Abstract Algebra David S Dummit

Getting the books Abstract Algebra David S Dummit now is not type of challenging means. You could not unaccompanied going once ebook hoard or library or borrowing from your friends to way in them. This is an totally easy means to specifically acquire lead by on-line. This online statement Abstract Algebra David S Dummit can be one of the options to accompany you taking into consideration having extra time.

It will not waste your time. take on me, the e-book will agreed song you extra concern to read. Just invest little times to read this on-line message Abstract Algebra David S Dummit as well as evaluation them wherever you are now.

Algebra in Action: A Course in Groups, Rings, and Fields Shahriar Shahriar 2017-08-16 This text—based on the author's popular courses at Pomona College—provides a readable, student-friendly, and somewhat sophisticated introduction to abstract algebra. It is aimed at sophomore or junior undergraduates who are seeing the material for the first time. In addition to the usual definitions and theorems, there is ample discussion to help students build intuition and learn how to think about the abstract concepts. The book has over 1300 exercises and mini-projects of varying degrees of difficulty, and, to facilitate active learning and self-study, hints and short answers for many of the problems are provided. There are full solutions to over 100 problems in order to augment the text and to model the writing of solutions. Lattice diagrams are used throughout to visually demonstrate results and proof techniques. The book covers groups, rings, and fields. In group theory, group actions are the unifying theme and are introduced early. Ring theory is motivated by what is needed for solving Diophantine equations, and, in field theory, Galois theory and the solvability of polynomials take center stage. In each area, the text goes deep enough to demonstrate the power of abstract thinking and to convince the reader that the subject is full of unexpected results.

Quiver Representations Ralf Schiffler 2014-09-04 This book is intended to serve as a textbook for a course in Representation Theory of Algebras at the beginning graduate level. The text has two parts. In Part I, the theory is studied in an elementary way using quivers and their representations. This is a very hands-on approach and requires only basic knowledge of linear algebra. The main tool for describing the representation theory of a finite-dimensional algebra is its Auslander-Reiten quiver, and the text introduces these quivers as early as possible. Part II then uses the language of algebras and modules to build on the material developed before. The equivalence of the two approaches is proved in the text. The last chapter gives a proof of Gabriel's Theorem. The language of category theory is developed along the way as needed.

Analytic Hyperbolic Geometry and Albert Einstein's Special Theory of Relativity Abraham A. Ungar 2008 This book presents a powerful way to study Einstein's special theory of relativity and its underlying hyperbolic geometry in which analogies with classical results form the right tool. It introduces the notion of vectors into analytic hyperbolic geometry, where they are called gyrovectors. Newtonian velocity addition is the common vector addition, which is both commutative and associative. The resulting vector spaces, in turn, form the algebraic setting for the standard model of Euclidean geometry. In full analogy, Einsteinian velocity addition is a gyrovector addition, which is both gyrocommutative and gyroassociative. The resulting gyrovector spaces, in turn, form the algebraic setting for the Beltrami–Klein ball model of the hyperbolic geometry of Bolyai and Lobachevsky. Similarly, Mฒbius addition gives rise to gyrovector spaces that form the algebraic setting for the Poincarɩ ball model of hyperbolic geometry. In full analogy with classical results, the book presents a novel relativistic interpretation of stellar aberration in terms of relativistic gyrotrigonometry and gyrovector addition. Furthermore, the book presents, for the first time, the relativistic center of mass of an isolated system of noninteracting particles that coincided at some initial time t = 0. The novel relativistic resultant mass of the system, concentrated at the relativistic center of mass, dictates the validity of the dark matter and the dark energy that were introduced by cosmologists as ad hoc postulates to explain cosmological observations about missing gravitational force and late-time cosmic accelerated expansion. The discovery of the relativistic center of mass in this book thus demonstrates once again the usefulness of the study of Einstein's special theory of relativity in terms of its underlying analytic hyperbolic geometry.

A Second Course in Linear Algebra Stephan Ramon Garcia 2017-05-11 A second course in linear algebra for undergraduates in mathematics, computer science, physics, statistics, and the biological sciences.

