Calculating The Cosmos How Mathematics Unveils The Universe

Professor Stewart's Hoard of Mathematical TreasuresA History of MathematicsWeird MathIs God a Mathematician?Our Mathematical UniverseDo Dice Play God?The Joy of xAn Introduction to Mathematical CosmologySignificant FiguresNature's NumbersConcise Handbook of Mathematics and PhysicsCelestial CalculationsThe Fabric of the CosmosBeyond InfinitySingularity Theory and Gravitational LensingGeometry with an Introduction to Cosmic TopologyProfessor Stewart's Incredible NumbersIn Pursuit of the UnknownMeasuring the UniverseFractal CosmosUntil the End of TimeThe Mathematics of LoveCalculating the CosmosUniversalThe Magic of MathInfinite PowersThe Doomsday CalculationWhy Beauty Is TruthA Most Elegant EquationLove and MathThe Knot BookMusic by the NumbersCosmic NumbersPoetry of the UniverseVisions of InfinityThe Universe Speaks in NumbersThe Mathematics of LifeMeasuring the CosmosThe Universe and the TeacupThe Cosmic Calculator

Professor Stewart's Hoard of Mathematical Treasures

At its heart, mathematics is about numbers, our fundamental tools for understanding the world. In

Professor Stewart's Incredible Numbers, Ian Stewart offers a delightful introduction to the numbers that surround us, from the common (Pi and 2) to the uncommon but no less consequential (1.059463 and 43,252,003,274,489,856,000). Along the way, Stewart takes us through prime numbers, cubic equations, the concept of zero, the possible positions on the Rubik's Cube, the role of numbers in human history, and beyond! An unfailingly genial guide, Stewart brings his characteristic wit and erudition to bear on these incredible numbers, offering an engaging primer on the principles and power of math.

A History of Mathematics

States that the mental construct of mathematics can provide humankind with a key tool to understanding the world, and discusses the implications of basic math concepts

Weird Math

Concise Handbook of Mathematics and Physics presents a unified and coherent treatment of all the major aspects of modern elementary physics and mathematics. This complete text/reference includes definitions of fundamental notations and physical and mathematical quantities, formulas that express the laws of physics, axioms and theorems of mathematics, and more. The information is organized logically (instead of alphabetically) for better comprehension and quick, convenient access. The book contains extensive cross-referencing between

the mathematical and physical sections. reflecting the considerable overlap between these two areas of study and increasing the usefulness of this handbook. Fundamental concepts, theorems, and laws are demonstrated through numerous practical examples and tasks to help build problem-solving skills.

Is God a Mathematician?

Humans have always viewed the heavens with wonder and awe. The skies have inspired reflection on the vastness of space, the wonder of creation, and humankind's role in the universe. In just over one hundred years, science has moved from almost total ignorance about the actual distances to the stars and earth's place in the galaxy to our present knowledge about the enormous size, mass, and age of the universe. We are reaching the limits of observation, and therefore the limits of human understanding. Beyond lies only our imagination, seeded by the theories of physics. In Measuring the Cosmos, science writers David and Matthew Clark tell the stories of both the well-known and the unsung heroes who played key roles in these discoveries. These true accounts reveal ambitions, conflicts, failures, as well as successes, as the astonishing scale and age of the universe were finally established. Few areas of scientific research have witnessed such drama in the form of ego clashes, priority claims, or failed (or even falsified) theories as that resulting from attempts to measure the universe. Besides giving credit where long overdue, Measuring the Cosmos explains the science behind these achievements in accessible

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language sure to appeal to astronomers, science buffs, and historians.

Our Mathematical Universe

The remarkable system of Vedic mathematics was created after careful study of ancient Sanskrit texts early last century. The Vedic system with its direct, easy and flexible approach forms a complete system of mental mathematics (though the methods can also be written down) and brings out the naturally coherent and unified structure of mathematics. Many of the features and techniques of this unique system are truly amazing in their efficiency and originality. Being a mental system, Vedic Mathematics encourages creativity and innovation. Mental mathematics increases mental agility, improves memory, the ability to hold ideas in the mind and promotes confidence, as well as being of great practical use. This course consists of three textbooks an Answer Book and a Teacher's Guide. The course is aimed at 11-14 year old pupils though some of it is very suitable for children from 8 years. Vedic Mathematics is being taught in many schools world-wide with great success: many top mathematics prizes have been won by students of this system. Contents Foreword, Introduction, Vedic Mathematics Sutras, Sub-Sutras, Recurring Decimals, Formulae, Squares, Cubes and Roots, Straight Division, Equations, Polygons, Similar Figures, The Musical Scale, nets and Networks, The Vedic Square, Probability, Pie, Volumes of Prisms and Pyramids, Parabolic Curves, Sequences, Loci, Motion, Auxiliary

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Fractions, Surveys, Codes Vectors, Simultaneous Equations, Divisibility and Simple Osculators, Square Roots, Quadratic Equations, Pythagoras' Theorem, Triples, Proof, Coordinate Geometry, The Platonic Solids, Historical Notes.

