

## **Concrete Abstract Algebra From Numbers To Grobner Bases By Cram101 Textbook Reviews | 12666bf69554d7930731ef8382d424f9**

Rings, Fields, and Vector Spaces  
Basic Abstract Algebra  
Abstract Algebra for Beginners - Solution Guide  
Abstract Algebra  
Algebra: Abstract and Concrete  
Sets, Groups, and Mappings: An Introduction to Abstract Mathematics  
Algebraic Geodesy and Geoinformatics  
Geospatial Algebraic Computations  
A Journey Through The Realm of Numbers  
Abstract Algebra and Famous Impossibilities  
Algebra: Abstract and Concrete, edition 2.6  
Introduction to Abstract Algebra  
Numbers & Ideals  
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Concrete Mathematics: A Foundation for Computer Science  
Abstract Algebra  
Mathematics for Machine Learning  
Boolean Algebra  
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Introduction to Abstract Algebra  
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Abstract Algebra  
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Abstract Algebra with Applications  
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Algebraic Theory of Numbers  
Elements of Algebra  
Studyguide for Concrete Abstract Algebra  
Concrete Abstract Algebra  
A Concrete Approach To Abstract Algebra,  
Student Solutions Manual (e-only)  
Elements of Abstract Algebra  
A Concrete Introduction to Higher Algebra  
Dynamical Systems with Applications Using Mathematica®  
Concrete Approach to Abstract Algebra  
Conics and Cubics

### **Rings, Fields, and Vector Spaces**

This is a new text for the Abstract Algebra course. The author has written this text with a unique, yet historical, approach: solvability by radicals. This approach depends on a fields-first organization. However, professors wishing to commence their course with group theory will find that the Table of Contents is highly flexible, and contains a generous amount of group coverage.

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### [Basic Abstract Algebra](#)

A Concrete Approach to Abstract Algebra presents a solid and highly accessible introduction to abstract algebra by providing details on the building blocks of abstract algebra. It begins with a concrete and thorough examination of familiar objects such as integers, rational numbers, real numbers, complex numbers, complex conjugation, and polynomials. The author then builds upon these familiar objects and uses them to introduce and motivate advanced concepts in algebra in a manner that is easier to understand for most students. Exercises provide a balanced blend of difficulty levels, while the quantity allows the instructor a latitude of choices. The final four chapters present the more theoretical material needed for graduate study. This text will be of particular interest to teachers and future teachers as it links abstract algebra to many topics which arise in courses in algebra, geometry, trigonometry, precalculus, and calculus. Presents a more natural 'rings first' approach to effectively leading the student into the the abstract material of the course by the use of motivating concepts from previous math courses to guide the discussion of abstract algebra Bridges the gap for students by showing how most of the concepts within an abstract algebra course are actually tools used to solve difficult, but well-known problems Builds on relatively familiar material (Integers, polynomials) and moves onto more abstract topics, while providing a historical approach of introducing groups first as automorphisms Exercises provide a balanced blend of difficulty levels, while the quantity allows the instructor a latitude of choices

### [Abstract Algebra for Beginners - Solution Guide](#)

This book is written as an introduction to higher algebra for students with a background of a year of calculus. The book developed out of a set of notes for a sophomore-junior level course at the State University of New York at Albany entitled Classical Algebra. In the 1950s and before, it was customary for the first course in algebra to be a course in the theory of equations, consisting of a study of polynomials over the complex, real, and rational numbers, and, to a lesser extent, linear algebra from the point of view of systems of equations. Abstract algebra, that is, the study of groups, rings, and fields, usually followed such a course. In recent years the theory of equations course has disappeared. Without it, students entering abstract algebra courses tend to lack the experience in the algebraic theory of the basic classical examples of the integers and

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polynomials necessary for understanding, and more importantly, for appreciating the formalism. To meet this problem, several texts have recently appeared introducing algebra through number theory.

