

# Character Theory of Finite Groups

by

Bertram Huppert



Walter de Gruyter · Berlin · New York 1998

# Contents

---

Introduction	1
Examples of groups	3
Notations and results from group theory	5
§ 1 Representations and representation modules	10
§ 2 Simple and semisimple modules	17
§ 3 Orthogonality relations	28
§ 4 The group algebra	46
§ 5 Characters of abelian groups	58
§ 6 Degrees of irreducible representations	66
§ 7 Characters of some small groups	79
§ 8 Products of representations and characters	96
§ 9 On the number of solutions of $g^m = 1$ in a group	108
§ 10 A theorem of A. Hurwitz on multiplicative sums of squares	124
§ 11 Permutation representations and characters	131
§ 12 The class number	163
§ 13 Real characters and real representations	171
§ 14 Coprime action	184
§ 15 Groups of order $p^a q^b$	190
§ 16 Frobenius groups	196
§ 17 Induced characters	215
§ 18 Brauer's permutation lemma and Glauberman's character correspondence	233
§ 19 Clifford Theory 1	252
§ 20 Projective representations	273
§ 21 Clifford Theory 2	285
§ 22 Extensions of characters	294
§ 23 Degree pattern and group structure	310
§ 24 Monomial groups	318
§ 25 Representations of wreath products	338
§ 26 Characters of $p$ -groups	351
§ 27 Groups with a small number of character degrees	375
§ 28 Linear groups	394
§ 29 Finite subgroups of $SO(3, \mathbb{R})$ and $SU(2, \mathbb{C})$	402
§ 30 The degree graph	413
§ 31 Groups all of whose character degrees are primes	416
§ 32 Two special degree problems	432

§ 33	Lengths of conjugacy classes	443
§ 34	R. Brauer's theorems on the character ring	466
§ 35	Applications of Brauer's theorems	477
§ 36	Artin's induction theorem	489
§ 37	Splitting fields	502
§ 38	The Schur index	507
§ 39	Integral representations	526
§ 40	Isaacs $\pi$ -special characters	538
§ 41	Three arithmetical applications	548
§ 42	Small kernels and faithful irreducible characters	554
§ 43	TI-sets	567
§ 44	Involutions	573
§ 45	Groups whose Sylow-2-subgroups are generalized quaternion groups	580
§ 46	Perfect Frobenius complements	597
Books		606
Bibliography		607
Index of names		614
Index of subjects		617