The Subgroup Structure Of The Finite Classical Groups London Mathematical Society Lecture Note Series

This is the sixth volume of a comprehensive and elementary treatment of finite group theory. This volume contains many hundreds of original exercises (including solutions for the more difficult ones) and an extended list of about 1000 open problems. The current book is based on Volumes 1–5 and it is suitable for researchers and graduate students working in group theory. This volume is an outcome of the International Conference on Algebra in celebration of the 70th birthday of Professor Shum Kar-Ping which was held in Gadjah Mada University on 7OCo10 October 2010. As a consequence of the wide coverage of his research interest and work, it presents 54 research papers, all original and referred, describing the latest research and development, and addressing a variety of issues and methods in semigroups, groups, rings and modules, lattices and Hopf Algebra. The book also provides five well-written expository survey articles which feature the structure of finite groups by A Ballester-Bolinches, R Esteban-Romero, and Yangming Li; new results of GrAbner-Shirshov basis by L A Bokut, Yuqun Chen, and K P Shum; polygroups and their properties by B Davvaz; main results on abstract characterizations of algebras of n-place functions obtained in the last 40 years by Wieslaw A Dudek and Valentin S Trokhimenko; Inverse semigroups and their generalizations by X M Ren and K P Shum. Recent work on cones of metrics and combinatorics done by M M Deza et al. is included."
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Group representation theory is both elegant and practical, with important applications to quantum mechanics, spectroscopy, crystallography, and other fields in the physical sciences. Until now, however, there have been virtually no accessible treatments of group theory that include representations and characters. The classic works in the field require a high level of mathematical sophistication, and other texts omit representations and characters. Groups and Characters offers an easy-to-follow introduction to the theory of groups and of group characters. Designed as a rapid survey of the subject, this unique text emphasizes examples and applications of the theorems, and avoids many of the longer and more difficult proofs. The author presents group theory through the Sylow Theorems and includes the full subgroup structure of A5. Representations and characters are worked out with numerous character tables, along with real and induced characters that lead to the table for S5. The text includes specific sections that provide the mathematical basis for some of the important applications of group theory in spectroscopy and molecular structure. It also offers numerous exercises-some stressing computation of concrete examples, others stressing development of the mathematical theory. Groups and Characters provides the ideal grounding for more advanced studies with the classic texts, and for more broad-based work in abstract algebra. Furthermore, physical scientists-whose experience with groups and characters may not be rigorous-will find Groups and Characters the ideal means for gaining a sense of the mathematics lying behind the techniques used in applications.

This volume contains the proceedings of the 2015 Clifford Lectures on Algebraic Groups: Structures and Actions, held from March 2–5, 2015, at Tulane University, New Orleans, Louisiana. This volume consists of six articles on algebraic groups, including an enhanced

exposition of the classical results of Chevalley and Rosenlicht on the structure of algebraic groups; an enhanced survey of the recently developed theory of pseudo-reductive groups; and an exposition of the recently developed operational -theory for singular varieties. In addition, there are three research articles containing previously unpublished foundational results on birational automorphism groups of algebraic varieties; solution of Hermite-Joubert problem over -closed fields; and cohomological invariants and applications to classifying spaces. The old and new results presented in these articles will hopefully become cornerstones for the future development of the theory of algebraic groups and applications. Graduate students and researchers working in the fields of algebraic geometry, number theory, and representation theory will benefit from this unique and broad compilation of fundamental results on algebraic group theory.

The study of finite groups factorised as a product of two or more subgroups has become a subject of great interest during the last years with applications not only in group theory, but also in other areas like cryptography and coding theory. It has experienced a big impulse with the introduction of some permutability conditions. The aim of this book is to gather, order, and examine part of this material, including the latest advances made, give some new approach to some topics, and present some new subjects of research in the theory of finite factorised groups.

Originating from a summer school taught by the authors, this concise treatment

includes many of the main results in the area. An introductory chapter describes the fundamental results on linear algebraic groups, culminating in the classification of semisimple groups. The second chapter introduces more specialized topics in the subgroup structure of semisimple groups and describes the classification of the maximal subgroups of the simple algebraic groups. The authors then systematically develop the subgroup structure of finite groups of Lie type as a consequence of the structural results on algebraic groups. This approach will help students to understand the relationship between these two classes of groups. The book covers many topics that are central to the subject, but missing from existing textbooks. The authors provide numerous instructive exercises and examples for those who are learning the subject as well as more advanced topics for research students working in related areas.