Do Dice Play God?

An awesome, globe-spanning, and New York Times best-selling journey through the beauty and power of mathematics What if you had to take an art class in which you were only taught how to paint a fence? What if you were never shown the paintings of van Gogh and Picasso, weren't even told they existed? Alas, this is how math is taught, and so for most of us it becomes the intellectual equivalent of watching paint dry. In Love and Math, renowned mathematician Edward Frenkel reveals a side of math we've never seen, suffused with all the beauty and elegance of a work of art. In this heartfelt and passionate book, Frenkel shows that mathematics, far from occupying a specialist niche, goes to the heart of all matter, uniting us across cultures, time, and space. Love and Math tells two intertwined stories: of the wonders of mathematics and of one young man's journey learning and living it. Having braved a discriminatory educational system to become one of the twenty-first century's leading mathematicians, Frenkel now works on one of the biggest ideas to come out of math in the last 50 years: the Langlands Program. Considered by many to be a Grand Unified Theory of mathematics, the Langlands Program enables researchers to translate findings from one field to

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another so that they can solve problems, such as Fermat's last theorem, that had seemed intractable before. At its core, Love and Math is a story about accessing a new way of thinking, which can enrich our lives and empower us to better understand the world and our place in it. It is an invitation to discover the magic hidden universe of mathematics.

The Joy of x

A prize-winning popular science writer uses mathematical modeling to explain the cosmos. In Calculating the Cosmos, Ian Stewart presents an exhilarating guide to the cosmos, from our solar system to the entire universe. He describes the architecture of space and time, dark matter and dark energy, how galaxies form, why stars implode, how everything began, and how it's all going to end. He considers parallel universes, the fine-tuning of the cosmos for life, what forms extraterrestrial life might take, and the likelihood of life on Earth being snuffed out by an asteroid. Beginning with the Babylonian integration of mathematics into the study of astronomy and cosmology, Stewart traces the evolution of our understanding of the cosmos: How Kepler's laws of planetary motion led Newton to formulate his theory of gravity. How, two centuries later, tiny irregularities in the motion of Mars inspired Einstein to devise his general theory of relativity. How, eighty years ago, the discovery that the universe is expanding led to the development of the Big Bang theory of its origins. How single-point origin and expansion led cosmologists to theorize new

components of the universe, such as inflation, dark matter, and dark energy. But does inflation explain the structure of today's universe? Does dark matter actually exist? Could a scientific revolution that will challenge the long-held scientific orthodoxy and once again transform our understanding of the universe be on the way? In an exciting and engaging style, Calculating the Cosmos is a mathematical quest through the intricate realms of astronomy and cosmology.

An Introduction to Mathematical Cosmology

An award-winning science writer introduces us to mathematics using the extraordinary equation that unites five of mathematics' most important numbers Bertrand Russell wrote that mathematics can exalt "as surely as poetry." This is especially true of one equation: $ei(pi) + 1 = 0$, the brainchild of Leonhard Euler, the Mozart of mathematics. More than two centuries after Euler's death, it is still regarded as a conceptual diamond of unsurpassed beauty. Called Euler's identity or God's equation, it includes just five numbers but represents an astonishing revelation of hidden connections. It ties together everything from basic arithmetic to compound interest, the circumference of a circle, trigonometry, calculus, and even infinity. In David Stipp's hands, Euler's identity formula becomes a contemplative stroll through the glories of mathematics. The result is an ode to this magical field.

Significant Figures

A noted science writer explores how mathematics can explain such events as the O. J. Simpson verdict and the errors undermining the infamous Bell Curve, and introduces a little-known woman without whom the theory of relativity never would have worked. Reprint. 35,000 first printing.

