

Mathematical Induction Problems With Solutions

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 bibliography

Induction in Geometry discusses the application of the method of mathematical induction to the solution of geometric problems, some of which are quite intricate. The book contains 37 examples with detailed solutions and 40 for which only brief hints are provided. Most of the material requires only a background in high school algebra and plane geometry; chapter six assumes some

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knowledge of solid geometry, and the text occasionally employs formulas from trigonometry. Chapters are self-contained, so readers may omit those for which they are unprepared. To provide additional background, this volume incorporates the concise text, *The Method of Mathematical Induction*. This approach introduces this technique of mathematical proof via many examples from algebra, geometry, and trigonometry, and in greater detail than standard texts. A background in high school algebra will largely suffice; later problems require some knowledge of trigonometry. The combination of solved problems within the text and those left for readers to work on, with solutions provided at the end, makes this volume especially practical for independent study.

Volume I of a two-part series, this book features a broad spectrum of 100 challenging problems related to probability theory and combinatorial analysis. The problems, most of which can be solved with elementary mathematics, range from relatively simple to extremely difficult. Suitable for students, teachers, and any lover of mathematics. Complete solutions.

- Chapter-wise & Topic-wise presentation
- Chapter Objectives-A sneak peek into the chapter
- Mind Map: A single page snapshot of the entire chapter
- Quick Review: Concept-based study material
- Tips & Tricks: Useful guidelines for attempting each question perfectly
- Some Commonly Made Errors: Most common and unidentified errors made by students discussed
- Expert Advice- Oswaal Expert Advice on how to score more!
- Oswaal QR Codes- For Quick Revision on your Mobile Phones & Tablets We hope that OSWAAL NCERT

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Solutions will help you at every step as you move closer to your educational goals.

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 clarifies the unwritten conventions in mathematics, and guides the students through a detailed discussion on how a proof is revised from its draft to a final 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 different perspective or at a higher level of complexity, in order to slowly develop the student's problem-solving and writing skills.

When Julie Miller began writing her successful developmental math series, one of her primary goals was to bridge the gap between preparatory courses and college algebra. For thousands of students, the Miller/O'Neill/Hyde (or M/O/H) series has provided a solid foundation in developmental mathematics. With the Miller College Algebra series, Julie has carried forward her clear, concise writing style; highly effective pedagogical features; and complete author-created technological package to students in this course area. The main objectives of the college algebra series are three-fold:

- Provide students with a clear and logical presentation of the basic concepts that will prepare them for continued study in mathematics.
- Help students develop logical thinking and problem-solving skills that

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will benefit them in all aspects of life. • Motivate students by demonstrating the significance of mathematics in their lives through practical applications.

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

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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 graduate students, as well as teachers and researchers in the physical sciences who wish to expand their mathematical horizons.

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

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interested in logic and proofs: computer scientists, philosophers, linguists, and, of course, mathematicians. 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.

The International Mathematical Olympiad (IMO) is a competition for high school students. China has taken part in the IMO 21 times since 1985 and has won the top ranking for countries 14 times, with a multitude of golds for individual students. The six students China has sent every year were selected from 20 to 30 students among approximately 130 students who took part in the annual China Mathematical Competition during the winter months. This volume of comprises a collection of original problems with solutions that China used to train their Olympiad team in the years from 2009 to 2010.

Mathematical Olympiad problems with solutions for the years 2002-2008 appear in an earlier volume, *Mathematical Olympiad in China*."

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

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reasoning by analogy, and the role they play in the most rigorous of deductive disciplines.

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

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discrete.openmathbooks.org

Every mathematician and student of mathematics needs a familiarity with mathematical induction. This volume provides advanced undergraduates and graduate students with an introduction and a thorough exposure to these proof techniques. 2017 edition.

