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Nota di contenuto	Frontmatter -- Contents -- List of definitions and notations -- Preface -- §46. Degrees of irreducible characters of Suzuki p-groups -- §47. On the number of metacyclic epimorphic images of finite p-groups -- §48. On 2-groups with small centralizer of an involution, I -- §49. On 2-groups with small centralizer of an involution, II -- §50. Janko's theorem on 2-groups without normal elementary abelian subgroups of order 8 -- §51. 2-groups with self centralizing subgroup isomorphic to $E_8$ -- §52. 2-groups with 2-subgroup of small order -- §53. 2-groups $G$ with $c_2(G) = 4$ -- §54. 2-groups $G$ with $cn(G) = 4$ , $n > 2$ -- §55. 2-groups $G$ with small subgroup $(x \in G \mid o(x) = 2)$ -- §56. Theorem of Ward on quaternion-free 2-groups -- §57. Nonabelian 2-groups all of whose minimal nonabelian subgroups are isomorphic and have exponent 4 -- §58. Non-Dedekindian p-groups all of whose nonnormal subgroups of the same order are conjugate -- §59. p-groups with few nonnormal subgroups -- §60. The structure of the Burnside group of order 212 -- §61. Groups of exponent 4 generated by three involutions -- §62. Groups with large normal closures of nonnormal cyclic subgroups -- §63. Groups all of whose cyclic subgroups of composite orders are normal -- §64. p-groups generated

by elements of given order -- §65. A2-groups -- §66. A new proof of Blackburn's theorem on minimal nonmetacyclic 2-groups -- §67. Determination of U2-groups -- §68. Characterization of groups of prime exponent -- §69. Elementary proofs of some Blackburn's theorems -- §70. Non-2-generator p-groups all of whose maximal subgroups are 2-generator -- §71. Determination of A2-groups -- §72. An-groups,  $n > 2$  -- §73. Classification of modular p-groups -- §74. p-groups with a cyclic subgroup of index  $p^2$  -- §75. Elements of order  $p$  in p-groups -- §76. p-groups with few A1-subgroups -- §77. 2-groups with a self-centralizing abelian subgroup of type  $(4, 2)$  -- §78. Minimal nonmodular p-groups -- §79. Nonmodular quaternion-free 2-groups -- §80. Minimal non-quaternion-free 2-groups -- §81. Maximal abelian subgroups in 2-groups -- §82. A classification of 2-groups with exactly three involutions -- §83. p-groups  $G$  with  $2(G)$  or  $2^*(G)$  extraspecial -- §84. 2-groups whose nonmetacyclic subgroups are generated by involutions -- §85. 2-groups with a nonabelian Frattini subgroup of order 16 -- §86. p-groups  $G$  with metacyclic  $2^*(G)$  -- §87. 2-groups with exactly one nonmetacyclic maximal subgroup -- §88. Hall chains in normal subgroups of p-groups -- §89. 2-groups with exactly six cyclic subgroups of order 4 -- §90. Nonabelian 2-groups all of whose minimal nonabelian subgroups are of order 8 -- §91. Maximal abelian subgroups of p-groups -- §92. On minimal nonabelian subgroups of p-groups -- Appendix 16. Some central products -- Appendix 17. Alternate proofs of characterization theorems of Miller and Janko on 2-groups, and some related results -- Appendix 18. Replacement theorems -- Appendix 19. New proof of Ward's theorem on quaternion-free 2-groups -- Appendix 20. Some remarks on automorphisms -- Appendix 21. Isaacs' examples -- Appendix 22. Minimal nonnilpotent groups -- Appendix 23. Groups all of whose noncentral conjugacy classes have the same size -- Appendix 24. On modular 2-groups -- Appendix 25. Schreier's inequality for p-groups -- Appendix 26. p-groups all of whose nonabelian maximal subgroups are either absolutely regular or of maximal class -- Research problems and themes II -- Backmatter

## Sommario/riassunto

This is the second of three volumes devoted to elementary finite p-group theory. Similar to the first volume, hundreds of important results are analyzed and, in many cases, simplified. Important topics presented in this monograph include: (a) classification of p-groups all of whose cyclic subgroups of composite orders are normal, (b) classification of 2-groups with exactly three involutions, (c) two proofs of Ward's theorem on quaternion-free groups, (d) 2-groups with small centralizers of an involution, (e) classification of 2-groups with exactly four cyclic subgroups of order  $2n + 2$ , (f) two new proofs of Blackburn's theorem on minimal nonmetacyclic groups, (g) classification of p-groups all of whose subgroups of index  $p^2$  are abelian, (h) classification of 2-groups all of whose minimal nonabelian subgroups have order 8, (i) p-groups with cyclic subgroups of index  $p^2$  are classified. This volume contains hundreds of original exercises (with all difficult exercises being solved) and an extended list of about 700 open problems. The book is based on Volume 1, and it is suitable for researchers and graduate students of mathematics with a modest background on algebra.