Number Theory for Computing

Introduction to Number Theory

Number Theory for Computing

Now in its second edition, this textbook provides an introduction and overview of number theory based on the density and properties of the prime numbers. This unique approach offers both a firm background in the standard material of number theory, as well as an overview of the entire discipline. All of the essential topics are covered, such as the fundamental theorem of arithmetic, theory of congruences, quadratic reciprocity, arithmetic functions, and the distribution of primes. New in this edition are coverage of p-adic numbers, Hensel's lemma, multiple zeta-values, and elliptic curve methods in primality testing. Key topics and features include: A solid introduction to analytic number theory, including full proofs of Dirichlet's Theorem and the Prime Number Theorem Concise treatment of algebraic number theory, including a complete presentation of primes, prime factorizations in algebraic number fields, and unique factorization of ideals Discussion of the AKS algorithm, which shows that primality testing is one of polynomial time, a topic not usually included in such texts Many interesting ancillary topics, such as primality testing and cryptography, Fermat and Mersenne numbers, and Carmichael numbers The user-friendly style, historical context, and wide range of exercises that range from simple to quite difficult (with solutions and hints provided for select exercises) make Number Theory: An Introduction via the Density of Primes ideal for both self-study and classroom use. Intended for upper level undergraduates and beginning graduate students, the only prerequisites are a basic knowledge of calculus, multivariable calculus, and some linear algebra. All necessary concepts from abstract algebra and complex analysis are introduced where needed.

A Computational Introduction to Number Theory and Algebra

Introduction to Number Theory

Very roughly speaking, representation theory studies symmetry in linear spaces. It is a beautiful mathematical subject which has many applications, ranging from number theory and combinatorics to geometry, probability theory, quantum mechanics, and quantum field theory. The goal of this book is to give a "holistic" introduction to representation theory, presenting it as a unified subject which studies representations of associative algebras and treating the representation theories of groups, Lie algebras, and quivers as special cases. Using this approach, the book covers a number of standard topics in the representation theories of these structures. Theoretical material in the book is supplemented by many problems and exercises which touch upon a lot of additional topics; the more difficult exercises are provided with hints. The book is designed as a textbook for advanced undergraduate and beginning graduate students. It should be accessible to students with a strong background in linear algebra and a basic knowledge of abstract algebra.

A Primer of Analytic Number Theory

A highly successful presentation of the fundamental concepts of number theory and computer programming Bridging an existing gap between mathematics and programming, Elementary Number Theory with Programming provides a unique introduction to elementary number theory with fundamental coverage of computer programming. Written by highly-qualified experts in the fields of computer science and mathematics, the book features accessible coverage for readers with various levels of experience and explores number theory in the context of programming without relying on advanced prerequisite knowledge and concepts in either area. Elementary Number Theory with Programming features comprehensive coverage of the methodology and applications of the most well-known theorems, problems, and concepts in number theory. Using standard mathematical applications within the programming field, the book presents modular arithmetic and prime decomposition, which are the basis of the public-private key system of cryptography. In addition, the book includes: Numerous examples, exercises, and research challenges in each chapter to encourage readers to work through the discussed concepts and ideas Select solutions to the chapter exercises in an appendix Pictorial sample computer programs to aid comprehension of the presented material for readers who have either never done any programming or need to improve their existing skill set A related website with links to select exercises An instructor's Solutions Manual available on a companion website Elementary Number Theory with Programming is a useful textbook for undergraduate and graduate-level students majoring in mathematics or computer science, as well as an excellent supplement for teachers and students who would like to better understand and appreciate number theory and computer programming. The book is also a great reference for computer scientists, programmers, and researchers interested in the mathematical applications of programming.

Introduction to Number Theory

Geometry and the theory of numbers are as old as some of the oldest historical records of humanity. Ever since antiquity, mathematicians have recorded many beautiful interactions between the two subjects and recorded them in such classical texts as Euclid's Elements and Diophantus's Aritmetica. Nowadays, the field of mathematics that studies the interactions between number theory and algebraic geometry is known as arithmetic geometry.
geometry. This book is an introduction to number theory and arithmetic geometry, and the goal of the text is to use geometry as the motivation to prove the main theorems in the book. For example, the fundamental theorem of arithmetic is a consequence of the tools we develop in order to find all the integral points on a line in the plane. Similarly, Gauss's law of quadratic reciprocity and the theory of continued fractions naturally arise when we attempt to determine the integral points on a curve in the plane given by a quadratic polynomial equation. A far an introduction to the theory of diophantine equations, the rest of the book is structured in three acts that correspond to the study of the integral and rational solutions of linear, quadratic, and cubic curves, respectively. This book describes many applications including modern applications in cryptography; it also presents some recent results in arithmetic geometry. With many exercises, this book can be used as a text for a first course in number theory or for a subsequent course on arithmetic (or diophantine) geometry at the junior-senior level.

