



CALIFORNIA

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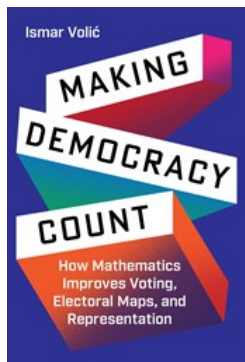
PRINCETON

THE UNIVERSITY PRESS GROUP

Mathematics

New and Best of Backlist

Spring / Summer 2024



Making Democracy Count – How Mathematics Improves Voting, Electoral Maps, and Representation

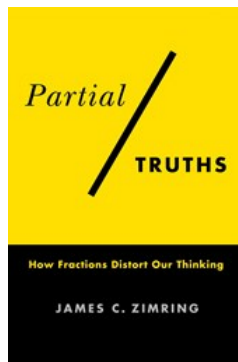
Ismar Volic
9780691248806
£28.00 • \$32.00 • Hardcover
Mathematics / Applied
May 2024
Princeton University Press

How we can repair our democracy by rebuilding the mechanisms that power it

What's the best way to determine what most voters want when multiple candidates are running? What's the fairest way to allocate legislative seats to different constituencies? What's the least distorted way to draw voting districts? Not the way we do things now. Democracy is mathematical to its very foundations. Yet most of the methods in use are a historical grab bag of the shortsighted, the cynical, the innumerate, and the outright discriminatory. *Making Democracy Count* sheds new light on our electoral systems, revealing how a deeper understanding of their mathematics is the key to creating civic infrastructure that works for everyone.

In this timely guide, Ismar Volic empowers us to use mathematical thinking as an objective, nonpartisan framework that rises above the noise and rancor of today's divided public square. Examining our representative democracy using powerful clarifying concepts, Volic shows why our current voting system stifles political diversity, why the size of the House of Representatives contributes to its paralysis, why gerrymandering is a sinister instrument that entrenches partisanship and disenfranchisement, why the Electoral College must be rethought, and what can work better and why. Volic also discusses the legal and constitutional practicalities involved and proposes a road map for repairing the mathematical structures that undergird representative government.

Making Democracy Count gives us the concrete knowledge and the confidence to advocate for a more just, equitable, and inclusive democracy.

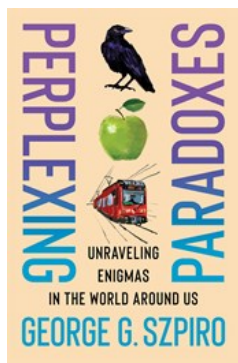


Partial Truths – How Fractions Distort Our Thinking

James C. Zimring
9780231216623
£17.99 • \$22.00 • Paperback
Mathematics / Probability & Statistics
January 2024
Columbia University Press

A fast-food chain once tried to compete with McDonald's quarter-pounder by introducing a third-pound hamburger—only for it to flop when consumers thought a third pound was less than a quarter pound because three is less than four. Separately, a rash of suicides by teenagers who played Dungeons and Dragons caused a panic in parents and the media. They thought D&D was causing teenage suicides—when in fact teenage D&D players died by suicide at a much lower rate than the national average. Errors of this type can be found from antiquity to the present, from the Peloponnesian War to the COVID-19 pandemic. How and why do we keep falling into these traps?

James C. Zimring argues that many of the mistakes that the human mind consistently makes boil down to misperceiving fractions. We see slews of statistics that are essentially fractions, such as percentages, probabilities, frequencies, and rates, and we tend to misinterpret them. Sometimes bad actors manipulate us by cherry-picking data or distorting how information is presented; other times, sloppy communicators inadvertently mislead us. In many cases, we fool ourselves and have only our own minds to blame. Zimring also explores the counterintuitive reason that these flaws might benefit us, demonstrating that individual error can be highly advantageous to problem solving by groups. Blending key scientific research in cognitive psychology with accessible real-life examples, *Partial Truths* helps readers spot the fallacies lurking in everyday information, from politics to the criminal justice system, from religion to science, from business strategies to New Age culture.



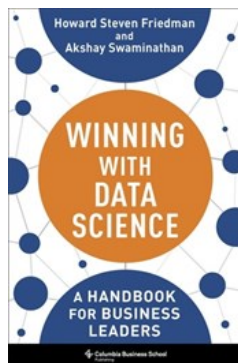
Perplexing Paradoxes – Unraveling Enigmas in the World Around Us

George G. Szpiro
9780231213769
£25.00 • \$35.00 • Hardcover
Mathematics / History & Philosophy
March 2024
Columbia University Press

Why does it always seem like the elevator is going down when you need to go up? Is it really true that $0.99999\dots$ with an infinite number of 9s after the decimal point, is equal to 1? What do tea leaves and river erosion have in common, per Albert Einstein? Does seeing a bed of red flowers help prove that all ravens are black? Can we make sense of a phrase like “this statement is unprovable”?

Exploring these questions and many more, George G. Szpiro guides readers through the puzzling world of paradoxes, from Socratic dialogues to the Monty Hall problem. *Perplexing Paradoxes* presents sixty counterintuitive conundrums drawn from diverse areas of thought—not only mathematics, statistics, logic, and philosophy but also social science, physics, politics, and religion. Szpiro offers a brisk history of each paradox, unpacks its inner workings, and considers where one might encounter it in daily life. Ultimately, he argues, paradoxes are not simple brain teasers or abstruse word games—they challenge us to hone our reasoning and become more alert to the flaws in received wisdom and common habits of thought.

Lighthearted, witty, and conversational, *Perplexing Paradoxes* presents sophisticated material in an accessible way for all readers interested in the world's boundless possibilities—and impossibilities.



Winning with Data Science – A Handbook for Business Leaders

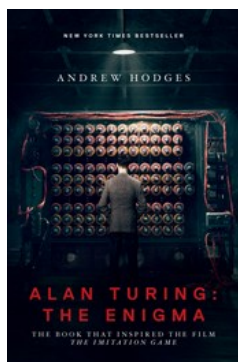
Howard Steven Friedman
9780231206860
£22.00 • \$27.95 • Hardcover
Computers / Data Science / Data Analytics
January 2024
Columbia University Press

Whether you are a newly minted MBA or a project manager at a Fortune 500 company, data science will play a major role in your career. Knowing how to communicate effectively with data scientists in order to obtain maximum value from their expertise is essential. This book is a compelling and comprehensive guide to data science, emphasizing its real-world business applications and focusing on how to collaborate productively with data science teams.

