

Maths

Recommended Reading List



Check out the Maths department's list of recommended reads

KS3

50 Mathematical Ideas You Really Need to Know by Tony Crilly

In this book, Professor Tony Crilly explains in 50 clear and concise essays the mathematical concepts - ancient and modern, theoretical and practical, everyday and esoteric - that allow us to understand and shape the world around us. Packed with diagrams, examples and anecdotes, this book is the perfect overview of this often daunting but always essential subject. For once, mathematics couldn't be simpler.

The Math Book by Clifford A Pickover

Mathematics' infinite mysteries and beauty unfold in this book. Beginning millions of years ago with ancient ant odometers and moving through time to our modern-day quest for new dimensions, prolific polymath Clifford Pickover covers 250 milestones in mathematical history. Among the numerous concepts readers will encounter as they dip into this inviting anthology: cicada-generated prime numbers, magic squares, the discovery of pi and calculus, and the butterfly effect. Each topic is presented in a lavishly illustrated spread, including formulas, fascinating facts about scientists' lives and real-world applications of the theorems.

Alex's Adventures in Numberland by Alex Bellos

The world of maths can seem mind-boggling, irrelevant and, sometimes, boring. This groundbreaking book reclaims maths from the geeks. Mathematical ideas underpin just about everything in our lives: from the surprising geometry of the 50p piece to how probability can help you win in any casino. In search of weird and wonderful mathematical phenomena, Alex Bellos travels across the globe and meets the world's fastest mental calculators in Germany and a startlingly numerate chimpanzee in Japan. Packed with fascinating, eye-opening anecdotes, Alex's Adventures in Numberland is an exhilarating cocktail of history, reportage and mathematical proofs that will leave you awestruck.

KS4

The Monty Hall Problem: Beyond Closed Doors by Rob Deaves

This short book explores the Monty Hall dilemma, a well known mathematical puzzle. The original problem, the controversy surrounding it and its solution are discussed. Further, the boundaries of the problem are expanded to consider prior knowledge and host intention. This book should be of interest to those who enjoy problem solving.

The Language of Mathematics by Keith Devlin

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.

The Music of the Primes by Marcus Du Sautoy

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

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.

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

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.

Chaos by James Gleick

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.

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

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.

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

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.

Fermat's Last Theorem by Simon Singh

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.

The Code Book by Simon Singh

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.

The Penguin Dictionary of Curious and Interesting Numbers by David Wells

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 (999...) 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.

The Number Mysteries by Marcus du Sautoy

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!

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

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.

KS5

Gödel, Escher, Bach: An Eternal Golden Braid by Douglas Hofstadter

Douglas Hofstadter's book is concerned directly with the nature of maps or links between formal systems. However, according to Hofstadter, the formal system that underlies all mental activity transcends the system that supports it. If life can grow out of the formal chemical substrate of the cell, if consciousness can emerge out of a formal system of firing neurons, then so too will computers attain human intelligence. Gödel, Escher, Bach is a wonderful exploration of fascinating ideas at the heart of cognitive science: meaning, reduction, recursion, and much more.

The Great Mathematical Problems by Ian Stewart

There are some mathematical problems whose significance goes beyond the ordinary - like Fermat's Last Theorem or Goldbach's Conjecture - they are the enigmas which define mathematics. This book explains why these problems exist, why they matter, what drives mathematicians to incredible lengths to solve them and where they stand in the context of mathematics and science as a whole. It contains solved problems - like the Poincaré Conjecture, cracked by the eccentric genius Grigori Perelman, who refused academic honours and a million-dollar prize for his work, and problems which, like the Riemann Hypothesis, remain baffling after centuries. Stewart is the guide to this mysterious and exciting world, showing how modern mathematicians constantly rise to the challenges set by their predecessors, as the great mathematical problems of the past succumb to the new techniques and ideas of the present.

Mathematical Puzzles: A Connoisseur's Collection by Peter Winkler

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.

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

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.

Towards Higher Mathematics: A Companion by Richard Earl

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.

The Art of the Infinite by Robert and Ellen Kaplan

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.

The Mathematics of Games and Gambling by Edward Packel

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.

How to Think Like a Mathematician by Kevin Houston

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.