## [Abstract Algebra](#)

Never HIGHLIGHT a Book Again Virtually all testable terms, concepts, persons, places, and events are included. Cram101 Textbook Outlines gives all of the outlines, highlights, notes for your textbook with optional online practice tests. Only Cram101 Outlines are Textbook Specific. Cram101 is NOT the Textbook. Accompanys: 9780521673761

## [Algebra: Abstract and Concrete](#)

Using the proof of the non-trisectability of an arbitrary angle as a final goal, the author develops in an easy conversational style the basics of rings, fields, and vector spaces. Originally developed as a text for an introduction to algebra course for future high-school teachers at California State University, Northridge, the focus of this book is on exposition. It would serve extremely well as a focused, one-semester introduction to abstract algebra.

## [Sets, Groups, and Mappings: An Introduction to Abstract Mathematics](#)

This book takes the reader on a journey from familiar high school mathematics to undergraduate algebra and number theory. The journey starts with the basic idea that new number systems arise from solving different equations, leading to (abstract) algebra. Along this journey, the reader will be exposed to important ideas of mathematics, and will learn a little about how mathematics is really done. Starting at an elementary level, the book gradually eases the reader into the complexities of higher mathematics; in particular, the formal structure of mathematical writing (definitions, theorems and proofs) is introduced in simple terms. The book covers a range of topics, from the very foundations (numbers, set theory) to basic abstract algebra (groups, rings, fields), driven throughout by the need to understand concrete equations and problems, such as determining which numbers are sums of squares. Some topics usually reserved for a more advanced

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audience, such as Eisenstein integers or quadratic reciprocity, are lucidly presented in an accessible way. The book also introduces the reader to open source software for computations, to enhance understanding of the material and nurture basic programming skills. For the more adventurous, a number of Outlooks included in the text offer a glimpse of possible mathematical excursions. This book supports readers in transition from high school to university mathematics, and will also benefit university students keen to explore the beginnings of algebraic number theory. It can be read either on its own or as a supporting text for first courses in algebra or number theory, and can also be used for a topics course on Diophantine equations.

### [Algebraic Geodesy and Geoinformatics](#)

Abstract Algebra with Applications provides a friendly and concise introduction to algebra, with an emphasis on its uses in the modern world. The first part of this book covers groups, after some preliminaries on sets, functions, relations, and induction, and features applications such as public-key cryptography, Sudoku, the finite Fourier transform, and symmetry in chemistry and physics. The second part of this book covers rings and fields, and features applications such as random number generators, error correcting codes, the Google page rank algorithm, communication networks, and elliptic curve cryptography. The book's masterful use of colorful figures and images helps illustrate the applications and concepts in the text. Real-world examples and exercises will help students contextualize the information. Meant for a year-long undergraduate course in algebra for mathematics, engineering, and computer science majors, the only prerequisites are calculus and a bit of courage when asked to do a short proof.

### [Geospatial Algebraic Computations](#)

Lucid coverage of the major theories of abstract algebra, with helpful illustrations and exercises included throughout. Unabridged, corrected republication of the work originally published 1971. Bibliography. Index. Includes 24 tables and figures.

### [A Journey Through The Realm of Numbers](#)

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This introduction to modern or abstract algebra addresses the conventional topics of groups, rings, and fields with symmetry as a unifying theme, while it introduces readers to the active practice of mathematics. Its accessible presentation is designed to teach users to think things through for themselves and change their view of mathematics from a system of rules and procedures, to an arena of inquiry. The volume provides plentiful exercises that give users the opportunity to participate and investigate algebraic and geometric ideas which are interesting, important, and worth thinking about. The volume addresses algebraic themes, basic theory of groups and products of groups, symmetries of polyhedra, actions of groups, rings, field extensions, and solvability and isometry groups. For those interested in a concrete presentation of abstract algebra.

