Principle Of Mathematical Induction

An understanding of developments in Arabic mathematics between the IXth and XVth century is vital to a full appreciation of the history of classical mathematics. This book draws together more than ten studies to highlight one of the major developments in Arabic mathematical thinking, provoked by the double fecondation between arithmetic and the algebra of al-Khwarizmi, which led to the foundation of diverse chapters of mathematics: polynomial algebra, combinatorial analysis, algebraic geometry, algebraic theory of numbers, diophantine analysis and numerical calculus. Thanks to epistemological analysis, and the discovery of hitherto unknown material, the author has brought these chapters into the light, proposes another periodization for classical mathematics, and questions current ideology in writing its history. Since the publication of the French version of these studies and of this book, its main results have been admitted by historians of Arabic mathematics, and integrated into their recent publications. This book is already a vital reference for anyone seeking to understand history of Arabic mathematics, and its contribution to Latin as well as to later mathematics. The English translation will be of particular value to historians and philosophers of mathematics and of science.

An introduction to the basic concepts of linear algebra, along with an introduction to the techniques of formal mathematics. Numerous worked examples and exercises, along with precise statements of definitions and complete proofs of every theorem, make the text ideal for independent study.

At the intersection of mathematics, computer science, and philosophy, mathematical logic examines the power and limitations of formal mathematical thinking. In this expansion of Leary's user-friendly 1st edition, readers with no previous study in the field are introduced to the basics of model theory, proof theory, and computability theory. The text is designed to be used either in an upper division undergraduate classroom, or for self study. Updating the 1st Edition's treatment of languages, structures, and deductions, leading to rigorous proofs of Godel's First and Second Incompleteness Theorems, the expanded 2nd Edition includes a new introduction to incompleteness through computability as well as solutions to selected exercises.

Based on a well-received course designed for philosophy students, this book is an informal introduction to mathematical thinking. The work will be rewarding not only for philosophers concerned with mathematical questions but also for serious amateur mathematicians with an interest in the "frontiers" as well as the foundations of mathematics. In what might be termed a sampler of the discipline, Konrad Jacobs discusses an unusually wide range of topics, including such items of contemporary interest as knot theory, optimization theory, and dynamical systems. Using Euclidean geometry and algebra to introduce the mathematical mode of thought, the author then turns to recent developments. In the process he offers what he calls a "Smithsonian of mathematical showpieces": the five Platonic Solids, the Mbius Strip, the Cantor Discontinuum, the Peano Curve, Reidemeister's Knot Table, the plane ornaments, Alexander's Horned Sphere, and Antoine's Necklace. The treatments of geometry and algebra are followed by a chapter on induction and one on optimization, game theory, and mathematical economics. The chapter on topology includes a discussion of topological spaces and continuous mappings, curves and knots, Euler's polyhedral formula for surfaces, and the fundamental group. The last chapter deals with dynamics and contains material on the Game of Life, circle rotation, Smale's "horseshoe," and stability and instability, among other topics.

This book takes the reader on a journey through the world of college mathematics, focusing on some of the most important concepts and results in the theories of polynomials, linear algebra, real analysis, differential equations, coordinate geometry, trigonometry, elementary number theory, combinatorics, and probability. Preliminary material provides an overview of common methods of proof: argument by contradiction, mathematical induction, pigeonhole principle, ordered sets, and invariants. Each chapter systematically presents a single subject within which problems are clustered in each section according to the specific topic. The exposition is driven by nearly 1300 problems and examples chosen from numerous sources from around the world; many original contributions come from the authors. The source, author, and historical background are cited whenever possible. Complete solutions to all problems are given at the end of the book. This second edition includes new sections on quad ratic polynomials, curves in the plane, quadratic fields, combinatorics of numbers, and graph theory, and added problems or theoretical expansion of sections on polynomials, matrices, abstract algebra, limits of sequences and functions, derivatives and their applications, Stokes' theorem, analytical geometry, combinatorial geometry, and counting strategies. Using the W.L. Putnam Mathematical Competition for undergraduates as an inspiring symbol to build an appropriate math background for graduate studies in pure or applied mathematics, the reader is eased into transitioning from problem-solving at the high school level to the university and beyond, that is, to mathematical research. This work may be used as a study guide for the Putnam exam, as a text for many different problem-solving courses, and as a source of problems for standard courses in undergraduate mathematics. Putnam and Beyond is organized for independent study by undergraduate and gradu ate students, as well as teachers and researchers in the physical sciences who wish to expand their mathematical horizons.