Nature's Numbers

The world's greatest mental mathematical magician takes us on a spellbinding journey through the wonders of numbers (and more) "Arthur Benjamin . . . joyfully shows you how to make nature's numbers dance." -- Bill Nye (the science guy) The Magic of Math is the math book you wish you had in school. Using a delightful assortment of examples-from ice-cream scoops and poker hands to measuring mountains and making magic squares-this book revels in key mathematical fields including arithmetic, algebra, geometry, and calculus, plus Fibonacci numbers, infinity, and, of course, mathematical magic tricks. Known throughout the world as the "mathemagician," Arthur Benjamin mixes mathematics and magic to make the subject fun, attractive, and easy to understand for math fan and math-phobic alike. "A positively joyful exploration of mathematics." -- Publishers Weekly, starred review "Each [trick] is more dazzling than the last." -- Physics World

Concise Handbook of Mathematics and

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Physics

From the author of Are You Smart Enough to Work at Google?, a fascinating look at how an equation that foretells the future is transforming everything we know about life, business, and the universe. In the 18th century, the British minister and mathematician Thomas Bayes devised a theorem that allowed him to assign probabilities to events that had never happened before. It languished in obscurity for centuries until computers came along and made it easy to crunch the numbers. Now, as the foundation of big data, Bayes' formula has become a linchpin of the digital economy. But here's where things get really interesting: Bayes' theorem can also be used to lay odds on the existence of extraterrestrial intelligence; on whether we live in a Matrix-like counterfeit of reality; on the "many worlds" interpretation of quantum theory being correct; and on the biggest question of all: how long will humanity survive? The Doomsday Calculation tells how Silicon Valley's profitable formula became a controversial pivot of contemporary thought. Drawing on interviews with thought leaders around the globe, it's the story of a group of intellectual mavericks who are challenging what we thought we knew about our place in the universe. The Doomsday Calculation is compelling reading for anyone interested in our culture and its future.

Celestial Calculations

Bestselling author and astrophysicist Mario Livio

examines the lives and theories of history's greatest mathematicians to ask how—if mathematics is an abstract construction of the human mind—it can so perfectly explain the physical world. Nobel Laureate Eugene Wigner once wondered about "the unreasonable effectiveness of mathematics" in the formulation of the laws of nature. Is God a Mathematician? investigates why mathematics is as powerful as it is. From ancient times to the present, scientists and philosophers have marveled at how such a seemingly abstract discipline could so perfectly explain the natural world. More than that—mathematics has often made predictions, for example, about subatomic particles or cosmic phenomena that were unknown at the time, but later were proven to be true. Is mathematics ultimately invented or discovered? If, as Einstein insisted, mathematics is "a product of human thought that is independent of experience," how can it so accurately describe and even predict the world around us? Physicist and author Mario Livio brilliantly explores mathematical ideas from Pythagoras to the present day as he shows us how intriguing questions and ingenious answers have led to ever deeper insights into our world. This fascinating book will interest anyone curious about the human mind, the scientific world, and the relationship between them.

The Fabric of the Cosmos

This monograph is the first to develop a mathematical theory of gravitational lensing. The theory applies to any finite number of deflector planes and highlights

the distinctions between single and multiple plane lensing. Introductory material in Parts I and II present historical highlights and the astrophysical aspects of the subject. Part III employs the ideas and results of singularity theory to put gravitational lensing on a rigorous mathematical foundation.

Beyond Infinity

The seventeen equations that form the basis for life as we know it Most people are familiar with history's great equations: Newton's Law of Gravity, for instance, or Einstein's theory of relativity. But the way these mathematical breakthroughs have contributed to human progress is seldom appreciated. In In Pursuit of the Unknown, celebrated mathematician Ian Stewart untangles the roots of our most important mathematical statements to show that equations have long been a driving force behind nearly every aspect of our lives. Using seventeen of our most crucial equations--including the Wave Equation that allowed engineers to measure a building's response to earthquakes, saving countless lives, and the Black-Scholes model, used by bankers to track the price of financial derivatives over time--Stewart illustrates that many of the advances we now take for granted were made possible by mathematical discoveries. An approachable, lively, and informative guide to the mathematical building blocks of modern life, In Pursuit of the Unknown is a penetrating exploration of how we have also used equations to make sense of, and in turn influence, our world.