Noncommutative Birational Geometry, Representations and Combinatorics Arkady. Berenstein 2013-05-01 "This volume contains the proceedings of the AMS Special Session on Noncommutative Birational Geometry, Representations and Cluster Algebras, held from January 6-7, 2012, in Boston, MA. The papers deal with various aspects of noncommutative birational geometry and related topics, focusing mainly on structure and representations of quantum groups and algebras, braided algebras, rational series in free groups, Poisson brackets on free algebras, and related problems in combinatorics. This volume is useful for researchers and graduate students in mathematics and mathematical physics who want to be introduced to different areas of current research in the new area of noncommutative algebra and geometry."--Publisher's website.

Algebra And Trigonometry Ushri Datta 2006-06-01

MATHEMATICAL COMBINATORICS, Vol. 3 / 2018 Linfan Mao The Mathematical Combinatorics (International Book Series) is a fully refereed international book series with ISBN number on each issue, sponsored by the MADIS of Chinese Academy of Sciences and published in USA quarterly comprising 110-160 pages approx. per volume, which publishes original research papers and survey articles in all aspects of Smarandache multi-spaces, Smarandache geometries, mathematical combinatorics, non-euclidean geometry and topology and their applications to other sciences.

An Invitation to General Algebra and Universal Constructions George M. Bergman 2015-02-05 Rich in examples and intuitive discussions, this book presents General Algebra using the unifying viewpoint of categories and functors. Starting with a survey, in non-category-theoretic terms, of many familiar and not-so-familiar constructions in algebra (plus two from topology for perspective), the reader is guided to an understanding and appreciation of the general concepts and tools unifying these constructions. Topics include: set theory, lattices, category theory, the formulation of universal constructions in category-theoretic terms, varieties of algebras, and adjunctions. A large number of exercises, from the routine to the challenging, interspersed through the text, develop the reader's grasp of the material, exhibit applications of the general theory to diverse areas of algebra, and in some cases point to outstanding open questions. Graduate students and researchers wishing to gain fluency in important mathematical constructions will welcome this carefully motivated book.

Advanced Linear Algebra Nicholas Loehr 2014-04-10 Designed for advanced undergraduate and beginning graduate students in linear or abstract algebra, Advanced Linear Algebra covers theoretical aspects of the subject, along with examples, computations, and proofs. It explores a variety of advanced topics in linear algebra that highlight the rich interconnections of the subject to geometry, algebra, analysis, combinatorics, numerical computation, and many other areas of mathematics. The book's 20 chapters are grouped into six main areas: algebraic structures, matrices, structured matrices, geometric aspects of linear algebra, modules, and multilinear algebra. The level of abstraction gradually increases as students proceed through the text, moving from matrices to vector spaces to modules. Each chapter consists of a mathematical vignette devoted to the development of one specific topic. Some chapters look at introductory material from a sophisticated or abstract viewpoint while others provide elementary expositions of more theoretical concepts. Several chapters offer unusual perspectives or novel treatments of standard results. Unlike similar advanced mathematical texts, this one minimizes the dependence of each chapter on material found in previous chapters so that students may immediately turn to the relevant chapter without first wading through pages of earlier material to access the necessary algebraic background and theorems. Chapter summaries contain a structured list of the principal definitions and results. End-of-chapter exercises aid students in digesting the material. Students are encouraged to use a computer algebra system to help solve computationally intensive exercises.

Elements of Modern Algebra Linda Gilbert 2014-01-01 ELEMENTS OF MODERN ALGEBRA, Eighth Edition, with its user-friendly format, provides you with the tools you need to succeed in abstract algebra and develop mathematical maturity as a bridge to higher-level mathematics courses. Strategy boxes give you guidance and explanations about techniques and enable you to become more proficient at constructing proofs. A summary of key words and phrases at the end of each chapter help you master the material. A reference section, symbolic marginal notes, an appendix, and numerous examples help you develop your problem-solving skills. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Modular Invariant Theory H.E.A. Eddy Campbell 2011-01-12 This book covers the modular invariant theory of finite groups, the case when the characteristic of

the field divides the order of the group, a theory that is more complicated than the study of the classical non-modular case. Largely self-contained, the book develops the theory from its origins up to modern results. It explores many examples, illustrating the theory and its contrast with the better understood non-modular setting. It details techniques for the computation of invariants for many modular representations of finite groups, especially the case of the cyclic group of prime order. It includes detailed examples of many topics as well as a quick survey of the elements of algebraic geometry and commutative algebra as they apply to invariant theory. The book is aimed at both graduate students and researchers—an introduction to many important topics in modern algebra within a concrete setting for the former, an exploration of a fascinating subfield of algebraic geometry for the latter.

