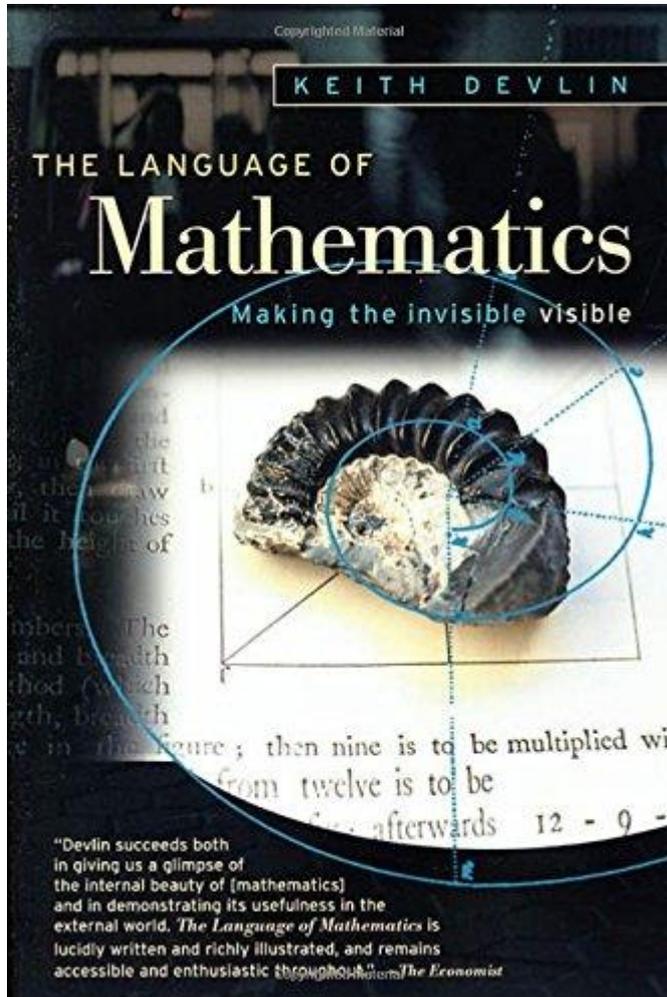


KS5 Maths Reading List

The Language of Mathematics by Keth Devlin



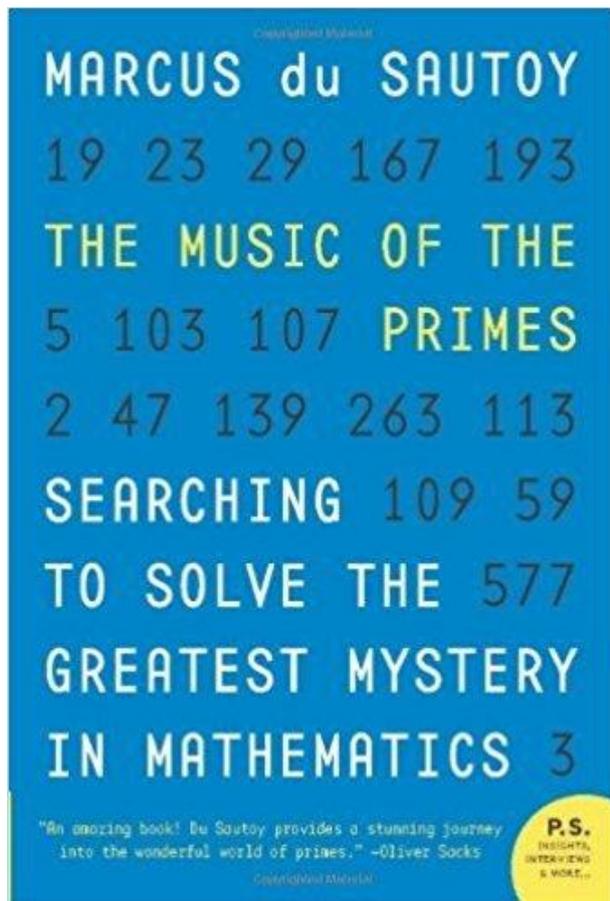
Age 14+

In *The Language of Mathematics*, award-winning author Keith Devlin reveals the vital role mathematics plays in our eternal quest to understand who we are and the world we live in. More than just the study of numbers, mathematics provides us with the eyes to recognize and describe the hidden patterns of life. Devlin shows us what keeps a jumbo jet in the air, explains how we can see and hear a football game on TV, allows us to predict the weather, the behavior of the stock market, and the outcome of elections. Far from a dry and esoteric subject, mathematics is a rich and living part of our culture. An exploration of an often woefully misunderstood subject, this book celebrates the simplicity, the precision, the purity, and the elegance of mathematics.



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The Music of the Primes by Marcus Du Sautoy



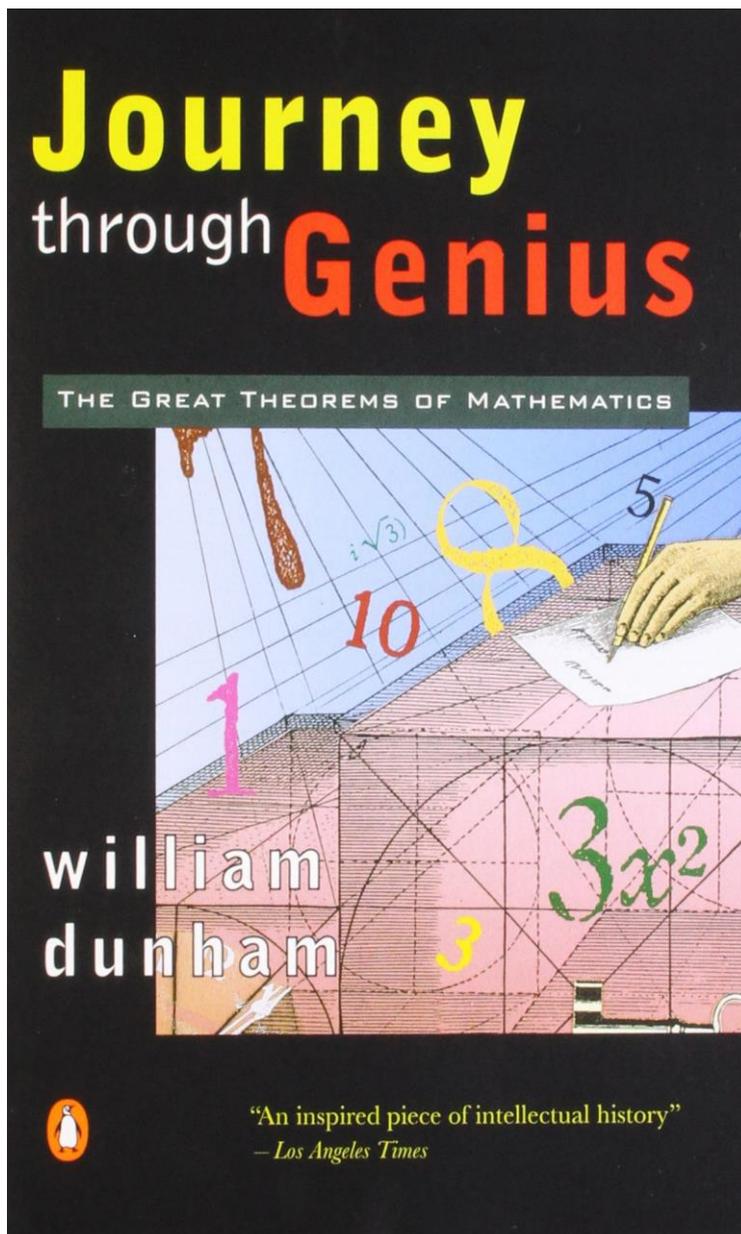
Age 14+

How can one predict when the next prime number will occur? Is there a formula which could generate primes? These apparently simple questions have confounded mathematicians ever since the Ancient Greeks. In 1859, the brilliant German mathematician Bernhard Riemann put forward a hypothesis which finally seemed to reveal a magical harmony at work in the numerical landscape. The promise that these eternal, unchanging numbers would finally reveal their secret thrilled mathematicians around the world. Yet Riemann never publicly provided a proof for his hypothesis and his housekeeper burned most of his personal papers on his death. Whoever cracks Riemann's hypothesis will go down in history, for it has implications far beyond mathematics. In business, it plays a central role in security and e-commerce. In science, it brings together vastly different areas, with critical ramifications in Quantum Mechanics, Chaos Theory and the future of computing. Pioneers in each of these fields are racing to crack the code and a prize of \$1 million has been offered to the winner. As yet, it remains unsolved.

Journey Through Genius: The Great Theorems of Mathematics by William Dunham



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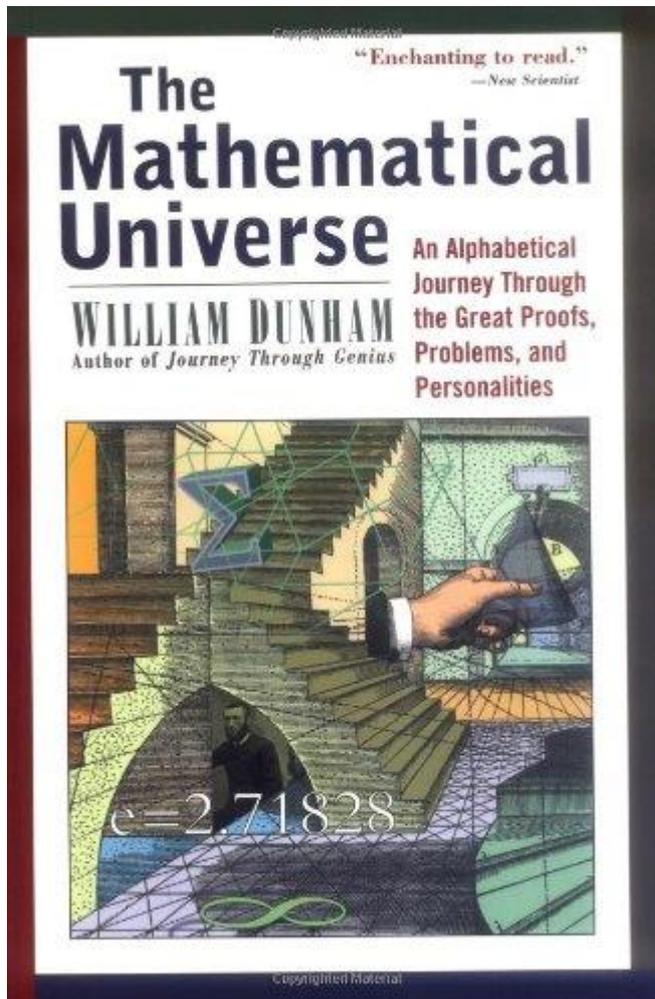
Age 14+

In this book Dunham treats mathematical theorems as creative works of art. He places each theorem within its historical context and explores the very human and often turbulent life of the creator. He studies such great mathematicians as Archimedes, Gerolamo Cardano and Georg Cantor. He also provides step-by-step proofs for the theorems, each easily accessible to readers with no more than a knowledge of high school mathematics.