Handbook of Mathematical InductionTheory and ApplicationsChapman & Hall/CRC

The book is about mathematical induction for college students. It discusses the first principle and its three variations such as the second principle.. As a self-study guide, the book gives plenty of examples and explanations to help readers to grasp math concepts.

This Book Enables Students To Thoroughly Master Pre-College Mathematics And Helps Them To Prepare For Various Entrance (Screening) Tests With Skill And Confidence. The Book Thoroughly Explains The Following:1. Algebra2. Trigonometry3. Co-Ordinate Geometry4. Three Dimensional Geometry5. Calculus6. Vectors7. StatisticsIn Addition To Theory, The Book Includes A Large Number Of * Solved Examples * Practice Problems With Answers * Objective Questions Including Multiple Choice, True/False And Fill-In-The-Blanks * Model Test Papers And Iit Screening Tests For Self-TestThe Language Is Clear And Simple Throughout The Book And The Entire Subject Is Explained In An Interesting And Easy-To-Understand Manner.

This influential 1888 publication explained the real numbers, and their construction and properties, from first principles.

This unique collection of new and classical problems provides full coverage of algebraic inequalities. Many of the exercises are presented with detailed author-prepared-solutions, developing creativity and an arsenal of new approaches for solving mathematical problems. Algebraic Inequalities can be considered a continuation of the book Geometric Inequalities: Methods of Proving by the authors. This book can serve teachers, high-school students, and mathematical competitors. It may also be used as supplemental reading, providing readers with new and classical methods for proving algebraic inequalities.

Mathematical Reasoning: Writing and Proof is a text for the ?rst college mathematics course that introduces students to the processes of constructing and writing proofs and focuses on the formal development of mathematics. The primary goals of the text are to help students: Develop logical thinking skills and to develop the ability to think more abstractly in a proof oriented setting; develop the ability to construct and write mathematical proofs using standard methods of mathematical proof including direct proofs, proof by contradiction, mathematical induction, case analysis, and counterexamples; develop the ability to read and understand written mathematical proofs; develop talents for creative thinking and problem solving; improve their quality of communication in mathematics. This includes improving writing techniques, reading comprehension, and oral communication in mathematics; better understand the nature of mathematics and its language. Another important goal of this text is to provide students with material that will be needed for their further study of mathematics. Important features of the book include: Emphasis on writing in mathematics; instruction in the process of constructing proofs; emphasis on active learning.There are no changes in content between Version 2.0 and previous versions of the book. The only change is that the appendix with answers and hints for selected exercises now contains solutions and hints for more exercises.

Susanna Epp's DISCRETE MATHEMATICS: AN INTRODUCTION TO MATHEMATICAL REASONING, provides the same clear introduction to discrete mathematics and mathematical reasoning as her highly acclaimed DISCRETE

MATHEMATICS WITH APPLICATIONS, but in a compact form that focuses on core topics and omits certain applications usually taught in other courses. The book is appropriate for use in a discrete mathematics course that emphasizes essential topics or in a mathematics major or minor course that serves as a transition to abstract mathematical thinking. The ideas of discrete mathematics underlie and are essential to the science and technology of the computer age. This book offers a synergistic union of the major themes of discrete mathematics together with the reasoning that underlies mathematical thought. Renowned for her lucid, accessible prose, Epp explains complex, abstract concepts with clarity and precision, helping students develop the ability to think abstractly as they study each topic. In doing so, the book provides students with a strong foundation both for computer science and for other upper-level mathematics courses. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

According to the great mathematician Paul Erdös, God maintains perfect mathematical proofs in The Book. This book presents the authors candidates for such "perfect proofs," those which contain brilliant ideas, clever connections, and wonderful observations, bringing new insight and surprising perspectives to problems from number theory, geometry, analysis, combinatorics, and graph theory. As a result, this book will be fun reading for anyone with an interest in mathematics.

