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π is Mysterious and Infinite Number

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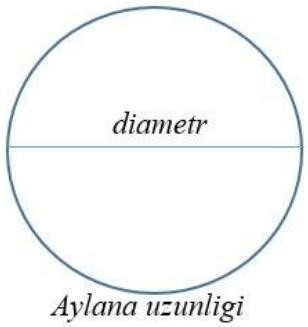
Abstract: The article presents a number of interesting facts and formulas about the number p, as well as detailed information about the unique aspects of the number. Drawings are provided for ease of explanation. Methods of learning numbers using infinite sequences and series are explained.

Keywords: formula, special program, centimeter, diameter, circle,perimeter, light year.

Every year on March 14, one of the most unusual holidays in the world - International π Day is celebrated. This day was celebrated for the first time in 1988 at the Exploratorium popular science museum in San Francisco (San Francisco Exploratorium), and this unofficial holiday was invented a year ago by San Francisco physicist Larry Shaw, who indicated March 14 in the American date system (month / date). March 14, i.e. $\frac{3}{14}$ corresponds to the first digits of the number π = 3.14. It is noteworthy that one of the most famous physicists, the creator of the theory of relativity, Albert Einstein, was also born on this day (Albert Einstein, 1879-1955). The number π is designated by the first letter of the Greek words "circle" and "perimeter". The number π has been known for 4000 years.

The number π (pronounced "pi") is the ratio of the length of the circle to the diameter; an irrational number and a transcendental (i.e. an algebraic equation with integer coefficients without a root) number. It is used to calculate the length of a circle, the surface of a circle, and the volume of rotating bodies.



$$\frac{aylana\ uzunligi}{diametr} = doimiy\ son$$

Figure 1. The origin of the number π.

The ancient Greek mathematician Archimedes calculated the value of π to three decimal places. Claudius Ptolemy showed the value of π to the fourth decimal place. At that time, the value of π was expressed in equivalents, since then there was no decimal point. For the next 1,500 years, the western world did not succeed in obtaining a more accurate value for π.

Who discovered π? Who and when first discovered the number π is still a mystery. It is known that the ancient Babylonian builders already used strong and basic in designing. Cuneiform tablets from thousands of years ago even preserved problems proposed to be solved using π. True, then it was believed that π is equal to three. This is confirmed by a tablet found in the city of Susa, two hundred kilometers from Babylon, where the number π is shown as $3\frac{1}{8}$. In the process of calculating π, the Babylonians found that the radius of a circle entered it six times as a chord, and they divided the circle into 360 degrees. And at the same time they did the same with the orbit of the sun. So, they decided to take into account that there are 360 days in a year. In ancient Egypt, π= 3.16. In ancient India, π= 3088. In Italy, throughout the ages, π= 3.125 was considered. Uniqueness of the number.

π is a real unique number.

According to scientists, the number of symbols in the number π is infinite. Their sequence is not repeated. Also, no one will ever find a duplicate. Since the number is infinite, it can contain absolutely anything, even Rachmaninov's symphony, the Old Testament, your phone number, and the year of the Apocalypse. π is related to chaos theory. The scientists concluded that Bailey's computing program showed that the sequence of numbers in π was completely random, which was consistent with the theory. It is almost impossible to calculate the number to the end - it takes a lot of time. π is an irrational number, that is, its value cannot be expressed as a fraction.π is a transcendental number. It cannot be obtained by performing any algebraic operations on integers.Thirty-nine fractions of the number π are enough to calculate the length of the circle surrounding certain cosmic bodies in the Universe with the error of the radius of a hydrogen atom.The number π is related to the concept of "golden section". In the process of measuring the Great Pyramid of Giza, archaeologists discovered that its height depends on the length of the base, just as the radius of the circle is related to its length.

Properties of Pi.

π is an irrational number, i.e. The value of pi cannot be expressed exactly in the form fractions $\frac{m}{n}$, where m and n are integers. This shows that the fractional representation never ends and is not periodic. π is a transcendental number, ie. it cannot be a root of any polynomial with integer coefficients. In 1882, Professor Königsberg proved the transcendence of π, and later Professor Lindemann of the University of Munich. A simplified proof by Felix Klein in 1894. since in Euclidean geometry the area of a circle and its circumference are functions of pi, then the proof of the transcendence of π put an end to the argument about the square of the circle, which continued much longer than that. 2.5 thousand years. π is an element of a periodic ring (that is, a countable and arithmetic number). But no one knows whether it belongs to the ring of periods or not. So, most of the time, our knowledge of the number π remains at the school level, and we know for sure that this number is primarily integral in geometry. In addition to the formulas for the length and area of a circle, the number π is used in the formulas of ellipses, spheres, cones, cylinders, ellipsoids, etc.: somewhere the formulas are simple and easy to remember, and somewhere they contain very complex integrals. Then we can find the number π in mathematical formulas, where at first glance the geometry is not visible. For example, $\frac{1}{(1-x^2)}$ the indefinite integral of is π. π is often used in sequential analysis. For example, here is a simple string that approximates π:

$$\frac{1}{1}-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\ldots=\frac{\pi}{4}$$

Among series, pi appears most unexpectedly in the famous Riemann zeta function. It is impossible to talk about it briefly, we will only say that someday the number $\boldsymbol{\pi}$ will help to find a formula for calculating prime numbers. And this is absolutely amazing: $\boldsymbol{\pi}$ is found in two of the most beautiful "royal" formulas of mathematics - Stirling's formula (helps to find the approximate value of the factorial and gamma function) and Euler's formula (which is related to many. five mathematical constants). However, the most unexpected discovery awaited mathematicians in the theory of probability. There is also $\boldsymbol{\pi}$. For example, the probability that two numbers are relatively prime is $\frac{6}{\pi^2}$. It appears in Pi Buffon's 18th-century needle threading problem: what is the probability that a needle thrown into a patterned sheet of paper will cross one of the lines? If the length of the needle is L and the distance between the lines is L and r > L, then we can approximately calculate the value of $\boldsymbol{\pi}$ using the probability formula $\frac{2L}{r}$

$\boldsymbol{\pi}$. Imagine - we can get $\boldsymbol{\pi}$ from random events. By the way, $\boldsymbol{\pi}$ exists in the normal probability distribution and appears in the equation of the famous Gaussian curve. We can also meet $\boldsymbol{\pi}$ in physics. $\boldsymbol{\pi}$ is found in Coulomb's law, which describes the force of interaction between two charges, in Kepler's third law, which describes the period of revolution of a planet around the Sun, and even in the arrangement of electron orbitals of the hydrogen atom. And again, the most incredible thing is that the number $\boldsymbol{\pi}$ is hidden in the formula of the Heisenberg Uncertainty Principle, the basic law of quantum physics.

CONCLUSION. Currently, the number $\boldsymbol{\pi}$ is associated with a set of obscure formulas, mathematical and physical facts. Their number continues to grow rapidly. All this indicates a growing interest in the most important mathematical constant that has been studied for more than twenty-two centuries. If there was no $\boldsymbol{\pi}$, the wheels would be square. The circumference and area of a circle are determined by this constant, and if it weren't for the number $\boldsymbol{\pi}$, we'd be measuring everything in squares.

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