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The Mathematical Universe: Alphabetical Journey Through the Great Proofs, Problems & Personalities by William Dunham



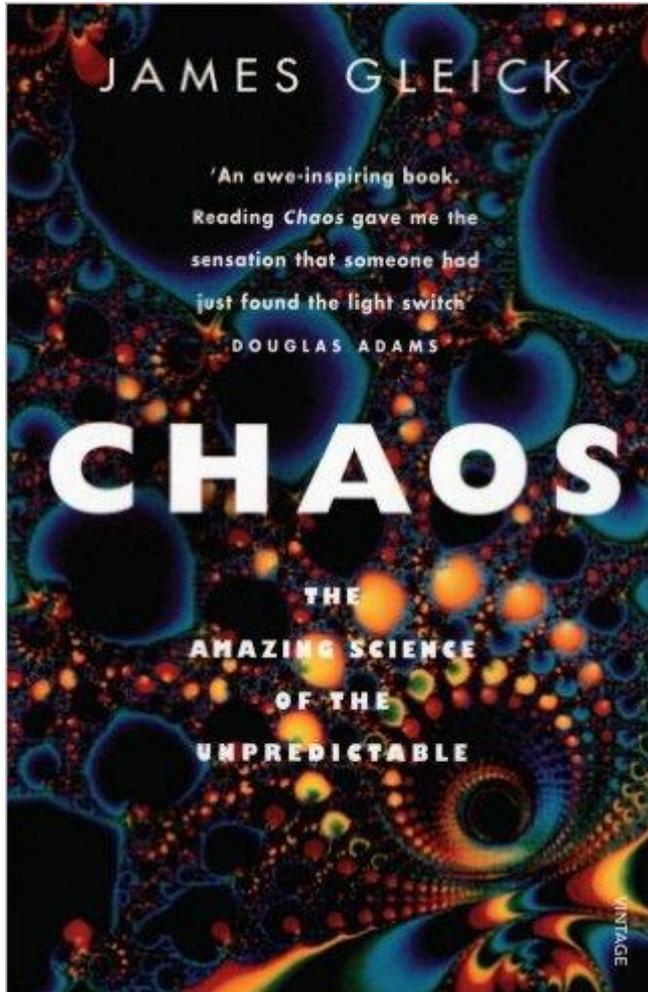
Age 14+

In this book, Dunham takes us through a tantalizing selection of the great proofs, notorious disputes, and intriguing unsolved mysteries of the mathematical universe. Subjects range from the golden age of Greek geometry to the furthest frontier of infinite series. Dunham explores more than five thousand years of mathematical history, digging into the earliest records in Egypt, Babylon, India, and China, and turning up surprising tales and tidbits from modern times. All along the way, Dunham portrays the great masters of mathematics at their work. In colorful anecdotes, the brilliant - often eccentric - luminaries chart the course of mathematical progress. This book is accessible to any reader with a basic knowledge of algebra and geometry. You will come away from this exhilarating book with a keen sense of the power and splendor of the magical mathematical world.



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Chaos by James Gleick



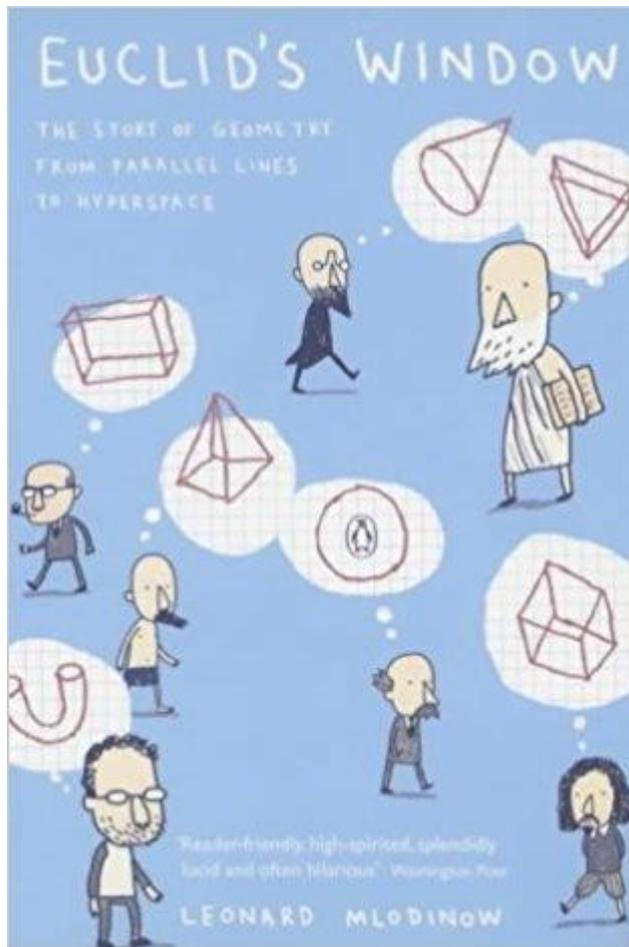
Age 14+

Chaos is what happens when the behaviour of a system gets too complicated to predict; the most familiar example is the weather, which apparently cannot be forecast accurately more than five days ahead. This book tells the story so far in the study of this new field of Physics.



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Euclid's Window: The Story of Geometry from Parallel Lines to Hyperspace by Leonard Mlodinow



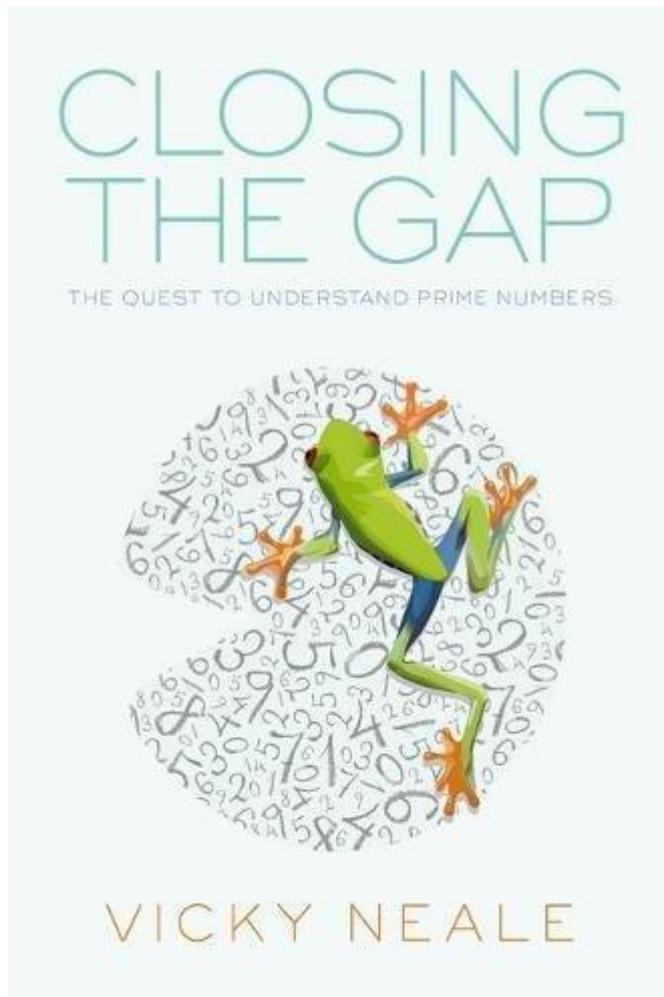
Age 14+

Anyone who thought geometry was boring or dry should prepare to be amazed. Despite its worthy cover this book is exactly what its title says - a story - and the plot of this story involves life, death and revolutions of understanding and belief. It stars the some of the most famous names in history, from Euclid who laid the logical foundations, to Albert Einstein, who united space and time in a single non-Euclidean geometry. It offers an alternative history of mathematics, revealing how simple questions anyone might ask about space - in the living room or in some other galaxy - have been the hidden engines of the highest achievements in science and technology.



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Closing the Gap: The Quest to Understand Prime Numbers by Vicky Neale



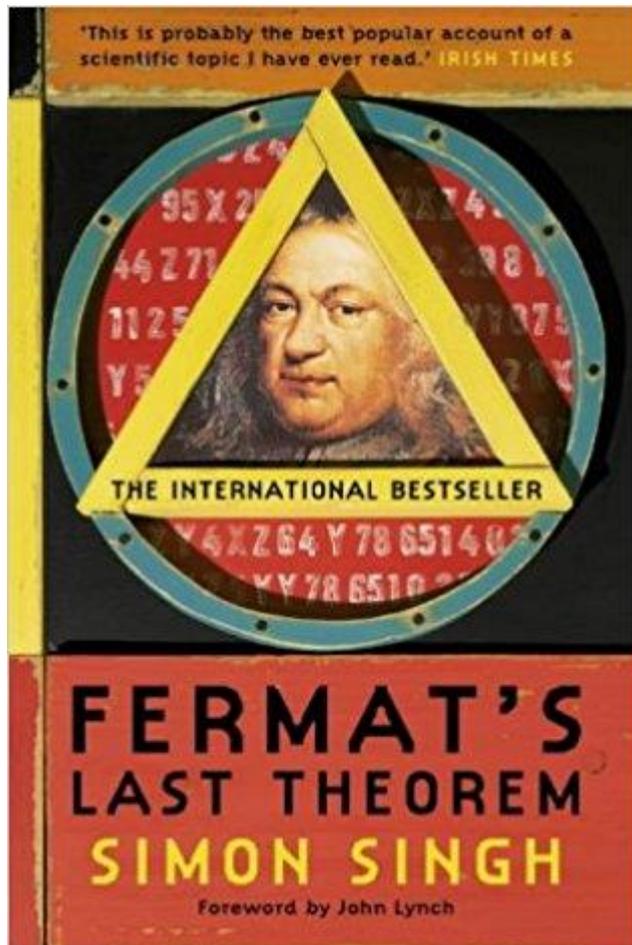
Age 14+

Prime numbers have intrigued, inspired and infuriated mathematicians for millennia. Every school student studies prime numbers and can appreciate their beauty, and yet mathematicians' difficulty with answering some seemingly simple questions about them reveals the depth and subtlety of prime numbers. In this book, Vicky Neale charts the recent progress towards proving the famous Twin Primes Conjecture, and the very different ways in which the breakthroughs have been made: a solo mathematician working in isolation and obscurity, and a large collaboration that is more public than any previous collaborative effort in mathematics. Interleaved with this story are highlights from a significantly older tale, going back two thousand years and more, of mathematicians' efforts to comprehend the beauty and unlock the mysteries of the prime numbers.