Singularity Theory and Gravitational Lensing

A successful science writer and a teenage math prodigy reveal the complex mathematics that is all around us Everyone has stared at the crumpled page of a math assignment and wondered, where on Earth will I ever use this? It turns out, Earth is precisely the place. As teen math prodigy Agnijo Banerjee and his teacher David Darling reveal, complex math surrounds us. If we think long enough about the universe, we're left not with material stuff, but a ghostly and beautiful set of equations. Packed with puzzles and paradoxes, mind-bending concepts, and surprising solutions, Weird Math leads us from a lyrical exploration of mathematics in our universe to profound questions about God, chance, and infinity. A magical introduction to the mysteries of math, it will entrance beginners and seasoned mathematicians alike.

Geometry with an Introduction to Cosmic Topology

How music has influenced mathematics, physics, and astronomy from ancient Greece to the twentieth century Music is filled with mathematical elements. The works of Bach are often said to possess a math-like logic, and Arnold Schoenberg, Iannis Xenakis, and Karlheinz Stockhausen wrote music explicitly based on mathematical principles. Yet Eli Maor argues that it is music that has had the greater influence on mathematics, not the other way around. Starting with

Pythagoras, proceeding through Schoenberg, and bringing the story up to the present with contemporary string theory, Music by the Numbers tells a fascinating story of composers, scientists, inventors, and eccentrics who have played a role in the age-old relationship between music, mathematics, and the physical sciences. Weaving compelling stories of historical episodes with Maor's personal reflections as a mathematician and lover of classical music, this book will delight anyone who loves math and music.

Professor Stewart's Incredible Numbers

A celebrated mathematician traces the history of math through the lives and work of twenty-five pioneering mathematicians In Significant Figures, acclaimed mathematician Ian Stewart introduces the visionaries of mathematics throughout history. Delving into the lives of twenty-five great mathematicians, Stewart examines the roles they played in creating, inventing, and discovering the mathematics we use today. Through these short biographies, we get acquainted with the history of mathematics from Archimedes to Benoit Mandelbrot, and learn about those too often left out of the cannon, such as Muhammad ibn Musa al-Khwarizmi (c. 780-850), the creator of algebra, and Augusta Ada King (1815-1852), Countess of Lovelace, the world's first computer programmer. Tracing the evolution of mathematics over the course of two millennia, Significant Figures will educate and delight aspiring mathematicians and experts alike.

In Pursuit of the Unknown

From preeminent math personality and author of The Joy of x, a brilliant and endlessly appealing explanation of calculus - how it works and why it makes our lives immeasurably better. Without calculus, we wouldn't have cell phones, TV, GPS, or ultrasound. We wouldn't have unraveled DNA or discovered Neptune or figured out how to put 5,000 songs in your pocket. Though many of us were scared away from this essential, engrossing subject in high school and college, Steven Strogatz's brilliantly creative, down-to-earth history shows that calculus is not about complexity; it's about simplicity. It harnesses an unreal number--infinity--to tackle real-world problems, breaking them down into easier ones and then reassembling the answers into solutions that feel miraculous. Infinite Powers recounts how calculus tantalized and thrilled its inventors, starting with its first glimmers in ancient Greece and bringing us right up to the discovery of gravitational waves (a phenomenon predicted by calculus). Strogatz reveals how this form of math rose to the challenges of each age: how to determine the area of a circle with only sand and a stick; how to explain why Mars goes "backwards" sometimes; how to make electricity with magnets; how to ensure your rocket doesn't miss the moon; how to turn the tide in the fight against AIDS. As Strogatz proves, calculus is truly the language of the universe. By unveiling the principles of that language, Infinite Powers makes us marvel at the world anew.

Measuring the Universe

Knots are familiar objects. We use them to moor our boats, to wrap our packages, to tie our shoes. Yet the mathematical theory of knots quickly leads to deep results in topology and geometry. The Knot Book is an introduction to this rich theory, starting from our familiar understanding of knots and a bit of college algebra and finishing with exciting topics of current research. The Knot Book is also about the excitement of doing mathematics. Colin Adams engages the reader with fascinating examples, superb figures, and thought-provoking ideas. He also presents the remarkable applications of knot theory to modern chemistry, biology, and physics. This is a compelling book that will comfortably escort you into the marvelous world of knot theory. Whether you are a mathematics student, someone working in a related field, or an amateur mathematician, you will find much of interest in The Knot Book.

