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Foundations Of Projective Geometry



Synopsis

This text is designed for a one-semester undergraduate course in projective geometry. It incorporates a synthetic approach starting with axioms from which the general theory is deduced, together with an analytic approach using the real projective plane as a model. The first is refined as the second is generalized until the two coincide via the introduction of coordinates in an abstract projective plane. Special attention is paid to the role of Desargues' and Pappus' axioms in the theory. At the end of the book is a list of problems that can be used as exercises while reading. The emphasis on the various groups of transformations that arise in projective geometry introduces the reader to group theory in a practical context. While the book does not assume any previous knowledge of abstract algebra, some familiarity with group theory would be useful. First published in 1967 and long out of print, this book is now reissued with a new preface, an appendix on the simple group of order 168, which appears as the group of automorphisms of a projective plane of seven points, and a list of errata.

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Customer Reviews

Robin Hartshorne is a professor of mathematics, emeritus, at the University of California at Berkeley. His area of research is algebraic geometry, about which he has written a textbook and many research articles. He also has a life-long interest in elementary geometry, starting from his class in mechanical drawing in the fifth grade of elementary school. Recently, based on a course he taught at Berkeley, he wrote a text of Euclidean and non-Euclidean geometry, called *Geometry*,

Euclid and Beyond. Aside from mathematics, he is a musician (flute, piano, shakuhachi), and an avid mountain climber. He also likes languages, speaking fluent English, French, German and Japanese. His wife, Edie, is a therapist, musician, and author. They have two children, Ben, a computer systems engineer, and Joemy, a third grade elementary school teacher.

As the preface says, this book approaches the subject from two different directions: analytic and synthetic. The synthetic approach seems to contain both (1) the parts of the subject best suited to students who know only high-school math, and (2) the parts ill-suited to those who are not "pure" mathematicians. An example of the former is a high-school-geometry-style proof that any three points on any line may be transformed to any three points on any other line via a composition of two perspectivities. An example of the latter is the projective plane that is freely generated by a configuration. The inclusion of things like this latter example is the reason why the word "foundations" is in the title; "foundations" does not mean that which should be learned before everything else; perhaps "foundations" should be defined as "that which will annoy those who want to apply projective geometry to computer graphics and which will delight 'pure' mathematicians who want to know how the subject interacts with abstract algebra." The latter group will like this book and will find it very readable. This book is short and omits some topics found in many books. Conics and polarities are not dealt with.

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This is one of those both popular and scientific books. It deals rigorously and reader-friendly with projective (and, subsequently, affine) planes. Desargues and Pappus axioms/theorems interactions are described; projective collineations are studied. Best for freshmen and their advisors, as well.

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