Taking an engaging narrative approach, *Winning with Data Science* covers the fundamental concepts without getting bogged down in complex equations or programming languages. It provides clear explanations of key terms, tools, and techniques, illustrated through practical examples. The book follows the stories of Kamala and Steve, two professionals who need to collaborate with data science teams to achieve their business goals. Howard Steven Friedman and Akshay Swaminathan walk readers through each step of managing a data science project, from understanding the different roles on a data science team to identifying the right software. They equip readers with critical questions to ask data analysts, statisticians, data scientists, and other technical experts to avoid wasting time and money. *Winning with Data Science* is a must-read for anyone who works with data science teams or is interested in the practical side of the subject.

The University Press Group

Mathematics 2024



Alan Turing – The Enigma – The Book That Inspired the Film The Imitation Game – Updated Edition

Andrew Hodges
9780691164724
£14.99 • \$17.95 • Paperback
Biography & Autobiography / Science &
Technology
December 2014
Princeton University Press

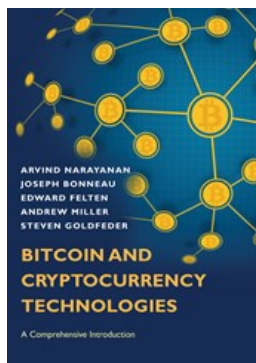
A NEW YORK TIMES BESTSELLER

The official book behind the Academy Award-winning film *The Imitation Game*, starring Benedict Cumberbatch and Keira Knightley

It is only a slight exaggeration to say that the British mathematician Alan Turing (1912–1954) saved the Allies from the Nazis, invented the computer and artificial intelligence, and anticipated gay liberation by decades—all before his suicide at age forty-one. This *New York Times*–bestselling biography of the founder of computer science, with a new preface by the author that addresses Turing's royal pardon in 2013, is the definitive account of an extraordinary mind and life.

Capturing both the inner and outer drama of Turing's life, Andrew Hodges tells how Turing's revolutionary idea of 1936—the concept of a universal machine—laid the foundation for the modern computer and how Turing brought the idea to practical realization in 1945 with his electronic design. The book also tells how this work was directly related to Turing's leading role in breaking the German Enigma ciphers during World War II, a scientific triumph that was critical to Allied victory in the Atlantic. At the same time, this is the tragic account of a man who, despite his wartime service, was eventually arrested, stripped of his security clearance, and forced to undergo a humiliating treatment program—all for trying to live honestly in a society that defined homosexuality as a crime.

The inspiration for a major motion picture starring Benedict Cumberbatch and Keira Knightley,



Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction

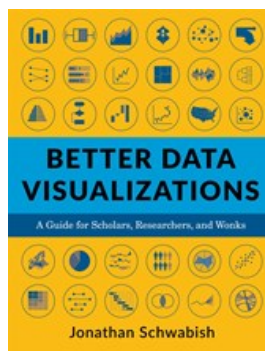
Arvind Narayanan
9780691171692
£48.00 • \$56.00 • Hardcover
Computers / Computer Science
August 2016
Princeton University Press

An authoritative introduction to the exciting new technologies of digital money

Bitcoin and Cryptocurrency Technologies provides a comprehensive introduction to the revolutionary yet often misunderstood new technologies of digital currency. Whether you are a student, software developer, tech entrepreneur, or researcher in computer science, this authoritative and self-contained book tells you everything you need to know about the new global money for the Internet age.

How do Bitcoin and its block chain actually work? How secure are your bitcoins? How anonymous are their users? Can cryptocurrencies be regulated? These are some of the many questions this book answers. It begins by tracing the history and development of Bitcoin and cryptocurrencies, and then gives the conceptual and practical foundations you need to engineer secure software that interacts with the Bitcoin network as well as to integrate ideas from Bitcoin into your own projects. Topics include decentralization, mining, the politics of Bitcoin, altcoins and the cryptocurrency ecosystem, the future of Bitcoin, and more.

- An essential introduction to the new technologies of digital currency
- Covers the history and mechanics of Bitcoin and the block chain, security, decentralization, anonymity, politics and regulation, altcoins, and much more
- Features an accompanying website that includes instructional videos for each chapter, homework problems, programming assignments, and lecture slides
- Also suitable for use with the authors' Coursera online course
- Electronic solutions manual (available only to professors)

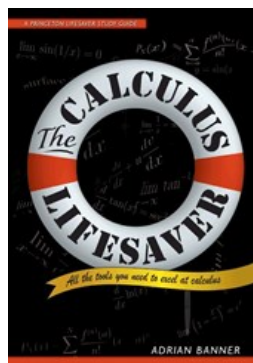


Better Data Visualizations – A Guide for Scholars, Researchers, and Wonks

Jonathan Schwabish
9780231193115
£30.00 • \$34.95 • Paperback
Computers / Data Science / Data
Visualization
April 2021
Columbia University Press

Now more than ever, content must be visual if it is to travel far. Readers everywhere are overwhelmed with a flow of data, news, and text. Visuals can cut through the noise and make it easier for readers to recognize and recall information. Yet many researchers were never taught how to present their work visually.

This book details essential strategies to create more effective data visualizations. Jonathan Schwabish walks readers through the steps of creating better graphs and how to move beyond simple line, bar, and pie charts. Through more than five hundred examples, he demonstrates the do's and don'ts of data visualization, the principles of visual perception, and how to make subjective style decisions around a chart's design. Schwabish surveys more than eighty visualization types, from histograms to horizon charts, ridgeline plots to choropleth maps, and explains how each has its place in the visual toolkit. It might seem intimidating, but everyone can learn how to create compelling, effective data visualizations. This book will guide you as you define your audience and goals, choose the graph that best fits for your data, and clearly communicate your message.



