Undergraduate Topics in Computer Science

Gerard O'Regan

Mathematics in Computing

An Accessible Guide to Historical, Foundational and Application Contexts

Second Edition

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Mathematics In Computing

David Ronald Kincaid,Elliott Ward Cheney

Mathematics In Computing:

Discrete Mathematics for Computing Andrew Vince,Claire Morris,1990 This text is suitable for an introductory course in the mathematics related to computing generally referred to as discrete mathematics Topics covered include set theory logic and methods of proof graphs digraphs and trees number systems and matrix algebra and an introduction to binary codes Throughout the book the interrelations between the mathematical structures and their representations is stressed and use is made of action diagrams as a language independent means of presenting algorithmic processes Readers who work through this text will acquire the mathematical knowledge and approach to problem solving required by introductory computing courses and a sound bases from which to pursue the subject further **Mathematics in Computing** Gerard O'Regan,2020-01-10 This illuminating textbook provides a concise review of the core concepts in mathematics essential to computer scientists Emphasis is placed on the practical computing applications enabled by seemingly abstract mathematical ideas presented within their historical context The text spans a broad selection of key topics ranging from the use of finite field theory to correct code and the role of number theory in cryptography to the value of graph theory when modelling networks and the importance of formal methods for safety critical systems This fully updated new edition has been expanded with a more comprehensive treatment of algorithms logic automata theory model checking software reliability and dependability algebra sequences and series and mathematical induction Topics and features includes numerous pedagogical features such as chapter opening key topics chapter introductions and summaries review questions and a glossary describes the historical contributions of such prominent figures as Leibniz Babbage Boole and von Neumann introduces the fundamental mathematical concepts of sets relations and functions along with the basics of number theory algebra algorithms and matrices explores arithmetic and geometric sequences and series mathematical induction and recursion graph theory computability and decidability and automata theory reviews the core issues of coding theory language theory software engineering and software reliability as well as formal methods and model checking covers key topics on logic from ancient Greek contributions to modern applications in AI and discusses the nature of mathematical proof and theorem proving presents a short introduction to probability and statistics complex numbers and quaternions and calculus This engaging and easy to understand book will appeal to students of computer science wishing for an overview of the mathematics used in computing and to mathematicians curious about how their subject is applied in the field of computer science The book will also capture the interest of the motivated general reader *Sets, Logic and Maths for Computing* David Makinson,2012-02-29 This easy to follow textbook introduces the mathematical language knowledge and problem solving skills that undergraduates need to study computing The language is in part qualitative with concepts such as set relation function and recursion induction but it is also partly quantitative with principles of counting and finite probability Entwined with both are the fundamental notions of logic and their use for representation and proof Features teaches finite math as a language for thinking as much as knowledge and skills to be acquired uses an intuitive approach with a focus on examples for all general concepts brings out the interplay between the qualitative and the quantitative in all areas covered particularly in the treatment of recursion and induction balances carefully the abstract and concrete principles and proofs specific facts and general perspectives includes highlight boxes that raise common queries and clear confusions provides numerous exercises with selected solutions *Mathematics and Computation* Avi Wigderson,2019-10-29 From the winner of the Turing Award and the Abel Prize an introduction to computational complexity theory its connections and interactions with mathematics and its central role in the natural and social sciences technology and philosophy Mathematics and Computation provides a broad conceptual overview of computational complexity theory the mathematical study of efficient computation With important practical applications to computer science and industry computational complexity theory has evolved into a highly interdisciplinary field with strong links to most mathematical areas and to a growing number of scientific endeavors Avi Wigderson takes a sweeping survey of complexity theory emphasizing the field s insights and challenges He explains the ideas and motivations leading to key models notions and results In particular he looks at algorithms and complexity computations and proofs randomness and interaction quantum and arithmetic computation and cryptography and learning all as parts of a cohesive whole with numerous cross influences Wigderson illustrates the immense breadth of the field its beauty and richness and its diverse and growing interactions with other areas of mathematics He ends with a comprehensive look at the theory of computation its methodology and aspirations and the unique and fundamental ways in which it has shaped and will further shape science technology and society For further reading an extensive bibliography is provided for all topics covered Mathematics and Computation is useful for undergraduate and graduate students in mathematics computer science and related fields as well as researchers and teachers in these fields Many parts require little background and serve as an invitation to newcomers seeking an introduction to the theory of computation Comprehensive coverage of computational complexity theory and beyond High level intuitive exposition which brings conceptual clarity to this central and dynamic scientific discipline Historical accounts of the evolution and motivations of central concepts and models A broad view of the theory of computation s influence on science technology and society Extensive bibliography *Foundation Mathematics for Computer Science* John Vince,2020-03-17 In this second edition of Foundation Mathematics for Computer Science John Vince has reviewed and edited the original book and written new chapters on combinatorics probability modular arithmetic and complex numbers These subjects complement the existing chapters on number systems algebra logic trigonometry coordinate systems determinants vectors matrices geometric matrix transforms differential and integral calculus During this journey the author touches upon more esoteric topics such as quaternions octonions Grassmann algebra Barrycentric coordinates transfinite sets and prime numbers John Vince describes a range of mathematical topics to provide a solid foundation for an undergraduate course in computer science starting with a review of number systems and their relevance to digital computers and finishing with differential and integral calculus Readers will find that the author s visual approach will greatly improve their understanding as to why certain mathematical structures exist together with how they are used in real world applications This second edition includes new full colour illustrations to clarify the mathematical descriptions and in some cases equations are also coloured to reveal vital algebraic patterns The numerous worked examples will help consolidate the understanding of abstract mathematical concepts Whether you intend to pursue a career in programming scientific visualisation artificial intelligence systems design or real time computing you should find the author s literary style refreshingly lucid and engaging and prepare you for more advanced texts **Mathematics for Computer Students** Rex Wilton,1995-10 Mathematics for Computer Students is a new text which takes a fresh approach to mathematics as it relates to good computing practice The book is a new addition to the popular Threshold series which have been widely adopted on business and computing courses throughout colleges of further education worldwide The book approaches the subject by encouraging students to understand the relationship between mathematics and computing so that they can select appropriate mathematical processes rather than seeing the former only as an assortment of disconnected practices To help the student to see familiar ground between the two subjects the author considers the practical applications of mathematics for computing before approaching the formal mathematics He considers step by step the following The skills of creating mathematical models numerical and logical The existing processes for manipulating those models The special demands imposed by the computer And throughout he considers how accuracy can be safeguarded and the control of the processing The text contains exercises both within the text and at the end of each chapter Understand Mathematics, Understand Computing Arnold L. Rosenberg,Denis Trystram,2020-12-05 In this book the authors aim to endow the reader with an operational conceptual and methodological understanding of the discrete mathematics that can be used to study understand and perform computing They want the reader to understand the elements of computing rather than just know them The basic topics are presented in a way that encourages readers to develop their personal way of thinking about mathematics Many topics are developed at several levels in a single voice with sample applications from within the world of computing Extensive historical and cultural asides emphasize the human side of mathematics and mathematicians By means of lessons and exercises on doing mathematics the book prepares interested readers to develop new concepts and invent new techniques and technologies that will enhance all aspects of computing The book will be of value to students scientists and engineers engaged in the design and use of computing systems and to scholars and practitioners beyond these technical fields who want to learn and apply novel computational ideas

