# A Logical Approach To Discrete Math

A Logical Approach to Discrete MathDiscrete MathematicsA Beginner's Guide to Discrete MathematicsDiscrete MathematicsInvitation to Discrete MathematicsAn Introduction to Discrete MathematicsDiscrete MathematicsDiscrete Mathematics With LogicProblems and Exercises in Discrete MathematicsDiscrete MathematicsIntroduction to Discrete Mathematics with ISETLFundamentals of Discrete Math for Computer ScienceIntroduction to Discrete MathematicsDiscrete Mathematics with ProofDiscrete MathematicsDiscrete MathematicsBasic Discrete Mathematics: Logic, Set Theory, And ProbabilityDiscrete Mathematics for Computer ScienceDiscrete MathematicsDiscrete Mathematics Through Applications David Gries Gary Chartrand W.D. Wallis Oscar Levin Ji^D%rí Matoušek Steven Roman Martin Aigner Martin Milanic G.P. Gavrilov James L. Hein William E. Fenton Tom Jenkyns Robert J. McEliece Eric Gossett Rowan Garnier Jean Gallier Richard Kohar Jon Pierre Fortney Jerrold W. Grossman Nancy Crisler

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this text attempts to change the way we teach logic to beginning students instead of teaching logic as a subject in isolation we regard it as a basic tool and show how to use it we strive to give students a skill in the propo sitional and predicate calculi and then to exercise that skill thoroughly in applications that arise in computer science and discrete mathematics we are not logicians but programming methodologists and this text reflects that perspective we are among the first generation of scientists who are more interested in using logic than in studying it with this text we hope to empower further generations of computer scientists and math ematicians to become serious users of logic logic is the glue logic is the glue that binds together methods of reasoning in all domains the traditional proof methods for example proof by assumption con tradiction mutual implication and induction have their basis in formal

logic thus whether proofs are to be presented formally or informally a study of logic can provide understanding

chartrand and zhangs discrete mathematics presents a clearly written student friendly introduction to discrete mathematics the authors draw from their background as researchers and educators to offer lucid discussions and descriptions fundamental to the subject of discrete mathematics unique among discrete mathematics textbooks for its treatment of proof techniques and graph theory topics discussed also include logic relations and functions especially equivalence relations and bijective functions algorithms and analysis of algorithms introduction to number theory combinatorics counting the pascal triangle and the binomial theorem discrete probability partially ordered sets lattices and boolean algebras cryptography and finite state machines this highly versatile text provides mathematical background used in a wide variety of disciplines including mathematics and mathematics education computer science biology chemistry engineering communications and business some of the major features and strengths of this textbook numerous carefully explained examples and applications facilitate learning more than 1 600 exercises ranging from elementary to challenging are included with hints answers to all odd numbered exercises descriptions of proof techniques are accessible and lively students benefit from the historical discussions throughout the textbook

this text is a basic introduction to those areas of discrete mathematics used by stu dents of mathematics and computer science introductory courses on this material are now standard at many colleges and universities usually these courses are of one semester s duration and usually they are offered at the sophomore level very often this will be the first course where the students see several real proofs the preparation of the students is very mixed and one cannot assume a strong back ground in particular the instructor should not assume that the students have seen a linear algebra course or any introduction to number systems that goes beyond college algebra in view of this i have tried to avoid too much sophistication while still re taining rigor i hope i have included enough problems so that the student can reinforce the concepts most of the problems are quite easy with just a few dif ficult exercises scattered through the text if the class is weak a small number of sections will be too hard while the instructor who has a strong class will need to include some supplementary material i think this is preferable to a book at a higher mathematical level which will scare away weaker students