The Calculus Lifesaver – All the Tools You Need to Excel at Calculus

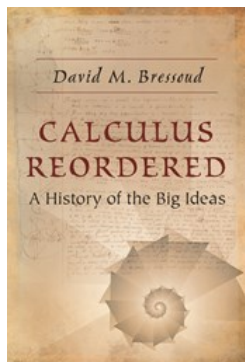
Adrian Banner
9780691130880
£25.00 • \$28.95 • Paperback
Mathematics / Calculus
April 2007
Princeton University Press

For many students, calculus can be the most mystifying and frustrating course they will ever take. *The Calculus Lifesaver* provides students with the essential tools they need not only to learn calculus, but to excel at it.

All of the material in this user-friendly study guide has been proven to get results. The book arose from Adrian Banner's popular calculus review course at Princeton University, which he developed especially for students who are motivated to earn A's but get only average grades on exams. The complete course will be available for free on the Web in a series of videotaped lectures. This study guide works as a supplement to any single-variable calculus course or textbook. Coupled with a selection of exercises, the book can also be used as a textbook in its own right. The style is informal, non-intimidating, and even entertaining, without sacrificing comprehensiveness. The author elaborates standard course material with scores of detailed examples that treat the reader to an "inner monologue"—the train of thought students should be following in order to solve the problem—providing the necessary reasoning as well as the solution. The book's emphasis is on building problem-solving skills. Examples range from easy to difficult and illustrate the in-depth presentation of theory.

The Calculus Lifesaver combines ease of use and readability with the depth of content and mathematical rigor of the best calculus textbooks. It is an indispensable volume for any student seeking to master calculus.

- Serves as a companion to any single-variable calculus textbook
- Informal, entertaining, and not intimidating



Calculus Reordered – A History of the Big Ideas

David M. Bressoud
9780691218786
£17.99 • \$20.95 • Paperback
Mathematics / Calculus
June 2021
Princeton University Press

A look at how calculus has evolved over hundreds of years and why calculus pedagogy needs to change

Calculus Reordered tells the remarkable story of how calculus grew over centuries into the subject we know today. David Bressoud explains why calculus is credited to seventeenth-century figures Isaac Newton and Gottfried Leibniz, how it was shaped by Italian philosophers such as Galileo Galilei, and how its current structure sprang from developments in the nineteenth century. Bressoud reveals problems with the standard ordering of its curriculum—limits, differentiation, integration, and series—and he argues that a pedagogy informed by the historical evolution of calculus represents a sounder way for students to learn this fascinating area of mathematics. From calculus's birth in the Hellenistic Eastern Mediterranean, India, and the Islamic Middle East, to its contemporary iteration, *Calculus Reordered* highlights the ways this essential tool of mathematics came to be.



Do Not Erase – Mathematicians and Their Chalkboards

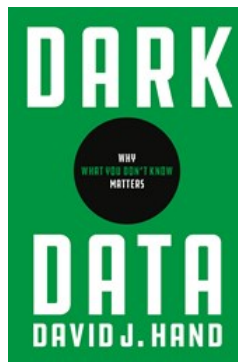
Jessica Wynne
9780691199221
£30.00 • \$35.00 • Hardcover
Mathematics
June 2021
Princeton University Press

A photographic exploration of mathematicians' chalkboards

"A mathematician, like a painter or poet, is a maker of patterns," wrote the British mathematician G. H. Hardy. In *Do Not Erase*, photographer Jessica Wynne presents remarkable examples of this idea through images of mathematicians' chalkboards. While other fields have replaced chalkboards with whiteboards and digital presentations, mathematicians remain loyal to chalk for puzzling out their ideas and communicating their research. Wynne offers more than one hundred stunning photographs of these chalkboards, gathered from a diverse group of mathematicians around the world. The photographs are accompanied by essays from each mathematician, reflecting on their work and processes. Together, pictures and words provide an illuminating meditation on the unique relationships among mathematics, art, and creativity.

The mathematicians featured in this collection comprise exciting new voices alongside established figures, including Sun-Yung Alice Chang, Alain Connes, Misha Gromov, Andre Neves, Kasso Okoudjou, Peter Shor, Christina Sormani, Terence Tao, Claire Voisin, and many others. The companion essays give insights into how the chalkboard serves as a special medium for mathematical expression. The volume also includes an introduction by the author, an afterword by *New Yorker* writer Alec Wilkinson, and biographical information for each contributor.

Do Not Erase is a testament to the myriad ways that mathematicians use their chalkboards to reveal the conceptual and visual beauty of their discipline—shapes, figures, formulas, and conjectures created through imagination, argument, and speculation.



Dark Data – Why What You Don't Know Matters

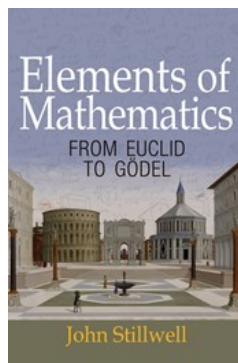
David J. Hand
9780691234465
£16.99 • \$19.95 • Paperback
Computers / Data Science / Data Analytics
April 2022
Princeton University Press

A practical guide to making good decisions in a world of missing data

In the era of big data, it is easy to imagine that we have all the information we need to make good decisions. But in fact the data we have are never complete, and may be only the tip of the iceberg. Just as much of the universe is composed of dark matter, invisible to us but nonetheless present, the universe of information is full of dark data that we overlook at our peril. In *Dark Data*, data expert David Hand takes us on a fascinating and enlightening journey into the world of the data we don't see.

Dark Data explores the many ways in which we can be blind to missing data and how that can lead us to conclusions and actions that are mistaken, dangerous, or even disastrous. Examining a wealth of real-life examples, from the Challenger shuttle explosion to complex financial frauds, Hand gives us a practical taxonomy of the types of dark data that exist and the situations in which they can arise, so that we can learn to recognize and control for them. In doing so, he teaches us not only to be alert to the problems presented by the things we don't know, but also shows how dark data can be used to our advantage, leading to greater understanding and better decisions.

Today, we all make decisions using data. *Dark Data* shows us all how to reduce the risk of making bad ones.



