

Introduction To Mathematical Thinking

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.

Why do some children seem to learn mathematics easily and others slave away at it, learning it only with great effort and apparent pain? Why are some people good at algebra but terrible at geometry? How can people who successfully run a business as adults have been failures at math in school? How come some professional mathematicians suffer terribly when trying to balance a checkbook? And why do school children in the United States perform so dismally in international comparisons? These are the kinds of real questions the editors set out to answer, or at least address, in editing this book on mathematical thinking. Their goal was to seek a diversity of contributors representing multiple viewpoints whose expertise might converge on the answers to these and other pressing and interesting questions regarding this subject. The chapter authors were asked to focus on their own approach to mathematical thinking, but also to address a common core of issues such as the nature of mathematical thinking, how it is similar to and different from other kinds of thinking, what makes some people or some groups better than others in this subject area, and how mathematical thinking can be assessed and taught. Their work is directed to a diverse audience -- psychologists interested in the nature of mathematical thinking and abilities, computer scientists who want to simulate mathematical thinking, educators involved in teaching and testing mathematical thinking, philosophers who need to understand the qualitative aspects of logical thinking, anthropologists and others interested in how and why mathematical thinking seems to differ in quality across cultures, and laypeople and others who have to think mathematically and want to understand how they are going to accomplish that feat.

Emotions play a critical role in mathematical cognition and learning. Understanding Emotions in Mathematical Thinking and Learning offers a multidisciplinary approach to the role of emotions in numerical cognition, mathematics education, learning sciences, and affective sciences. It addresses ways in which emotions relate to cognitive processes involved in learning and doing mathematics, including processing of numerical and physical magnitudes (e.g. time and space), performance in arithmetic and algebra, problem solving and reasoning attitudes, learning technologies, and mathematics achievement. Additionally, it covers social and affective issues such as identity and attitudes toward mathematics. Covers methodologies in studying emotion in mathematical knowledge Reflects the diverse and innovative nature of the methodological approaches and theoretical frameworks proposed by current investigations of emotions and mathematical cognition Includes perspectives from cognitive experimental psychology, neuroscience, and from sociocultural, semiotic, and discursive approaches Explores the role of anxiety in mathematical learning Synthesizes unifies the work of multiple sub-disciplines in one place

A Friendly Introduction to Mathematical Logic

A First Course in Topology

Mathematical Reasoning

Introduction to Mathematical Thinking: the Formation of Concepts in Modern Mathemat

Discrete Mathematics: Introduction to Mathematical Reasoning

This review of the work done to date on the computer modelling of mathematical reasoning processes brings together a variety of approaches and disciplines within a coherent frame. A limited knowledge of mathematics is assumed in the introduction to the principles of mathematical logic. The plan of the book is such that students with varied backgrounds can find necessary information as quickly as possible. Exercises are included throughout the book.

Mathematical Reasoning: Writing and Proof is a text for the 7rst 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.

The columnist for Slate's popular "Do the Math" celebrates the logical, illuminating nature of math in today's world, sharing in accessible language mathematical approaches that demystify complex and everyday problems.

Introduction to Mathematical Thinking

How to Develop it in the Classroom

An Introduction to Mathematical Reasoning

Teaching and Learning from an Interdisciplinary Perspective

Mathematical Thinking and Problem Solving

This book adopts an interdisciplinary approach to investigate the development of mathematical reasoning in both children and adults and to show how understanding the learner 's cognitive processes can help teachers develop better strategies to teach mathematics. This contributed volume departs from the interdisciplinary field of psychology of mathematics education and brings together contributions by researchers from different fields and disciplines, such as cognitive psychology, neuroscience and mathematics education. The chapters are presented in the light of the three instances that permeate the entire book: the learner, the teacher, and the teaching and learning process. Some of the chapters analyse the didactic challenges that teachers face in the classroom, such as how to interpret students' reasoning, the use of digital technologies, and their knowledge about mathematics. Other chapters examine students' opinions about mathematics, and others analyse the ways in which students solve situations that involve basic and complex mathematical concepts. The approaches adopted in the description and interpretation of the data obtained in the studies documented in this book point out the limits, the development, and the possibilities of students' thinking, and present didactic and cognitive perspectives to the learning scenarios in different school settings. Mathematical Reasoning of Children and Adults: Teaching and Learning from an Interdisciplinary Perspective will be a valuable resource for both mathematics teachers and researchers studying the development of mathematical reasoning in different fields, such as mathematics education, educational psychology, cognitive psychology, and developmental psychology.

