Roads to Geometry (3rd Edition)

By Edward C. Wallace, Stephen F. West

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This new book clarifies, extends, and unifies concepts discussed in basic high school geometry courses. It gives readers a comprehensive introduction to plane geometry in a historical context. Chapter topics include axiomatic systems, axiom sets for geometry, neutral geometry, Euclidean geometry of the plane, analytic and transformational geometry, non-Euclidean geometries, and projective geometry. For anyone in need of a refresher course in geometry.

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Editorial Review

From the Publisher
This book provides a geometrical experience that unifies Euclidean concepts generally discussed in traditional high school geometry courses with various non-Euclidean views of the world. It offers the reader a "map" for a voyage through plane geometry and its various branches, as well as side-trips that discuss analytic and transformational geometry.

From the Back Cover
This new book clarifies, extends, and unifies concepts discussed in basic high school geometry courses. It gives readers a comprehensive introduction to plane geometry in a historical context. Chapter topics include axiomatic systems, axiom sets for geometry, neutral geometry, Euclidean geometry of the plane, analytic and transformational geometry, non-Euclidean geometries, and projective geometry. For anyone in need of a refresher course in geometry.

The goal of this book is to provide a geometric experience that clarifies, extends, and unifies concepts that are generally discussed in traditional high school geometry courses and to present additional topics which assist in gaining a better understanding of elementary geometry. As its title indicates, this book is designed to provide the reader with a "map" for a voyage through plane geometry and its various branches. As prerequisites, this book assumes only a prior course in high school geometry and the mathematical maturity usually provided by a semester of calculus or discrete mathematics.

Preparations for our voyage begin in Chapter One with a discussion of the "Rules of the Road" during which time the reader is familiarized with the properties of axiomatic systems and the application of the axiomatic method to investigation of these systems. A discussion of several examples of finite and incidence geometries provides a framework upon which to investigate plane geometry.

With preparations complete, our voyage actually begins in Chapter Two, where we are confronted with "Many Ways to Go." Here, within a historical perspective, we travel a variety of "roads" through plane geometry by investigating different axiomatic approaches to the study of Euclidean plane geometry. Axiomatic developments of geometry as proposed by Euclid, David Hilbert, G. D. Birkhoff, and the School Mathematics Study Group (SMSG) are compared and contrasted. A brief discussion of non-Euclidean geometries is also included.

In Chapter Three, by "Traveling Together," we investigate the content of Neutral Geometry. The first fifteen of the SMSG postulates provide our pedagogical choice for a "main arterial" as we prepare ourselves to choose between the Euclidean and non-Euclidean "exits" that appear on the horizon.

Chapter Four provides "One Way to Go" as we travel through Euclidean Plane Geometry. In this chapter we extend ideas developed in Neutral Geometry to provide a traditional look at the geometric topics of congruence, area, similarity, circles, triangles, and constructions from a Euclidean perspective. At the end of Chapter Four you will find a set of laboratory investigations that make use of Geometer's SketchPad® or Cabri II Geometry™ software.

While still traveling through Euclidean Plane Geometry, Chapter Five offers "Side Trips" through analytical

and transformational approaches to geometry. The real numbers, algebra, isometries, similarities, analytical transformations, and inversion and their applications to proving geom2tric theorems are discussed.

In Chapter Six we consider "Other Ways to Go:" We return briefly to Neutral Geometry, in preparation for our venture into non-Euclidean Geometry. In addition to a discussion of hyperbolic geometry, this chapter contains a detailed description of the Poincare disk model and a brief excursion into elliptic geometry. Appendix E contains a collection of scripts, custom tools, and macros that allow for a dynamic investigation of the Poincare disk. Like Chapter Four, Chapter Six ends with a collection of laboratory activities that provide students with an opportunity to explore the hyperbolic plane first hand.

Finally, in Chapter Seven, "All Roads Lead To... " projective geometry. Here we delve into a more general geometry than we have studied in previous chapters as we investigate the real projective plane in addition to the ideas of duality, perspectivity, and a brief look at projective transformations.

New to the third edition of *Roads to Geometry* are enhanced problem sets at the end of each section and the inclusion of Laboratory Activities using Geometer's SketchPad® and Cabri II Geometry™ at the end of Chapter Four, Euclidean Geometry of the Plane, and of Chapter Six, Non-Euclidean Geometries.

This text is appropriate for several kinds of students. Pre-service teachers of geometry are provided with a rigorous yet accessible treatment of plane geometry in a historical context. Mathematics majors will find its axiomatic development sufficiently rigorous to provide a foundation for further study in the areas of Euclidean and non-Euclidean geometry. By using the SMSG postulate set as a basis for the development of plane geometry, we avoid the pitfalls of many "foundations of geometry" texts that encumber the reader with such a detailed development of preliminary results that many other substantive and elegant results are inaccessible in a one-semester course.

The chapters of this book separate nicely into independent units. The material in Chapters One and Two provides preliminary groundwork for the study of geometry. Instructors who feel that their classes are exceptionally well prepared could omit these chapters in the interest of freeing time for material that is presented later in the book. Instructors teaching more typical classes will find the discussion of axiomatics in Chapter One and the comparisons of the various axiom sets in Chapter Two very helpful in conveying the notion of mathematical rigor. Instructors can teach a semester of Euclidean Geometry using Chapters 1, 2, 3, 4, and 5. Instructors more interested in nonEuclidean Geometries can opt to cover Chapters 1, 2, 3, and 6.

At the end of each section is an ample collection of exercises of varying difficulty that provides problems that both extend and clarify results of that section, as well as problems that apply those results. At the end of each of chapters, Three through Seven, is a summary which lists all of the new definitions and theorems of that chapter.

The authors gratefully acknowledge the following mathematicians who look of their time to review the current manuscript: David Bellamy, Univer',Bity of Delaware; Jack Tsui, Oakland University; Julia Wilson, State University College of New York at Fredonia; Peter Stiller, Texas A&M University; Money Davidson, Kent University; Kimberly Cervello, State University College of New York at Geneseo; and Joel Zeitlin, California State University at Northridge.

The authors hope that *Roads to Geometry* will in some way encourage the reader to more fully appreciate the marvelous worlds of Euclidean and non-Euclidean Geometry and to that end we wish you bon voyage.

E.C. Wallace
S.F. West

June 2003

Users Review

From reader reviews:

Maxine Lucas:

Why don't make it to become your habit? Right now, try to ready your time to do the important take action, like looking for your favorite guide and reading a reserve. Beside you can solve your trouble; you can add your knowledge by the guide entitled Roads to Geometry (3rd Edition). Try to the actual book Roads to Geometry (3rd Edition) as your pal. It means that it can to get your friend when you really feel alone and beside that of course make you smarter than previously. Yeah, it is very fortuned for you. The book makes you more confidence because you can know almost everything by the book. So , let's make new experience as well as knowledge with this book.

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Gertrude Hoskins:

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