Elements of Quasigroup Theory and Applications Victor Shcherbacov 2017-05-12 This book provides an introduction to quasigroup theory along with new structural results on some of the quasigroup classes. Many results are presented with some of them from mathematicians of the former USSR. These included results have not been published before in the western mathematical literature. In addition, many of the achievements obtained with regard to applications of quasigroups in coding theory and cryptology are described.

Abstract Algebra Theodore Shifrin 1996 Appropriate for a 1 or 2 term course in Abstract Algebra at the Junior level. This book explores the essential theories and techniques of modern algebra, including its problem-solving skills, basic proof techniques, many unusual applications, and the interplay between algebra and geometry. It takes a concrete, example-oriented approach to the subject matter.

Encyclopedia of Mathematics Education Louise Grinstein 2001-03-15 First published in 2001. Routledge is an imprint of Taylor & Francis, an informa company.

Abstract Algebra, 2Nd Ed David S. Dummit 2008-07-28 · Group Theory · Ring Theory · Modules and Vector Spaces · Field Theory and Galois Theory · An Introduction to Commutative Rings, Algebraic Geometry, and Homological Algebra· Introduction to the Representation Theory of Finite Groups

Introduction to Riemannian Manifolds John M. Lee 2019-01-02 This text focuses on developing an intimate acquaintance with the geometric meaning of curvature and thereby introduces and demonstrates all the main technical tools needed for a more advanced course on Riemannian manifolds. It covers proving the four most fundamental theorems relating curvature and topology: the Gauss-Bonnet Theorem, the Cartan-Hadamard Theorem, Bonnet's Theorem, and a special case of the Cartan-Ambrose-Hicks Theorem.

Separable Algebras Timothy J. Ford 2017-09-26 This book presents a comprehensive introduction to the theory of separable algebras over commutative rings. After a thorough introduction to the general theory, the fundamental roles played by separable algebras are explored. For example, Azumaya algebras, the henselization of local rings, and Galois theory are rigorously introduced and treated. Interwoven throughout these applications is the important notion of étale algebras. Essential connections are drawn between the theory of separable algebras and Morita theory, the theory of faithfully flat descent, cohomology, derivations, differentials, reflexive lattices, maximal orders, and class groups. The text is accessible to graduate students who have finished a first course in algebra, and it includes necessary foundational material, useful exercises, and many nontrivial examples.

Analytische Mechanik Joseph Louis Lagrange 1887

Win-- Women in Numbers Alina Carmen Cojocaru 2011-01-01 This volume is a collection of papers on number theory which evolved out of the workshop WIN - Women in Numbers, held November 2nd-7th, 2008, in Alberta, Canada. The book includes articles showcasing outcomes from collaborative research initiated during the workshop.

The Life of Primes in 37 Episodes Jean-Marie De Koninck 2021-05-19 This book is about the life of primes. Indeed, once they are defined, primes take on a life of their own and the mysteries surrounding them begin multiplying, just like living cells reproduce themselves, and there seems to be no end to it. This monograph takes the reader on a journey through time, providing an accessible overview of the numerous prime number theory problems that mathematicians have been working on since Euclid. Topics are presented in chronological order as episodes. These include results on the distribution of primes, from the most elementary to the proof of the famous prime number theorem. The book also covers various primality tests and factorisation algorithms. It is then shown how our inability to factor large integers has allowed mathematicians to create today's most secure encryption method. Computer science buffs may be tempted to tackle some of the many open problems appearing in the episodes. Throughout the presentation, the human side of mathematics is displayed through short biographies that give a glimpse of the lives of the people who contributed to the life of primes. Each of the 37 episodes concludes with a series of problems (many with solutions) that will assist the reader in gaining a better understanding of the theory.

Lineare Darstellungen endlicher Gruppen Jean Pierre Serre 2013-03-09

Galoissche Theorie ["Galois theory"]... Emil Artin 1959

Beyond the Quadratic Formula Ron Irving 2020-01-29 The quadratic formula for the solution of quadratic equations was discovered independently by scholars in many ancient cultures and is familiar to everyone. Less well known are formulas for solutions of cubic and quartic equations whose discovery was the high point of 16th century mathematics. Their study forms the heart of this book, as part of the broader theme that a polynomial's coefficients can be used to obtain detailed information on its roots. The book is designed for self-study, with many results presented as exercises and some supplemented by outlines for solution. The intended audience includes in-service and prospective secondary mathematics teachers, high school students eager to go beyond the standard curriculum, undergraduates who desire an in-depth look at a topic they may have unwittingly skipped over, and the mathematically curious who wish to do some work to unlock the mysteries of this beautiful subject.