## [Abstract Algebra and Famous Impossibilities](#)

## [Algebra: Abstract and Concrete, edition 2.6](#)

This textbook is an introduction to algebra via examples. The book moves from properties of integers, through other examples, to the beginnings of group theory. Applications to public key codes and to error correcting codes are emphasised. These applications, together with sections on logic and finite state machines, make the text suitable for students of computer science as well as mathematics students. Attention is paid to historical development of the mathematical ideas. This second edition contains new material on mathematical reasoning skills and a new chapter on polynomials has been added. The book was developed from first-level courses taught in the UK and USA. These courses proved successful in developing not only a theoretical understanding but also algorithmic skills. This book can be used at a wide range of levels: it is suitable for first- or second-level university students, and could be used as enrichment material for upper-level school students.

## [Introduction to Abstract Algebra](#)

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This two-volume course on abstract algebra provides a broad introduction to the subject for those with no previous knowledge of it but who are well grounded in ordinary algebraic techniques. It starts from the beginning, leading up to fresh ideas gradually and in a fairly elementary manner, and moving from discussion of particular (concrete) cases to abstract ideas and methods. It thus avoids the common practice of presenting the reader with a mass of ideas at the beginning, which he is only later able to relate to his previous mathematical experience. The work contains many concrete examples of algebraic structures. Each chapter contains a few worked examples for the student - these are divided into straightforward and more advanced categories. Answers are provided. From general sets, Volume 1 leads on to discuss special sets of the integers, other number sets, residues, polynomials and vectors. A chapter on mappings is followed by a detailed study of the fundamental laws of algebra, and an account of the theory of groups which takes the idea of subgroups as far as Langrange's theorem. Some improvements in exposition found desirable by users of the book have been incorporated into the second edition and the opportunity has also been taken to correct a number of errors.

## [Numbers & Ideals](#)

This book bridges the gap between abstract mathematics and and concrete application in Modern Algebra and Modern Number Theory. It provides an introduction to some basic notions of Algebra and Number Theory, such as rings, fields and ideals, grouped around the theory of algebraic integers in quadratic number theories.

## [Numbers, Groups and Codes](#)

This text provides a thorough introduction to “modern” or “abstract” algebra at a level suitable for upper-level undergraduates and beginning graduate students. The book addresses the conventional topics: groups, rings, fields, and linear algebra, with symmetry as a unifying theme. This subject matter is central and ubiquitous in modern mathematics and in applications ranging from quantum physics to digital communications. The most important goal of this book is to engage students in the active practice of mathematics.

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## **Concrete Mathematics: A Foundation for Computer Science**

Algebraic curves are the graphs of polynomial equations in two variables, such as  $y^3 + 5xy^2 = x + 2xy$ . By focusing on curves of degree at most 3—lines, conics, and cubics—this book aims to fill the gap between the familiar subject of analytic geometry and the general study of algebraic curves. This text is designed for a one-semester class that serves both as a geometry course for mathematics majors in general and as a sequel to college geometry for teachers of secondary school mathematics. The only prerequisite is first-year calculus. On the one hand, this book can serve as a text for an undergraduate geometry course for all mathematics majors. Algebraic geometry unites algebra, geometry, topology, and analysis, and it is one of the most exciting areas of modern mathematics. Unfortunately, the subject is not easily accessible, and most introductory courses require a prohibitive amount of mathematical machinery. We avoid this problem by focusing on curves of degree at most 3. This keeps the results tangible and the proofs natural. It lets us emphasize the power of two fundamental ideas, homogeneous coordinates and intersection multiplicities.

## **Abstract Algebra**

Relations between groups and sets, results and methods of abstract algebra in terms of number theory and geometry, and noncommutative and homological algebra. Solutions. 2006 edition.

## **Mathematics for Machine Learning**

This unique text provides students with a basic course in both calculus and analytic geometry — no competitive editions cover both topics in a single volume. Its prerequisites are minimal, and the order of its presentation promotes an intuitive approach to calculus. Algebraic concepts receive an unusually strong emphasis. Numerous exercises appear throughout the text. 1951 edition.