Introduction to Representation Theory

This witty introduction to number theory deals with the properties of numbers and numbers as abstract concepts. Topics include primes, divisibility, quadratic forms, and related theorems.

Number Theory

This introductory book emphasizes algorithms and applications, such as cryptography and error correcting codes.

A Friendly Introduction to Number Theory

A n undergraduate-level 2003 introduction whose only prerequisite is a standard calculus course.

Mathematical Software - ICM S 2010

For one-semester undergraduate courses in Elementary Number Theory. A Friendly Introduction to Number Theory, Fourth Edition is designed to introduce students to the overall themes and methodology of mathematics through the detailed study of one particular facet-number theory. Starting with nothing more than basic high school algebra, students are gradually led to the point of actively performing mathematical research while getting a glimpse of current mathematical frontiers. The writing is appropriate for the undergraduate audience and includes many numerical examples, which are analyzed for patterns and used to make conjectures. Emphasis is on the methods used for proving theorems rather than on specific results.

Elementary Number Theory


A n Adventurer's Guide to Number Theory

Presents a groundbreaking investigation into the origins of morality at the core of religion and politics, offering scholarly insight into the motivations behind cultural clashes that are polarizing America.

Introduction to Analytic Number Theory

Developed from the author's popular text, A Concise Introduction to the Theory of Numbers, this book provides a comprehensive initiation to all the major branches of number theory. Beginning with the rudiments of the subject, the author proceeds to more advanced topics, including elements of cryptography and primality testing, an account of number fields in the classical vein including properties of their units, ideals and ideal classes, aspects of analytic number theory including studies of the Riemann zeta-function, the prime-number theorem and primes in arithmetical progressions, a description of the Hardy–Littlewood and sieve methods from respectively additive and multiplicative number theory and an exposition of the arithmetic of elliptic curves. The book includes many worked examples, exercises and further reading. Its wider coverage and versatility make this book suitable for courses extending from the elementary to beginning graduate studies.

Ramsey Theory on the Integers

"This book is the first volume of a two-volume textbook for undergraduates and is indeed the crystallization of a course offered by the author at the California Institute of Technology to undergraduates without any previous knowledge of number theory. For this reason, the book starts with the most elementary properties of the natural integers. Nevertheless, the text succeeds in presenting an enormous amount of material in little more than 300 pages."—MATHEMATICAL REVIEWS

A Friendly Introduction to Numerical Analysis

Number Theory Revealed: A Masterclass acquaints enthusiastic students with the "Queen of Mathematics". The text offers a fresh take on congruences, power residues, quadratic residues, primes, and Diophantine equations and presents hot topics like cryptography, factoring, and primality testing. Students are also introduced to beautiful enlightening questions like the structure of Pascal's triangle mod $p$ and modern twists on traditional questions like the values represented by binary quadratic forms, the anatomy of integers, and elliptic curves. This Masterclass edition contains many additional chapters and appendices not found in Number Theory Revealed: A Friendly Introduction to Numerical Analysis.

Number Theory Revealed: A Masterclass acquaints enthusiastic students with the "Queen of Mathematics". The text offers a fresh take on congruences, power residues, quadratic residues, primes, and Diophantine equations and presents hot topics like cryptography, factoring, and primality testing. Students are also introduced to beautiful enlightening questions like the structure of Pascal's triangle mod $p$ and modern twists on traditional questions like the values represented by binary quadratic forms, the anatomy of integers, and elliptic curves. This Masterclass edition contains many additional chapters and appendices not found in Number Theory Revealed: A Friendly Introduction to Numerical Analysis.

An Introduction, highlighting beautiful developments and inspiring other subjects in mathematics (like algebra). This allows instructors to tailor a course suited to their own (and their students') interests. There are new yet accessible topics like the curvature of circles in a tiling of a circle by circles, the latest discoveries on gaps between primes, a new proof of Mordell's Theorem for congruent elliptic curves, and a discussion of the
The K not Book

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.

Friendly Introduction to Number Theory, A,

A word to the wise: this book is for self-study. We recommend that you be sure you know your high school algebra and trigonometry. Of course, we provide a list of prerequisite topics if you need help. The book is intended for anyone who would like an introduction to number theory, where number theory is broadly interpreted to include both congruences and the certainty of number theory.

A Comprehensive Course in Number Theory

Number Theory

Originally published in 2013, reissued as part of Pearson's modern classic series.