1. Sets, 2. Relations and Functions, 3. Trigonometric Functions, 4. Principle of Mathematical Induction, 5. Complex Numbers and Quadratic Equations, 6. Linear Inequalities, 7. Permutations and Combinations, 8. Binomial Theorem, 9. Sequences and Series, 10. Straight Lines, 11. Conic Sections, 12. Introduction to Three-Dimensional Geometry, 13. Limits and Derivatives, 14. Mathematical Reasoning, 15. Statistics, 16. Probability.

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 discuss

Chapter wise & Topic wise presentation for ease of learning
Quick Review for in depth study
Mind maps for clarity of concepts
All MCQs with explanation against the correct option
Some important questions developed by 'Oswaal Panel' of experts
Previous Year's Questions
Fully Solved Complete Latest NCERT Textbook & Intext Questions
Fully Solved Quick Response (QR Codes) for Quick Revision on your Mobile Phones / Tablets
Expert Advice how to score more suggestion and ideas shared

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Intended for one- or two-term introductory discrete mathematics courses, this text gives a focused introduction to the primary themes in a discrete mathematics course and demonstrates the relevance and practicality of discrete mathematics to a variety of real-world applications...from computer science to data networking, to psychology, and others.

Mathematical Reasoning: Writing and Proof is a text for the first 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

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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.

Detailed guidance on the mathematics behind equity derivatives Problems and Solutions in Mathematical Finance Volume II is an innovative reference for quantitative practitioners and students, providing guidance through a range of mathematical problems encountered in the finance industry. This volume focuses solely on equity derivatives problems, beginning with basic problems in derivatives securities before moving on to more advanced applications, including the construction of volatility surfaces to price exotic options. By providing a methodology for solving theoretical and practical problems, whilst explaining the limitations of financial models, this book helps readers to develop the skills they need to advance their careers. The text covers a wide range of derivatives pricing, such as European, American, Asian, Barrier and other exotic options. Extensive appendices provide a summary of important formulae from calculus, theory of probability, and differential equations, for the convenience of readers. As Volume II of the four-volume Problems and Solutions in Mathematical Finance series, this book provides clear explanation of the mathematics behind equity derivatives, in order to help readers gain a deeper understanding of their mechanics and a firmer grasp of the calculations. Review the fundamentals of equity derivatives Work through problems from basic securities to advanced exotics pricing Examine numerical methods

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and detailed derivations of closed-form solutions Utilise formulae for probability, differential equations, and more Mathematical finance relies on mathematical models, numerical methods, computational algorithms and simulations to make trading, hedging, and investment decisions. For the practitioners and graduate students of quantitative finance, Problems and Solutions in Mathematical Finance Volume II provides essential guidance principally towards the subject of equity derivatives.

Known for its accessible, precise approach, Epp's DISCRETE MATHEMATICS WITH APPLICATIONS, 5th Edition, introduces discrete mathematics with clarity and precision. Coverage emphasizes the major themes of discrete mathematics as well as the reasoning that underlies mathematical thought. Students learn to think abstractly as they study the ideas of logic and proof. While learning about logic circuits and computer addition, algorithm analysis, recursive thinking, computability, automata, cryptography and combinatorics, students discover that ideas of discrete mathematics underlie and are essential to today's science and technology. The author's emphasis on reasoning provides a foundation for computer science and 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.

Volume I of a two-part series, this book features a broad spectrum of 100 challenging problems related to probability theory and combinatorial analysis. Most can be solved with elementary mathematics. Complete

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solutions.

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.

Many important problems in applied science and engineering, such as the Navier Stokes equations in fluid dynamics, the primitive equations in global climate modeling, the strain-stress equations in mechanics, the neutron diffusion equations in nuclear engineering, and