Outlines and Highlights for Abstract Algebra by David S Dummit Cram101 Textbook Reviews 2010-12-01 Never HIGHLIGHT a Book Again! Virtually all of the testable terms, concepts, persons, places, and events from the textbook are included. Cram101 Just the FACTS101 studyguides give all of the outlines, highlights, notes, and quizzes for your textbook with optional online comprehensive practice tests. Only Cram101 is Textbook Specific. Accompanys: 9780471433347 .

Groups, Matrices, and Vector Spaces James B. Carrell 2017-09-02 This unique text provides a geometric approach to group theory and linear algebra, bringing to light the interesting ways in which these subjects interact. Requiring few prerequisites beyond understanding the notion of a proof, the text aims to give students a strong foundation in both geometry and algebra. Starting with preliminaries (relations, elementary combinatorics, and induction), the book then proceeds to the core topics: the elements of the theory of groups and fields (Lagrange's Theorem, cosets, the complex numbers and the prime fields), matrix theory and matrix groups, determinants, vector spaces, linear mappings, eigentheory and diagonalization, Jordan decomposition and normal form, normal matrices, and quadratic forms. The final two chapters consist of a more intensive look at group theory, emphasizing orbit stabilizer methods, and an introduction to linear algebraic groups, which enriches the notion of a matrix group. Applications involving symm etry groups, determinants, linear coding theory and cryptography are interwoven throughout. Each section ends with ample practice problems assisting the reader to better understand the material. Some of the applications are illustrated in the chapter appendices. The author's unique melding of topics evolved from a two semester course that he taught at the University of British Columbia consisting of an undergraduate honors course on abstract linear algebra and a similar course on the theory of groups. The combined content from both makes this rare text ideal for a year-long course, covering more material than most linear algebra texts. It is also optimal for independent study and as a supplementary text for various professional applications. Advanced undergraduate or graduate students in mathematics, physics, computer science and engineering will find this book both useful and enjoyable.

Mathematical Software - ICMS 2006 Andres Iglesias 2006-08-24 This book constitutes the refereed proceedings of the Second International Congress on Mathematical Software, ICMS 2006. The book presents 45 revised full papers, carefully reviewed and selected for presentation. The papers are organized in topical sections on new developments in computer algebra packages, interfacing computer algebra in mathematical visualization, software for algebraic geometry and related topics, number-theoretical software, methods in computational number theory, free software for computer algebra, and general issues.

A Guide to Groups, Rings, and Fields Fernando Q. Gouvêa 2012-12-31 Insightful overview of many kinds of algebraic structures that are ubiquitous in mathematics. For researchers at graduate level and beyond.

Ring Theory and Its Applications Dinh Van Huynh 2014-02-21 This volume contains the proceedings of the Ring Theory Session in honor of T. Y. Lam's 70th birthday, at the 31st Ohio State-Denison Mathematics Conference, held from May 25-27, 2012, at The Ohio State University, Columbus, Ohio. Included are expository articles and research papers covering topics such as cyclically presented modules, Eggert's conjecture, the Mittag-Leffler conditions, clean rings, McCoy rings, QF rings, projective and injective modules, Baer modules, and Leavitt path algebras. Graduate students and researchers in many areas of algebra will find this volume valuable as the papers point out many directions for future work; in particular, several articles contain explicit lists of open questions.

Angewandte abstrakte Algebra Rudolf Lidl 1982

Symmetry in Graphs Ted Dobson 2022-05-12 This is the first full-length book on the major theme of symmetry in graphs. Forming part of algebraic graph

theory, this fast-growing field is concerned with the study of highly symmetric graphs, particularly vertex-transitive graphs, and other combinatorial structures, primarily by group-theoretic techniques. In practice the street goes both ways and these investigations shed new light on permutation groups and related algebraic structures. The book assumes a first course in graph theory and group theory but no specialized knowledge of the theory of permutation groups or vertex-transitive graphs. It begins with the basic material before introducing the field's major problems and most active research themes in order to motivate the detailed discussion of individual topics that follows. Featuring many examples and over 450 exercises, it is an essential introduction to the field for graduate students and a valuable addition to any algebraic graph theorist's bookshelf.