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 360 exercises including 230 with solutions and 130 more involved problems suitable for homework 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 update as of july 2017 this 2nd edition has been updated correcting numerous typos and a few mathematical errors pagination is almost identical to the earlier printing of the 2nd edition for a list of changes see the book s website discretetext oscarlevin com

this book is a clear and self contained introduction to discrete mathematics aimed mainly at undergraduate and early graduate students of mathematics and computer science it is written with the goal of stimulating interest in mathematics and an active problem solving approach to the presented material the reader is led to an understanding of the basic principles and methods of actually doing mathematics and having fun at that being more narrowly focused than many discrete mathematics textbooks and treating selected topics in an unusual depth and from several points of view the book reflects the conviction of the authors active and internationally renowned mathematicians that the most important gain from studying mathematics is the cultivation of clear and logical thinking and habits useful for attacking new problems more than 400 enclosed exercises with a wide range of difficulty many of them accompanied by hints for solution support this approach to teaching the readers will appreciate the lively and informal style of the text accompanied by more than 200 drawings and diagrams specialists in various parts of science with a basic mathematical education wishing to apply discrete mathematics in their field can use the book as a useful source and even experts in combinatorics may occasionally learn from pointers to research literature or from presentations of recent results invitation to discrete mathematics should make a delightful reading both for beginners and for mathematical professionals the main topics include elementary counting problems asymptotic estimates partially ordered sets basic graph theory and graph algorithms finite projective planes elementary probability and the probabilistic method generating functions ramsey s theorem and combinatorial applications of linear algebra general mathematical notions going beyond the high school level are thoroughly explained in the introductory chapter an appendix summarizes the undergraduate algebra needed in some of the more advanced sections of the book

the advent of fast computers and the search for efficient algorithms revolutionized combinatorics and brought about the field of discrete mathematics this book is an introduction to the main ideas and results of discrete mathematics and with its emphasis on algorithms it should be interesting to mathematicians and computer scientists alike the book is organized into three parts enumeration graphs and

algorithms and algebraic systems there are 600 exercises with hints and solutions to about half of them the only prerequisites for understanding everything in the book are linear algebra and calculus at the undergraduate level praise for the german edition this book is a well written introduction to discrete mathematics and is highly recommended to every student of mathematics and computer science as well as to teachers of these topics konrad engel for mathscinet martin aigner is a professor of mathematics at the free university of berlin he received his phd at the university of vienna and has held a number of positions in the usa and germany before moving to berlin he is the author of several books on discrete mathematics graph theory and the theory of search the monthly article turan s graph theorem earned him a 1995 lester r ford prize of the maa for expository writing and his book proofs from the book with günter m ziegler has been an international success with translations into 12 languages

discrete mathematics provides key concepts and a solid rigorous foundation in mathematical reasoning appropriate for undergraduate as well as a starting point for more advanced class the resource offers a logical progression through key topics without assuming any background in algebra or computational skills and without duplicating what they will learn in higher level courses the book is designed as an accessible introduction for students in mathematics or computer science as it explores questions that test the understanding of proof strategies such as mathematical induction for students interested to dive into this subject the text offers a rigorous introduction to mathematical thought through useful examples and exercises provides a class tested reference used on multiple years includes many exercises and helpful guided solutions to aid student comprehension and practice appropriate for undergraduate courses and for students with no background in algebra or computational skills

many years of practical experience in teaching discrete mathematics form the basis of this text book part i contains problems on such topics as boolean algebra k valued logics graphs and networks elements of coding theory automata theory algorithms theory combinatorics boolean minimization and logical design the exercises are preceded by ample theoretical background material for further study the reader is referred to the extensive bibliography part ii follows the same structure as part i and gives helpful hints and solutions audience this book will be of great value to undergraduate students of discrete mathematics whereas the more difficult exercises which comprise about one third of the material will also appeal to postgraduates and researchers

winner at the 46th annual new england book show 2003 in the college covers jackets category this introduction to discrete mathematics prepares future computer scientists engineers and mathematicians for success by providing extensive and concentrated coverage of logic functions algorithmic analysis and algebraic structures discrete mathematics second edition illustrates the relationships between