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Fermat's Last Theorem by Simon Singh



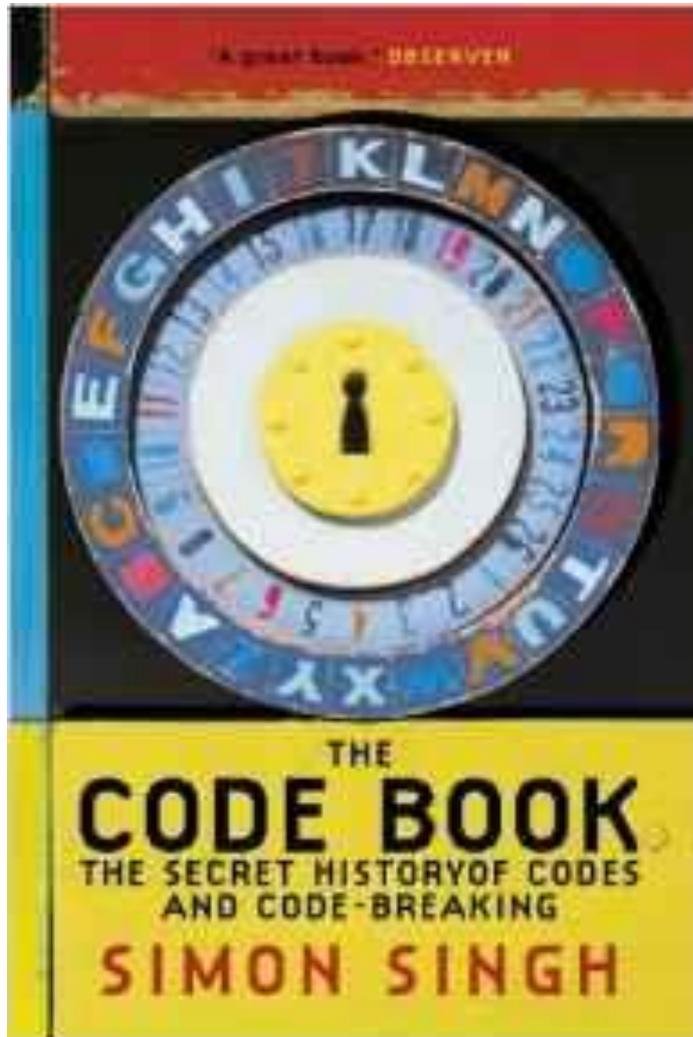
Age 14+

The story of the solving of a puzzle that has confounded mathematicians since the 17th century. In 1963, a schoolboy browsing in his local library stumbled across the world's greatest mathematical problem: Fermat's Last Theorem, a puzzle that every child can understand but which has baffled mathematicians for over 300 years. Aged just ten, Andrew Wiles dreamed that he would crack it. Wiles's lifelong obsession with a seemingly simple challenge set by a long-dead Frenchman is an emotional tale of sacrifice and extraordinary determination. In the end, Wiles was forced to work in secrecy and isolation for seven years, harnessing all the power of modern maths to achieve his childhood dream. Many before him had tried and failed, including a 18-century philanderer who was killed in a duel. An 18-century Frenchwoman made a major breakthrough in solving the riddle, but she had to attend maths lectures at the Ecole Polytechnique disguised as a man since women were forbidden entry to the school.



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The Code Book by Simon Singh



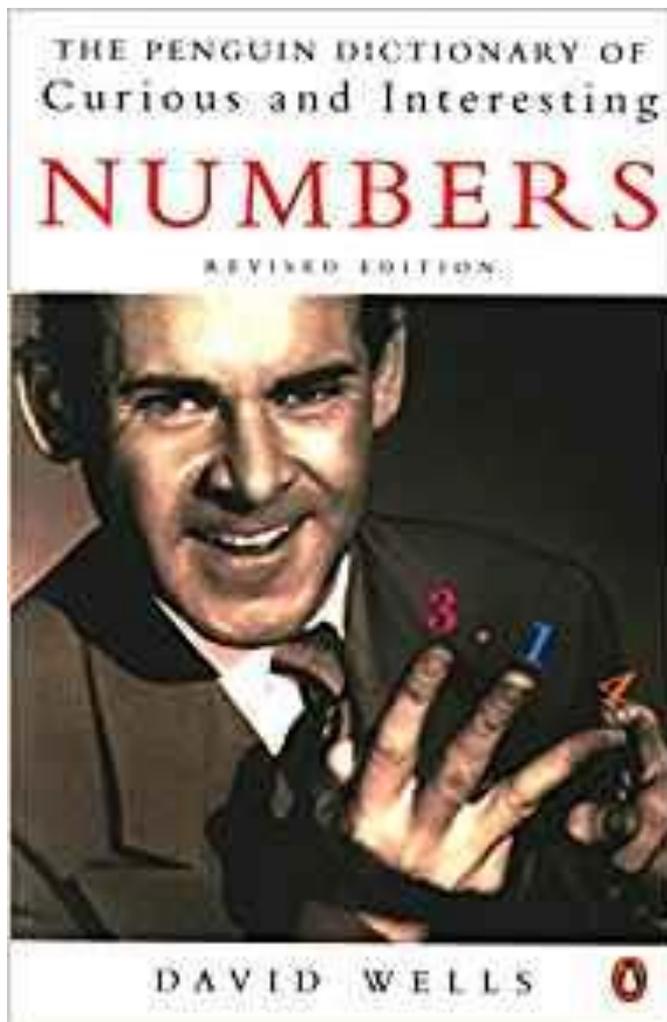
Age 14+

The Code Book is a history of man's urge to uncover the secrets of codes, from Egyptian puzzles to modern day computer encryptions. As in Fermat's Last Theorem, Simon Singh brings life to an astonishing story of puzzles, codes, languages and riddles that reveals man's continual pursuit to disguise and uncover, and to work out the secret languages of others. Codes have influenced events throughout history, both in the stories of those who make them and those who break them. The betrayal of Mary Queen of Scots and the cracking of the enigma code that helped the Allies in World War II are major episodes in a continuing history of cryptography. In addition to stories of intrigue and warfare, Simon Singh also investigates other codes, the unravelling of genes and the rediscovery of ancient languages and most tantalisingly, the Beale ciphers, an unbroken code that could hold the key to a 20 million dollar treasure.



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The Penguin Dictionary of Curious and Interesting Numbers by David Wells



Age 14+

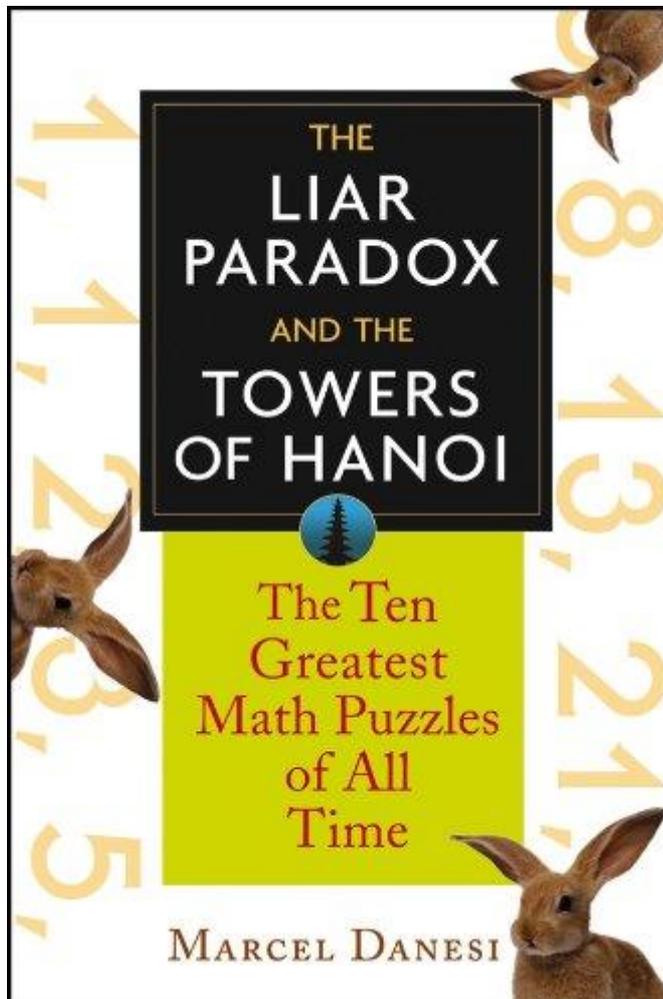
Look up 1729 to see why it is 'among the most famous of all numbers'. Look up $0.7404 (= \pi^{18})$ to discover that this is the density of closely packed identical spheres in what is believed by many mathematicians (though it was at that time an unproven hypothesis) and is known by all physicists and greengrocers to be the optimal packing. Look up Graham's number (the last one in the book), which is inconceivably big: even written as a tower of powers ($9^{9^{\dots}}$) it would take up far more ink than could be made from all the atoms in the universe. It is an upper bound for a quantity in Ramsey theory whose actual value is believed to be about 6. A book to be dipped into at leisure.



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Recreational

The Liar Paradox and the Towers of Hanoi: 10 Greatest Math Puzzles of All Time by Marcel Danesi



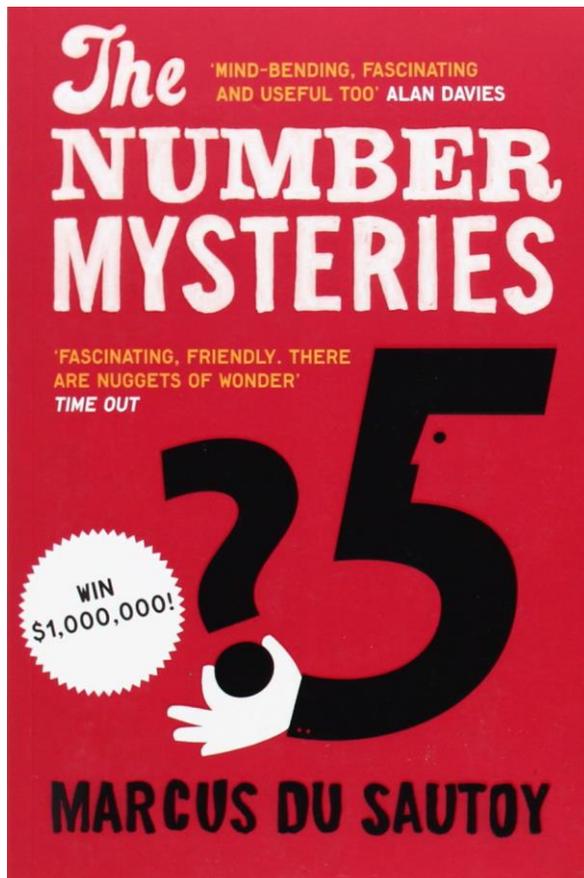
Age 14+

Ever since the Sphinx asked his legendary riddle of Oedipus, riddles, conundrums, and puzzles of all sizes have kept humankind perplexed and amused. *The Liar Paradox and the Towers of Hanoi* takes die-hard puzzle experts on a tour of the world's most enduringly intriguing braintwisters, from Königsberg's Bridges and the Hanoi Towers to Fibonacci's Rabbits, the Four Color Problem, and the Magic Square. Each chapter introduces the basic puzzle, discusses the mathematics behind it, and includes exercises and answers plus additional puzzles similar to the one under discussion. Here is a veritable kaleidoscope of puzzling labyrinths, maps, bridges, and optical illusions that will keep aficionados entertained for hours.



