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3.14 and the rest



Pi can be found in the design of the pyramids at Giza

By **David Blatner**

It's Pi Day, a celebration of the mathematical ratio that man has been trying to unlock for millennia. But why are we driven to find the answers behind it?

As we're all taught at school, pi represents the number you get when you divide the distance around a circle (its circumference) by the distance across (the diameter).

With just a string and a ruler you can quickly measure that pi must be just over three-and-an-eighth (3.125). With more precise measurements, you may be able to narrow it down to 3.14.

However, if you ask a typical maths nerd, you'll get an earful of pi - 3.14159265 and so on. A surprising number of students have memorised 50 or even 100 digits after the decimal point.

SLICE OF PI

“ **3.1415926535
8979323846 2643383279
5028841971** ”

The rough ratio of pi 3.14 gives us the date for Pi Day. March 14, or 3/14 in American dating style, makes sense for a celebration of this famous constant.

Coincidentally, Pi Day is also the birthday of Albert Einstein, who no doubt knew more than a little about pi. Pi Day celebrants, usually children with an enthusiastic teacher and a varying degree of personal interest in the subject, learn about pi, circles, and, if they're lucky, eat baked pies of various sorts.

Famous constant

Some classes offer prizes for memorising the most digits of pi, or for creating interesting mnemonic devices. Count the

Magazine



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It's Pi Day, when we celebrate the circular ratio. But why are we obsessed?

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letters in each word of this classic poem:

Sir, I bear a rhyme excelling
In mystic force and magic spelling.

Pi, more commonly known by the 16th letter of the Greek alphabet, is the most widely-known mathematical constant in the world. Even long after people forget their school lessons, they still recognise the symbol.

Pi conjures a sense of mystery, so the symbol makes regular appearances in popular culture - it's the secret code in both Alfred Hitchcock's *Torn Curtain* and the Sandra Bullock vehicle *The Net*.



Aliens/hoaxers also need pi

And while pi is a number, its importance goes far beyond simple geometry. Pi represents a deep universal mystery - how is it that something this basic, this fundamental to maths and science, could turn out to be so incredibly difficult to pin down?

In fact, it's literally impossible to know what pi is, because its digits rattle off into infinity.

While there are many infinitely long numbers in maths, pi is the only one in which an infinitely simple idea - the circle - unfolds into an infinitely complex value. This paradox drives many people to distraction.

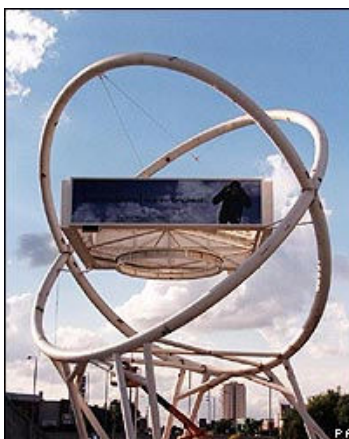
Life's work

One of the most endearing and enduring qualities of humans is that we're so often sure that we can find the answer to any problem if we just try hard enough. For 3,500 years, humankind has attempted to solve the puzzle of pi, also called "squaring the circle", calculating the exact ratio of a circle's circumference to its diameter. However, no matter how hard anyone tries, they find only a new approximation.

In ancient Greece, the great mathematician Archimedes worked tirelessly to discover the ratio, uncovering only a few digits of accuracy. When he tried to stop a Roman soldier from blundering over his work by shouting "do not touch my circles" he was unceremoniously murdered.

By the time Ludolf van Ceulen died in 1610, he had spent many years of his life tediously calculating pi, resulting in only 35 accurate digits. And in 1873, William Shanks announced he had found 707 digits over years of hand-cramping work; unfortunately, he had made a mistake after the 527th place. The following digits were all wrong.

The most recent attempt, by a Japanese computer scientist in 2002, found 1.24 trillion digits of pi. To put all this in perspective, even an astrophysicist, attempting to measure galaxies, would never need more than 10 or 15 digits of precision. But pi beckons us on further. Some mathematicians believe that if we could only find some pattern in pi, even some hint that there were more fours than sevens, it could lead to a huge breakthrough in our understanding of the universe.



