Permutation group algorithms comprise one of the workhorses of symbolic algebra systems computing with groups and play an indispensable role in the proof of many deep results, including the construction and study of sporadic finite simple groups. This book describes the theory behind permutation group algorithms, up to the most recent developments based on the classification of finite simple groups. Rigorous complexity estimates, implementation hints, and advanced exercises are included throughout.

The central theme is the description of nearly linear-time algorithms, which are extremely fast in terms of both asymptotic analysis and practical running time. A significant part of the permutation group library of the computational group algebra system GAP is based on nearly linear-time algorithms.

The book fills a significant gap in the symbolic computation literature. It is recommended for everyone interested in using computers in group theory and is suitable for advanced graduate courses.

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Contents