Number Theory and Geometry: An Introduction to Arithmetic Geometry

Number theory is one of the oldest branches of mathematics that is primarily concerned with positive integers. While it has long been studied for its beauty and elegance as a branch of pure mathematics, it has seen a resurgence in recent years with the advent of the digital world for its modern applications in both computer science and cryptography. Number Theory: Step by Step is an undergraduate-level introduction to number theory that assumes no prior knowledge, but works to gradually increase the reader's confidence and ability to tackle more difficult material. The strength of the text is in its large number of examples and the step-by-step explanation of each topic as it is introduced to help aid understanding of the abstract mathematics of number theory. It is compiled in such a way that allows self-study, with explicit solutions to all the set of problems freely available online via the companion website. Punctuating the text are short and engaging historical profiles that add context for the topics covered and provide a dynamic background for the subject matter.

Fundamentals of Number Theory

Undergraduate text uses combinatorial approach to accommodate both math majors and liberal arts students. Covers the basics of number theory, offers an outstanding introduction to partitions, plus chapters on multiplicativity-divisibility, quadratic congruences, additivity, and more.

The Righteous Mind

One of the oldest branches of mathematics, number theory is a vast field devoted to studying the properties of whole numbers. Offering a flexible format for a one- or two-semester course, Introduction to Number Theory uses worked examples, numerous exercises, and two popular software packages to describe a diverse array of number theory topics. This classroom-tested, student-friendly text covers a wide range of subjects, from the ancient Euclidean algorithm for finding the greatest common divisor of two integers to recent developments that include cryptography, the theory of elliptic curves, and the negative solution of Hilbert's tenth problem. The authors illustrate the connections between number theory and other areas of mathematics, including algebra, analysis, and combinatorics. They also describe applications of number theory to real-world problems, such as congruences in the ISBN system, modular arithmetic and Euler's theorem in RSA encryption, and quadratic residues in the construction of tournaments. The book interleaves the theoretical development of the material with Mathematica and Maple calculations while giving brief tutorials on the software in the appendices. Highlighting both fundamental and advanced topics, this introduction provides all of the tools to achieve a solid foundation in number theory.

Number Theory Revealed: A Masterclass

One of the oldest branches of mathematics, number theory is a vast field devoted to studying the properties of whole numbers. Offering a flexible format for a one- or two-semester course, Introduction to Number Theory uses worked examples, numerous exercises, and two popular software packages to describe a diverse array of number theory topics. This classroom-tested, student-friendly text covers a wide range of subjects, from the ancient Euclidean algorithm for finding the greatest common divisor of two integers to recent developments that include cryptography, the theory of elliptic curves, and the negative solution of Hilbert's tenth problem. The authors illustrate the connections between number theory and other areas of mathematics, including algebra, analysis, and combinatorics. They also describe applications of number theory to real-world problems, such as congruences in the ISBN system, modular arithmetic and Euler's theorem in RSA encryption, and quadratic residues in the construction of tournaments. The book interleaves the theoretical development of the material with Mathematica and Maple calculations while giving brief tutorials on the software in the appendices. Highlighting both fundamental and advanced topics, this introduction provides all of the tools to achieve a solid foundation in number theory.

Number Theory and Geometry: An Introduction to Arithmetic Geometry

Originally published in 2013, reissued as part of Pearson's modern classic series.
Number Theory

In a manner accessible to beginning undergraduates, An Invitation to Modern Number Theory introduces many of the central problems, conjectures, results, and techniques of the field, such as the Riemann Hypothesis, Roth's Theorem, the Circle Method, and Random Matrix Theory. Showing how experiments are used to test conjectures and prove theorems, the book allows students to do original work on such problems, often using little more than calculus (though there are numerous remarks for those with deeper backgrounds). It shows students what number theory theorems are used for and what led to them and suggests problems for further research. Steven Miller and Ramin Takloo-Bighash introduce the problems and the computational skills required to numerically investigate them, providing background material (from probability to statistics to Fourier analysis) whenever necessary. They guide students through a variety of problems, ranging from basic number theory, cryptography, and Goldbach's Problem, to the algebraic structures of numbers and continued fractions, showing connections between these subjects and encouraging students to study them further. In addition, this is the first undergraduate book to explore Random Matrix Theory, which has recently become a powerful tool for predicting answers in number theory. Providing exercises, references to the background literature, and Weblinks to previous student research projects, An Invitation to Modern Number Theory can be used to teach a research seminar or a lecture class.