For one/two-term courses in Transition to Advanced Mathematics or Introduction to Proofs. Also suitable for courses in Analysis or Discrete Math. This title is part of the Pearson Modern Classics series. Pearson Modern Classics are acclaimed titles at a value price. Please visit www.pearsonhighered.com/math-classics-series for a complete list of titles. This text is designed to prepare students thoroughly in the logical thinking skills necessary to understand and communicate fundamental ideas and proofs in mathematics-skills vital for success throughout the upperclass mathematics curriculum. The text offers both discrete and continuous mathematics, allowing instructors to emphasize one or to present the fundamentals of both. It begins by discussing mathematical language and proof techniques (including induction), applies them to easily-understood questions in elementary number theory and counting, and then develops additional techniques of proof via important topics in discrete and continuous mathematics. The stimulating exercises are acclaimed for their exceptional quality.

Developing mathematical thinking is one of major aims of mathematics education. In mathematics education research, there are a number of researches which describe what it is and how we can observe in experimental research. However, teachers have difficulties developing it in the classrooms. This book is the result of lesson studies over the past 50 years. It describes three perspectives of mathematical thinking: Mathematical Attitude (Minds set), Mathematical Methods in General and Mathematical Ideas with Content and explains how to develop them in the classroom with illuminating examples.

An Introduction to Mathematical Thinking

Algebra and Number Systems

Distilling Ideas

Puzzles, Paradoxes, and Problem Solving

Essentials of Mathematical Thinking

Examinations of arithmetic, geometry, and theory of integers; rational and natural numbers; complete induction; limit and point of accumulation; remarkable curves; complex and hypercomplex numbers; more. Includes 27 figures. 1959 edition.

Essentials of Mathematical Thinking addresses the growing need to better comprehend mathematics today. Increasingly, our world is driven by mathematics in all aspects of life. The book is an excellent introduction to the world of mathematics for students not majoring in mathematical studies. The author has written this book in an enticing, rich manner that will engage students and introduce new paradigms of thought. Careful readers will develop critical thinking skills which will help them compete in today's world. The book explains: What goes behind a Google search algorithm How to calculate the odds in a lottery The value of Big Data How the nefarious Ponzi scheme operates Instructors will treasure the book for its ability to make the field of mathematics more accessible and alluring with relevant topics and helpful graphics. The author also encourages readers to see the beauty of mathematics and how it relates to their lives in meaningful ways.

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.

Sets, Functions, and Logic

The Power of Mathematical Thinking

How Not to be Wrong

INTRODUCTION TO MATHEMATICAL THINKING (Coursepack)