key concepts through its thematic organization and provides a seamless transition between subjects distinct for the depth with which it covers logic this text emphasizes problem solving and the application of theory as it carefully guides the reader from basic to more complex topics discrete mathematics is an ideal resource for discovering the fundamentals of discrete math discrete mathematics second edition is designed for an introductory course in discrete mathematics for the prospective computer scientist applied mathematician or engineer who wants to learn how the ideas apply to computer sciences the choice of topics and the breadth of coverage reflects the desire to provide students with the foundations needed to successfully complete courses at the upper division level in undergraduate computer science courses this book differs in several ways from current books about discrete mathematics it presents an elementary and unified introduction to a collection of topics that has not been available in a single source a major feature of the book is the unification of the material so that it does not fragment into a collection of seemingly unrelated ideas

intended for first or second year undergraduates this introduction to discrete mathematics covers the usual topics of such a course but applies constructivist principles that promote indeed require active participation by the student working with the programming language isetl whose syntax is close to that of standard mathematical language the student constructs the concepts in her or his mind as a result of constructing them on the computer in the syntax of isetl this dramatically different approach allows students to attempt to discover concepts in a socratic dialog with the computer the discussion avoids the formal definition theorem approach and promotes active involvement by the reader by its questioning style an instructor using this text can expect a lively class whose students develop a deep conceptual understanding rather than simply manipulative skills topics covered in this book include the propositional calculus operations on sets basic counting methods predicate calculus relations graphs functions and mathematical induction

this clearly written textbook presents an accessible introduction to discrete mathematics for computer science students offering the reader an enjoyable and stimulating path to improve their programming competence the text empowers students to think critically to be effective problem solvers to integrate theory and practice and to recognize the importance of abstraction its motivational and interactive style provokes a conversation with the reader through a questioning commentary and supplies detailed walkthroughs of several algorithms this updated and enhanced new edition also includes new material on directed graphs and on drawing and coloring graphs in addition to more than 100 new exercises with solutions to selected exercises topics and features assumes no prior mathematical knowledge and discusses concepts in programming as and when they are needed designed for both classroom use and self study presenting modular and self contained chapters that follow acm curriculum recommendations describes mathematical processes in an algorithmic manner often supported by a walkthrough

demonstrating how the algorithm performs the desired task includes an extensive set of exercises throughout the text together with numerous examples and shaded boxes highlighting key concepts selects examples that demonstrate a practical use for the concept in question students embarking on the start of their studies of computer science will find this book to be an easy to understand and fun to read primer ideal for use in a mathematics course taken concurrently with their first programming course

a trusted guide to discrete mathematics with proof now in a newly revised edition discrete mathematics has become increasingly popular in recent years due to its growing applications in the field of computer science discrete mathematics with proof second edition continues to facilitate an up to date understanding of this important topic exposing readers to a wide range of modern and technological applications the book begins with an introductory chapter that provides an accessible explanation of discrete mathematics subsequent chapters explore additional related topics including counting finite probability theory recursion formal models in computer science graph theory trees the concepts of functions and relations additional features of the second edition include an intense focus on the formal settings of proofs and their techniques such as constructive proofs proof by contradiction and combinatorial proofs new sections on applications of elementary number theory multidimensional induction counting tulips and the binomial distribution important examples from the field of computer science presented as applications including the halting problem shannon s mathematical model of information regular expressions xml and normal forms in relational databases numerous examples that are not often found in books on discrete mathematics including the deferred acceptance algorithm the boyer moore algorithm for pattern matching sierpinski curves adaptive quadrature the josephus problem and the five color theorem extensive appendices that outline supplemental material on analyzing claims and writing mathematics along with solutions to selected chapter exercises combinatorics receives a full chapter treatment that extends beyond the combinations and permutations material by delving into non standard topics such as latin squares finite projective planes balanced incomplete block designs coding theory partitions occupancy problems stirling numbers ramsey numbers and systems of distinct representatives a related site features animations and visualizations of combinatorial proofs that assist readers with comprehension in addition approximately 500 examples and over 2 800 exercises are presented throughout the book to motivate ideas and illustrate the proofs and conclusions of theorems assuming only a basic background in calculus discrete mathematics with proof second edition is an excellent book for mathematics and computer science courses at the undergraduate level it is also a valuable resource for professionals in various technical fields who would like an introduction to discrete mathematics