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MRIICT medical simulations, involve complicated systems of nonlinear partial differential equations. When discretized, such problems produce extremely large, nonlinear systems of equations, whose numerical solution is prohibitively costly in terms of time and storage. High-performance (parallel) computers and efficient (parallelizable) algorithms are clearly necessary. Three classical approaches to the solution of such systems are: Newton's method, Preconditioned Conjugate Gradients (and related Krylov-space acceleration techniques), and multigrid methods. The first two approaches require the solution of large sparse linear systems at every iteration, which are themselves often solved by multigrid methods. Developing robust and efficient multigrid algorithms is thus of great importance. The original multigrid algorithm was developed for the Poisson equation in a square, discretized by finite differences on a uniform grid. For this model problem, multigrid exhibits extremely rapid convergence, and actually solves the problem in the minimal possible time. The original algorithm uses rediscrretization of the partial differential equation (POE) on each grid in the hierarchy of coarse grids that are used. However, this approach would not work for more complicated problems, such as problems on complicated domains and nonuniform grids, problems with variable coefficients, and non symmetric and indefinite equations. In these cases, matrix-based multi grid methods are in order.

This updated and extended edition of the book combines the topics provided in the two parts of the previous

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editions as well as new topics. It is a comprehensive compilation covering most areas in mathematical and theoretical physics. The book provides a collection of problems together with their detailed solutions which will prove to be valuable to students as well as to researchers in the fields of mathematics, physics, engineering and other sciences. Each chapter provides a short introduction with the relevant definitions and notations. All relevant definitions are given. The topics range in difficulty from elementary to advanced. Almost all problems are solved in detail and most of the problems are self-contained. Stimulating supplementary problems are also provided in each chapter. Students can learn important principles and strategies required for problem solving. Teachers will also find this text useful as a supplement, since important concepts and techniques are developed in the problems. Introductory problems for both undergraduate and advanced undergraduate students are provided. More advanced problems together with their detailed solutions are collected, to meet the needs of graduate students and researchers. Problems included cover new fields in theoretical and mathematical physics such as tensor product, Lax representation, Bäcklund transformation, soliton equations, Hilbert space theory, uncertainty relation, entanglement, spin systems, Lie groups, Bose system, Fermi systems differential forms, Lie algebra valued differential forms, metric tensor fields, Hirota technique, Painlevé test, Bethe ansatz, Yang-Baxter relation, wavelets, gauge theory, differential geometry, string theory, chaos, fractals, complexity, ergodic theory,

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etc. A number of software implementations are also provided.

This problem-solving book is an introduction to the study of Diophantine equations, a class of equations in which only integer solutions are allowed. The presentation features some classical Diophantine equations, including linear, Pythagorean, and some higher degree equations, as well as exponential Diophantine equations. Many of the selected exercises and problems are original or are presented with original solutions. *An Introduction to Diophantine Equations: A Problem-Based Approach* is intended for undergraduates, advanced high school students and teachers, mathematical contest participants — including Olympiad and Putnam competitors — as well as readers interested in essential mathematics. The work uniquely presents unconventional and non-routine examples, ideas, and techniques.

In China, lots of excellent maths students takes an active part in various maths contests and the best six senior high school students will be selected to form the IMO National Team to compete in the International Mathematical Olympiad. In the past ten years, China's IMO Team has achieved outstanding results — they have won the first place almost every year. The author is one of the senior coaches of China's IMO National Team, he is the headmaster of Shanghai senior high school which is one of the best high schools of China. In the past decade, the students of this school have won the IMO gold medals almost every year. The author attempts to use some common characteristics of sequence and mathematical induction to fundamentally connect Math Olympiad problems to particular branches of mathematics. In doing so, the author hopes to reveal the beauty and joy involved with math exploration and at the same time, attempts to arouse readers' interest of learning math and invigorate their courage to

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challenge themselves with difficult problems.

The Nuts and Bolts of Proofs instructs students on the primary basic logic of mathematical proofs, showing how proofs of mathematical statements work. The text provides basic core techniques of how to read and write proofs through examples. The basic mechanics of proofs are provided for a methodical approach in gaining an understanding of the fundamentals to help students reach different results. A variety of fundamental proofs demonstrate the basic steps in the construction of a proof and numerous examples illustrate the method and detail necessary to prove various kinds of theorems. New chapter on proof by contradiction New updated proofs A full range of accessible proofs Symbols indicating level of difficulty help students understand whether a problem is based on calculus or linear algebra Basic terminology list with definitions at the beginning of the text The articles in the proceedings are closely related to the lectures presented at the topology conference held at the University of Hawaii, August 12-18, 1990. These cover recent results in algebraic topology, algebraic transformation groups, real algebraic geometry, low-dimensional topology, and Nielsen Fixed Point Theory.