Problems in Abstract Algebra A. R. Wadsworth 2017-05-10 This is a book of problems in abstract algebra for strong undergraduates or beginning graduate students. It can be used as a supplement to a course or for self-study. The book provides more variety and more challenging problems than are found in most algebra textbooks. It is intended for students wanting to enrich their learning of mathematics by tackling problems that take some thought and effort to solve. The book contains problems on groups (including the Sylow Theorems, solvable groups, presentation of groups by generators and relations, and structure and duality for finite abelian groups); rings (including basic ideal theory and factorization in integral domains and Gauss's Theorem); linear algebra (emphasizing linear transformations, including canonical forms); and fields (including Galois theory). Hints to many problems are also included.

Ring And Field Theory Kaiming Zhao 2022-04-14 This book is intended as a textbook for a one-term senior undergraduate (or graduate) course in Ring and Field Theory, or Galois theory. The book is ready for an instructor to pick up to teach without making any preparations.The book is written in a way that is easy to understand, simple and concise with simple historic remarks to show the beauty of algebraic results and algebraic methods. The book contains 240 carefully selected exercise questions of varying difficulty which will allow students to practice their own computational and proof-writing skills. Sample solutions to some exercise questions are provided, from which students can learn to approach and write their own solutions and proofs. Besides standard ones, some of the exercises are new and very interesting. The book contains several simple-to-use irreducibility criteria for rational polynomials which are not in any such textbook.This book can also serve as a reference for professional mathematicians. In particular, it will be a nice book for PhD students to prepare their qualification exams.

Algebra Michael Artin 1998-05-19 Important though the general concepts and propositions may be with which the modem and industrious passion for axiomatizing and generalizing has presented us, in algebra perhaps more than anywhere else, nevertheless I am convinced that the special problems in all their complexity constitute the stock and core of mathematics, and that to master their difficulties requires on the whole the harder labor. HERMANN WEYL Die Arbeit an diesem Buch begann vor etwa zwanzig Jahren mit Aufzeichnungen zur Ergänzung meiner Algebravorlesungen. Ich wollte einige konkrete Themen, wie Symmetrie, lineare Gruppen und quadratische Zahlkörper, ausführlicher be handeln als dies im vorgesehenen Text der Fall war, und darüberhinaus wollte ich den Schwerpunkt in der Gruppentheorie von den Permutationsgruppen auf Matrixgruppen verlagern. Ein anderes ständig wiederkehrendes Thema, nämlich Gitter, sind spontan aufgetaucht. Ich hoffte, der konkrete Stoff könne das Interesse der Studenten wecken und gleichzeitig die Abstraktionen verständlicher machen, kurz gesagt, sie sollten weiter kommen, indem sie beides gleichzeitig lernten. Das bewährte sich gut. Es dauerte einige Zeit, bis ich entschieden hatte, welche Themen ich behandeln wollte, und allmählich verteilte ich mehr und mehr Aufzeichnungen und ging schließlich dazu über, die ganze Vorlesung mit diesem Skript zu bestrei ten. Auf diese Weise ist ein Buch entstanden, das, wie ich meine, etwas anders ist als die existierenden Bücher. Allerdings haben mir die Probleme, die ich damit hatte, die einzelnen Teile des Buches zu einem Ganzen zusammenzufügen, einige Kopfschmerzen bereitet; ich kann also nicht empfehlen, auf diese Art anzufangen, ein Buch zu schreiben.

ABSTRACT ALGEBRA, 3RD EDITION David Steven Dummit 2004 Market_Desc: Mathematics students at both the advanced undergraduate and graduate levels. Special Features: Over 1500 exercises, many with multiple parts, ranging in scope from routine to fairly sophisticated, and ranging in purpose from basic application of text material to exploration of important theoretical or computational techniques. · The emphasis throughout has been to motivate the introduction and development of important algebraic concepts using as many examples as possible. · Contains many topics not usually found in a basic algebra book such as rings of algebraic integers, semidirect products and the theory of extensions, criteria for Principal Ideal Domains, criteria for solvability of a quintic, and Dedekind Domains. About The Book: Widely acclaimed algebra text. This book is designed to give the reader insight into the power and beauty that accrues from a rich interplay between different areas of mathematics. The book carefully develops the theory of different algebraic structures, beginning from basic definitions to some in-depth results, using numerous examples and exercises to aid the reader's understanding. In this way, readers gain an appreciation for how mathematical structures and their interplay lead to powerful results and insights in a number of different settings.