in a comprehensive yet easy to follow manner discrete mathematics for new technology follows the progression from the basic mathematical concepts covered by

the gcse in the uk and by high school algebra in the usa to the more sophisticated mathematical concepts examined in the latter stages of the book the book punctuates the rigorous treatment of theory with frequent uses of pertinent examples and exercises enabling readers to achieve a feel for the subject at hand the exercise hints and solutions are provided at the end of the book topics covered include logic and the nature of mathematical proof set theory relations and functions matrices and systems of linear equations algebraic structures boolean algebras and a thorough treatise on graph theory although aimed primarily at computer science students the structured development of the mathematics enables this text to be used by undergraduate mathematicians scientists and others who require an understanding of discrete mathematics

this books gives an introduction to discrete mathematics for beginning undergraduates one of original features of this book is that it begins with a presentation of the rules of logic as used in mathematics many examples of formal and informal proofs are given with this logical framework firmly in place the book describes the major axioms of set theory and introduces the natural numbers the rest of the book is more standard it deals with functions and relations directed and undirected graphs and an introduction to combinatorics there is a section on public key cryptography and rsa with complete proofs of fermat s little theorem and the correctness of the rsa scheme as well as explicit algorithms to perform modular arithmetic the last chapter provides more graph theory eulerian and hamiltonian cycles are discussed then we study flows and tensions and state and prove the max flow min cut theorem we also discuss matchings covering bipartite graphs

this lively introductory text exposes the student in the humanities to the world of discrete mathematics a problem solving based approach grounded in the ideas of george pólya are at the heart of this book students learn to handle and solve new problems on their own a straightforward clear writing style and well crafted examples with diagrams invite the students to develop into precise and critical thinkers particular attention has been given to the material that some students find challenging such as proofs this book illustrates how to spot invalid arguments to enumerate possibilities and to construct probabilities it also presents case studies to students about the possible detrimental effects of ignoring these basic principles the book is invaluable for a discrete and finite mathematics course at the freshman undergraduate level or for self study since there are full solutions to the exercises in an appendix written with clarity humor and relevant real world examples basic discrete mathematics is a wonderful introduction to discrete mathematical reasoning arthur benjamin professor of mathematics at harvey mudd college and author of the magic of math

discrete mathematics for computer science an example based introduction is intended for a first or second year discrete mathematics course for computer science majors it covers many important mathematical topics essential for future computer

science majors such as algorithms number representations logic set theory boolean algebra functions combinatorics algorithmic complexity graphs and trees features designed to be especially useful for courses at the community college level ideal as a first or second year textbook for computer science majors or as a general introduction to discrete mathematics written to be accessible to those with a limited mathematics background and to aid with the transition to abstract thinking filled with over 200 worked examples boxed for easy reference and over 200 practice problems with answers contains approximately 40 simple algorithms to aid students in becoming proficient with algorithm control structures and pseudocode includes an appendix on basic circuit design which provides a real world motivational example for computer science majors by drawing on multiple topics covered in the book to design a circuit that adds two eight digit binary numbers jon pierre fortney graduated from the university of pennsylvania in 1996 with a ba in mathematics and actuarial science and a bse in chemical engineering prior to returning to graduate school he worked as both an environmental engineer and as an actuarial analyst he graduated from arizona state university in 2008 with a phd in mathematics specializing in geometric mechanics since 2012 he has worked at zayed university in dubai this is his second mathematics textbook

focuses on concepts and their application as opposed to a heavy theoretical approach covers topics in greater depth than do competitors

listen here for author nancy crisler s introduction to discrete mathematics through applications written specifically for high school courses discrete mathematics through applications is designed to help you put the established nctm standards for discrete math to work in your classroom in a way that promotes active learning critical thinking and fully engaged student participation with this text students will see the connections among mathematical topics and real life events and situations while sharpening their problem solving mathematical reasoning and communication skills the new edition adds new topics and significantly revised exercise sets and enhanced supplements

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