A Study of Numerate Practice

In the twenty-first century, everyone can benefit from being able to think mathematically. This is not the same as "doing math." The latter usually involves the application of formulas, procedures, and symbolic manipulations; mathematical thinking is a powerful way of thinking about things in the world -- logically, analytically, quantitatively, and with precision. It is not a natural way of thinking, but it can be learned. Mathematicians, scientists, and engineers need to "do math," and it takes many years of college-level education to learn all that is required. Mathematical thinking is valuable to everyone, and can be mastered in about six weeks by anyone who has completed high school mathematics. Mathematical thinking does not have to be about mathematics at all, but parts of mathematics provide the ideal target domain to learn how to think that way, and that is the approach taken by this short but valuable book. The book is written primarily for first and second year students of science, technology, engineering, and mathematics (STEM) at colleges and universities, and for high school students intending to study a STEM subject at university. Many students encounter difficulty going from high school math to college-level mathematics. Even if they did well at math in school, most are knocked off course for a while by the shift in emphasis, from the K-12 focus on mastering procedures to the "mathematical thinking" characteristic of much university mathematics. Though the majority survive the transition, many do not. To help them make the shift, colleges and universities often have a "transition course." This book could serve as a textbook or a supplementary source for such a course. Because of the widespread applicability of mathematical thinking, however, the book has been kept short and written in an engaging style, to make it accessible to anyone who seeks to extend and improve their analytic thinking skills. Going beyond a basic grasp of analytic thinking that she can benefit from, the STEM student who truly masters mathematical thinking will find that college-level mathematics goes from being confusing, frustrating, and at times seemingly impossible, to making sense and being hard but doable. Dr. Keith Devlin is a professional mathematician at Stanford University and the author of 51 previous books and over 80 research papers. His books have earned him many awards, including the Pythagoras Prize, the Carl Sagan Award, and the Joint Policy Board for Mathematics Communications Award. He is known to millions of NPR listeners as "The Math Guy" on Weekend Edition with Scott Simon. He writes a popular monthly blog "Devlin's Angle" for the Mathematical Association of America, another blog under the name "prokethevlin", and also blogs on various topics for the Huffington Post.

Students must prove all of the theorems in this undergraduate-level text, which features extensive outlines to assist in study and comprehension. Thorough and well-written, the treatment provides sufficient material for a one-year undergraduate course. The logical presentation anticipates students' questions, and complete definitions and expositions of topics relate new concepts to previously discussed subjects. Most of the material focuses on point-set topology with the exception of the last chapter. Topics include sets and functions, infinite sets and transfinite numbers, topological spaces and basic concepts, product spaces, connectivity, and compactness. Additional subjects include separation axioms, complete spaces, and homotopy and the fundamental group. Numerous hints and figures illuminate the text. Dover (2014) republication of the edition originally published by The Williams & Wilkins Company, Baltimore, 1975. See every Dover book in print at www.doverpublications.com

Award-winning author Keith Devlin reveals the vital role mathematics plays in our eternal quest to understand who we are and the world we live in. More than just the study of numbers, mathematics provides us with the eyes to recognize and describe the hidden patterns of life.

The Nature of Mathematical Thinking

The Formation of Concepts in Modern Mathematics : with a Foreword by Karl Menger ; Translated by Theodore J. Benac

Introduction to Mathematical Thinking: the Formation of Concepts in Modern Mathematics. with a Foreword by Karl Menger. [Translated by Theodore J. Benac].

The Formation of Concepts in Modern Mathematics. With a Foreword by Karl Menger ... Tr. from the German Einführung in Das Mathematische Denken, by Theodore J. Benac ..

Understanding Emotions in Mathematical Thinking and Learning

Thinking Mathematically is perfect for anyone who wants to develop their powers to think mathematically, whether at school, at university or just out of interest. This book is invaluable for anyone who wishes to promote mathematical thinking in others or for anyone who has always wondered what lies at the core of mathematics. Thinking Mathematically reveals the processes at the heart of mathematics and demonstrates how to encourage and develop them. Extremely practical, it involves the reader in questions so that subsequent discussions speak to immediate experience.

*The crisis around teaching and learning of mathematics and its use in everyday life and work relate to a number of issues. These include: The doubtful transferability of school maths to real life contexts, the declining participation in A level and higher education maths courses, the apparent exclusion of some groups, such as women and the aversion of many people to maths. This book addresses these issues by considering a number of key problems in maths education and numeracy: *differences among social groups, especially those related to gender and social class *the inseparability of cognition and emotion in mathematical activity *the understanding of maths anxiety in traditional psychological, psychoanalytical and feminist theories *how adults' numerate thinking and performance must be understood in context. The author's findings have practical applications in education and training, such as clarifying problems of the transfer of learning, and of countering maths anxiety.*