## **A Boolean Algebra**

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Abstract Algebra for Beginners - Solution Guide This book contains complete solutions to the problems in the 16 Problem Sets in Abstract Algebra for Beginners. Note that this book references examples and theorems from Abstract Algebra for Beginners. Therefore, it is strongly suggested that you purchase a copy of that book before purchasing this one.

## [Numbers and Symmetry](#)

Taking a slightly different approach from similar texts, Introduction to Abstract Algebra presents abstract algebra as the main tool underlying discrete mathematics and the digital world. It helps students fully understand groups, rings, semigroups, and monoids by rigorously building concepts from first principles. A Quick Introduction to Algebra The first three chapters of the book show how functional composition, cycle notation for permutations, and matrix notation for linear functions provide techniques for practical computation. The author also uses equivalence relations to introduce rational numbers and modular arithmetic as well as to present the first isomorphism theorem at the set level. The Basics of Abstract Algebra for a First-Semester Course Subsequent chapters cover orthogonal groups, stochastic matrices, Lagrange's theorem, and groups of units of monoids. The text also deals with homomorphisms, which lead to Cayley's theorem of reducing abstract groups to concrete groups of permutations. It then explores rings, integral domains, and fields. Advanced Topics for a Second-Semester Course The final, mostly self-contained chapters delve deeper into the theory of rings, fields, and groups. They discuss modules (such as vector spaces and abelian groups), group theory, and quasigroups.

## [Introduction to Abstract Algebra](#)

Accessible but rigorous, this outstanding text encompasses all of the topics covered by a typical course in elementary abstract algebra. Its easy-to-read treatment offers an intuitive approach, featuring informal discussions followed by thematically arranged exercises. This second edition features additional exercises to improve student familiarity with applications. 1990 edition.

## [A Concrete Approach to Abstract Algebra](#)

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A Concrete Approach to Abstract Algebra begins with a concrete and thorough examination of familiar objects like integers, rational numbers, real numbers, complex numbers, complex conjugation and polynomials, in this unique approach, the author builds upon these familiar objects and then uses them to introduce and motivate advanced concepts in algebra in a manner that is easier to understand for most students. The text will be of particular interest to teachers and future teachers as it links abstract algebra to many topics which arise in courses in algebra, geometry, trigonometry, precalculus and calculus. The final four chapters present the more theoretical material needed for graduate study.

### [A Book of Abstract Algebra](#)

Presents information on the book "Algebra: Abstract and Concrete," by Frederick M. Goodman. Includes the table of contents, images from the text, and some 3D graphics adapted from the book. Contains images of symmetry axes of the cube, symmetry axes of the tetrahedron, and tetrahedra imbedded in a cube. Provides a summary of the book.

### [Abstract Algebra](#)

While preparing and teaching 'Introduction to Geodesy I and II' to undergraduate students at Stuttgart University, we noticed a gap which motivated the writing of the present book: Almost every topic that we taught required some skills in algebra, and in particular, computer algebra! From positioning to transformation problems inherent in geodesy and geoinformatics, knowledge of algebra and application of computer algebra software were required. In preparing this book therefore, we have attempted to put together basic concepts of abstract algebra which underpin the techniques for solving algebraic problems. Algebraic computational algorithms useful for solving problems which require exact solutions to nonlinear systems of equations are presented and tested on various problems. Though the present book focuses mainly on the two fields, the concepts and techniques presented herein are nonetheless applicable to other fields where algebraic computational problems might be encountered. In Engineering for example, network densification and robotics apply resection and intersection techniques which require algebraic solutions. Solution of nonlinear systems of equations is an indispensable task in almost all geosciences such as geodesy,

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geoinformatics, geophysics (just to mention but a few) as well as robotics. These equations which require exact solutions underpin the operations of ranging, resection, intersection and other techniques that are normally used. Examples of problems that require exact solutions include; • three-dimensional resection problem for determining positions and orientation of sensors, e. g. , camera, theodolites, robots, scanners etc.