Proceedings of the Ninth International Conference on Mathematics and Computing Debasis Giri,Dieter Gollmann,S. Ponnusamy,Sakurai Kouichi,Predrag S. Stanimirović,J. K. Sahoo,2023-07-31 This book features selected papers from the 9th International Conference on Mathematics and Computing ICMC 2023 organized at BITS Pilani K K Birla Goa Campus India during 6 8 January 2023 It covers recent advances in the field of mathematics statistics and scientific computing The book presents innovative work by leading academics researchers and experts from industry in mathematics statistics cryptography network security cybersecurity machine learning data analytics and blockchain technology in computer science and information technology *Mathematics for Computing* C. A. Whitehead,1992-01-01 **Mathematics for Computing** Robert Callan,1998 This book provides an approachable introduction to mathematical concepts explaining their importance and how they fit into the study of computing It is written for students who are taking a first unit in Computing Mathematics as part of a Computing Degree or HND Relating theory to practice helps demonstrate difficult concepts to students The author therefore concludes most topics with a short discussion of some areas of application to aid comprehension Self test questions are included in each chapter to allow the reader to review a topic and check their understanding before progressing This book provides an approachable introduction to mathematical concepts explaining their importance and how they fit into the study of computing It is written for students who are taking a first unit in Computing Mathematics as part of a Computing Degree or HND Relating theory to practice helps demonstrate difficult concepts to students The author therefore concludes most topics with a short discussion of some areas of application to aid comprehension Self test questions are included in each chapter to allow the reader to review a topic and check their understanding before progressing