A Classroom-Tested, Alternative Approach to Teaching Math for Liberal Arts Puzzles, Paradoxes, and Problem Solving: An Introduction to Mathematical Thinking uses puzzles and paradoxes to introduce basic principles of mathematical thought. The text is designed for students in liberal arts mathematics courses. Decision-making situations that progress from recreational problems to important contemporary applications develop the critical-thinking skills of non-science and non-technical majors. The logical underpinnings of this textbook were developed and refined throughout many years of classroom feedback and in response to commentary from presentations at national conferences. The text's five units focus on graphs, logic, probability, voting, and cryptography. The authors also cover related areas, such as operations research, game theory, number theory, combinatorics, statistics, and circuit design. The text uses a core set of common representations, strategies, and algorithms to analyze diverse games, puzzles, and applications. This unified treatment logically connects the topics with a recurring set of solution approaches. Requiring no mathematical prerequisites, this book helps students explore creative mathematical thinking and enhance their own critical-thinking skills. Students will acquire quantitative literacy and appreciation of mathematics through the text's unified approach and wide range of interesting applications.

the formation of concepts in modern mathematics in modern mathematics; with a foreword by Karl Menger

Making the Invisible Visible

Conjecture & Proof

The Math Gene

Mathematical Thinking

A Classroom-Tested, Alternative Approach to Teaching Math for Liberal Arts Puzzles, Paradoxes, and Problem Solving: An Introduction to Mathematical Thinking uses puzzles and paradoxes to introduce basic principles of mathematical thought. The text is designed for students in liberal arts mathematics courses. Decision-making situations that progress

This book eases students into the rigors of university mathematics. The emphasis is on understanding and constructing proofs and writing clear mathematics. The author achieves this by exploring set theory, combinatorics, and number theory, topics that include many fundamental ideas and may not be a part of a young mathematician's toolkit. This material illustrates how familiar ideas can be formulated rigorously, provides examples demonstrating a wide range of basic methods of proof, and includes some of the all-time-great classic proofs. The book presents mathematics as a continually developing subject. Material meeting the needs of readers from a wide range of backgrounds is included. The over 250 problems include questions to interest and challenge the most able student but also plenty of routine exercises to help familiarize the reader with the basic ideas.

Why is math so hard? And why, despite this difficulty, are some people so good at it? If there's some inborn capacity for mathematical thinking—which there must be, otherwise no one could do it —why can't we all do it well? Keith Devlin has answers to all these difficult questions, and in giving them shows us how mathematical ability evolved, why it's a part of language ability, and how we can make better use of this innate talent. He also offers a breathtakingly new theory of language development—that language evolved in two stages, and its main purpose was not communication—to show that the ability to think mathematically arose out of the same symbol-manipulating ability that was so crucial to the emergence of true language. Why, then, can't we do math as well as we can speak? The answer, says Devlin, is that we can and do—we just don't recognize when we're using mathematical reasoning.

Thinking Mathematically

Mathematical Reasoning of Children and Adults

Introduction to mathematical thinking

Numbers, Sets and Functions

The Language of Mathematics

Keith Devlin. You know him. You've read his columns in MAA Online, you've heard him on the radio, and you've seen his popular mathematics books. In between all those activities and his own research, he's been hard at work revising Sets, Functions and Logic. his standard-setting text that has smoothed the road to pure mathematics for legions of undergraduate students. Now in its third edition, Devlin has fully reworked the book to reflect a new generation. The narrative is more lively and less textbook-like. Remarks and asides link the topics presented to the real world of students' experience. The chapter on complex numbers and the discussion of formal symbolic logic are gone in favor of more exercises, and a new introductory chapter on the nature of mathematics—one that motivates readers and sets the stage for the challenges that lie ahead. Students crossing the bridge from calculus to higher mathematics need and deserve all the help they can get. Sets, Functions, and Logic, Third Edition is an affordable little book that all of your transition-course students not only can afford, but will actually read...and enjoy...and learn from. About the Author Dr. Keith Devlin is Executive Director of Stanford University's Center for the Study of Language and Information and a Consulting Professor of Mathematics at Stanford. He has written 23 books, one interactive book on CD-ROM, and over 70 published research articles. He is a Fellow of the American Association for the Advancement of Science, a World Economic Forum Fellow, and a former member of the Mathematical Sciences Education Board of the National Academy of Sciences.. Dr. Devlin is also one of the world's leading popularizers of mathematics. Known as "The Math Guy" on NPR's Weekend Edition, he is a frequent contributor to other local and national radio and TV shows in the US and Britain,