Fractal Cosmos

Our fascination with numbers begins when we are children and continues throughout our lives. We start counting our fingers and toes and end up balancing checkbooks and calculating risk. So powerful is the appeal of numbers that many people ascribe to them a mystical significance. Other numbers go beyond the supernatural, working to explain our universe and how it behaves. In Cosmic Numbers, mathematics professor James D. Stein traces the discovery, evolution, and interrelationships of the numbers that

define our world. Everyone knows about the speed of light and absolute zero, but numbers like Boltzmann's constant and the Chandrasekhar limit are not as well known, and they do far more than one might imagine: They tell us how this world began and what the future holds. Much more than a gee-whiz collection of facts and figures, Cosmic Numbers illuminates why particular numbers are so important—both to the scientist and to the rest of us.

Until the End of Time

An awe-inspiring, unforgettable journey of scientific exploration from Brian Cox and Jeff Forshaw, the international bestselling authors of Why Does E=MC2? and The Quantum Universe, with 55 black-&-white and 45 full-color pages featuring photographs, diagrams, maps, tables, and graphs We dare to imagine a time before the Big Bang, when the entire universe was compressed into a space smaller than an atom. And now, as Brian Cox and Jeff Forshaw show, we can do more than imagine: we can understand. Universal takes us on an epic journey of scientific exploration. It reveals how we can all come to grips with some of the most fundamental questions about our Earth, Sun, and solar system--and the star-filled galaxies beyond. How big is our solar system? How quickly is space expanding? How big is the universe? What is it made of? Some of these questions can be answered on the basis of observations you can make in your own backyard. Other answers draw on the astonishing information now being gathered by teams of astronomers

operating at the frontiers of the known universe. At the heart of all this lies the scientific method. Science reveals a deeper beauty and connects us to each other, to our world, and to our universe. Science reaches out into the unknown. As Universal demonstrates, if we dare to imagine, we can do the same.

The Mathematics of Love

"Delightful . . . easily digestible chapters include plenty of helpful examples and illustrations. You'll never forget the Pythagorean theorem again!"—Scientific American Many people take math in high school and promptly forget much of it. But math plays a part in all of our lives all of the time, whether we know it or not. In The Joy of x, Steven Strogatz expands on his hit New York Times series to explain the big ideas of math gently and clearly, with wit, insight, and brilliant illustrations. Whether he is illuminating how often you should flip your mattress to get the maximum lifespan from it, explaining just how Google searches the internet, or determining how many people you should date before settling down, Strogatz shows how math connects to every aspect of life. Discussing pop culture, medicine, law, philosophy, art, and business, Strogatz is the math teacher you wish you'd had. Whether you aced integral calculus or aren't sure what an integer is, you'll find profound wisdom and persistent delight in The Joy of x.

Calculating the Cosmos

The Fractal Cosmos Calendar has been the most successful calendar for Amber Lotus. Over the years, Amber Lotus has published the development in Fractal Art. Now, Amber Lotus publishes FRactal Images by Lifesmith, including an introductory text, a brief history as well as the mechanics of mathematical art. The book includes 350 color images of popular designs in modern fractals. Amber Lotus also publishes Fractal Arts as greeting cards, wrapping paper, calendars, and blank journals.

Universal

From the world-renowned physicist and best-selling author of The Elegant Universe comes this captivating exploration of deep time and humanity's search for purpose. Until the End of Time is Brian Greene's breathtaking new exploration of the cosmos and our quest to understand it. Greene takes us on a journey across time, from our most refined understanding of the universe's beginning, to the closest science can take us to the very end. He explores how life and mind emerged from the initial chaos, and how our minds, in coming to understand their own impermanence, seek in different ways to give meaning to experience: in narrative, myth, religion, creative expression, science, the quest for truth, and our longing for the eternal. Through a series of nested stories that explain distinct but interwoven layers of reality--from quantum mechanics to consciousness to black holes--Greene provides us with a clearer sense of how we came to be, a finer picture of where we are now, and a firmer understanding of where we are

headed. With this grand tour of the universe, beginning to end, Brian Greene allows us all to grasp and appreciate our fleeting but utterly exquisite moment in the cosmos.