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The Number Mysteries by Marcus du Sautoy



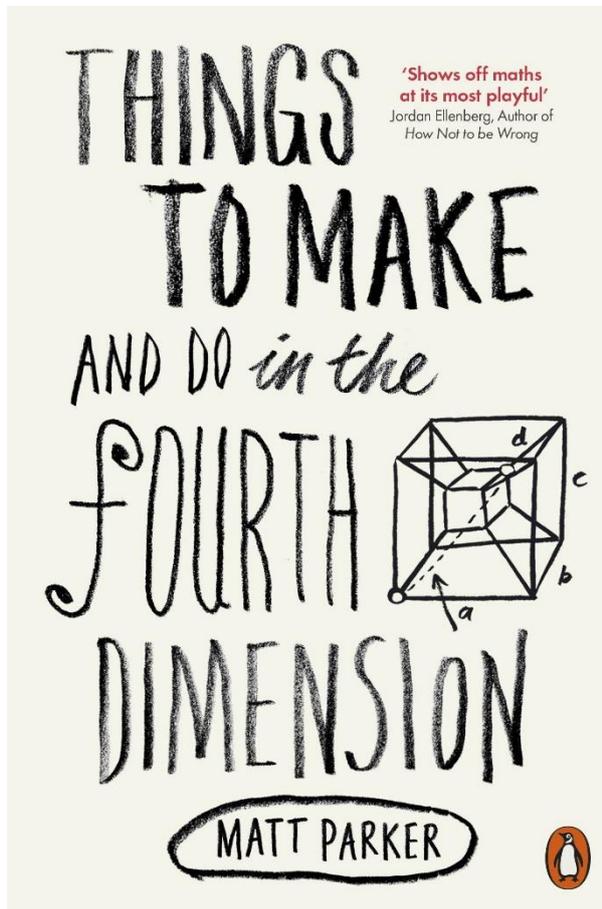
Age 14+

An exploration of surprising ways maths occurs in our everyday lives, centred around five famous unsolved problems in mathematics. Topics include how to detect an art forgery, winning strategies in Monopoly, and how to crack a code. Sprinkled with games and links to interactive online content so you can try out some of the ideas for yourself!



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Things to Make and Do in the Fourth Dimension by Matt Parker



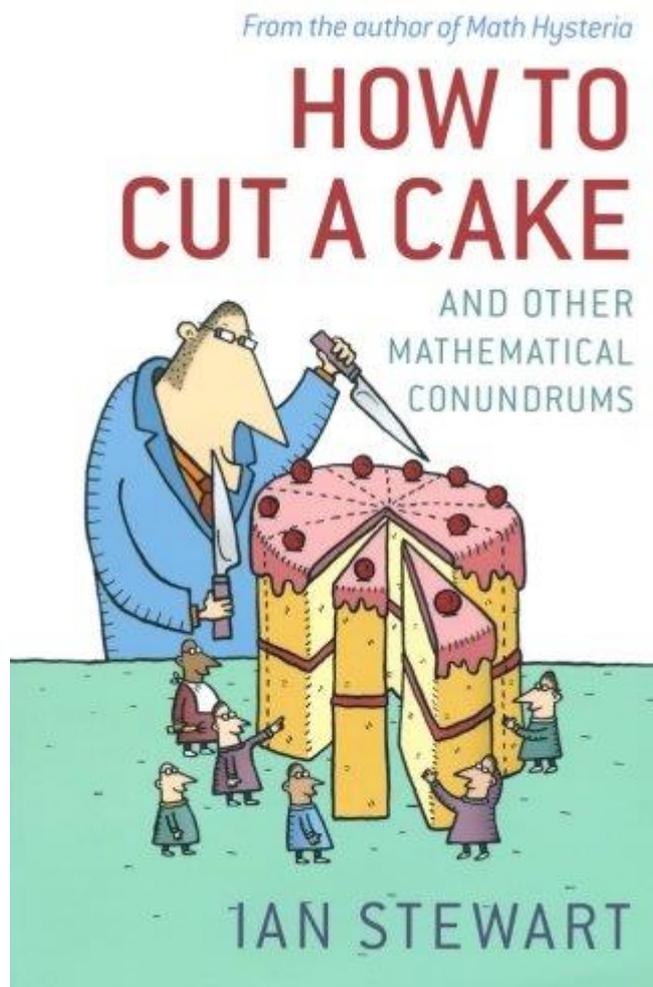
Age 14+

This is the complete guide to exploring the fascinating world of maths you were never told about at school. Stand-up comedian and mathematician Matt Parker uses bizarre Klein Bottles, unimaginably small pizza slices, knots no one can untie and computers built from dominoes to reveal some of the most exotic and fascinating ideas in mathematics. Starting with simple numbers and algebra, this book goes on to deal with inconceivably big numbers in more dimensions than you ever knew existed. And always with something for you to make or do along the way.



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How to Cut a Cake: and Other Mathematical Conundrums by Ian Stewart



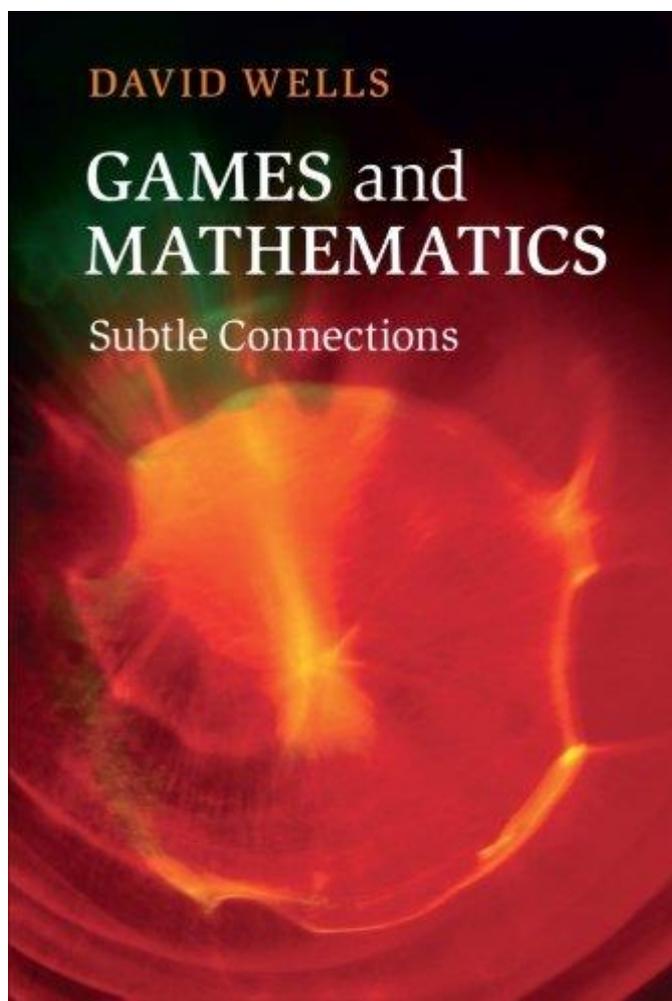
Age 14+

In this book are twenty more curious puzzles and fantastical mathematical stories from one of the world's most popular and accessible writers on mathematics. This is a strange world of never-ending chess games, empires on the moon, furious fireflies, and, of course, disputes over how best to cut a cake. Each chapter - with titles such as, "How to Play Poker By Post" and "Repealing the Law of Averages" - presents a fascinating mathematical puzzle that is challenging, fun, and introduces the reader to a significant mathematical problem in an engaging and witty way. Illustrated with clever and quirky cartoons, each tale will delight those who love puzzles and mathematical conundrums.



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Games and Mathematics by David Wells



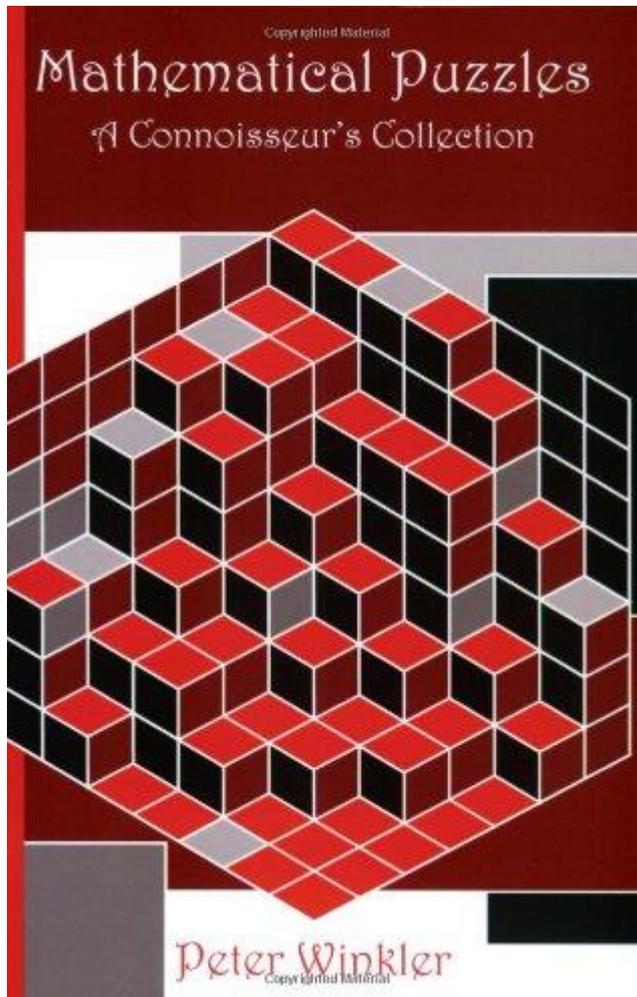
Age 14+

The appeal of games and puzzles is timeless and universal. In this book, David Wells explores the fascinating connections between games and mathematics, proving that mathematics is not just about tedious calculation but imagination, insight and intuition. The first part of the book introduces games, puzzles and mathematical recreations, including knight tours on a chessboard. The second part explains how thinking about playing games can mirror the thinking of a mathematician, using scientific investigation, tactics and strategy, and sharp observation. Finally the author considers game-like features found in a wide range of human behaviours, illuminating the role of mathematics and helping to explain why it exists at all. This thought-provoking book is perfect for anyone with a thirst for mathematics and its hidden beauty; a good high school grounding in mathematics is all the background that is required, and the puzzles and games will suit pupils from 14 years.



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Mathematical Puzzles: A Connoisseur's Collection by Peter Winkler



Age 16+

Collected over several years by Peter Winkler, dozens of elegant, intriguing challenges are presented in this book. The answers are easy to explain, but without this book, devilishly hard to find. Creative reasoning is the key to these puzzles. No involved computation or higher mathematics is necessary, but your ability to construct a mathematical proof will be severely tested - even if you are a professional mathematician. For the truly adventurous, there is even a chapter on unsolved puzzles.