A Spiral Workbook for Discrete Mathematics covers the standard topics in a sophomore-level course in discrete mathematics: logic, sets, proof techniques, basic number theory, functions,relations, and elementary combinatorics, with an emphasis on motivation. The text explains and claries the unwritten conventions in mathematics, and guides the students through a detailed discussion on how a proof is revised from its draft to a nal polished form. Hands-on exercises help students understand a concept soon after learning it. The text adopts a spiral approach: many topics are revisited multiple times, sometimes from a dierent perspective or at a higher level of complexity, in order to slowly develop the student's problem-solving and writing skills.

Mathematical induction — along with its equivalents, complete induction and well-ordering, and its immediate consequence, the pigeonhole principle — constitute essential proof techniques. Every mathematician is familiar with mathematical induction, and every student of mathematics requires a grasp of its concepts. This volume provides an introduction and a thorough exposure to these proof techniques. Geared toward students of mathematics at all levels, the text is particularly suitable for courses in mathematical induction, theorem-proving, and problem-solving. The treatment begins with both intuitive and formal explanations of mathematical induction and its equivalents. The next chapter presents many problems consisting of results to be proved by induction, with solutions omitted to enable instructors to assign them to students. Problems vary in difficulty; the majority of them require little background, and the most advanced involve calculus or linear algebra. The final chapter features proofs too complicated for students to find on their own, some of which are famous theorems by well-known mathematicians. For these beautiful and important theorems, the author provides expositions and proofs. The text concludes with a helpful Appendix providing the logical equivalence of the various forms of induction.

Note: This is the 3rd edition. If you need the 2nd edition for a course you are taking, it can be found as a "other format" on amazon, or by searching its isbn: 1534970746 This gentle introduction to discrete mathematics is written for first and second year math majors, especially those who intend to teach. The text began as a set of lecture notes for the discrete mathematics course at the University of Northern Colorado. This course serves both as an introduction to topics in discrete math and as the "introduction to proof" course for math majors. The course is usually taught with a large amount of student inquiry, and this text is written to help facilitate this. Four main topics are covered: counting, sequences, logic, and graph theory. Along the way proofs are introduced, including proofs by contradiction, proofs by induction, and combinatorial proofs. The book contains over 470 exercises, including 275 with solutions and over 100 with hints. There are also Investigate! activities throughout the text to support active, inquiry based learning. While there are many fine discrete math textbooks available, this text has the following advantages: It is written to be used in an inquiry rich course. It is written to be used in a course for future math teachers. It is open source, with low cost print editions and free electronic editions. This third edition brings improved exposition, a new section on trees, and a bunch of new and improved exercises. For a complete list of changes, and to view the free electronic version of the text, visit the book's website at discrete.openmathbooks.org

This book prepares students for the more abstract mathematics courses that follow calculus. The author introduces students to proof techniques, analyzing proofs, and writing proofs of their own. It also provides a solid introduction to such topics as relations, functions, and cardinalities of sets, as well as the theoretical aspects of fields such as number theory, abstract algebra, and group theory.

This book explains you about mathematical induction by means of cluster of worked out examples.Mathematical induction is a mathematical proof technique used to prove a given statement about any well-ordered set. Most commonly, it is used to establish statements for the set of all natural numbers.Mathematical induction is a form of direct proof, usually done in two steps. When trying to prove a given statement for a set of natural numbers, the first step, known as the base case, is to prove the given statement for the first natural number. The second step, known as the inductive step, is to prove that, if the statement is assumed to be true for any one natural number, then it must be true for the next natural number as well. Having proved these two steps, the rule of inference establishes the statement to be true for all natural numbers. In common terminology, using the stated approach is referred to as using the Principle of mathematical induction

This book serves as a one-semester introductory course in number theory. Throughout the book, Tattersall adopts a historical perspective and gives emphasis to some of the subject's applied aspects, highlighting the field of cryptography. At the heart of the book are the major number theoretic accomplishments of Euclid, Fermat, Gauss, Legendre, and Euler, and to fully illustrate the properties of numbers and concepts developed in the text, a wealth of exercises has been included. The reader should have "pencil in hand" and ready access to a calculator or computer. For students new to number theory, whatever their background, this is a stimulating and entertaining introduction to the subject.

