Elements of Algebra: Geometry, Numbers, Equations (Undergraduate Texts in Mathematics)

By John Stillwell

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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 th the 19 century, with the advent of abstract algebra. As we now know, alge bra 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.

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Editorial Review

Review

"...The book is written in a very clear and pleasing style. Each of the 9 chapters of the book concludes with a section called "Discussions", which contains very interesting and valuable historical information and comments on the topics presented in the respective chapter. We strongly recommend this nice volume not only to beginners but also to experts."--MATHEMATICAL REVIEWS

From the Back Cover
This book is a concise, self-contained introduction to abstract algebra that stresses its unifying role in geometry and number theory. Classical results in these fields, such as the straightedge-and-compass constructions and their relation to Fermat primes, are used to motivate and illustrate algebraic techniques. Classical algebra itself is used to motivate the problem of solvability by radicals and its solution via Galois theory. This historical approach has at least two advantages: On the one hand it shows that abstract concepts have concrete roots, and on the other it demonstrates the power of new concepts to solve old problems. Algebra has a pedigree stretching back at least as far as Euclid, but today its connections with other parts of mathematics are often neglected or forgotten. By developing algebra out of classical number theory and geometry and reviving these connections, the author has made this book useful to beginners and experts alike. The lively style and clear exposition make it a pleasure to read and to learn from.

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