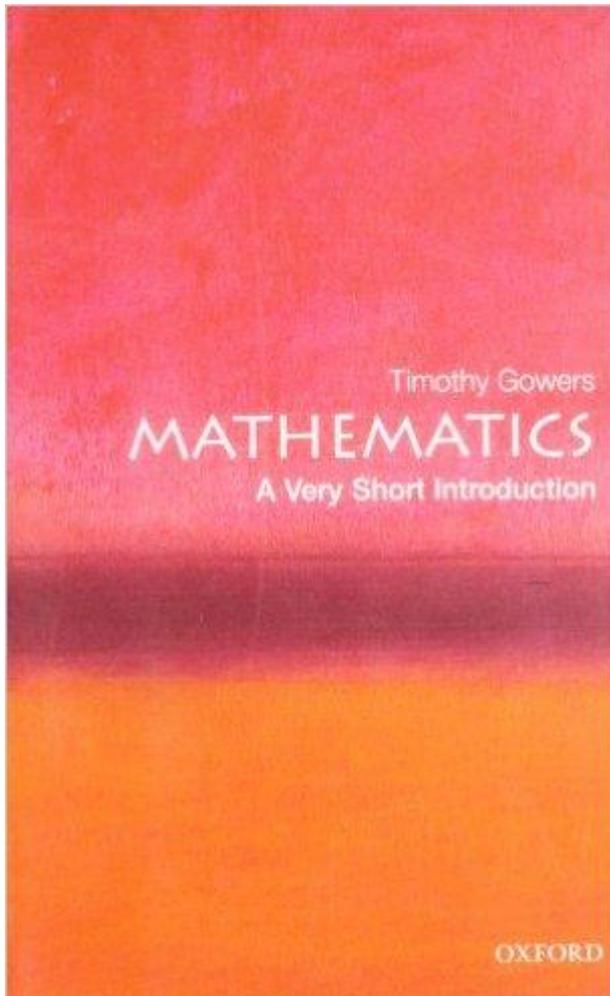


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Mathematics: A Very Short Introduction by Timothy Gowers



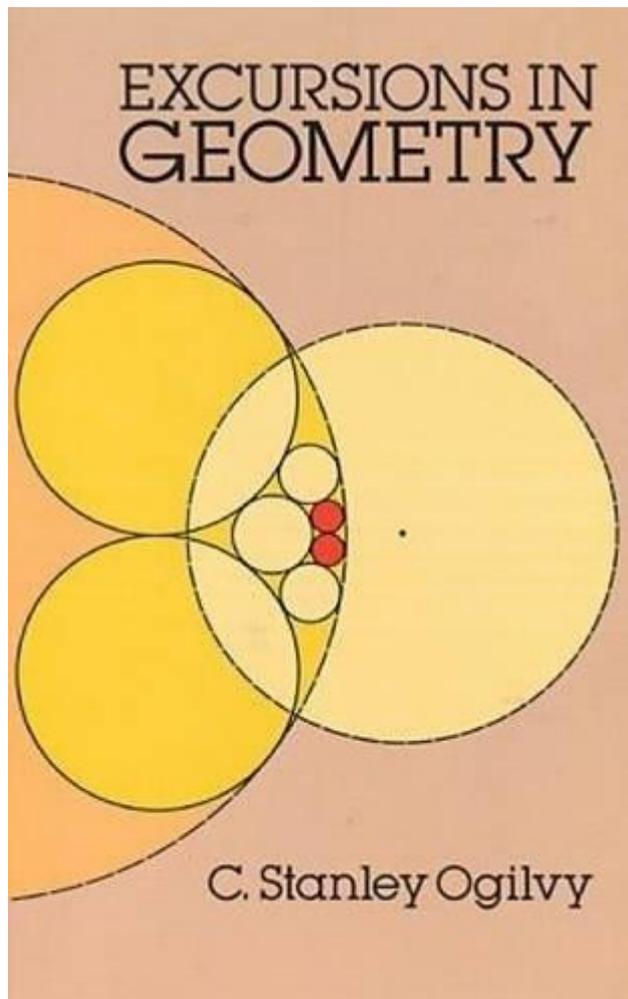
Age 14+

Tim Gowers is a Fields Medalist (the Fields medal is the mathematical equivalent of the Nobel prize), so it is not at all surprising that what he writes is worth reading. What is surprising is the ease and charm of his writing. He touches lightly many areas of mathematics, some that will be familiar (Pythagoras) and some that may not be (manifolds) and has something illuminating to say about all of them.



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Excursions in Geometry by C. Stanley Ogilvy



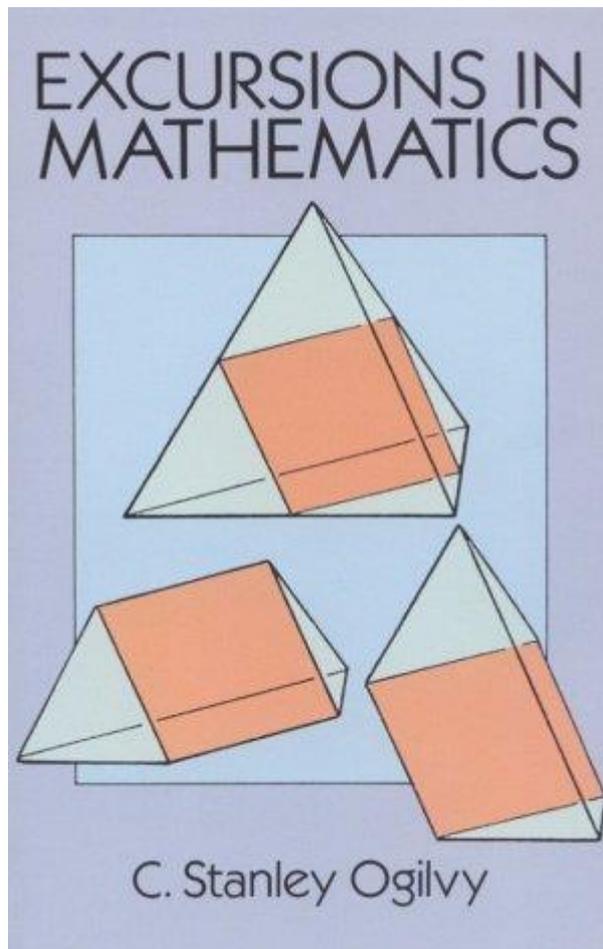
Age 14+

In this book, Professor Ogilvy demonstrates the mathematical challenge and satisfaction to be had from geometry, the only requirement being two simple implements (straight-edge and compass) and a little thought. Topics including harmonic division and Apollonian circles, inversive geometry, the hexlet, conic sections, projective geometry, the Golden Section and angle trisection are addressed in a way that brings out the true intellectual excitement inherent in each. Also included are some unsolved problems of modern geometry.



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Excursions in Mathematics by C. Stanley Ogilvy



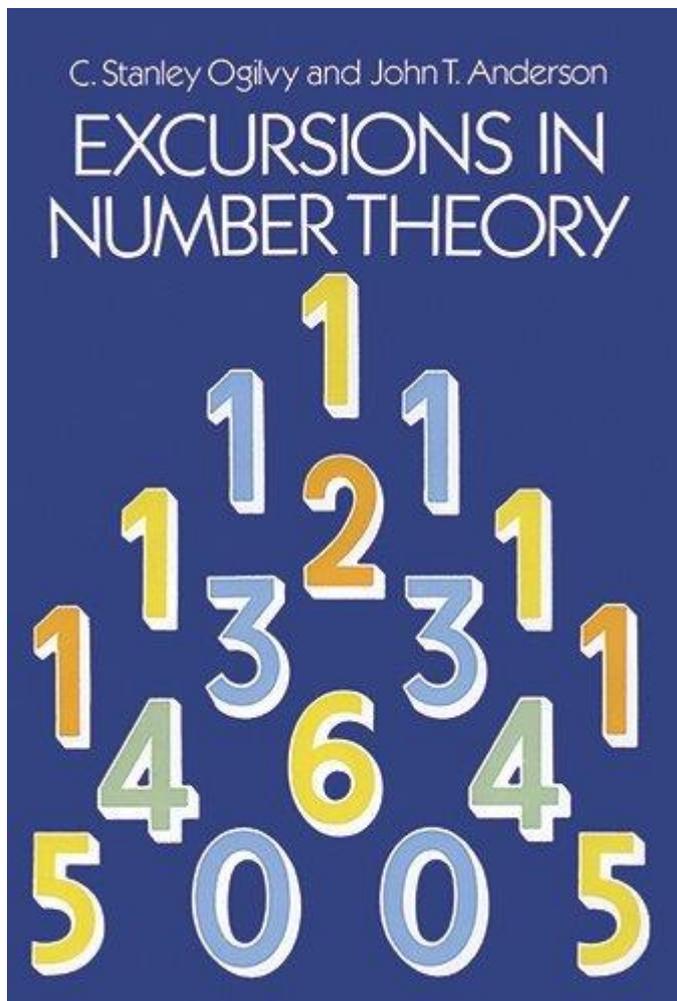
Age 14+

This book offers a fascinating glimpse into the world of mathematics and mathematicians. It is designed for the reader who has no advanced mathematical background or special aptitude, but who wants to acquaint him or herself with the intellectually stimulating and aesthetically satisfying aspects of the subject. After illuminating the role of the mathematician and dispelling several popular misconceptions about the nature of mathematics, Professor Ogilvy takes you on a lively tour of the four basic branches of the subject: number theory, algebra, geometry and analysis. Focusing on the interesting, and even amusing, aspects of mathematics, he points out the interconnections between the branches and presents mathematics as a vital subject whose frontiers are continually expanding. Many illustrations and examples illuminate classic aspects of the subject as well as recent advances.



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Excursions in Number Theory by C. Stanley Ogilvy and John Anderson



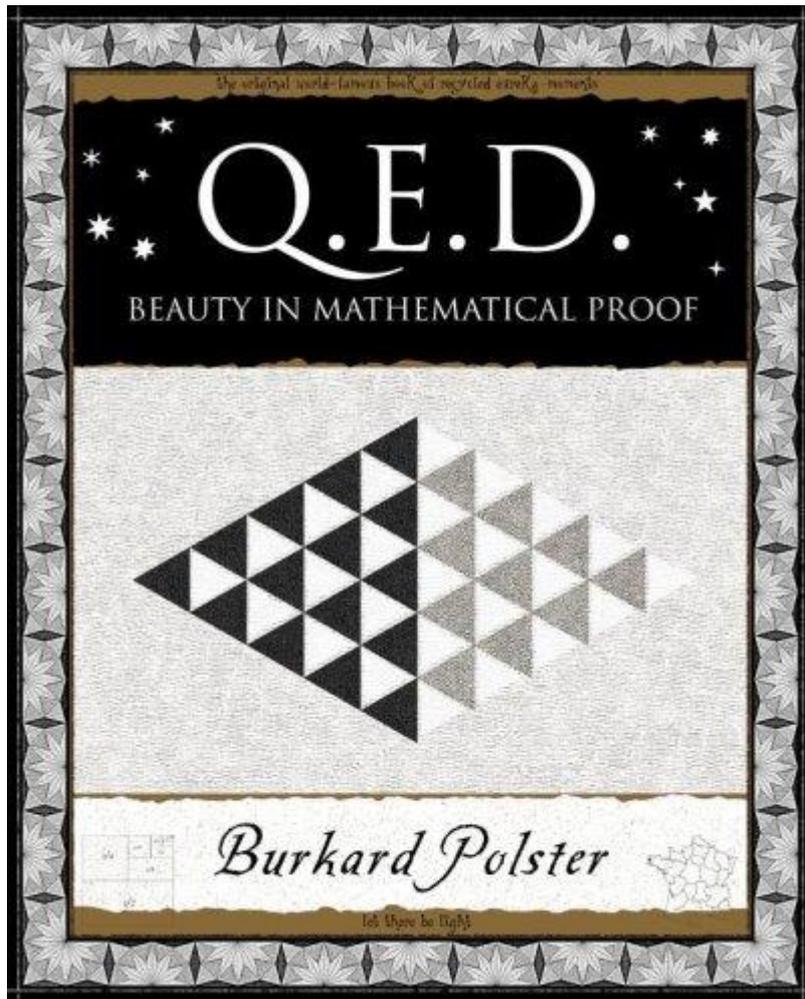
Age 14+

This delightful volume, by two well-known mathematicians, invites readers to join a challenging expedition into the mystery and magic of number theory. No special training is needed - just high school mathematics, a fondness for figures and an inquisitive mind. Beginning with familiar notions, the authors skillfully transport the reader to higher realms of mathematics, developing the necessary concepts along the way. Included are thorough discussions of prime numbers, number patterns, irrationals and iterations and calculating prodigies, among other topics.