Elements of Mathematics – From Euclid to Gödel

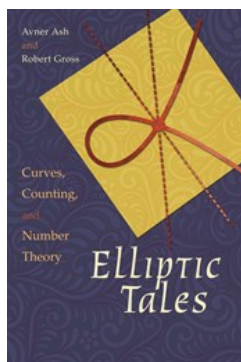
John Stillwell
9780691178547
£18.99 • \$22.95 • Paperback
Mathematics / History & Philosophy
December 2017
Princeton University Press

An exciting look at the world of elementary mathematics

Elements of Mathematics takes readers on a fascinating tour that begins in elementary mathematics—but, as John Stillwell shows, this subject is not as elementary or straightforward as one might think. Not all topics that are part of today's elementary mathematics were always considered as such, and great mathematical advances and discoveries had to occur in order for certain subjects to become "elementary." Stillwell examines elementary mathematics from a distinctive twenty-first-century viewpoint and describes not only the beauty and scope of the discipline, but also its limits.

From Gaussian integers to propositional logic, Stillwell delves into arithmetic, computation, algebra, geometry, calculus, combinatorics, probability, and logic. He discusses how each area ties into more advanced topics to build mathematics as a whole. Through a rich collection of basic principles, vivid examples, and interesting problems, Stillwell demonstrates that elementary mathematics becomes advanced with the intervention of infinity. Infinity has been observed throughout mathematical history, but the recent development of "reverse mathematics" confirms that infinity is essential for proving well-known theorems, and helps to determine the nature, contours, and borders of elementary mathematics.

Elements of Mathematics gives readers, from high school students to professional mathematicians, the highlights of elementary mathematics and glimpses of the parts of math beyond its boundaries.



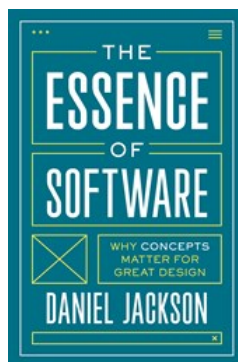
Elliptic Tales – Curves, Counting, and Number Theory

Avner Ash
9780691163505
£13.99 • \$16.95 • Paperback
Mathematics / History & Philosophy
October 2014
Princeton University Press

A look at one of the most exciting unsolved problems in mathematics today

Elliptic Tales describes the latest developments in number theory by looking at one of the most exciting unsolved problems in contemporary mathematics—the Birch and Swinnerton-Dyer Conjecture. In this book, Avner Ash and Robert Gross guide readers through the mathematics they need to understand this captivating problem.

The key to the conjecture lies in elliptic curves, which may appear simple, but arise from some very deep—and often very mystifying—mathematical ideas. Using only basic algebra and calculus while presenting numerous eye-opening examples, Ash and Gross make these ideas accessible to general readers, and, in the process, venture to the very frontiers of modern mathematics.



The Essence of Software – Why Concepts Matter for Great Design

Daniel Jackson
9780691230832
£20.00 • \$23.95 • Paperback
Computers / Computer Science
August 2023
Princeton University Press

A revolutionary concept-based approach to thinking about, designing, and interacting with software

As our dependence on technology increases, the design of software matters more than ever before. Why then is so much software flawed? Why hasn't there been a systematic and scalable way to create software that is easy to use, robust, and secure?

Examining these issues in depth, *The Essence of Software* introduces a theory of software design that gives new answers to old questions. Daniel Jackson explains that a software system should be viewed as a collection of interacting concepts, breaking the functionality into manageable parts and providing a new framework for thinking about design. Through this radical and original perspective, Jackson lays out a practical and coherent path, accessible to anyone—from strategist and marketer to UX designer, architect, or programmer—for making software that is empowering, dependable, and a delight to use.

Jackson explores every aspect of concepts—what they are and aren't, how to identify them, how to define them, and more—and offers prescriptive principles and practical tips that can be applied cost-effectively in a wide range of domains. He applies these ideas to contemporary software designs, drawing examples from leading software manufacturers such as Adobe, Apple, Dropbox, Facebook, Google, Microsoft, Twitter, and others. Jackson shows how concepts let designers preserve and reuse design knowledge, rather than starting from scratch in every project.

An argument against the status quo and a guide to improvement for both working designers and novices to the field, *The Essence of Software* brings a fresh approach to software and its creation.

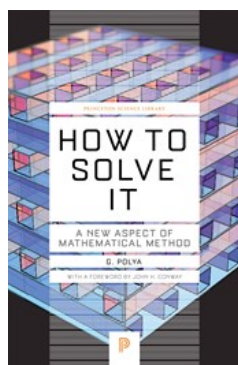


Guesstimation – Solving the World's Problems on the Back of a Cocktail Napkin

Lawrence Weinstein
9780691129495
£16.99 • \$19.95 • Paperback
Mathematics / Recreations & Games
May 2008
Princeton University Press

Guesstimation is a book that unlocks the power of approximation—it's popular mathematics rounded to the nearest power of ten! The ability to estimate is an important skill in daily life. More and more leading businesses today use estimation questions in interviews to test applicants' abilities to think on their feet. *Guesstimation* enables anyone with basic math and science skills to estimate virtually anything—quickly—using plausible assumptions and elementary arithmetic.

Lawrence Weinstein and John Adam present an eclectic array of estimation problems that range from devilishly simple to quite sophisticated and from serious real-world concerns to downright silly ones. How long would it take a running faucet to fill the inverted dome of the Capitol? What is the total length of all the pickles consumed in the US in one year? What are the relative merits of internal-combustion and electric cars, of coal and nuclear energy? The problems are marvelously diverse, yet the skills to solve them are the same. The authors show how easy it is to derive useful ballpark estimates by breaking complex problems into simpler, more manageable ones—and how there can be many paths to the right answer. The book is written in a question-and-answer format with lots of hints along the way. It includes a handy appendix summarizing the few formulas and basic science concepts needed, and its small size and French-fold design make it conveniently portable. Illustrated with humorous pen-and-ink sketches, *Guesstimation* will delight popular-math enthusiasts and is ideal for the classroom.



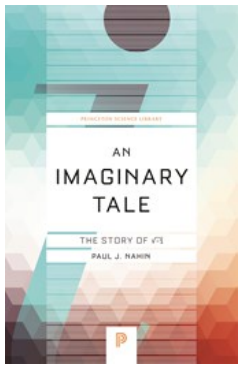
How to Solve it – A New Aspect of Mathematical Method

G. Polya
9780691164076
£16.99 • \$19.95 • Paperback
Mathematics / Logic
October 2014
Princeton University Press

The bestselling book that has helped millions of readers solve any problem

A must-have guide by eminent mathematician G. Polya, *How to Solve It* shows 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 help you attack any problem that can be reasoned out—from building a bridge to winning a game of anagrams. *How to Solve It* includes a heuristic dictionary with dozens of entries on how to make problems more manageable—from analogy and induction to the heuristic method of starting with a goal and working backward to something you already know.

