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Mathematics : Discrete Mathematics

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Handbook of Set Theory

- Definitive compendium of all of modern set theory
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Numbers imitate space, which is of such a different nature —Blaise Pascal It is fair to date the study of the foundation of mathematics back to the ancient Greeks. The urge to understand and systematize the mathematics of the time led Euclid to postulate axioms in an early attempt to put geometry on a firm footing. With roots in the Elements, the distinctive methodology of mathematics has become proof. Inevitably two questions arise: What are proofs? and What assumptions are proofs based on? The first question, traditionally an internal question of the field of logic, was also wrestled with in antiquity. Aristotle gave his famous syllogistic systems, and the Stoics had a nascent propositional logic. This study continued with its roots and starts, through Boethius, the Arabs and the medieval logicians in Paris and London. The early germs of logic emerged in the context of philosophy and theology. The development of analytic geometry, as exemplified by Descartes, illustrated one of the fundamental questions inherent in founding mathematics. It is classically phrased as the question of how one reconciles the arithmetic with the geometric. Are numbers one type of thing and geometric objects another? What are the relationships between these two types of objects? How can they interact? Discovery of new types of mathematical objects, such as imaginary numbers and, much later, formal objects such as free groups and formal power series make the problem of finding a common playing field for all of mathematics important. Several pressures made foundational issues urgent in the 19th century.

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