The Magic of Math

From Brian Greene, one of the world's leading physicists and author of the Pulitzer Prize finalist The Elegant Universe, comes a grand tour of the universe that makes us look at reality in a completely different way. Space and time form the very fabric of the cosmos. Yet they remain among the most mysterious of concepts. Is space an entity? Why does time have a direction? Could the universe exist without space and time? Can we travel to the past? Greene has set himself a daunting task: to explain non-intuitive, mathematical concepts like String Theory, the Heisenberg Uncertainty Principle, and Inflationary Cosmology with analogies drawn from common experience. From Newton's unchanging realm in which space and time are absolute, to Einstein's fluid conception of spacetime, to quantum mechanics' entangled arena where vastly distant objects can instantaneously coordinate their behavior, Greene takes us all, regardless of our scientific backgrounds, on an irresistible and revelatory journey to the new layers of reality that modern physics has discovered lying just beneath the surface of our everyday world.

Infinite Powers

At the heart of relativity theory, quantum mechanics,

string theory, and much of modern cosmology lies one concept: symmetry. In Why Beauty Is Truth, world-famous mathematician Ian Stewart narrates the history of the emergence of this remarkable area of study. Stewart introduces us to such characters as the Renaissance Italian genius, rogue, scholar, and gambler Girolamo Cardano, who stole the modern method of solving cubic equations and published it in the first important book on algebra, and the young revolutionary Evariste Galois, who refashioned the whole of mathematics and founded the field of group theory only to die in a pointless duel over a woman before his work was published. Stewart also explores the strange numerology of real mathematics, in which particular numbers have unique and unpredictable properties related to symmetry. He shows how Wilhelm Killing discovered "Lie groups" with 14, 52, 78, 133, and 248 dimensions-groups whose very existence is a profound puzzle. Finally, Stewart describes the world beyond superstrings: the "octonionic" symmetries that may explain the very existence of the universe.

The Doomsday Calculation

Opening another drawer in his Cabinet of Curiosities, renowned mathematics professor Ian Stewart presents a new medley of games, paradoxes, and riddles in Professor Stewart's Hoard of Mathematical Treasures. With wit and aplomb, Stewart mingles casual puzzles with grander forays into ancient and modern mathematical thought. Amongst a host of arcane and astonishing facts about every kind of

number from irrational and imaginary to complex and cuneiform, we learn: – How to organize chaos – How matter balances anti-matter – How to turn a sphere inside out (without creasing it) – How to calculate pi by observing the stars – and why you can't comb a hairy ball. Along the way Stewart offers the reader tantalizing glimpses of the mathematics underlying life and the universe. Mind-stretching, enlightening, and endlessly amusing, Professor Stewart's Hoard of Mathematical Treasures will stimulate, delight, and enthrall.

Why Beauty Is Truth

The content of Geometry with an Introduction to Cosmic Topology is motivated by questions that have ignited the imagination of stargazers since antiquity. What is the shape of the universe? Does the universe have and edge? Is it infinitely big? Dr. Hitchman aims to clarify this fascinating area of mathematics. This non-Euclidean geometry text is organized intothree natural parts. Chapter 1 provides an overview including a brief history of Geometry, Surfaces, and reasons to study Non-Euclidean Geometry. Chapters 2-7 contain the core mathematical content of the text, following the ErlangenProgram, which develops geometry in terms of a space and a group of transformations on that space. Finally chapters 1 and 8 introduce (chapter 1) and explore (chapter 8) the topic of cosmic topology through the geometry learned in the preceding chapters.

A Most Elegant Equation

How to predict and calculate the positions of stars, planets, the sun, the moon, and satellites using a personal computer and high school mathematics. Our knowledge of the universe is expanding rapidly, as space probes launched decades ago begin to send information back to earth. There has never been a better time to learn about how planets, stars, and satellites move through the heavens. This book is for amateur astronomers who want to move beyond pictures of constellations in star guides and solve the mysteries of a starry night. It is a book for readers who have wondered, for example, where Saturn will appear in the night sky, when the sun will rise and set, or how long the space station will be over their location. In Celestial Calculations, J. L. Lawrence shows readers how to find the answers to these and other astronomy questions with only a personal computer and high school math. Using an easy-to-follow step-by-step approach, Lawrence explains what calculations are required, why they are needed, and how they all fit together. Lawrence begins with basic principles: unit of measure conversions, time conversions, and coordinate systems. He combines these concepts into a computer program that can calculate the location of a star, and uses the same methods for predicting the locations of the sun, moon, and planets. He then shows how to use these methods for locating the many satellites we have sent into orbit. Finally, he describes a variety of resources and tools available to the amateur astronomer, including star charts and astronomical tables. Diagrams illustrate the major concepts, and computer programs that implement the algorithms are included.

Photographs of actual celestial objects accompany the text, and interesting astronomical facts are interspersed throughout.