A Dictionary of Media and Communication

You can go after the job you want—and get it! Y ou can take the job you have—and improve it! Y ou can take any situation—and make it work for you! Dale Carnegie’s rock-solid, time-tested advice has carried countless people up the ladder of success in their business and personal lives. One of the most groundbreaking and timeless bestsellers of all time, How to Win Friends & Influence People will teach you: Six ways to make people like you—Twelve ways to win people to your way of thinking—Nine ways to change people without arousing resentment And much more! Achieve your maximum potential—a must-read for the twenty-first century with more than 15 million copies sold!

Elementary Number Theory

This is the eBook of the printed book and may not include any media, website access codes, or print supplements that may come packaged with the bound book. A Friendly Introduction to Number Theory, Fourth Edition is designed to introduce readers to the overall themes and methodology of mathematics through the detailed study of one particular facet—number theory. Starting with nothing more than basic high school algebra, readers are gradually led to the point of actively performing mathematical research while getting a glimpse of current mathematical frontiers. The writing is appropriate for the undergraduate audience and includes many numerical examples, which are analyzed for patterns and used to make conjectures. Emphasis is on the methods used for proving theorems rather than on specific results.

A Friendly Introduction To Number Theory, 3/E

A n undergraduate-level introduction to number theory, with the emphasis on fully explained proofs and examples. Exercises, together with their solutions, are integrated into the text, and the first few chapters assume only basic school algebra. Elementary ideas about groups and rings are then used to study groups of units, quadratic residues and arithmetic functions with applications to enumeration and cryptography. The final part, suitable for third-year students, uses ideas from algebra, analysis, calculus and geometry to study Dirichlet series and sums of squares. In particular, the last chapter gives a concise account of Fermat's Last Theorem, from its origin in the ancient Babylonian and Greek study of Pythagorean triples to its recent proof by Andrew Wiles.

Elementary Number Theory

This is a book about prime numbers, congruences, secret messages, and elliptic curves that you can read cover to cover. It grew out of undergraduate courses that the author taught at Harvard, UC San Diego, and the University of Washington. The systematic study of number theory was initiated around 3000 BC when Euclid proved that there are infinitely many prime numbers, and also cleverly deduced the fundamental theorem of arithmetic, which asserts that every positive integer factors uniquely as a product of primes. Over a thousand years later (around 972 AD), Arab mathematicians formulated the congruent number problem that asks for a way to decide whether or not a given positive integer is in the area of a right triangle, all three of whose sides are rational numbers. Then another thousand years later (in 1776), Diophantus solved the first ever public-key cryptosystem, which enabled two people to communicate secretly over a public communications channel with no predetermined secret; this invention and the ones that followed it revolutionized the world of digital communication. In the 1980s and 1990s, elliptic curves revolutionized number theory, providing striking new insights into the congruent number problem, primality testing, public-key cryptography, attacks on public-key systems, and playing a central role in Andrew Wiles' resolution of Fermat's Last Theorem.

An Invitation to Modern Number Theory
With almost a thousand imaginative exercises and problems, this book stimulates curiosity about numbers and their properties.

The Whole Truth About Whole Numbers

This book presents material suitable for an undergraduate course in elementary number theory from a computational perspective. It seeks to not only introduce students to the standard topics in elementary number theory, such as prime factorization and modular arithmetic, but also to develop their ability to formulate and test precise conjectures from experimental data. Each topic is motivated by a question to be answered, followed by some experimental data, and, finally, the statement and proof of a theorem. There are numerous opportunities throughout the chapters and exercises for the students to engage in (guided) open-ended exploration. At the end of a course using this book, the students will understand how mathematics is developed from asking questions to gathering data to formulating and proving theorems. The mathematical prerequisites for this book are few. Early chapters contain topics such as integer divisibility, modular arithmetic, and applications to cryptography, while later chapters contain more specialized topics, such as Diophantine approximation, number theory of dynamical systems, and number theory with polynomials. Students of all levels will be drawn in by the patterns and relationships of number theory uncovered through data driven exploration.

Number Theory

Ramsey theory is the study of the structure of mathematical objects that is preserved under partitions. In its full generality, Ramsey theory is quite powerful, but can quickly become complicated. By limiting the focus of this book to Ramsey theory applied to the set of integers, the authors have produced a gentle, but meaningful, introduction to an important and enticing branch of modern mathematics. Ramsey Theory on the Integers offers students a glimpse into the world of mathematical research and the opportunity for them to begin pondering unsolved problems. For this new edition, several sections have been added and others have been significantly updated. Among the newly introduced topics are: rainbow Ramsey theory, an "inequality" version of Schur's theorem, monochromatic solutions of recurrence relations, Ramsey results involving both sums and products, monochromatic sets avoiding certain differences, Ramsey properties for polynomial progressions, generalizations of the Erdős-Ginzburg-Ziv theorem, and the number of arithmetic progressions under arbitrary colorings. Many new results and proofs have been added, most of which were not known when the first edition was published. Furthermore, the book's tables, exercises, lists of open research problems, and bibliography have all been significantly updated. This innovative book also provides the first cohesive study of Ramsey theory on the integers. It contains perhaps the most substantial account of solved and unsolved problems in this blossoming subject. This breakthrough book will engage students, teachers, and researchers alike.

