced as "pie" (/paɪ/, paɪ). In mathematical use, the lowercase letter π (or π in sans-serif font) is distinguished from its capital counterpart Π , which denotes a product of a sequence.

The choice of the symbol π is discussed in the section Adoption of the symbol π .

= Definition =

π is commonly defined as the ratio of a circle's circumference C to its diameter d :

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