### [Basic Abstract Algebra](#)

### [Algebra](#)

### [A Concrete Approach to Abstract Algebra](#)

This book provides an introduction to the theory of dynamical systems with the aid of the Mathematica® computer algebra package. The book has a very hands-on approach and takes the reader from basic theory to recently published research material. Emphasized throughout are numerous applications to biology, chemical kinetics, economics, electronics, epidemiology, nonlinear optics, mechanics, population dynamics, and neural networks. Theorems and proofs are kept to a minimum. The first section deals with continuous systems using ordinary differential equations, while the second part is devoted to the study of discrete dynamical systems.

### [Introduction to Modern Algebra and Matrix Theory](#)

A Concrete Approach to Abstract Algebra begins with a concrete and thorough examination of familiar objects like integers, rational numbers, real numbers, complex numbers, complex conjugation and polynomials, in this unique approach, the author builds upon these familiar objects and then uses them to introduce and motivate advanced concepts in algebra in a manner that is easier to understand for most students. The text will be of particular interest to teachers and future teachers as it links abstract algebra to many topics which arise in courses in algebra, geometry, trigonometry, precalculus and calculus. The final four

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chapters present the more theoretical material needed for graduate study. Ancillary list: \* Online ISM-  
<http://textbooks.elsevier.com/web/manuals.aspx?isbn=9780123749413> \* Online SSM-  
<http://www.elsevierdirect.com/product.jsp?isbn=9780123749413> \* Ebook-  
<http://www.elsevierdirect.com/product.jsp?isbn=9780123749413> Presents a more natural 'rings first'  
approach to effectively leading the student into the the abstract material of the course by the use of  
motivating concepts from previous math courses to guide the discussion of abstract algebra Bridges the gap  
for students by showing how most of the concepts within an abstract algebra course are actually tools used to  
solve difficult, but well-known problems Builds on relatively familiar material (Integers, polynomials) and  
moves onto more abstract topics, while providing a historical approach of introducing groups first as  
automorphisms Exercises provide a balanced blend of difficulty levels, while the quantity allows the  
instructor a latitude of choices

## **Abstract Algebra with Applications**

This book provides a complete abstract algebra course, enabling instructors to select the topics for use in individual classes.

## **A Concrete Introduction to Higher Algebra**

Improved geospatial instrumentation and technology such as in laser scanning has now resulted in millions of data being collected, e.g., point clouds. It is in realization that such huge amount of data requires efficient and robust mathematical solutions that this third edition of the book extends the second edition by introducing three new chapters: Robust parameter estimation, Multiobjective optimization and Symbolic regression. Furthermore, the linear homotopy chapter is expanded to include nonlinear homotopy. These disciplines are discussed first in the theoretical part of the book before illustrating their geospatial applications in the applications chapters where numerous numerical examples are presented. The renewed electronic supplement contains these new theoretical and practical topics, with the corresponding Mathematica statements and functions supporting their computations introduced and applied. This third edition is renamed in light of these technological advancements.

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## [An Introduction to Abstract Algebra](#)

This textbook presents modern algebra from the ground up using numbers and symmetry. The idea of a ring and of a field are introduced in the context of concrete number systems. Groups arise from considering transformations of simple geometric objects. The analysis of symmetry provides the student with a visual introduction to the central algebraic notion of isomorphism. Designed for a typical one-semester undergraduate course in modern algebra, it provides a gentle introduction to the subject by allowing students to see the ideas at work in accessible examples, rather than plunging them immediately into a sea of formalism. The student is involved at once with interesting algebraic structures, such as the Gaussian integers and the various rings of integers modulo  $n$ , and is encouraged to take the time to explore and become familiar with those structures. In terms of classical algebraic structures, the text divides roughly into three parts:

## [Algebraic Theory of Numbers](#)

Praise for the Third Edition ". . . an expository masterpiece of the highest didactic value that has gained additional attractivity through the various improvements . . ."—Zentralblatt MATH The Fourth Edition of Introduction to Abstract Algebra continues to provide an accessible approach to the basic structures of abstract algebra: groups, rings, and fields. The book's unique presentation helps readers advance to abstract theory by presenting concrete examples of induction, number theory, integers modulo  $n$ , and permutations before the abstract structures are defined. Readers can immediately begin to perform computations using abstract concepts that are developed in greater detail later in the text. The Fourth Edition features important concepts as well as specialized topics, including: The treatment of nilpotent groups, including the Frattini and Fitting subgroups Symmetric polynomials The proof of the fundamental theorem of algebra using symmetric polynomials The proof of Wedderburn's theorem on finite division rings The proof of the Wedderburn-Artin theorem Throughout the book, worked examples and real-world problems illustrate concepts and their applications, facilitating a complete understanding for readers regardless of their background in mathematics. A wealth of computational and theoretical exercises, ranging from basic to complex, allows readers to test their comprehension of the material. In addition, detailed historical notes and

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biographies of mathematicians provide context for and illuminate the discussion of key topics. A solutions manual is also available for readers who would like access to partial solutions to the book's exercises. Introduction to Abstract Algebra, Fourth Edition is an excellent book for courses on the topic at the upper-undergraduate and beginning-graduate levels. The book also serves as a valuable reference and self-study tool for practitioners in the fields of engineering, computer science, and applied mathematics.

## [Elements of Algebra](#)

Algebraic number theory introduces students not only to new algebraic notions but also to related concepts: groups, rings, fields, ideals, quotient rings and quotient fields, homomorphisms and isomorphisms, modules, and vector spaces. Author Pierre Samuel notes that students benefit from their studies of algebraic number theory by encountering many concepts fundamental to other branches of mathematics — algebraic geometry, in particular. This book assumes a knowledge of basic algebra but supplements its teachings with brief, clear explanations of integrality, algebraic extensions of fields, Galois theory, Noetherian rings and modules, and rings of fractions. It covers the basics, starting with the divisibility theory in principal ideal domains and ending with the unit theorem, finiteness of the class number, and the more elementary theorems of Hilbert ramification theory. Numerous examples, applications, and exercises appear throughout the text.

## [Studyguide for Concrete Abstract Algebra](#)

The fundamental mathematical tools needed to understand machine learning include linear algebra, analytic geometry, matrix decompositions, vector calculus, optimization, probability and statistics. These topics are traditionally taught in disparate courses, making it hard for data science or computer science students, or professionals, to efficiently learn the mathematics. This self-contained textbook bridges the gap between mathematical and machine learning texts, introducing the mathematical concepts with a minimum of prerequisites. It uses these concepts to derive four central machine learning methods: linear regression, principal component analysis, Gaussian mixture models and support vector machines. For students and others with a mathematical background, these derivations provide a starting point to machine learning texts. For those learning the mathematics for the first time, the methods help build intuition and practical

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experience with applying mathematical concepts. Every chapter includes worked examples and exercises to test understanding. Programming tutorials are offered on the book's web site.

## [Concrete Abstract Algebra](#)

Brief, clear, and well written, this introductory treatment bridges the gap between traditional and modern algebra. Includes exercises with complete solutions. The only prerequisite is high school-level algebra. 1959 edition.