Proofs play a central role in advanced mathematics and theoretical computer science, yet many students struggle the first time they take a course in which proofs play a significant role. This bestselling text's third edition helps students transition from solving problems to proving theorems by teaching them the techniques needed to read and write proofs. Featuring over 150 new exercises and a new chapter on number theory, this new edition introduces students to the world of advanced mathematics through the mastery of proofs. The book begins with the basic concepts of logic and set theory to familiarize students with the language of mathematics and how it is interpreted. These concepts are used as the basis for an analysis of techniques that can be used to build up complex proofs step by step, using detailed 'scratch work' sections to expose the machinery of proofs about numbers, sets, relations, and functions. Assuming no background beyond standard high school mathematics, this book will be useful to anyone interested in logic and proofs: computer scientists, philosophers, linguists, and, of course, mathematicians.

Here the author of How to Solve It explains how to become a "good guesser." Marked by G. Polya's simple, energetic prose and use of clever examples from a wide range of human activities, this two-volume work explores techniques of guessing, inductive reasoning, and reasoning by analogy, and the role they play in the most rigorous of deductive disciplines.

Discrete Mathematics and Combinatorics provides a concise and practical introduction to the core components of discrete mathematics, featuring a balanced mix of basic theories and applications. The book covers both fundamental concepts such as sets and logic, as well as advanced topics such as graph theory and Turing machines. The example-driven approach will help readers in understanding and applying the concepts. Other pedagogical tools - illustrations, practice questions, and suggested reading - facilitate learning and mastering the subject."--Cover

This book leads readers through a progressive explanation of what mathematical proofs are, why they are important, and how they work, along with a presentation of basic techniques used to construct proofs. The Second Edition presents more examples, more exercises, a more

complete treatment of mathematical induction and set theory, and it incorporates suggestions from students and colleagues. Since the mathematical concepts used are relatively elementary, the book can be used as a supplement in any post-calculus course. This title has been successfully class-tested for years. There is an index for easier reference, a more extensive list of definitions and concepts, and an updated bibliography. An extensive collection of exercises with complete answers are provided, enabling students to practice on their own. Additionally, there is a set of problems without solutions to make it easier for instructors to prepare homework assignments. * Successfully class-tested over a number of years * Index for easy reference * Extensive list of definitions and concepts * Updated biblography
Chapters and topics have been organized in a reader-friendly manner. Ample number of solved examples and exercise problems included in each chapter. Extensive coverage of applications of mathematical modeling in business.
What kind of book is this? It is a book produced by a remarkable cultural circumstance in the former Soviet Union which fostered the creation of groups of students, teachers, and mathematicians called "mathematical circles". The work is predicated on the idea that studying mathematics can generate the same enthusiasm as playing a team sport - without necessarily being competitive. This book is intended for both students and teachers who love mathematics and want to study its various branches beyond the limits of school curriculum.
The Art of Proof is designed for a one-semester or two-quarter course. A typical student will have studied calculus (perhaps also linear algebra) with reasonable success. With an artful mixture of chatty style and interesting examples, the student's previous intuitive knowledge is placed on solid intellectual ground. The topics covered include: integers, induction, algorithms, real numbers, rational numbers, modular arithmetic, limits, and uncountable sets. Methods, such as axiom, theorem and proof, are taught while discussing the mathematics rather than in abstract isolation. The book ends with short essays on further topics suitable for seminar-style presentation by small teams of students, either in class or in a mathematics club setting. These include: continuity, cryptography, groups, complex numbers, ordinal number, and generating functions.
This stimulating textbook presents a broad and accessible guide to the fundamentals of discrete mathematics, highlighting how the techniques may be applied to various exciting areas in computing. The text is designed to motivate and inspire the reader, encouraging further study in this important skill. Features: provides an introduction to the building blocks of discrete mathematics, including sets, relations and functions; describes the basics of number theory, the techniques of induction and recursion, and the applications of mathematical sequences, series, permutations, and combinations; presents the essentials of algebra; explains the fundamentals of automata theory, matrices, graph theory, cryptography, coding theory, language theory, and the concepts of computability and decidability; reviews the history of logic, discussing propositional and predicate logic, as well as advanced topics; examines the field of software engineering, describing formal methods; investigates probability and statistics.
Introduction to Mathematical Proofs helps students develop the necessary skills to write clear, correct, and concise proofs. Unlike similar textbooks, this one begins with logic since it is the underlying language of mathematics and the basis of reasoned arguments. The text then discusses deductive mathematical systems and the systems of natural numbers, integers, rational numbers, and real numbers. It also covers elementary topics in set theory, explores various properties of relations and functions, and proves several theorems using induction. The final chapters introduce the concept of cardinalities of sets and the concepts and proofs of real analysis and group theory. In the appendix, the author includes some basic guidelines to follow when writing proofs. This new edition includes more than 125 new exercises in sections titled More Challenging Exercises. Also, numerous examples illustrate in detail how to write proofs and show how to solve problems. These