This disarmingly elementary book explains how to harness curiosity in the classroom, bring the inventive faculties of students into play, and experience the triumph of discovery. But it's not just for the classroom. Generations of readers from all walks of life have relished Polya's brilliantly deft instructions on stripping away irrelevancies and going straight to the heart of a problem.



An Imaginary Tale - The Story of -1

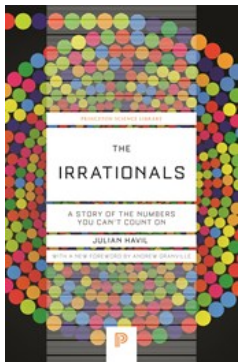
Paul J. Nahin
9780691169248

£13.99 • \$16.95 • Paperback
Mathematics / History & Philosophy
April 2016
Princeton University Press

Today complex numbers have such widespread practical use—from electrical engineering to aeronautics—that few people would expect the story behind their derivation to be filled with adventure and enigma. In *An Imaginary Tale*, Paul Nahin tells the 2000-year-old history of one of mathematics' most elusive numbers, the square root of minus one, also known as i . He recreates the baffling mathematical problems that conjured it up, and the colorful characters who tried to solve them.

In 1878, when two brothers stole a mathematical papyrus from the ancient Egyptian burial site in the Valley of Kings, they led scholars to the earliest known occurrence of the square root of a negative number. The papyrus offered a specific numerical example of how to calculate the volume of a truncated square pyramid, which implied the need for i . In the first century, the mathematician-engineer Heron of Alexandria encountered i in a separate project, but fudged the arithmetic; medieval mathematicians stumbled upon the concept while grappling with the meaning of negative numbers, but dismissed their square roots as nonsense. By the time of Descartes, a theoretical use for these elusive square roots—now called "imaginary numbers"—was suspected, but efforts to solve them led to intense, bitter debates. The notorious i finally won acceptance and was put to use in complex analysis and theoretical physics in Napoleonic times.

Addressing readers with both a general and scholarly interest in mathematics, Nahin weaves into this narrative entertaining historical facts and mathematical discussions, including the application of complex numbers and functions to important problems, such as Kepler's laws of planetary motion and ac electrical circuits. This book can be read as an engaging history, almost a biography, of one of the most evasive and pervasive "numbers" in all of mathematics.



The Irrationals - A Story of the Numbers You Can't Count On

Julian Havil
9780691247663

£16.99 • \$19.95 • Paperback
Mathematics / History & Philosophy
June 2023
Princeton University Press

An entertaining and enlightening history of irrational numbers, from ancient Greece to the twenty-first century

The ancient Greeks discovered them, but it wasn't until the nineteenth century that irrational numbers were properly understood and rigorously defined, and even today not all their mysteries have been revealed. In *The Irrationals*, the first popular and comprehensive book on the subject, Julian Havil tells the story of irrational numbers and the mathematicians who have tackled their challenges, from antiquity to the twenty-first century. Along the way, he explains why irrational numbers are surprisingly difficult to define—and why so many questions still surround them. Fascinating and illuminating, this is a book for everyone who loves math and the history behind it.



In Pursuit of Zeta-3 - The World's Most Mysterious Unsolved Math Problem

Paul J. Nahin
9780691247649

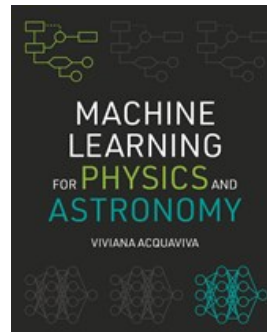
£17.99 • \$21.95 • Paperback
Mathematics / History & Philosophy
May 2023
Princeton University Press

An engrossing look at the history and importance of a centuries-old but still unanswered math problem

For centuries, mathematicians the world over have tried, and failed, to solve the zeta-3 problem. Math genius Leonhard Euler attempted it in the 1700s and came up short. The straightforward puzzle considers if there exists a simple symbolic formula for the following: $1 + (1/2)^3 + (1/3)^3 + (1/4)^3 + \dots$. But why is this issue—the sum of the reciprocals of the positive integers cubed—so important? With *In Pursuit of Zeta-3*, popular math writer Paul Nahin investigates the history and significance of this mathematical conundrum.

Drawing on detailed examples, historical anecdotes, and even occasionally poetry, Nahin sheds light on the richness of the nature of zeta-3. He shows its intimate connections to the Riemann hypothesis, another mathematical mystery that has stumped mathematicians for nearly two centuries. He looks at its links with Euler's achievements and explores the modern research area of Euler sums, where zeta-3 occurs frequently. An exact solution to the zeta-3 question wouldn't simply satisfy pure mathematical interest: it would have critical ramifications for applications in physics and engineering, such as quantum electrodynamics. Challenge problems with detailed solutions and *MATLAB* code are included at the end of each of the book's sections.

Detailing the trials and tribulations of mathematicians who have approached one of the field's great unsolved riddles, *In Pursuit of Zeta-3* will tantalize curious math enthusiasts everywhere.



Machine Learning for Physics and Astronomy

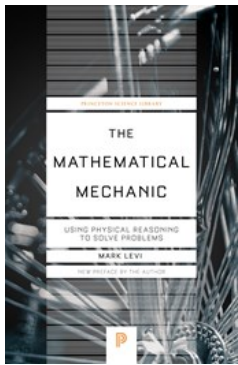
Viviana Acquaviva
9780691206417

£38.00 • \$45.00 • Paperback
Science / Physics / Mathematical & Computational
October 2023
Princeton University Press

A hands-on introduction to machine learning and its applications to the physical sciences

As the size and complexity of data continue to grow exponentially across the physical sciences, machine learning is helping scientists to sift through and analyze this information while driving breathtaking advances in quantum physics, astronomy, cosmology, and beyond. This incisive textbook covers the basics of building, diagnosing, optimizing, and deploying machine learning methods to solve research problems in physics and astronomy, with an emphasis on critical thinking and the scientific method. Using a hands-on approach to learning, *Machine Learning for Physics and Astronomy* draws on real-world, publicly available data as well as examples taken directly from the frontiers of research, from identifying galaxy morphology from images to identifying the signature of standard model particles in simulations at the Large Hadron Collider.