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Q.E.D. - Beauty in Mathematical Proof by Burkard Polster



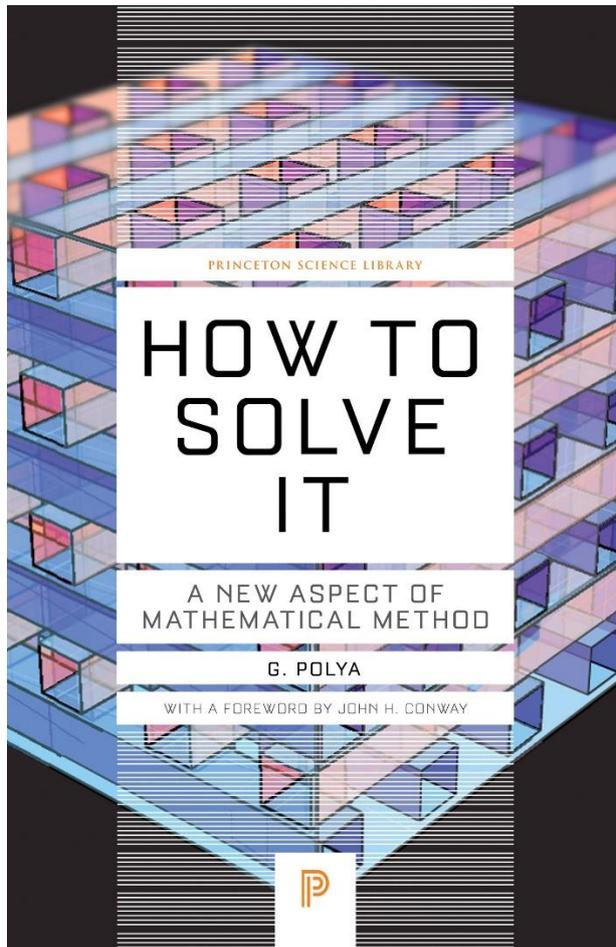
Age 14+

Which famous proof did Archimedes inscribe on his tombstone? How and why do knots make perfect pentagons? Have you ever seen a proof so completely that it is just obvious? In this delicious little book, top down-under mathemagician Dr. Polster presents many of the most visually intuitive and exciting proofs from the dusty annuals of mathematical history. You can test your ability to follow the logic, leap into mathemagnosis and experience eureka-moment after eureka-moment.



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How to Solve It by George Polya



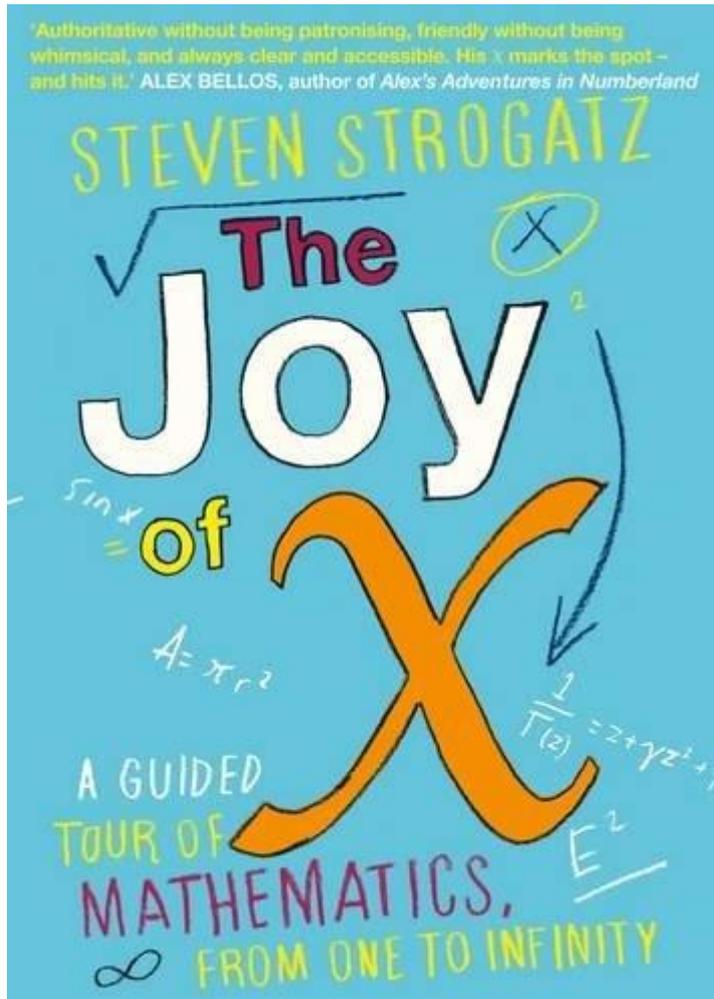
Age 14+

A perennial bestseller by eminent mathematician G. Polya, *How to Solve It* will show anyone in any field how to think straight. In lucid and appealing prose, Polya reveals how the mathematical method of demonstrating a proof or finding an unknown can be of help in attacking any problem that can be "reasoned" out - from building a bridge to winning a game of anagrams. Generations of readers have relished Polya's deft - indeed, brilliant - instructions on stripping away irrelevancies and going straight to the heart of the problem.



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The Joy of X: A Guided Tour of Mathematics from One to Infinity by Steven Strogatz



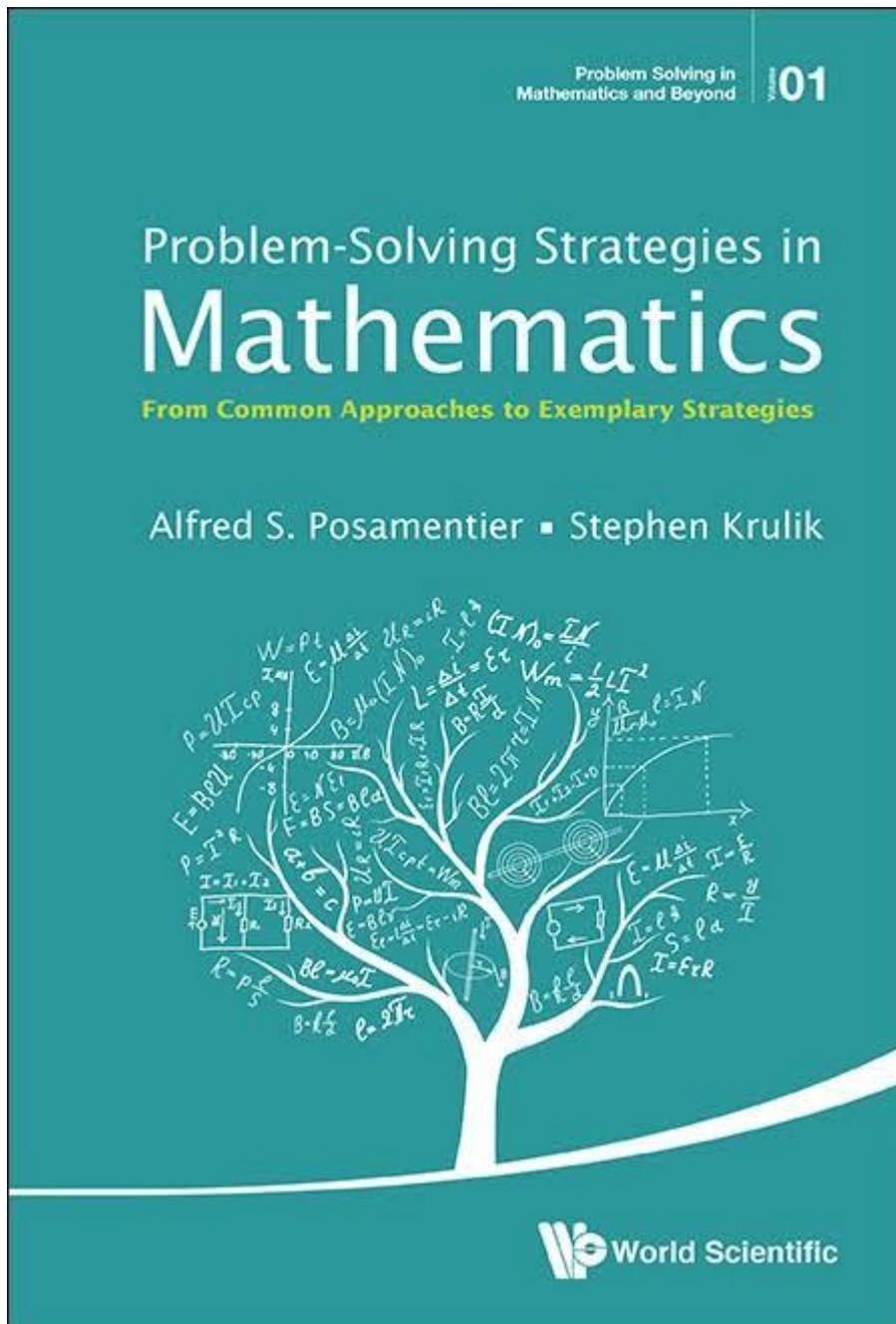
Age 14+

Maths is everywhere, often where we don't even realise. Award-winning professor Steven Strogatz acts as our guide as he takes us on a tour of numbers that - unbeknownst to the uninitiated - connect pop culture, literature, art, philosophy, current affairs, business and even every day life. In *The Joy of X*, Strogatz explains the great ideas of maths - from negative numbers to calculus, fat tails to infinity - with clarity, wit and insight. He is the maths teacher you never had and this book is perfect for the smart and curious, the expert and the beginner.