This book provides an extensive collection of problems with detailed solutions in introductory and advanced matrix calculus. Supplementary problems in each chapter will challenge and excite the reader, ideal for both graduate and undergraduate mathematics and theoretical physics students. The coverage includes systems of linear equations, linear differential equations, integration and matrices, Kronecker product and vec-operation as well as functions of matrices. Furthermore, specialized topics such as spectral theorem, nonnormal matrices and mutually unbiased bases are included. Many of the problems are related to applications for group theory, Lie algebra theory, wavelets, graph theory and

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matrix-valued differential forms, benefitting physics and engineering students and researchers alike. It also branches out to problems with tensors and the hyperdeterminant. Computer algebra programs in Maxima and SymbolicC++ have also been provided.

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.

This book is a collection of problems with detailed solutions which will prove valuable to students and research workers in mathematics, physics, engineering and other sciences. The topics range in difficulty from elementary to advanced level. Almost all the problems are solved in detail and most of them are self-contained. All relevant definitions are given. Students

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can learn important principles and strategies required for problem solving. Teachers will find this text useful as a supplement, since important concepts and techniques are developed through the problems. The material has been tested in the author's lectures given around the world. The book is divided into two volumes. Volume I presents the introductory problems, for undergraduate and advanced undergraduate students. In Volume II, the more advanced problems, together with detailed solutions, are collected, to meet the needs of graduate students and researchers. The problems included cover most of the new fields in theoretical and mathematical physics, such as Lax representation, Backlund transformation, soliton equations, Lie-algebra-valued differential forms, the Hirota technique, the Painleve test, the Bethe ansatz, the Yang -- Baxter relation, chaos, fractals, complexity, etc.

A Spiral Workbook for Discrete Mathematics
Open SUNY Textbooks

Equip yourself for success with a state-of-the-art approach to algorithms available only in Miller/Boxer's ALGORITHMS SEQUENTIAL AND PARALLEL: A UNIFIED APPROACH, 3E. This unique and functional text gives you an introduction to algorithms and paradigms for modern computing systems, integrating the study of parallel and sequential algorithms within a focused presentation. With a wide range of practical exercises and engaging examples drawn from fundamental application domains, this book prepares you to design, analyze, and implement algorithms for modern computing systems. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

This comprehensive study guide covers the complete HSC Maths Extension 1 course and has been specifically created to maximise exam success. This guide has been designed to

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meet all study needs, providing up-to-date information in an easy-to-use format. Excel HSC Maths Extension 1 includes: free HSC study cards for revision on the go or at home comprehensive topic-by-topic summaries of the course preliminary course topics covered in detail illustrated examples of each type of question self-testing questions to reinforce what you have just learned fully worked solutions for every problem chapter summaries for pre-exam revision icons and boxes to highlight key ideas and words four complete trial HSC exam papers with worked solutions extra questions with answers

Mathematics is a fine art, like painting, sculpture, or music. This book teaches the art of solving challenging mathematics problems. Part I presents a general process for solving problems. Part II contains 35 difficult and challenging mathematics problems with complete solutions. The goal is to teach the reader how to proceed from an initial state of "panic and fear" to finding a beautiful and elegant solution to a problem.

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

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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.

Appealing to everyone from college-level majors to independent learners, *The Art and Craft of Problem Solving*, 3rd Edition introduces a problem-solving approach to mathematics, as opposed to the traditional exercises approach. The goal of *The Art and Craft of Problem Solving* is to develop strong problem solving skills, which it achieves by encouraging students to do math rather than just study it. Paul Zeitz draws upon his experience as a coach for the international mathematics Olympiad to give students an enhanced sense of mathematics and the ability to investigate and solve problems.

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