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A Pythagorean Introduction to Number Theory

Right Triangles, Sums of Squares, and Arithmetic

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Mathematics : Number Theory

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A Pythagorean Introduction to Number Theory

Right Triangles, Sums of Squares, and Arithmetic

- Offers an innovative approach to elementary number theory motivated by right triangles
- Inspires students to explore number theory through investigation of concrete examples
- Provides historical context throughout, showing how ideas developed in the field
- Features numerous engaging exercises, including many designed for SageMath

Right triangles are at the heart of this textbook's vibrant new approach to elementary number theory. Inspired by the familiar Pythagorean theorem, the author invites the reader to ask natural arithmetic questions about right triangles, then proceeds to develop the theory needed to respond. Throughout, students are encouraged to engage with the material by posing questions, working through exercises, using technology, and learning about the broader context in which ideas developed. Progressing from the fundamentals of number theory through to Gauss sums and quadratic reciprocity, the first part of this text presents an innovative first course in elementary number theory. The advanced topics that follow, such as counting lattice points and the four squares theorem, offer a variety of options for extension, or a higher-level course; the breadth and modularity of the later material is ideal for creating a senior capstone course. Numerous exercises are included throughout, many of which are designed for SageMath. By involving students in the active process of inquiry and investigation, this textbook imbues the foundations of number theory with insights into the lively mathematical process that continues to advance the field today. Experience writing proofs is the only formal prerequisite for the book, while a background in basic real analysis will enrich the reader's appreciation of the final chapters.

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