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Problem-Solving Strategies In Mathematics: From Common Approaches To Exemplary Strategies by Alfred S Posamentier and Stephen Krulik



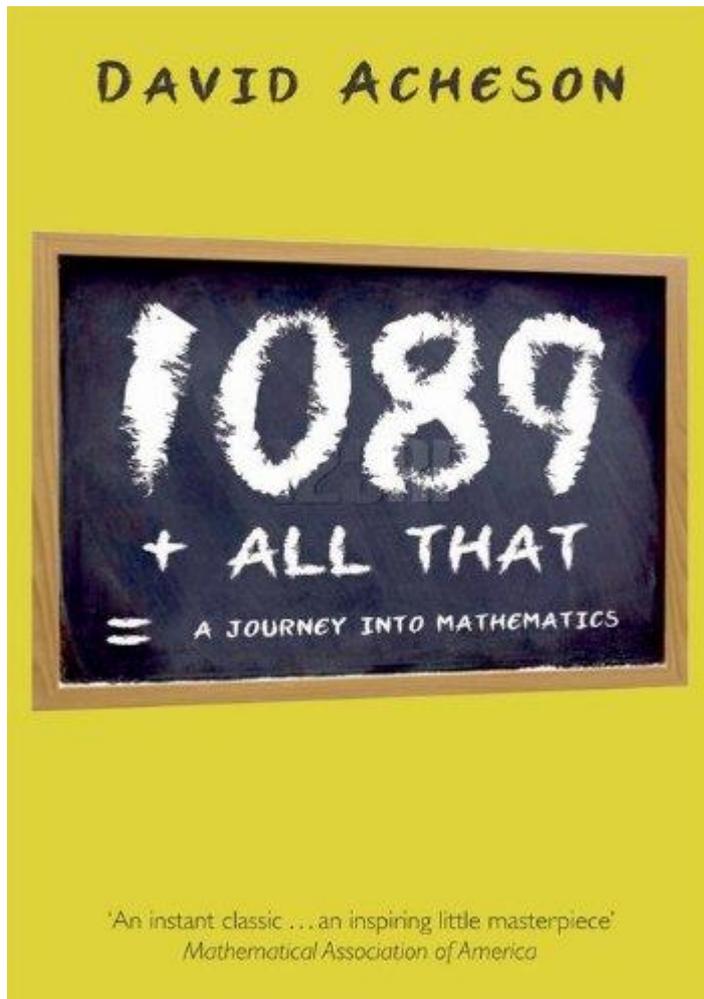
Age 15+

This book introduces ten problem-solving strategies by first presenting the strategy and then applying it to problems in elementary mathematics. In so doing, the common less efficient approach is first mentioned and then the effective strategy is shown. Elementary mathematics is used so that the reader can focus on the strategy and not be distracted by some more sophisticated mathematics.



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1089 and All That: A Journey into Mathematics by David Acheson



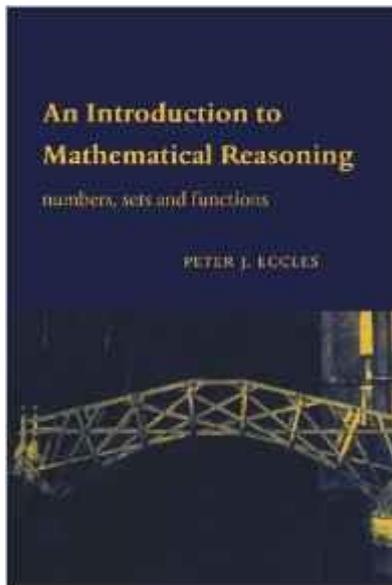
Age 15+

David Acheson's extraordinary little book makes mathematics accessible to everyone. From very simple beginnings he takes us on a thrilling journey to some deep mathematical ideas. On the way, via Kepler and Newton, he explains what calculus really means, gives a brief history of pi, and even takes us to chaos theory and imaginary numbers. Every short chapter is carefully crafted to ensure that no one will get lost on the journey. Packed with puzzles and illustrated by world famous cartoonists, this is one of the most readable and imaginative books on mathematics ever written.



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An Introduction to Mathematical Reasoning by Peter Eccles



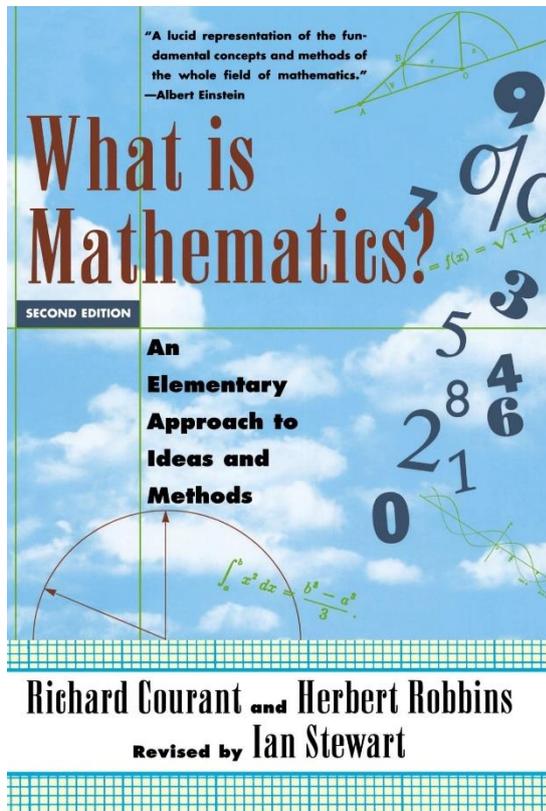
Age 15+

The purpose of this book is to introduce the basic ideas of mathematical proof to students. The emphasis is on helping the reader in understanding and constructing proofs and writing clear mathematics. This is achieved by exploring set theory, combinatorics and number theory, topics which include many fundamental ideas which are part of the tool kit of any mathematician. This material illustrates how familiar ideas can be formulated rigorously, provides examples demonstrating a wide range of basic methods of proof, and includes some of the classic proofs.



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What is Mathematics? by Richard Courant, Herbert Robbins and Ian Stewart



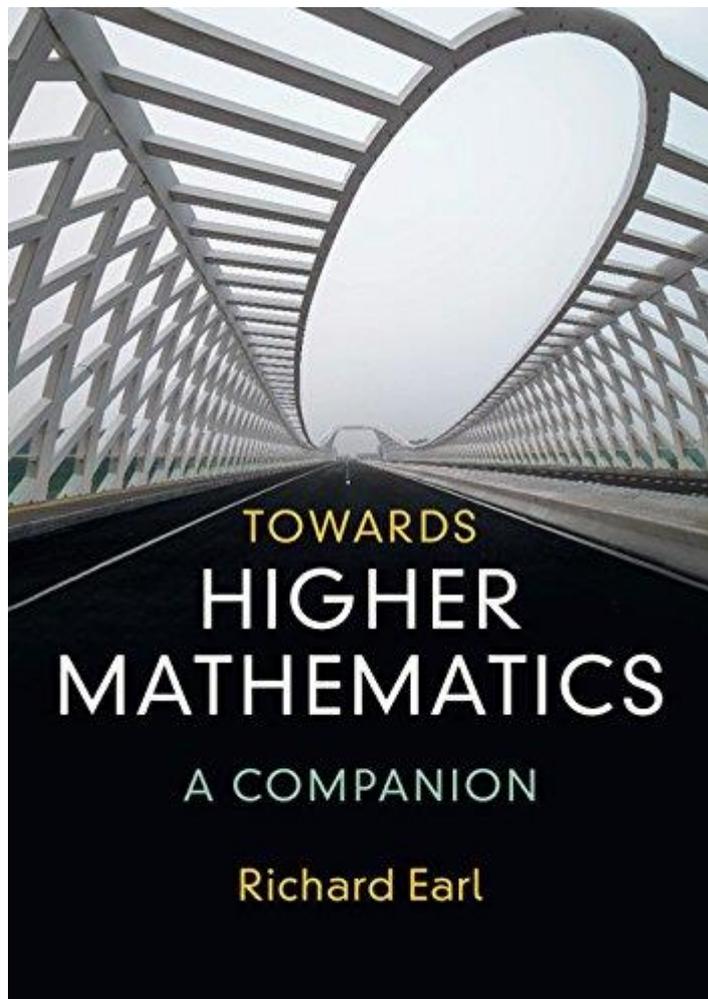
Age 16+

Written for beginners and scholars, for students and teachers, for philosophers and engineers, this book is a sparkling collection of mathematical gems that offers an entertaining and accessible portrait of the mathematical world. Covering everything from natural numbers and the number system to geometrical constructions and projective geometry, this fascinating survey allows readers to delve into mathematics as an organic whole rather than an empty drill in problem solving. With chapters largely independent of one another and sections that lead upward from basic to more advanced discussions, readers can easily pick and choose areas of particular interest without impairing their understanding of subsequent parts.



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Towards Higher Mathematics: A Companion by Richard Earl



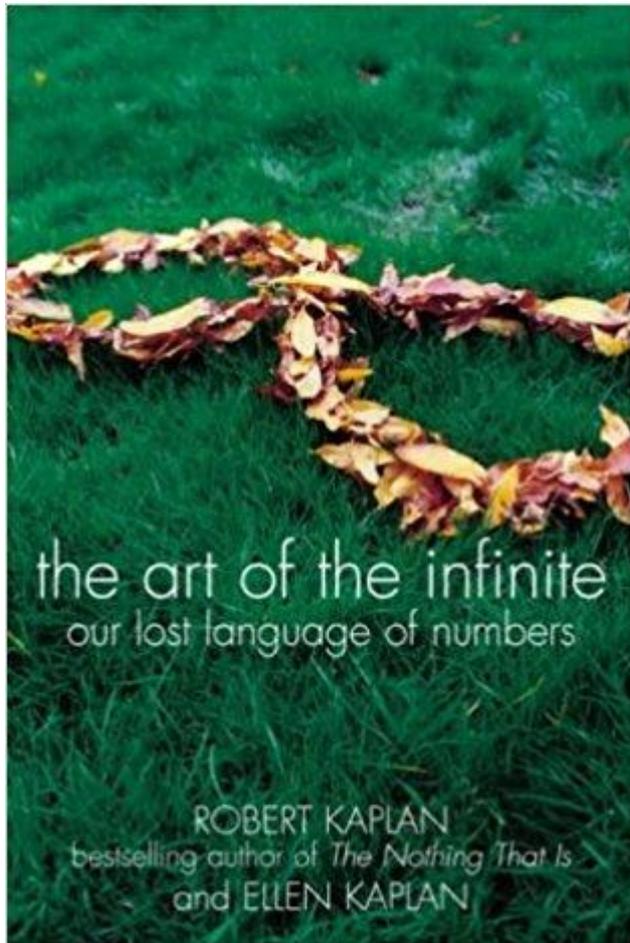
Age 16+

Containing a large and varied set of problems, this rich resource will allow students to stretch their mathematical abilities beyond the school syllabus, and bridge the gap to university-level mathematics. Many proofs are provided to better equip students for the transition to university. The author covers substantial extension material using the language of sixth-form mathematics, thus enabling students to understand the more complex material. There are over 1500 carefully graded exercises, with hints included in the text, and solutions available online. Historical and contextual asides highlight each area of mathematics and show how it has developed over time.