writes a monthly column for the Web Journal MAA Online, and regularly writes on mathematics and computers for the British newspaper The Guardian. In the early 1980s there was virtually no serious communication among the various groups that contribute to mathematics education -- mathematicians, mathematics educators, classroom teachers, and cognitive scientists. Members of these groups came from different traditions, had different perspectives, and rarely gathered in the same place to discuss issues of common interest. Part of the problem was that there was no common ground for the discussions -- given the disparate traditions and perspectives. As one way of addressing this problem, the Sloan Foundation funded two conferences in the mid-1980s, bringing together members of the different communities in a ground clearing effort, designed to establish a base for communication. In those conferences, interdisciplinary teams reviewed major topic areas and put together distillations of what was known about them.* A more recent conference -- upon which this volume is based -- offered a forum in which various people involved in education reform would present their work, and members of the broad communities gathered would comment on it. The focus was primarily on college mathematics, informed by developments in K-12 mathematics. The main issues of the conference were mathematical thinking and problem solving.

Introduction to Mathematical Thinking (Custom Edition eBook).

Adults' Mathematical Thinking and Emotions

Writing and Proof Version 2.0

The Formation of Concepts in Modern Mathematics

An Introduction to Abstract Mathematics, Third Edition

The Computer Modelling of Mathematical Reasoning

Designed for undergraduate students and lecturers, this text guides its users to develop the skills, attitudes, and habits of mind of a mathematician. It presents a carefully designed sequence of exercises and theorems so that its readers will be directed to discover mathematical ideas, strategies of proof, and strategies of thinking. Through the exploration of interesting mathematical content including graphs, groups, and calculus, this book helps to foster habits of inquiry. This book can be used by instructors as a text for an inquiry-based introduction to proof course, or as an independent study guide for mathematics students. The three core mathematical topics are presented separately, and each helps students develop theorem-proving skills and strategies of thinking whilst also providing an organised set of challenges that lead students to understand the process of mathematical creativity and development.

Besides giving readers the techniques for solving polynomial equations and congruences, An Introduction to Mathematical Thinking provides preparation for understanding more advanced topics in Linear and Modern Algebra, as well as Calculus. This book introduces proofs and mathematical thinking while teaching basic algebraic skills involving number systems, including the integers and complex numbers. Ample questions at the end of each chapter provide opportunities for learning and practice; the Exercises are routine applications of the material in the chapter, while the Problems require more ingenuity, ranging from easy to nearly impossible. Topics covered in this comprehensive introduction range from logic and proofs, integers and diophantine equations, congruences, induction and binomial theorem, rational and real numbers, and functions and bijections to cryptography, complex numbers, and polynomial equations. With its comprehensive appendices, this book is an excellent desk reference for mathematicians and those involved in computer science.

Students must prove all of the theorems in this undergraduate-level text, which focuses on point-set topology and emphasizes continuity. The final chapter explores homotopy and the fundamental group. 1975 edition.

How Mathematical Thinking Evolved And Why Numbers Are Like Gossip

Introduction to Mathematical Thinking (Custom Edition eBook)

Arithmetical View Points

An Introduction to Mathematics

Concise volume for general students by prominent philosopher and mathematician explains what math is and does, and how mathematicians do it. "Lucid and cogent ... should delight you." — The New York Times. 1911 edition.