- Introduces readers to best practices in data-driven problem-solving, from preliminary data exploration and cleaning to selecting the best method for a given task
- Each chapter is accompanied by Jupyter Notebook worksheets in Python that enable students to explore key concepts
- Includes a wealth of review questions and quizzes
- Ideal for advanced undergraduate and early graduate students in STEM disciplines such as physics, computer science, engineering, and applied mathematics
- Accessible to self-learners with a basic knowledge of linear algebra and calculus
- Slides and assessment questions (available only to instructors)



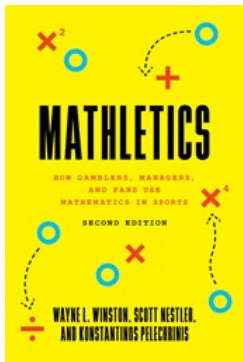
The Mathematical Mechanic – Using Physical Reasoning to Solve Problems

Mark Levi
9780691242057
£15.99 • \$18.95 • Paperback
Mathematics
March 2023
Princeton University Press

Everybody knows that mathematics is indispensable to physics—imagine where we'd be today if Einstein and Newton didn't have the math to back up their ideas. But how many people realize that physics can be used to produce many astonishing and strikingly elegant solutions in mathematics? Mark Levi shows how in this delightful book, treating readers to a host of entertaining problems and mind-bending puzzlers that will amuse and inspire their inner physicist.

Levi turns math and physics upside down, revealing how physics can simplify proofs and lead to quicker solutions and new theorems, and how physical solutions can illustrate why results are true in ways lengthy mathematical calculations never can. Did you know it's possible to derive the Pythagorean theorem by spinning a fish tank filled with water? Or that soap film holds the key to determining the cheapest container for a given volume? Or that the line of best fit for a data set can be found using a mechanical contraption made from a rod and springs? Levi demonstrates how to use physical intuition to solve these and other fascinating math problems. More than half the problems can be tackled by anyone with precalculus and basic geometry, while the more challenging problems require some calculus. This one-of-a-kind book explains physics and math concepts where needed, and includes an informative appendix of physical principles.

The Mathematical Mechanic will appeal to anyone interested in the little-known connections between mathematics and physics and how both endeavors relate to the world around us.

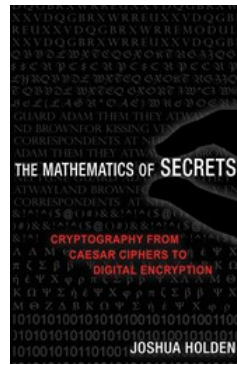


Mathletics – How Gamblers, Managers, and Fans Use Mathematics in Sports, Second Edition

Wayne L. Winston
9780691177625
£22.00 • \$26.95 • Paperback
Computers / Data Science / Data Analytics
April 2022
Princeton University Press

How to use math to improve performance and predict outcomes in professional sports

Mathletics reveals the mathematical methods top coaches and managers use to evaluate players and improve team performance, and gives math enthusiasts the practical skills they need to enhance their understanding and enjoyment of their favorite sports—and maybe even gain the outside edge to winning bets. This second edition features new data, new players and teams, and new chapters on soccer, e-sports, golf, volleyball, gambling Calcuttas, analysis of camera data, Bayesian inference, ridge regression, and other statistical techniques. After reading *Mathletics*, you will understand why baseball teams should almost never bunt; why football overtime systems are unfair; why points, rebounds, and assists aren't enough to determine who's the NBA's best player; and more.



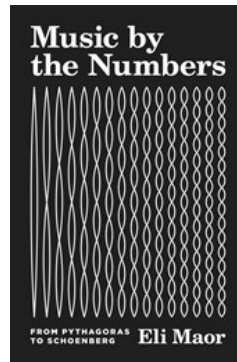
The Mathematics of Secrets – Cryptography from Caesar Ciphers to Digital Encryption

Joshua Holden
9780691183312
£15.99 • \$18.95 • Paperback
Computers / Security / Cryptography &
Encryption
October 2018
Princeton University Press

Explaining the mathematics of cryptography

The Mathematics of Secrets takes readers on a fascinating tour of the mathematics behind cryptography—the science of sending secret messages. Using a wide range of historical anecdotes and real-world examples, Joshua Holden shows how mathematical principles underpin the ways that different codes and ciphers work. He focuses on both code making and code breaking and discusses most of the ancient and modern ciphers that are currently known. He begins by looking at substitution ciphers, and then discusses how to introduce flexibility and additional notation. Holden goes on to explore polyalphabetic substitution ciphers, transposition ciphers, connections between ciphers and computer encryption, stream ciphers, public-key ciphers, and ciphers involving exponentiation. He concludes by looking at the future of ciphers and where cryptography might be headed. *The Mathematics of Secrets* reveals the mathematics working stealthily in the science of coded messages.

A blog describing new developments and historical discoveries in cryptography related to the material in this book is accessible at <http://press.princeton.edu/titles/10826.html>.

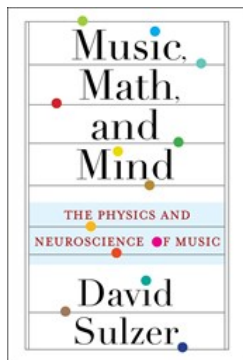


Music by the Numbers – From Pythagoras to Schoenberg

Eli Maor
9780691202969
£14.99 • \$17.95 • Paperback
Mathematics / History & Philosophy
March 2020
Princeton University Press

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.