## [A Concrete Approach To Abstract Algebra, Student Solutions Manual \(e-only\)](#)

Algebra is abstract mathematics - let us make no bones about it - yet it is also applied mathematics in its best and purest form. It is not abstraction for its own sake, but abstraction for the sake of efficiency, power and insight. Algebra emerged from the struggle to solve concrete, physical problems in geometry, and succeeded after 2000 years of failure by other forms of mathematics. It did this by exposing the mathematical structure of geometry, and by providing the tools to analyse it. This is typical of the way algebra is applied; it is the best and purest form of application because it reveals the simplest and most universal mathematical structures. The present book aims to foster a proper appreciation of algebra by showing abstraction at work on concrete problems, the classical problems of construction by straightedge and compass. These problems originated in the time of Euclid, when geometry and number theory were paramount, and were not solved until the 19th century, with the advent of abstract algebra. As we now know, algebra brings about a unification of geometry, number theory and indeed most branches of mathematics. This is not really surprising when one has a historical understanding of the subject, which I also hope to impart.

## [Elements of Abstract Algebra](#)

An informal and readable introduction to higher algebra at the post-calculus level. The concepts of ring and field are introduced through study of the familiar examples of the integers and polynomials, with much emphasis placed on congruence classes leading the way to finite groups and finite fields. New examples and

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theory are integrated in a well-motivated fashion and made relevant by many applications -- to cryptography, coding, integration, history of mathematics, and especially to elementary and computational number theory. The later chapters include expositions of Rabin's probabilistic primality test, quadratic reciprocity, and the classification of finite fields. Over 900 exercises, ranging from routine examples to extensions of theory, are scattered throughout the book, with hints and answers for many of them included in an appendix.

## [\*\*A Concrete Introduction to Higher Algebra\*\*](#)

This book presents abstract algebra based on concrete examples and applications. All the traditional material with exciting directions.

## [\*\*Dynamical Systems with Applications Using Mathematica®\*\*](#)

This book introduces students to the world of advanced mathematics using algebraic structures as a unifying theme. Having no prerequisites beyond precalculus and an interest in abstract reasoning, the book is suitable for students of math education, computer science or physics who are looking for an easy-going entry into discrete mathematics, induction and recursion, groups and symmetry, and plane geometry. In its presentation, the book takes special care to forge linguistic and conceptual links between formal precision and underlying intuition, tending toward the concrete, but continually aiming to extend students' comfort with abstraction, experimentation, and non-trivial computation. The main part of the book can be used as the basis for a transition-to-proofs course that balances theory with examples, logical care with intuitive plausibility, and has sufficient informality to be accessible to students with disparate backgrounds. For students and instructors who wish to go further, the book also explores the Sylow theorems, classification of finitely-generated Abelian groups, and discrete groups of Euclidean plane transformations.

## [\*\*Concrete Approach to Abstract Algebra\*\*](#)

The famous problems of squaring the circle, doubling the cube and trisecting an angle captured the imagination of both professional and amateur mathematicians for over two thousand years. Despite the

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enormous effort and ingenious attempts by these men and women, the problems would not yield to purely geometrical methods. It was only the development of abstract algebra in the nineteenth century which enabled mathematicians to arrive at the surprising conclusion that these constructions are not possible. In this book we develop enough abstract algebra to prove that these constructions are impossible. Our approach introduces all the relevant concepts about fields in a way which is more concrete than usual and which avoids the use of quotient structures (and even of the Euclidean algorithm for finding the greatest common divisor of two polynomials). Having the geometrical questions as a specific goal provides motivation for the introduction of the algebraic concepts and we have found that students respond very favourably. We have used this text to teach second-year students at La Trobe University over a period of many years, each time refining the material in the light of student performance.

### Conics and Cubics

Abstract Algebra: Theory and Applications is an open-source textbook that is designed to teach the principles and theory of abstract algebra to college juniors and seniors in a rigorous manner. Its strengths include a wide range of exercises, both computational and theoretical, plus many non-trivial applications. The first half of the book presents group theory, through the Sylow theorems, with enough material for a semester-long course. The second half is suitable for a second semester and presents rings, integral domains, Boolean algebras, vector spaces, and fields, concluding with Galois Theory.

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