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The Art of the Infinite by Robert and Ellen Kaplan



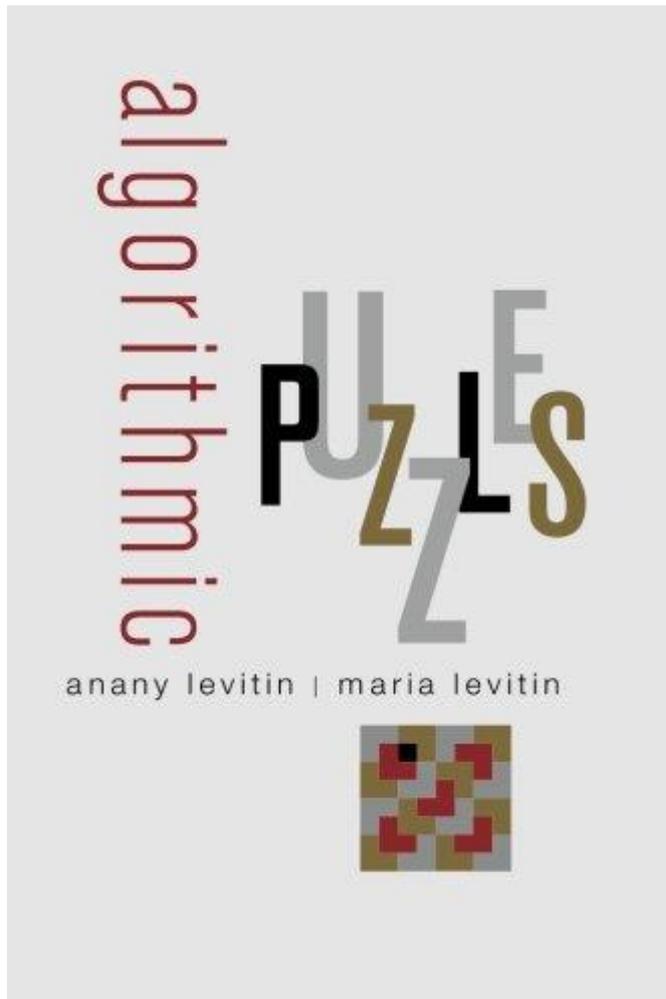
Age 16+

This book unlocks the secrets of maths - revealing it to be our lost, native language, as much a part of us as the words we use every day. Number and form are the essence of our world: from the patterns of the stars to the pulses of the market, from the beats of our hearts to catching a ball or tying our shoelaces. Drawing on science, literature, history and philosophy, this book makes the rich patterns of maths brilliantly clear.



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Algorithmic Puzzles by Anany & Maria Levitin



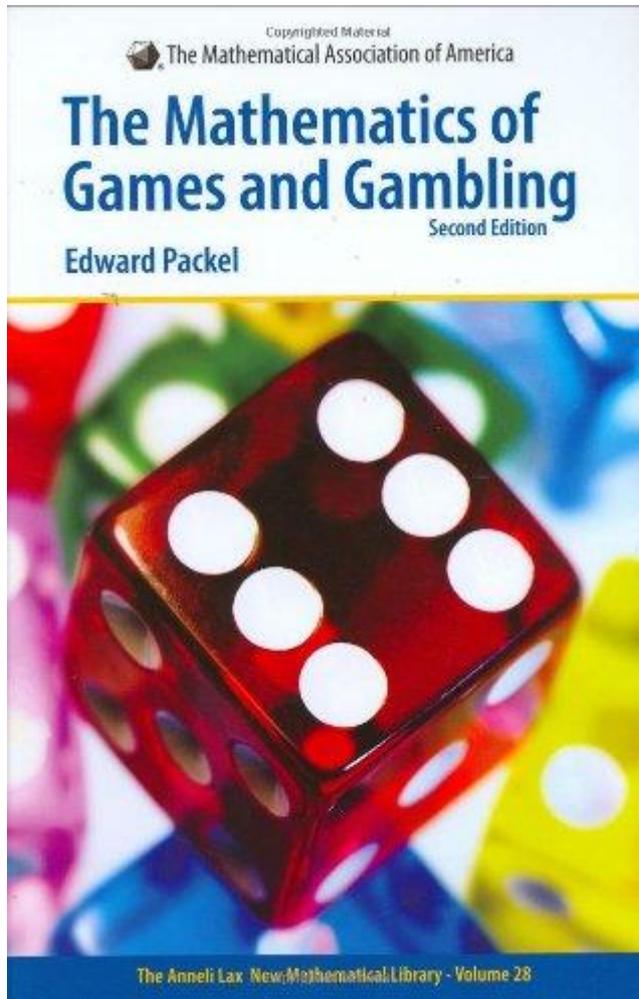
Age 16+

In this book, Anany and Maria Levitin use many classic brainteasers as well as newer examples from job interviews with major corporations to show readers how to apply analytical thinking to solve puzzles requiring well-defined procedures. The book's unique collection of puzzles is supplemented with carefully developed tutorials on algorithm design strategies and analysis techniques intended to walk the reader step-by-step through the various approaches to algorithmic problem solving. Mastery of these strategies - exhaustive search, backtracking, and divide-and-conquer, among others - will aid the reader in solving not only the puzzles contained in this book, but also others encountered in interviews, puzzle collections, and throughout everyday life. Each of the 150 puzzles contains hints and solutions, along with commentary on the puzzle's origins and solution methods. Readers with only middle school mathematics will develop their algorithmic problem-solving skills through puzzles at the elementary level, while seasoned puzzle solvers will enjoy the challenge of thinking through more difficult puzzles.



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The Mathematics of Games and Gambling by Edward Packel



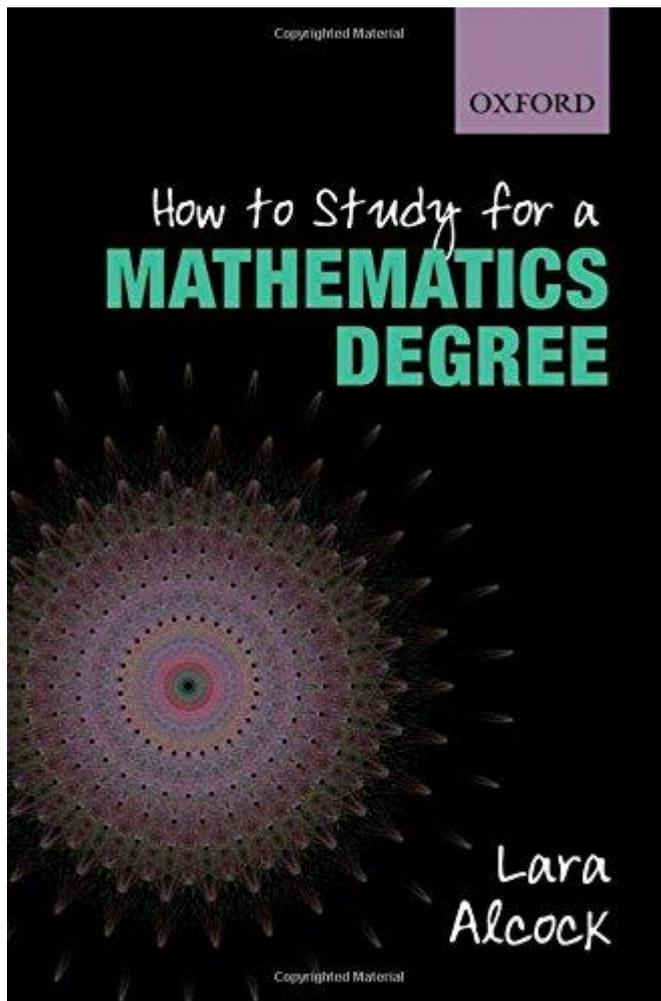
Age 16+

This book introduces and develops some of the important and beautiful elementary mathematics needed for rational analysis of various gambling and game activities. Most of the standard casino games (roulette, craps, blackjack, keno), some social games (backgammon, poker, bridge) and various other activities (state lotteries, horse racing) are treated in ways that bring out their mathematical aspects. The mathematics developed ranges from the predictable concepts of probability, expectation, and binomial coefficients to some less well-known ideas of elementary game theory. Game-related exercises are included and solutions to some appear at the end of the book.



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How to Study for a Mathematics Degree by Lara Alcock



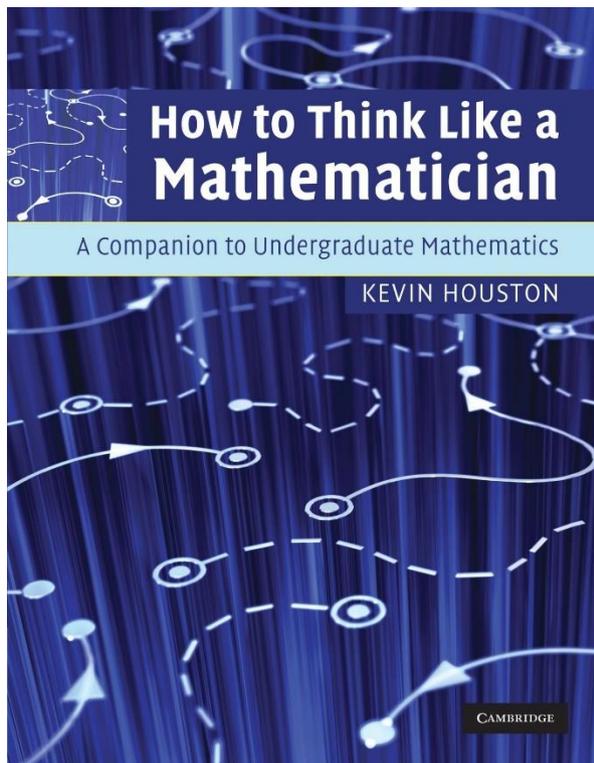
Age 17+

Every year, thousands of students go to university to study mathematics. Many of these students are extremely intelligent and hardworking, but even the best will, at some point, struggle with the demands of making the transition to advanced mathematics. The mathematics shifts in focus from calculation to proof, so students are expected to interact with it in different ways. These changes need not be mysterious - mathematics education research has revealed many insights into the adjustments that are necessary - but they are not obvious and they do need explaining. This book translates these research-based insights into practical advice for a student audience. It covers every aspect of studying for a mathematics degree, from the most abstract intellectual challenges to the everyday business of interacting with lecturers and making good use of study time.



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How to Think Like a Mathematician by Kevin Houston



Age 17+

Looking for a head start in your undergraduate degree in mathematics? This friendly companion will ease your transition to real mathematical thinking. Working through the book you will develop an arsenal of techniques to help you unlock the meaning of definitions, theorems and proofs, solve problems, and write mathematics effectively. All the major methods of proof - direct method, cases, induction, contradiction and contrapositive - are featured. Concrete examples are used throughout, and you'll get plenty of practice on topics common to many courses such as divisors, Euclidean algorithms, modular arithmetic, equivalence relations, and injectivity and surjectivity of functions. With over 300 exercises to help you test your progress, you'll soon learn how to think like a mathematician.



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