Combinatorics and Graph Theory: Foundations and Applications

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Abstract: *Combinatorics and graph theory are foundational branches of mathematics that explore the structure, arrangement, and relationships within sets and graphs. These fields have vast applications across computer science, optimization, and network analysis. This research paper provides an in-depth exploration of combinatorics and graph theory, detailing fundamental principles, significant theorems, and practical applications. By analyzing key combinatorial and graph-theoretic techniques and their implementation in solving real-world problems, this study aims to highlight the importance and versatility of these mathematical disciplines in advancing modern science and technology.*

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