$$\frac{2}{\pi} = \sqrt{\frac{1}{2}}\sqrt{\frac{1}{2} - \frac{1}{2}\sqrt{\frac{1}{2}}}\sqrt{\frac{1}{2} - \frac{1}{2}\sqrt{\frac{1}{2} - \frac{1}{2}\sqrt{\frac{1}{2}}}}\cdots$$

$$4/\pi = 1 + \cfrac{1}{2 + \cfrac{3^2}{2 + \cfrac{5^2}{2 + \cfrac{7^2}{2 + \cfrac{9^2}{\ddots}}}}}$$

$$\frac{\pi}{2} = 1 + \frac{1}{3}\left(1 + \frac{2}{5}\left(1 + \frac{3}{7}\left(1 + \frac{4}{9}(1 + \cdots)\right)\right)\right)$$

$$\pi = \sum_{n=0}^{\infty} \binom{2n}{n}^3 \frac{42n+5}{2^{12n+4}}$$

$$\frac{\pi}{4} = \sum_{i=1}^{\infty} \arctan\left(1/F_{2i+2}\right)$$
$$= \arctan\frac{1}{3} + \arctan\frac{1}{8} + \arctan\frac{1}{21} + \cdots$$

$$\pi = 11.$$
$$
\begin{array}{l}
001001000011111101101010100010001000100 \\
001011010001100001000110100110001001 00 \\
110001100110001010001011100000001 10 \\
1110000011100110100010010100100000 00 \\
1001001110000010001000101001100111 1 \\
1001100011101000000001000001011101 1 \\
1110101001100011101100010011100110 1 \\
1001000100101000101001010000010000 1 \\
1110011000011100011010000000010011011 \\
1011110111110010101000110011011001 1 \\
1100110100111010010000110001101100 1 \\
100000001010110000101001101101111100 \\
1001011111000101000011011101001111 1 \\
1100001001101010110110101101101010 1 \\
000111000001001000101111100100100000 10 \\
1101101010111101100110001001011110 01 \\
1111101100011011111010001001100010 00 \\
0101110100110100110001101111111011 01 \\
0110101100001011111111111010111_{(2)} \ldots
\end{array}
$$

$$\pi = \lim_{n^2 \to \infty} \frac{4}{n^2} \sum_{j=0}^{n} \sqrt{n^2 - j^2}$$

$$\pi = 6\left(\frac{1}{2} + \frac{1}{2 \cdot 3 \cdot 2^2} + \frac{1 \cdot 3}{2 \cdot 4 \cdot 5 \cdot 2^4} + \frac{1 \cdot 3 \cdot 5}{2 \cdot 4 \cdot 6 \cdot 7 \cdot 2^8} + \cdots\right)$$

$$\pi = \frac{1}{2i} \oint_{\gamma} \frac{dx}{x+iy} + \frac{i\,dy}{x+iy}$$

where $\gamma$ is any simple closed

counterclockwise path in $\mathbb{C}$ containing the origin

$$\frac{6}{\pi^2}$$

is the limit, as $n$ goes to infinity, of the probability that two random integers selected uniformly from $1, \ldots, n$, are not relatively prime the symbol $\pi$ was first used to denote the ratio of a circle's circumference to its radius around 1706, by William Jones, in his *Synopsis Palmariorum Matheseos*

$$1 - \langle e^{\sqrt{163}\pi} \rangle < 10^{-12}$$

where $\langle x \rangle$ denotes the fractional part of $x$

$$\frac{1}{\pi}$$

is the probability that a needle of length $\ell$ will land on a line, given a floor with equally spaced parallel lines a distance $\ell$ apart

$$2\sqrt{\pi}$$

is the minimum length of fence needed to completely enclose one square unit of area

“Why, $\pi$! Stop, $\pi$! Weird anomalies do behave badly!
You, madly conjured, imperfect, strange, numerical,
Why do you maintain this facade?
In finite time you are barbaric!
You do wonders, mesmerize minds!
O, do elements numerous have a beautiful meaning-
A system isolating all mysteries, solutions for puzzles, chaos, a
O snafu apparent in O Universal Concept from believing lies?
That there, obstinate in you, O Strange Constant,
A Divine Sign O exists is unlikely unless
Is O revealed Something Brilliant, negating belief!
In formulas, O, you show yourself in Greek and math as a $\pi$ forever–
O hidden wonders absconded, infinite, in a tiny constant,
O, sneakily, rather?
Never, I say!”