examples can serve as models for students to emulate when solving exercises. Several biographical sketches and historical comments have been included to enrich and enliven the text. Written in a conversational style, yet maintaining the proper level of mathematical rigor, this accessible book teaches students to reason logically, read proofs critically, and write valid mathematical proofs. It prepares them to succeed in more advanced mathematics courses, such as abstract algebra and analysis.

This book is an introduction to the language and standard proof methods of mathematics. It is a bridge from the computational courses (such as calculus or differential equations) that students typically encounter in their first year of college to a more abstract outlook. It lays a foundation for more theoretical courses such as topology, analysis and abstract algebra. Although it may be more meaningful to the student who has had some calculus, there is really no prerequisite other than a measure of mathematical maturity.

Handbook of Mathematical Induction: Theory and Applications shows how to find and write proofs via mathematical induction. This comprehensive book covers the theory, the structure of the written proof, all standard exercises, and hundreds of application examples from nearly every area of mathematics. In the first part of the book, the author discusses different inductive techniques, including well-ordered sets, basic mathematical induction, strong induction, double induction, infinite descent, downward induction, and several variants. He then introduces ordinals and cardinals, transfinite induction, the axiom of choice, Zorn's lemma, empirical induction, and fallacies and induction. He also explains how to write inductive proofs. The next part contains more than 750 exercises that highlight the levels of difficulty of an inductive proof, the variety of inductive techniques available, and the scope of results provable by mathematical induction. Each self-contained chapter in this section includes the necessary definitions, theory, and notation and covers a range of theorems and problems, from fundamental to very specialized. The final part presents either solutions or hints to the exercises. Slightly longer than what is found in most texts, these solutions provide complete details for every step of the problem-solving process.

Presents a uniquely balanced approach that bridges introductory and advanced topics in modern mathematics An accessible treatment of the fundamentals of modern mathematics, Principles of Mathematics: A Primer provides a unique approach to introductory andadvanced mathematical topics. The book features six main subjects, whichcan be studied independently or in conjunction with each other including: settheory; mathematical logic; proof theory; group theory; theory of functions; andlinear algebra. The author begins with comprehensive coverage of the necessary building blocks in mathematics and emphasizes the need to think abstractly and develop an appreciation for mathematical thinking. Maintaining a useful balance of introductory coverage and mathematical rigor, Principles of Mathematics: A Primer features: Detailed explanations of important theorems and their applications Hundreds of completely solved problems throughout each chapter Numerous exercises at the end of each chapter to encourage further exploration Discussions of interesting and provocative issues that spark readers' curiosity and facilitate a better understanding and appreciation of the field of mathematics Principles of Mathematics: A Primer is an ideal textbook for upper-undergraduate courses in the foundations of mathematics and mathematical logic as well as for graduate-level courses related to physics, engineering, and computer science. The book is also a useful reference for readers interested in pursuing careers in mathematics and the sciences.