Love and Math

In the bestselling literary tradition of Lewis Thomas's Lives of a Cell and James Watson's The Double Helix, Poetry of the Universe is a delightful and compelling narrative charting the evolution of mathematical ideas that have helped to illuminate the nature of the observable universe. In a richly anecdotal fashion, the book explores teh leaps of imagination and vision in mathematics that have helped pioneer our understanding of the world around us.

The Knot Book

Max Tegmark leads us on an astonishing journey through past, present and future, and through the physics, astronomy and mathematics that are the foundation of his work, most particularly his hypothesis that our physical reality is a mathematical structure and his theory of the ultimate multiverse. In a dazzling combination of both popular and groundbreaking science, he not only helps us grasp his often mind-boggling theories, but he also shares with us some of the often surprising triumphs and disappointments that have shaped his life as a scientist. Fascinating from first to last—this is a book that has already prompted the attention and admiration of some of the most prominent scientists and mathematicians.

Music by the Numbers

Uncertainty is everywhere. It lurks in every consideration of the future - the weather, the economy, the sex of an unborn child - even quantities we think that we know such as populations or the transit of the planets contain the possibility of error. It's no wonder that, throughout that history, we have attempted to produce rigidly defined areas of uncertainty - we prefer the surprise party to the surprise asteroid. We began our quest to make certain an uncertain world by reading omens in livers, tea leaves, and the stars. However, over the centuries, driven by curiosity, competition, and a desire be better gamblers, pioneering mathematicians and scientists began to reduce wild uncertainties to tame distributions of probability and statistical inferences. But, even as unknown unknowns became known unknowns, our pessimism made us believe that some problems were unsolvable and our intuition misled us. Worse, as we realized how omnipresent and varied uncertainty is, we encountered chaos, quantum mechanics, and the limitations of our predictive power. Bestselling author Professor Ian Stewart explores the history and mathematics of uncertainty. Touching on gambling, probability, statistics, financial and weather forecasts, censuses, medical studies, chaos, quantum physics, and climate, he makes one thing clear: a reasonable probability is the only certainty.

Cosmic Numbers

A History of Mathematics: From Mesopotamia to Modernity covers the evolution of mathematics through time and across the major Eastern and Western civilizations. It begins in Babylon, then describes the trials and tribulations of the Greek mathematicians. The important, and often neglected, influence of both Chinese and Islamic mathematics is covered in detail, placing the description of early Western mathematics in a global context. The book concludes with modern mathematics, covering recent developments such as the advent of the computer, chaos theory, topology, mathematical physics, and the solution of Fermat's Last Theorem. Containing more than 100 illustrations and figures, this text, aimed at advanced undergraduates and postgraduates, addresses the methods and challenges associated with studying the history of mathematics. The reader is introduced to the leading figures in the history of mathematics (including Archimedes, Ptolemy, Qin Jiushao, al-Kashi, al-Khwarizmi, Galileo, Newton, Leibniz, Helmholtz, Hilbert, Alan Turing, and Andrew Wiles) and their fields. An extensive bibliography with cross-references to key texts will provide invaluable resource to students and exercises (with solutions) will stretch the more advanced reader.

Poetry of the Universe

How math helps us solve the universe's deepest mysteries One of the great insights of science is that the universe has an underlying order. The supreme goal of physicists is to understand this order through

laws that describe the behavior of the most basic particles and the forces between them. For centuries, we have searched for these laws by studying the results of experiments. Since the 1970s, however, experiments at the world's most powerful atom-smashers have offered few new clues. So some of the world's leading physicists have looked to a different source of insight: modern mathematics. These physicists are sometimes accused of doing 'fairy-tale physics', unrelated to the real world. But in The Universe Speaks in Numbers, award-winning science writer and biographer Farmelo argues that the physics they are doing is based squarely on the well-established principles of quantum theory and relativity, and part of a tradition dating back to Isaac Newton. With unprecedented access to some of the world's greatest scientific minds, Farmelo offers a vivid, behind-the-scenes account of the blossoming relationship between mathematics and physics and the research that could revolutionize our understanding of reality. A masterful account of the some of the most groundbreaking ideas in physics in the past four decades. The Universe Speaks in Numbers is essential reading for anyone interested in the quest to discover the fundamental laws of nature.