Pi is in art

The late physicist Carl Sagan, in his novel *Contact*, imagined a time when Earth scientists were sufficiently able to unravel enough of pi to find encoded messages from our creators—messages that would allow our primitive race to leap into a greater universal awareness. After all, if you were going to hide a long numeric message in the very fabric of our reality, pi would be a natural place to do it.

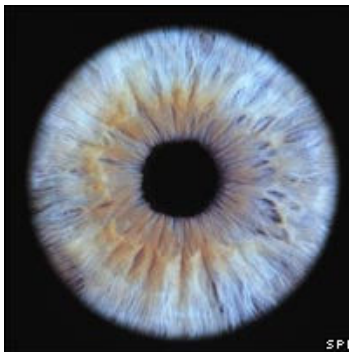
Fundamental equations

Nevertheless, pi continues to frustrate. In the late 19th Century, it was categorically proven that pi was infinitely long and could not be solved with any finite number of equations. That hasn't stopped modern-day circle-squarers, who continue to claim that mathematicians are wrong and that pi is really just 3 or 3.25 or some other finite-but-erroneous answer.

Pi Day is a time to honour not just a number and our fascination with it, but also the essential truth that there are some things we simply cannot know. We can only get close to knowing.

Pi shows up everywhere. In mathematics, pi appears in many fundamental equations that have nothing to do with circles. In science, pi is inextricable from measuring everything from ocean waves to economic statistics.

Pi is found in the very measurements of the Great Pyramid at Giza. And if you divide the length of a river from source to mouth across a gently sloping plane by its direct length "as the crow flies", you'll find pi.



We have pi in our eyes

Pi also appears where you least expect it. Religious scholars point to the Old Testament which, when describing the measurements of Solomon's Temple, implies that pi is only three. In the transcripts of the famed OJ Simpson trial, you can find arguments between the judge and an FBI agent

about the actual value of pi.

For a time, Givenchy offered a men's cologne emblazoned only with the symbol. Nobel Prize winner Wislawa Szymborska wrote a poem about pi, and pop star Kate Bush sang 100 digits of pi on her album Aerial.

In this age of high-tech precision instruments, where we assure ourselves that perfection is attainable, pi is an ever-present, sometimes grating reminder that there are puzzles that can be solved and there are mysteries that, perhaps, can not.

David Blatner is the author of The Joy of Pi.

Send us your comments using the form below.

Funny about Carl Sagan expecting to find encoded messages in Pi. It's an infinite series, which means that any message you want to find will be there somewhere.

Magnus B, London UK

I understand why today was mentioned, but are we going to get special days for the other equally important constants? 0, 1, "i" and "e" are just as fundamental (although "i" isn't really on show in every day life as much as the others)

Nic Brough, London, UK

Don't forget the movie Pi either.

Garnet Hoyes, Korat, Thailand

Pi also works in deadlines for projects: take your estimated target deadline period, multiply it by pi, and you end up with the time you will need to actually finish the project.

Erik, Leuven, Belgium

Sir, I send a rhyme excelling
In sacred truth and rigid spelling
Numerical sprites elucidate
For me the lexicon's full weight

Count the letters in the words for pi to 20 decimal places easily remembered.

Tuppennyblue, Worcester, UK

Why not have pi day on the 22nd July? Every schoolchild of my age knows that pi is best approximated by 22/7.

John Gillham, Malvern Worcestershire

My old maths teacher used to hold the world record for reciting pi, and once spent a lesson reciting the first thousand for "Children in Need" whilst we all checked a huge list of random numbers to spot if he made any errors. Well, it was better than a real maths lesson.

Tony, Blackburn

The value and usage of pi is only theoretical as it's impossible to create a perfect circle. There will be always some miniscule anomaly in its shape - even if you go right down to atomic level.

Kenny Laing, Grantham, UK

Every time we ask our computer to generate a random number (which might show up, for example, as a random letter or word, or as random movements in a game) we are using pi. A computer on its own cannot create a truly random number so it uses the apparently random sequence of digits in pi to produce a very good approximation of randomness.

Tony Palmer, Watford, UK

"Squaring the circle" has nothing to do with working our the value of pi - it refers to the problem of constructing a square from a circle, where the square is to have the same area as the circle.

Calum, Edinburgh

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