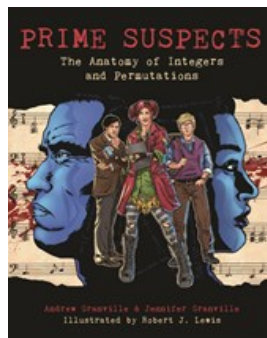
Music, Math, and Mind – The Physics and Neuroscience of Music

David Sulzer
9780231193795
£22.00 • \$28.00 • Paperback
Mathematics
June 2021
Columbia University Press

Why does a clarinet play at lower pitches than a flute? What does it mean for sounds to be in or out of tune? How are emotions carried by music? Do other animals perceive sound like we do? How might a musician use math to come up with new ideas?

This book offers a lively exploration of the mathematics, physics, and neuroscience that underlie music in a way that readers without scientific background can follow. David Sulzer, also known in the musical world as Dave Soldier, explains why the perception of music encompasses the physics of sound, the functions of the ear and deep-brain auditory pathways, and the physiology of emotion. He delves into topics such as the math by which musical scales, rhythms, tuning, and harmonies are derived, from the days of Pythagoras to technological manipulation of sound waves. Sulzer ranges from styles from around the world to canonical composers to hip-hop, the history of experimental music, and animal sound by songbirds, cetaceans, bats, and insects. He makes accessible a vast range of material, helping readers discover the universal principles behind the music they find meaningful.

Written for musicians and music lovers with any level of science and math proficiency, including none, *Music, Math, and Mind* demystifies how music works while testifying to its beauty and wonder.



Prime Suspects – The Anatomy of Integers and Permutations

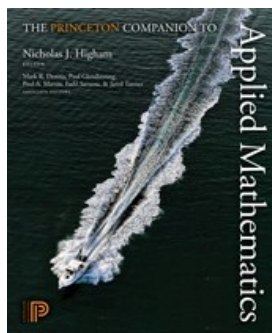
Andrew Granville
9780691149158
£18.99 • \$22.95 • Paperback
Mathematics / Number Theory
June 2019
Princeton University Press

An outrageous graphic novel that investigates key concepts in mathematics

Integers and permutations—two of the most basic mathematical objects—are born of different fields and analyzed with separate techniques. Yet when the Mathematical Sciences Investigation team of crack forensic mathematicians, led by Professor Gauss, begins its autopsies of the victims of two seemingly unrelated homicides, Arnie Integer and Daisy Permutation, they discover the most extraordinary similarities between the structures of each body.

Prime Suspects is a graphic novel that takes you on a voyage of forensic discovery, exploring some of the most fundamental ideas in mathematics. Travel with Detective von Neumann as he leaves no clue unturned, from shepherds' huts in the Pyrenees to secret societies in the cafés of Paris, from the hidden codes in the music of the stones to the grisly discoveries in Finite Fields. Tremble at the ferocity of the believers in deep and rigid abstraction. Feel the frustration—and the excitement—of our young heroine, Emmy Germain, as she blazes a trail for women in mathematical research and learns from Professor Gauss, the greatest forensic detective of them all.

Beautifully drawn and exquisitely detailed, *Prime Suspects* is unique, astonishing, and witty—a once-in-a-lifetime opportunity to experience mathematics like never before.



Princeton Companion to Applied Mathematics

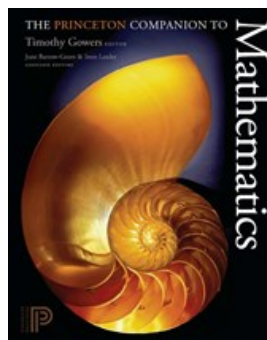
Nicholas J. Higham
9780691150390
£88.00 • \$105.00 • Hardcover
Mathematics / Reference
September 2015
Princeton University Press

The must-have compendium on applied mathematics

This is the most authoritative and accessible single-volume reference book on applied mathematics. Featuring numerous entries by leading experts and organized thematically, it introduces readers to applied mathematics and its uses; explains key concepts; describes important equations, laws, and functions; looks at exciting areas of research; covers modeling and simulation; explores areas of application; and more.

Modeled on the popular *Princeton Companion to Mathematics*, this volume is an indispensable resource for undergraduate and graduate students, researchers, and practitioners in other disciplines seeking a user-friendly reference book on applied mathematics.

- Features nearly 200 entries organized thematically and written by an international team of distinguished contributors
- Presents the major ideas and branches of applied mathematics in a clear and accessible way
- Explains important mathematical concepts, methods, equations, and applications
- Introduces the language of applied mathematics and the goals of applied mathematical research
- Gives a wide range of examples of mathematical modeling
- Covers continuum mechanics, dynamical systems, numerical analysis, discrete and combinatorial mathematics, mathematical physics, and much more
- Explores the connections between applied mathematics and other disciplines
- Includes suggestions for further reading, cross-references, and a comprehensive index



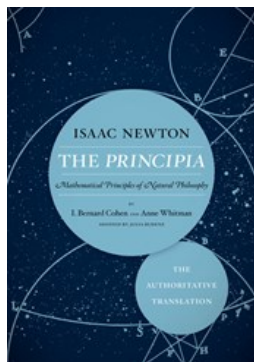
The Princeton Companion to Mathematics

Timothy Gowers
9780691118802
£84.00 • \$99.50 • Hardcover
Mathematics / Reference
October 2008
Princeton University Press

This is a one-of-a-kind reference for anyone with a serious interest in mathematics. Edited by Timothy Gowers, a recipient of the Fields Medal, it presents nearly two hundred entries, written especially for this book by some of the world's leading mathematicians, that introduce basic mathematical tools and vocabulary; trace the development of modern mathematics; explain essential terms and concepts; examine core ideas in major areas of mathematics; describe the achievements of scores of famous mathematicians; explore the impact of mathematics on other disciplines such as biology, finance, and music—and much, much more.

Unparalleled in its depth of coverage, *The Princeton Companion to Mathematics* surveys the most active and exciting branches of pure mathematics. Accessible in style, this is an indispensable resource for undergraduate and graduate students in mathematics as well as for researchers and scholars seeking to understand areas outside their specialties.