encodes the first 144 digits of $\pi$: the number of letters in each word gives the sequence of digits, and O stands for 0

$$\frac{2}{\pi} = \sqrt{\frac{1}{2}}\sqrt{\frac{1}{2}-\frac{1}{2}\sqrt{\frac{1}{2}}}\sqrt{\frac{1}{2}-\frac{1}{2}\sqrt{\frac{1}{2}-\frac{1}{2}\sqrt{\frac{1}{2}}}}\cdots$$

**Not** $\pi$. Change the - symbols to + signs and you get Viète's formula, the first (1593) infinite series for $\pi$.

$$4/\pi = 1 + \cfrac{1}{2 + \cfrac{3^2}{2 + \cfrac{5^2}{2 + \cfrac{7^2}{2 + \cfrac{9^2}{\ddots}}}}}$$

$\pi$. This formula comes from Brouckner (circa 1650), and was derived from Wallis' formula.

$$\frac{\pi}{2} = 1 + \frac{1}{3}\left(1 + \frac{2}{5}\left(1 + \frac{3}{7}\left(1 + \frac{4}{9}(1 + \cdots)\right)\right)\right)$$

$\pi$. Beeler et al, 1972. Converges at one bit per term.

$$\pi = \sum_{n=0}^{\infty} \binom{2n}{n}^3 \frac{42n+5}{2^{12n+4}}$$

**Not** $\pi$. Change $\pi$ to $1/\pi$ and you get an identity of Ramanujan's.

$$\frac{\pi}{4} = \sum_{i=1}^{\infty} \arctan(1/F_{2i+2})$$
$$= \arctan\frac{1}{3} + \arctan\frac{1}{8} + \arctan\frac{1}{21} + \cdots$$

**Not** $\pi$. Change $F_{2i+2}$ to $F_{2i+1}$ and the equality is true.

$$\pi = 11.$$
$$00100100001111110110101010001000100$$
$$0010110100011000010001101001 10_{(2)}\ldots$$

$\pi$. Computed using Maple.

$$\pi = \lim_{n^2\to\infty} \frac{4}{n^2} \sum_{j=0}^{n} \sqrt{n^2 - j^2}$$

$\pi$. This represents four times the area of a quarter-circle, converted from integral form.

$$\pi = 6\left(\frac{1}{2} + \frac{1}{2\cdot 3\cdot 2^2} + \frac{1\cdot 3}{2\cdot 4\cdot 5\cdot 2^4} + \frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6\cdot 7\cdot 2^8} + \cdots\right)$$

**Not** $\pi$. Change $3, 5, 7, \ldots,$ to $2, 4, 8, \ldots,$ and you obtain an identity of Newton's derived from the arcsine power series. In 22 terms it gave 16 decimal places.

$$\pi = \frac{1}{2i}\oint_\gamma \frac{dx}{x+iy} + \frac{i\,dy}{x+iy}$$

where $\gamma$ is any simple closed counterclockwise path in $\mathbb{C}$ containing the origin

$\pi$. This is a rewriting of the definition of the winding number from complex analysis.

$$\frac{6}{\pi^2}$$

is the limit, as $n$ goes to infinity, of the probability that two random integers selected uniformly from $1, \ldots, n$, are not relatively prime

**Not** $\pi$. Remove the word, ''not'' and this is true. It can be proved by using the fact that the sum of the reciprocals of the square numbers is $\pi^2/6$.

the symbol $\pi$ was first used to denote the ratio of a circle's circumference to its diameter around 1706, by William Jones, in his *Synopsis Palmariorum Matheseos*

$\pi$. Previously, the famous ratio was called the Ludolphian number, after Ludolph van Ceulen, a German mathematician. The use of the symbol was popularized by Euler later that century.

$$1 - \langle e^{\sqrt{163}\pi} \rangle < 10^{-12}$$

where $\langle x \rangle$ denotes the fractional part of $x$

$\pi$. Actually, Martin Gardner once falsely claimed that Ramanujan proved $e^{\sqrt{163}\pi}$ to be an integer. (It was the April 1st issue.) For this reason the number is called the Ramanujan constant.

$$\frac{1}{\pi}$$

is the probability that a needle of length $\ell$ will land on a line, given a floor with equally spaced parallel lines a distance $\ell$ apart

**Not** $\pi$**.** `The left hand side should be` $2/\pi$. `This is Buffon's needle problem.`

$$2\sqrt{\pi}$$

is the minimum length of fence needed to completely enclose one square unit of area

$\pi$. `This relates to the isoperimetric problem: among all closed curves with a given perimeter, the circle has the largest area.`

"Why, $\pi$! Stop, $\pi$! Weird anomalies do behave badly!
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Never, I say!"

encodes the first 144 digits of $\pi$: the number of letters in each word gives the sequence of digits, and O stands for 0

**Not** $\pi$**.** `There are 112 words.`