Visions of Infinity

In this must-have for anyone who wants to better understand their love life, a mathematician pulls back the curtain and reveals the hidden patterns—from dating sites to divorce, sex to marriage—behind the rituals of love. The roller coaster of romance is hard to

quantify; defining how lovers might feel from a set of simple equations is impossible. But that doesn't mean that mathematics isn't a crucial tool for understanding love. Love, like most things in life, is full of patterns. And mathematics is ultimately the study of patterns—from predicting the weather to the fluctuations of the stock market, the movement of planets or the growth of cities. These patterns twist and turn and warp and evolve just as the rituals of love do. In The Mathematics of Love, Dr. Hannah Fry takes the reader on a fascinating journey through the patterns that define our love lives, applying mathematical formulas to the most common yet complex questions pertaining to love: What's the chance of finding love? What's the probability that it will last? How do online dating algorithms work, exactly? Can game theory help us decide who to approach in a bar? At what point in your dating life should you settle down? From evaluating the best strategies for online dating to defining the nebulous concept of beauty, Dr. Fry proves—with great insight, wit, and fun—that math is a surprisingly useful tool to negotiate the complicated, often baffling, sometimes infuriating, always interesting, mysteries of love.

The Universe Speaks in Numbers

Recounts the mathematical reasoning which was used to calculate first the size of the earth, then the solar system, and so on up to the universe.

The Mathematics of Life

Biologists have long dismissed mathematics as being unable to meaningfully contribute to our understanding of living beings. Within the past ten years, however, mathematicians have proven that they hold the key to unlocking the mysteries of our world--and ourselves. In The Mathematics of Life, Ian Stewart provides a fascinating overview of the vital but little-recognized role mathematics has played in pulling back the curtain on the hidden complexities of the natural world--and how its contribution will be even more vital in the years ahead. In his characteristically clear and entertaining fashion, Stewart explains how mathematicians and biologists have come to work together on some of the most difficult scientific problems that the human race has ever tackled, including the nature and origin of life itself.

Measuring the Cosmos

An introductory textbook on mathematical cosmology for beginning graduate students.

The Universe and the Teacup

SHORTLISTED FOR THE 2017 ROYAL SOCIETY SCIENCE BOOK PRIZE Even small children know there are infinitely many whole numbers - start counting and you'll never reach the end. But there are also infinitely many decimal numbers between zero and one. Are these two types of infinity the same? Are they larger or smaller than each other? Can we even talk about 'larger' and 'smaller' when we talk about

infinity? In Beyond Infinity, international maths sensation Eugenia Cheng reveals the inner workings of infinity. What happens when a new guest arrives at your infinite hotel - but you already have an infinite number of guests? How does infinity give Zeno's tortoise the edge in a paradoxical foot-race with Achilles? And can we really make an infinite number of cookies from a finite amount of cookie dough? Wielding an armoury of inventive, intuitive metaphor, Cheng draws beginners and enthusiasts alike into the heart of this mysterious, powerful concept to reveal fundamental truths about mathematics, all the way from the infinitely large down to the infinitely small.

The Cosmic Calculator

It is one of the wonders of mathematics that, for every problem mathematicians solve, another awaits to perplex and galvanize them. Some of these problems are new, while others have puzzled and bewitched thinkers across the ages. Such challenges offer a tantalizing glimpse of the field's unlimited potential, and keep mathematicians looking toward the horizons of intellectual possibility. In Visions of Infinity, celebrated mathematician Ian Stewart provides a fascinating overview of the most formidable problems mathematicians have vanquished, and those that vex them still. He explains why these problems exist, what drives mathematicians to solve them, and why their efforts matter in the context of science as a whole. The three-century effort to prove Fermat's last theorem—first posited in 1630, and finally solved by Andrew Wiles in

1995—led to the creation of algebraic number theory and complex analysis. The Poincaré conjecture, which was cracked in 2002 by the eccentric genius Grigori Perelman, has become fundamental to mathematicians' understanding of three-dimensional shapes. But while mathematicians have made enormous advances in recent years, some problems continue to baffle us. Indeed, the Riemann hypothesis, which Stewart refers to as the "Holy Grail of pure mathematics," and the P/NP problem, which straddles mathematics and computer science, could easily remain unproved for another hundred years. An approachable and illuminating history of mathematics as told through fourteen of its greatest problems, Visions of Infinity reveals how mathematicians the world over are rising to the challenges set by their predecessors—and how the enigmas of the past inevitably surrender to the powerful techniques of the present.

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