Introduction to Number Theory

This book provides a good introduction to the classical elementary number theory and the modern algorithmic number theory, and their applications in computing and information technology, including computer systems design, cryptography and network security. In this second edition proofs of many theorems have been provided, further additions and corrections were made.

Many Variations of Mahler Measures

Elementary Number Theory: Primes, Congruences, and Secrets

Number Theory: A Lively Introduction with Proofs, Applications, and Stories, is a new book that provides a rigorous yet accessible introduction to elementary number theory along with relevant applications. Readable discussions motivate new concepts and theorems before their formal definitions and statements are presented. Many theorems are preceded by Numerical Proof Previews, which are numerical examples that will help give students a concrete understanding of both the statements of the theorems and the ideas behind their proofs, before the statement and proof are formalized in more abstract terms. In addition, many applications of number theory are explained in detail throughout the text, including some that have rarely (if ever) appeared in textbooks. A unique feature of the book is that every chapter includes a math myth, a fictional story that introduces an important number theory topic in a friendly, inviting manner. Many of the exercises sets include in-depth Explorations, in which a series of exercises develop a topic that is related to the material in the section.

An Invitation to Applied Category Theory

This authoritative and up-to-date A-Z covers all aspects of interpersonal, mass, and networked communication, including digital and mobile media, advertising, journalism, and nonverbal communication. This new edition is particularly focused on expanding coverage of social media terms, to reflect its increasing prominence to media and communication studies as a whole. More than 2,000 entries have been revised, and over 500 new terms have been added to reflect current theoretical terminology, including concepts such as artificial intelligence, clickbait, fake news, hive mind, use theory, and wikiality. The dictionary also bridges the gap between theory and practice, and contains many technical terms that are relevant to the communication industry, including dialogue editing, news aggregator, and primary colour correction. The text is complemented by biographical notes and extensively cross-referenced, while web links supplement the entries. It is an indispensable guide for undergraduate students of media and communication studies, and also for those taking related subjects such as television studies, video production, communication design, visual communication, marketing communications, semiotics, and cultural studies.

Number Theory

This practical and versatile text evolved from the author's years of teaching experience and the input of his students. Vanden Eynden strives to alleviate the anxiety that many students experience when approaching any proof-oriented area of mathematics, including number theory. His informal yet straightforward writing style explains the ideas behind the process of proof construction, showing that mathematicians develop theorems and proofs from trial and error and evolutionary improvement, not spontaneous insight. Furthermore, the book includes more computational problems than most other number theory texts to build students' familiarity and confidence with the theory behind the material. The author has devised the content, organization, and writing style so that information is accessible, students can gain self-confidence with respect to mathematics, and the book can be used in a wide range of courses—from those that emphasize history and type A problems to those that are proof oriented.

Friendly Introduction to Number Theory (Classic Version)
Publisher's description: A Friendly Introduction to Number Theory is an introductory undergraduate text designed to entice non-math majors into learning some mathematics, while at the same time teaching them how to think mathematically. The exposition is informal, with a wealth of numerical examples that are analyzed for patterns and used to make conjectures. Only then are theorems proved, with the emphasis on methods of proof rather than on specific results. Starting with nothing more than basic high school algebra, the reader is gradually led to the point of producing their own conjectures and proofs, as well as getting some glimpses at the frontiers of current mathematical research.

An Experimental Introduction to Number Theory


A Friendly Introduction to Number Theory

Category theory is unmatched in its ability to organize and layer abstractions and to find commonalities between structures of all sorts. No longer the exclusive preserve of pure mathematicians, it is now proving itself to be a powerful tool in science, informatics, and industry. By facilitating communication between communities and building rigorous bridges between disparate worlds, applied category theory has the potential to be a major organizing force. This book offers a self-contained tour of applied category theory. Each chapter follows a single thread motivated by a real-world application and discussed with category-theoretic tools. We see data migration as an adjoint functor, electrical circuits in terms of monoidal categories and operads, and collaborative design via enriched profunctors. All the relevant category theory, from simple to sophisticated, is introduced in an accessible way with many examples and exercises, making this an ideal guide even for those without experience of university-level mathematics.