Mathematics of Discrete Structures for Computer Science Gordon J. Pace,2012-09-13 Mathematics plays a key role in computer science some researchers would consider computers as nothing but the physical embodiment of mathematical systems And whether you are designing a digital circuit a computer program or a new programming language you need mathematics to be able to reason about the design its correctness robustness and dependability This book covers the foundational mathematics necessary for courses in computer science The common approach to presenting mathematical concepts and operators is to define them in terms of properties they satisfy and then based on these definitions develop ways of computing the result of applying the operators and prove them correct This book is mainly written for computer science students so here the author takes a different approach he starts by defining ways of calculating the results of applying the operators and then proves that they satisfy various properties After justifying his underlying approach the author offers detailed chapters covering propositional logic predicate calculus sets relations discrete structures structured types numbers and reasoning about programs The book contains chapter and section summaries detailed proofs and many end of section exercises key to the learning process The book is suitable for undergraduate and graduate students and although the treatment focuses on areas with frequent applications in computer science the book is also suitable for students of mathematics and engineering **Mathematics for Computing** G. P. McKeown,V. J. Rayward-Smith,1982 **Personal Mathematics and Computing** Frank Wattenberg,1991-01-01 Computers can be effective tools for participating in the affairs of the world They can also be used by the experts to erect barriers to participation This book is a self contained tutorial that can assist any reader with a background in high school mathematics in learning how to apply personal computing to enhance his or her understanding of modern quantitative methods in such areas as politics and economics in environment and ecology or in probability and statistics The first part briefly introduces programming in True BASIC and includes eight programming projects that teach by example These illustrate a variety of interesting applications and methods of computer based quantitative reasoning in lotteries and property taxes in the law of supply and demand and the laws of chance ESP dice rolling coin flipping test taking and in the use of peremptory challenges in jury selection The remainder of the book applies mathematics and computing to real problems Here the emphasis is on the art of expressing problems in ways that are amenable to computer analysis with assignments for writing a number of computer programs for a wide variety of applications in probability and statistics a statistical comparison of two popular beers with the aid of a random number generator a comparison of two roulette strategies a statistical analysis of polling results the Bell Shaped Curve and an analysis of a program aimed at reducing recidivism in economic modeling changing prices inflation mathematical tools for decision making game theory in optics Fermat s principle reflection and refraction light caustics funhouse mirrors and an optical paradox in Massachusetts local aid distribution and in population models and ecology Frank Wattenberg is Professor of Mathematics at the University of Massachusetts Amherst Maths for Computing and Information Technology Frank Giannasi,Robert Low,1995-01 The Essential Maths for Students series provides the fundamental mathematical and statistical techniques required by students entering Higher Education in a wide range of courses Reflecting the needs of both student and lecturer each text assumes little previous knowledge and is designed to raise the reader s proficiency to the level required by today s courses Maths for Computing and Information Technology provides a solid introductory grounding in the maths required for modules or courses in computer science and information technology Through worked examples highlighted key points and self assessment questions the book explains essential mathematical ideas and applies them to the I T field Topics covered include propositional and predicate calculus matrices sets mathematical proofs probability co ordinate geometry and finite state automata **Numerical Analysis** David Ronald Kincaid,Elliott Ward Cheney,2009 This book introduces students with diverse backgrounds to various types of mathematical analysis that are commonly needed in scientific computing The subject of numerical analysis is treated from a mathematical point of view offering a complete analysis of methods for scientific computing with appropriate motivations and careful proofs In an engaging and informal style the authors demonstrate that many computational procedures and intriguing questions of computer science arise from theorems and proofs Algorithms are presented in pseudocode so that students can immediately write computer programs in standard languages or use interactive mathematical software packages This book occasionally touches upon more advanced topics that are not usually contained in standard textbooks at this level **Mathematical Computing in J: Introduction** Howard A. Peelle,2004 This book introduces mathematical computing using J a powerful new programming language with applications in mathematics actuarial analysis scientific research business data processing and education Derived from APL J was designed as an executable mathematical notation by Dr Kenneth E Iverson and was implemented by Roger K W Hui J unifies many areas of mathematics has a simple consistent syntax with very few rules yet includes a large number of functions and operators as tools for thinking and problem solving *Modelling Computing Systems* Faron Moller,Georg Struth,2013-07-24 This engaging text presents the fundamental mathematics and modelling techniques for computing systems in a novel and light hearted way which can be easily followed by students at the very beginning of their university education Key concepts are taught through a large collection of challenging yet fun mathematical games and logical puzzles that require no prior knowledge about computers The text begins with intuition and examples as a basis from which precise concepts are then developed demonstrating how by working within the confines of a precise structured method the occurrence of errors in the system can be drastically reduced Features demonstrates how game theory provides a paradigm for an intuitive understanding of the nature of computation contains more than 400 exercises throughout the text with detailed solutions to half of these presented at the end of the book together with numerous theorems definitions and examples describes a modelling approach based on state transition systems **Statistical Computing** Kennedy,1980-03-01 This book provides an introduction to statistical computing and a critical balanced presentation of the algorithms and computational methods used in software systems discussing techniques for implementing algorithms in a computer It is intended for graduate students in statistics *Discrete Mathematics for Computing* Peter Grossman,2008-12-16 For first year undergraduate computing students with very little mathematical background this is a low level introductory text which takes the topics at a gentle pace covering all the essential material that forms the background for studies in computing and information systems *Computers and Mathematics* Erich Kaltofen,Stephen M Watt,1989-06-06

Mathematics In Computing: Bestsellers in 2023 The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous compelling novels enthralling the hearts of readers worldwide. Lets delve into the realm of popular books, exploring the fascinating narratives that have charmed audiences this year. Mathematics In Computing : Colleen Hoovers "It Ends with Us" This heartfelt tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover expertly weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can prevail. Mathematics In Computing : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This intriguing historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids captivating storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Mathematics In Computing : Delia Owens "Where the Crawdads Sing" This evocative coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens crafts a tale of resilience, survival, and the transformative power of nature, captivating readers with its evocative prose and mesmerizing setting. These popular novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of engaging stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a masterful and suspenseful novel that will keep you speculating until the very end. The novel is a cautionary tale about the dangers of obsession and the power of evil.

https://staging.conocer.cide.edu/data/scholarship/HomePages/eric%20carles%20treasury%20of%20classic%20stories%20for%20children.pdf

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