this lil guy pops up in weird places

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

this is an "infinite sum" meaning that you can get as close as you want to the actual value of π/4 if you add up enough terms on the left.
it's often attributed to Leibniz but is actually a special case of a formula discovered by the Indian mathematician Madhava in the 14th century!

$$\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\cdots=\frac{\pi^2}{6}$$

ditto "infinite sum". figuring out the value of this sum is called "the basel problem" and was first solved by... you guessed it... ya boy Euler

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

an infinite product! as above, but with multiplication. from John Wallis in 1656

Buffon's needle problem: if we have a floor made of parallel strips of wood, each the same width, and we drop a needle as long as the strips are wide onto the floor, the probability that the needle will lie across a line between two strips is 2/π

i – the "imaginary" unit

for "real" numbers (i.e. numbers that you find on a number line), multiplying two negatives cancels both of them out

$$-2 \times -3 = 6$$

a square root of *x* is a number you can multiply by itself ("square") to get *x*, i.e. $\sqrt{4} = 2$ because $2 \times 2 = 4$

but also $\sqrt{4} = -2$ since the negatives cancel out in $-2 \times -2 = 4$!

since squaring a real number always cancels out its negative, what the heck is $\sqrt{-1}$?

it can't be any real number so people call it "imaginary" and use i to represent it