Cryptography Simon Rubinstein-Salzedo 2018-09-27 This text introduces cryptography, from its earliest roots to cryptosystems used today for secure online communication. Beginning with classical ciphers and their cryptanalysis, this book proceeds to focus on modern public key cryptosystems such as Diffie-Hellman, ElGamal, RSA, and elliptic curve cryptography with an analysis of vulnerabilities of these systems and underlying mathematical issues such as factorization algorithms. Specialized topics such as zero knowledge proofs, cryptographic voting, coding theory, and new research are covered in the final section of this book. Aimed at undergraduate students, this book contains a large selection of problems, ranging from straightforward to difficult, and can be used as a textbook for classes as well as self-study. Requiring only a solid grounding in basic mathematics, this book will also appeal to advanced high school students and amateur mathematicians interested in this fascinating and topical subject.

Exploratory Galois Theory John Swallow 2004-10-11 Combining a concrete perspective with an exploration-based approach, Exploratory Galois Theory develops Galois theory at an entirely undergraduate level. The text grounds the presentation in the concept of algebraic numbers with complex approximations and assumes of its readers only a first course in abstract algebra. For readers with Maple or Mathematica, the text introduces tools for hands-on experimentation with finite extensions of the rational numbers, enabling a familiarity never before available to students of the subject. The text is appropriate for traditional lecture courses, for seminars, or for self-paced independent study by undergraduates and graduate students.

Gorenstein Homological Algebra Alina Iacob 2018-08-06 Gorenstein homological algebra is an important area of mathematics, with applications in commutative and noncommutative algebra, model category theory, representation theory, and algebraic geometry. While in classical homological algebra the existence of the projective, injective, and flat resolutions over arbitrary rings are well known, things are a little different when it comes to Gorenstein homological algebra. The main open problems in this area deal with the existence of the Gorenstein injective, Gorenstein projective, and Gorenstein flat resolutions. Gorenstein Homological Algebra is especially suitable for graduate students interested in homological algebra and its applications.

Abstract Algebra David S. Dummit 2003-07-14 Widely acclaimed algebra text. This book is designed to give the reader insight into the power and beauty that accrues from a rich interplay between different areas of mathematics. The book carefully develops the theory of different algebraic structures, beginning from basic definitions to some in-depth results, using numerous examples and exercises to aid the reader's understanding. In this way, readers gain an appreciation for how mathematical structures and their interplay lead to powerful results and insights in a number of different settings. * The emphasis throughout has been to motivate the introduction and development of important algebraic concepts using as many examples as possible.

Recent Developments in Representation Theory Alex Martsinkovsky 2016-08-26 This volume contains selected expository lectures delivered at the Maurice Auslander Distinguished Lectures and International Conference, held May 1–6, 2014, at the Woods Hole Oceanographic Institute, Woods Hole, MA. Several significant developments of the last decade in representation theory of finite-dimensional algebras are related to combinatorics. Three of the five lectures in this volume deal, respectively, with the Catalan combinatorics, the combinatorics of Gelfand-Zetlin polytopes, and the combinatorics of tilting modules. The remaining papers present history and recent advances in the study of left orders in left Artinian rings and a survey on invariant theory of Artin-Schelter regular algebras.

Discrete Mathematics Research Progress Kenneth Brian Moore 2008 Discrete mathematics, also called finite mathematics or Decision Maths, is the study of mathematical structures that are fundamentally discrete, in the sense of not supporting or requiring the notion of continuity. Most, if not all, of the objects studied in finite mathematics are countable sets, such as integers, finite graphs, and formal languages. Discrete mathematics has become popular in recent decades because of its applications to computer science. Concepts and notations from discrete mathematics are useful to study or describe objects or problems in computer algorithms and programming languages. In some mathematics curricula, finite mathematics courses cover discrete mathematical concepts for business, while discrete mathematics courses emphasise concepts for computer science majors.