- Features nearly 200 entries, organized thematically and written by an international team of distinguished contributors
- Presents major ideas and branches of pure mathematics in a clear, accessible style
- Defines and explains important mathematical concepts, methods, theorems, and open problems
- Introduces the language of mathematics and the goals of mathematical research
- Covers number theory, algebra, analysis, geometry, logic, probability, and more
- Traces the history and development of modern mathematics
- Profiles more than ninety-five mathematicians who influenced those working today
- Explores the influence of mathematics on other disciplines



The Principia: The Authoritative Translation – Mathematical Principles of Natural Philosophy

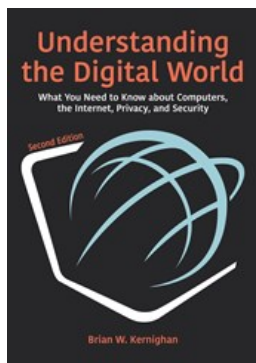
Isaac Newton
9780520290747
£16.99 • \$19.95 • Paperback
Science / Physics / Mathematical & Computational
February 2016
University of California Press

In his monumental 1687 work, *Philosophiæ Naturalis Principia Mathematica*, known familiarly as the *Principia*, Isaac Newton laid out in mathematical terms the principles of time, force, and motion that have guided the development of modern physical science. Even after more than three centuries and the revolutions of Einsteinian relativity and quantum mechanics, Newtonian physics continues to account for many of the phenomena of the observed world, and Newtonian celestial dynamics is used to determine the orbits of our space vehicles.

This authoritative, modern translation by I. Bernard Cohen and Anne Whitman, the first in more than 285 years, is based on the 1726 edition, the final revised version approved by Newton; it includes extracts from the earlier editions, corrects errors found in earlier versions, and replaces archaic English with contemporary prose and up-to-date mathematical forms.

Newton's principles describe acceleration, deceleration, and inertial movement; fluid dynamics; and the motions of the earth, moon, planets, and comets. A great work in itself, the *Principia* also revolutionized the methods of scientific investigation. It set forth the fundamental three laws of motion and the law of universal gravity, the physical principles that account for the Copernican system of the world as emended by Kepler, thus effectively ending controversy concerning the Copernican planetary system.

The translation-only edition of this preeminent work is truly accessible for today's scientists, scholars, and students.



Understanding the Digital World – What You Need to Know about Computers, the Internet, Privacy, and Security, Second Edition

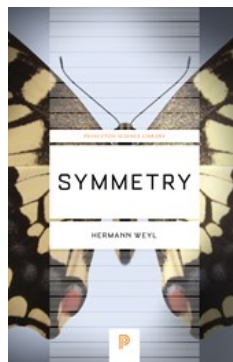
Brian W. Kernighan
9780691219103
£28.00 • \$31.95 • Paperback
Computers
April 2021
Princeton University Press

A brand-new edition of the popular introductory textbook that explores how computer hardware, software, and networks work

Computers are everywhere. Some are highly visible, in laptops, tablets, cell phones, and smart watches. But most are invisible, like those in appliances, cars, medical equipment, transportation systems, power grids, and weapons. We never see the myriad computers that quietly collect, share, and sometimes leak personal data about us. Governments and companies increasingly use computers to monitor what we do. Social networks and advertisers know more about us than we should be comfortable with. Criminals have all-too-easy access to our data. Do we truly understand the power of computers in our world?

In this updated edition of *Understanding the Digital World*, Brian Kernighan explains how computer hardware, software, and networks work. Topics include how computers are built and how they compute; what programming is; how the Internet and web operate; and how all of these affect security, privacy, property, and other important social, political, and economic issues. Kernighan touches on fundamental ideas from computer science and some of the inherent limitations of computers, and new sections in the book explore Python programming, big data, machine learning, and much more. Numerous color illustrations, notes on sources for further exploration, and a glossary explaining technical terms and buzzwords are included.

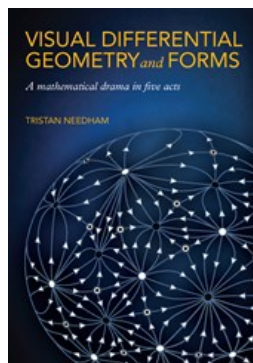
Understanding the Digital World is a must-read for readers of all backgrounds who want to know more about computers and communications.



Symmetry

Hermann Weyl
9780691173252
£14.99 • \$17.95 • Paperback
Mathematics
October 2016
Princeton University Press

Symmetry is a classic study of symmetry in mathematics, the sciences, nature, and art from one of the twentieth century's greatest mathematicians. Hermann Weyl explores the concept of symmetry beginning with the idea that it represents a harmony of proportions, and gradually departs to examine its more abstract varieties and manifestations—as bilateral, translatory, rotational, ornamental, and crystallographic. Weyl investigates the general abstract mathematical idea underlying all these special forms, using a wealth of illustrations as support. *Symmetry* is a work of seminal relevance that explores the great variety of applications and importance of symmetry.



Visual Differential Geometry and Forms – A Mathematical Drama in Five Acts

Tristan Needham
9780691203706
£40.00 • \$48.00 • Paperback
Mathematics / Geometry / Differential
August 2021
Princeton University Press

An inviting, intuitive, and visual exploration of differential geometry and forms

Visual Differential Geometry and Forms fulfills two principal goals. In the first four acts, Tristan Needham puts the geometry back into differential geometry. Using 235 hand-drawn diagrams, Needham deploys Newton's geometrical methods to provide geometrical explanations of the classical results. In the fifth act, he offers the first undergraduate introduction to differential forms that treats advanced topics in an intuitive and geometrical manner.

Unique features of the first four acts include: four distinct geometrical proofs of the fundamentally important Global Gauss-Bonnet theorem, providing a stunning link between local geometry and global topology; a simple, geometrical proof of Gauss's famous Theorema Egregium; a complete geometrical treatment of the Riemann curvature tensor of an n -manifold; and a detailed geometrical treatment of Einstein's field equation, describing gravity as curved spacetime (General Relativity), together with its implications for gravitational waves, black holes, and cosmology. The final act elucidates such topics as the unification of all the integral theorems of vector calculus; the elegant reformulation of Maxwell's equations of electromagnetism in terms of 2-forms; de Rham cohomology; differential geometry via Cartan's method of moving frames; and the calculation of the Riemann tensor using curvature 2-forms. Six of the seven chapters of Act V can be read completely independently from the rest of the book.

Requiring only basic calculus and geometry, *Visual Differential Geometry and Forms* provocatively rethinks the way this important area of mathematics should be considered and taught.

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