



Transformational Plane Geometry (Textbooks in Mathematics)

Ronald N. Umble, Zhigang Han

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Designed for a one-semester course at the junior undergraduate level, **Transformational Plane Geometry** takes a hands-on, interactive approach to teaching plane geometry. The book is self-contained, defining basic concepts from linear and abstract algebra gradually as needed.

The text adheres to the National Council of Teachers of Mathematics *Principles and Standards for School Mathematics* and the Common Core State Standards Initiative *Standards for Mathematical Practice*. Future teachers will acquire the skills needed to effectively apply these standards in their classrooms.

Following Felix Klein's *Erlangen Program*, the book provides students in pure mathematics and students in teacher training programs with a concrete visual alternative to Euclid's purely axiomatic approach to plane geometry. It enables geometrical visualization in three ways:

1. Key concepts are motivated with exploratory activities using software specifically designed for performing geometrical constructions, such as *Geometer's Sketchpad*.
2. Each concept is introduced synthetically (without coordinates) and analytically (with coordinates).
3. Exercises include numerous geometric constructions that use a reflecting instrument, such as a MIRA.

After reviewing the essential principles of classical Euclidean geometry, the book covers general transformations of the plane with particular attention to translations, rotations, reflections, stretches, and their compositions. The authors apply these transformations to study congruence, similarity, and symmetry of plane figures and to classify the isometries and similarities of the plane.

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