This book was written by David Stipp, who is an award winning science writer.

"Richard Feynman worked on a Manhattan Project, won a Nobel Prize, led the investigation of the 1986 Space Shuttle Challenge distaster, to top it off, radiated almost superhuman joie de vivre."

Hermann Weyl put it with greater gravitas, the goal of mathematics is "the symbolic coprehension of the infinite with human, that is finite, means"

Legend has it that Hippasus, the mathematician who brought attention to the weirdness, was drowned by his fellow Pythagoreans as punishment (brought attention to the weirdness of irrational numbers).

In short, infinity is like a colossal dragon that's know for inducing madness in those who dare to stare hard at it but which is also known for making an honest living by traveling around the countryside and hiring itself out to pull farmers' plows.

Chinese Mathematician Zu Chongzi topped Archimedes in the fith century by approximating pi as 355/113-this fraction's decimal equivalent is good to an accuracy of six decimals.

Essentially throwing up his hands, he wrote that they're "impossible" numbers, and exist merely in the imagination.

Euler had a remarkable memory (9500 lines of Virgil's Aenid from memory. He knew five languages: Latin, Russian, German, French, and English. It's said that he could reel off the first 6 integer powers of any number between 1 and 100..). Also said that he was the greatest math explainer ever. His most popular math book Euclid's Elements (second more printed book in history in terms of frequency to the bible).

Daniel Bernoulli son of Euler's mentor his **irascible** father took credit for most of his work.
"**Irascible**" describes someone who is easily angered or prone to irritability.

Redefine trig to be x-y coordinate outputs to understand angles greater than 90 and expand the function from context of right triangles.

Euler's discovery of suprising connection between trigonometry and imaginary-number exponents wasn't the first example of a link between trig and the imaginaries. In the early 1700s, French mathematician Abraham de Moivre effectively constructed a bridge between these two math topics by originating a variant of this equation now known as Moivre's formula (not written in the standard way).

De Moivre accredited to more than his **eponymous** formula
"**Eponymous**" refers to the name of a person that something, such as a book, movie, or place, is named after. It can also describe the title character of a work.

Caspar Wessel, an amateur mathemacian who always had trouble making ends meet with his wretchedly low-paid surveying work. An acquaintance described him in a letter as having "a bright, but very slow head, and whe he sets out to study something, he can have no peace until he completely understands it." "If he has been in possession of more courage and assurance when it comes to trying unaccostomed work, then with his insight and talen, he could have done a lot for the benefit of the community as well as for himself" - fellow surveyor

Caspar took the idea of complex numbers into the cartesian grid (world of maps, where coincidentally he spent his career).

Irish mathematician William Rowan Hamilton expanded the concept of numbers even further by introducing four-dimensional numbers called quarternions and working out how to do calculations with them. Such numbers today are used in everything from computer graphics to aircraft navigation systems. Physicists have a thing for many-dimensional numbers too. Einstein pictured the world as having four dimensions.

Raising e to an imaginary-number power can be pictures as a roation operation in the complex plane. Applying this interpreation to e raised to the "i times pi" power means that Euler's formula can be pictured in geometric terms as modeling a half-circle rotation.

Charles Proteus Steinmetz spearheaded the use of the imaginaries in calculations related to electrical current. (Interestingly Steinmetz had an exotic menageria of peculiar pets).

But despite the risk of getting mired in a **morass** of conflicting opinions (on why Euler's identity is beautiful)! A "**morass**" refers to a complicated or confusing situation, often likened to a swamp or marsh that is difficult to navigate or escape. It can also be used more generally to describe a complex and entangled situation.

The sublime: Groundwork towards a Theory published in 1998 Tsang Lap-Chuen he wrote that the sublime "evokes our awareness of our being on the threshold from the human to that which transcends the human; which borders on the possible and the impossible; the knowable and the unknowable; the meaninful and the fortuitious; the finite and the infinite."

"The most inspiring teeachers I've known possessed the gift of infectious enthusiasm-they communicated intellectual excitement about their subjects by seeming to regard them with fresh eyes of impassioned novices."

The idea that math statements express truths that exist independenly of human thought is called mathematical Platonism. G. H. Hardy was one of the most prominent modern math Platonists. "I believe that mathematical reality lies outside us, that our function is to discover or observe it, and that the theorems which we prove, and which we describe grandiloquently as our 'creations,' are simply our notes of our observations.

Harvard Mathematician Barry Mazur nicely describeed the kind of ambivalence I experience on this topic in his book Imagining Numbers (Particularly the Square Root of Minus Fifteen): "On the days when the world of mathematics seems unpermissive, with its gem-hard exigencies, we all become fervid Platonists (mathematical objects are 'out there,' waiting to be discovered-or not) and mathematics is all discovery." And on other days, when we see someone who... seemingly by willpower alone, extends the range of our mathematical intuition the freeness and open permissiveness of mathematical invention dazzle us, and mathematics is all invention."

Martin Gardner and Reuben Hersh clashed about these ideas. Martin argued "if all intelligent minds in the universe disappearedm the universe would still have a mathematical structure, and that in some sense even the theorems of pure mathematics would continue to be 'true.'

Hersch countered that mathematics is a human cultural construct that has no reality independent of people's minds. Its statemetns are invented "social objects." And although he says that mathematics is objective, he interprets the word objective to mean "agreed upon by all qualified people who check it out" -not "out there" in some sense. "Saying [mathematics] is really 'out there,' he adds, "is a reach for a superhuman certainty that is not attained by any human activity."

Physicist Eugene Wigner famously dubbed this phenomenon "the unreasonable effectivess of mathematics in the natural sciences."

Haim Ofek has theorized that resource exchanges helped drive the explosive growth in brain size and cognitive abilities that led to modern humans. As he has observed, "Exchange requires certain levels of dexterity in commmunication, quantification, abstraction, and orientation in time and spae- all of which depende (i.e. put selective pressure) on the lingual, mathematical, and even artistic faculties of the human mind."

Stanislas Dehaene theorizes we posess brain circuits that evolved specifically to represent basic arithmetic logic. He and colleague Marie Almaric showed via brain imaging that high-level math thinking in mathematicians activates a brain network that appears to be largely dedicated to mathematical reasoning.

Explains an idea of prominent mathematicians ability to know maths as true without being able to explain why. No one illustrated this more than prominent mathematician Srinivasa Ramanujan.

Learning math from metaphors. Where Mathematics Comes From makes a strong case for paying more attention to metaphors in math education. Lakoff and Nunez.

German physicist Heinrich Hertz bears on this point: "One cannot escape the feelings that these mathematical formulas have an independent existense and an intelligence of their own."

Euler's initial proof of in Intrdocutio of in Analysin Infinitorum (Introduction to the Analysis of the Infinite)

When Euler discovered i ^ i is real, he exclaimed in a letter to a friend that "this seems extraordinary to me" - part of his genius, as well of his charm, ws an inexhaustible capacity to be suprised and delighted by his discoveries.