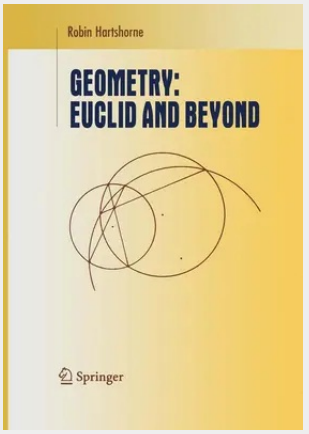
Hartshorne

Geometry: Euclid and Beyond

In recent years, I have been teaching a junior-senior-level course on the classi cal geometries. This book has grown out of that teaching experience. I assume only high-school geometry and some abstract algebra. The course begins in Chapter 1 with a critical examination of Euclid's Elements. Students are expected to read concurrently Books I-IV of Euclid's text, which must be obtained sepa rately. The remainder of the book is an exploration of questions that arise natu rally from this reading, together with their modern answers. To shore up the foundations we use Hilbert's axioms. The Cartesian plane over a field provides an analytic model of the theory, and conversely, we see that one can introduce coordinates into an abstract geometry. The theory of area is analyzed by cutting figures into triangles. The algebra of field extensions provides a method for deciding which geometrical constructions are possible. The investigation of the parallel postulate leads to the various non-Euclidean geometries. And in the last chapter we provide what is missing from Euclid's treatment of the five Platonic solids in Book XIII of the Elements. For a one-semester course such as I teach, Chapters 1 and 2 form the core material, which takes six to eight weeks.

Preliminary Booksellers Text: Do Not Use This book takes Euclid's "Elements" ad the starting point for a study of geometry from a modern mathematical perspective. To begin, the reader will become familiar with the content of Euclid's work, at least those parts which deal with geometry. At a second level, the book studies the logical structure of Euclid's presentation. Euclid's "Elements" has been regarded for more than two thousand years as the prime example of the axiomatic method. At the third level of reading, involving rather broader investigaions than the first two levels mentioned above, the author considers various mathematical questions and subsequent developments which arise naturally from Euclid's



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