This book is a timely survey of much of the algebra developed during the last several centuries including its applications to algebraic geometry and its potential use in geometric modeling. The present volume makes an ideal textbook for an abstract algebra course, while the forthcoming sequel. Lectures on Algebra II, will serve as a textbook for a linear algebra course. The author's fondness for algebraic geometry shows up in both volumes, and his recent preoccupation with the applications of group theory to the calculation of Galois groups is evident in

the second volume which contains more local rings and more algebraic geometry. Both books are based on the author's lectures at Purdue University over the last few years.

The series is aimed specifically at publishing peer reviewed reviews and contributions presented at workshops and conferences. Each volume is associated with a particular conference, symposium or workshop. These events cover various topics within pure and applied mathematics and provide up-to-date coverage of new developments, methods and applications.

It is a great satisfaction for a mathematician to witness the growth and expansion of a theory in which he has taken some part during its early years. When H. Weyl coined the words "classical groups", foremost in his mind were their connections with invariant theory, which his famous book helped to revive. Although his approach in that book was deliberately algebraic, his interest in these groups directly derived from his pioneering study of the special case in which the scalars are real or complex numbers, where for the first time he injected Topology into Lie theory. But ever since the definition of Lie groups, the analogy between simple classical groups over finite fields and simple classical groups over IR or C had been observed, even if the concept of "simplicity" was not quite the same in both cases. With the discovery of the exceptional simple complex Lie algebras by

Killing and E. Cartan, it was natural to look for corresponding groups over finite fields, and already around 1900 this was done by Dickson for the exceptional Lie algebras G and E • However, a deep reason for this 2 6 parallelism was missing, and it is only Chevalley who, in 1955 and 1961, discovered that to each complex simple Lie algebra corresponds, by a uniform process, a group scheme (fj over the ring Z of integers, from which, for any field K, could be derived a group (fj(K).

First Published in 1995. Routledge is an imprint of Taylor & Francis, an informa company.

This book is intended as an overview of a research area that combines geometries for groups (such as Tits buildings and generalizations), topological aspects of simplicial complexes from p-subgroups of a group (in the spirit of Brown, Quillen, and Webb), and combinatorics of partially ordered sets. The material is intended to serve as an advanced graduate-level text and partly as a general reference on the research area. The treatment offers optional tracks for the reader interested in buildings, geometries for sporadic simple groups, and G-equivariant equivalences and homology for subgroup complexes.

The impetus for current research in pro-p groups comes from four main directions: from new applications in number theory, which continue to be a source of deep and challenging problems; from the traditional problem of classifying finite p-groups; from questions arising in infinite group theory; and finally, from the younger subject of

'profinite group theory'. A correspondingly diverse range of mathematical techniques is being successfully applied, leading to new results and pointing to exciting new directions of research. In this work important theoretical developments are carefully presented by leading mathematicians in the field, bringing the reader to the cutting edge of current research. With a systematic emphasis on the construction and examination of many classes of examples, the book presents a clear picture of the rich universe of pro-p groups, in its unity and diversity. Thirty open problems are discussed in the appendix. For graduate students and researchers in group theory, number theory, and algebra, this work will be an indispensable reference text and a rich source of promising avenues for further exploration.

The first textbook on the subgroup structure, in particular maximal subgroups, for both algebraic and finite groups of Lie type.

A rigorous construction and uniqueness proof for the Monster group, detailing its relation to Majorana involutions.

Research in Personnel and Human Resources Management is designed to promote theory and research on important substantive and methodological topics in the field of human resources management.

The Subgroup Structure of the Finite Classical GroupsCambridge University Press

The author extends results of McLaughlin and Kantor on overgroups of long root subgroups and long root elements in finite classical groups. In particular he determines the maximal subgroups of this form. He also determines the maximal overgroups of short root subgroups in

finite classical groups and the maximal overgroups in finite orthogonal groups of c-root subgroups.

Authoritative collection of surveys and papers. Indispensable to all research workers in the area.

A concise treatment of topics from group theory and representation theory for use in a one-term course. Focussing on the non-commutative side of the field, this advanced textbook emphasizes the general linear group as the most important group and example. Readers are expected to be familiar with groups, rings, and fields, and to have a solid knowledge of linear algebra. Close to 200 exercises of varying difficulty serve both to reinforce the main concept of the text and to introduce the reader to additional topics.

With the classification of the finite simple groups complete, much work has gone into the study of maximal subgroups of almost simple groups. In this volume the authors investigate the maximal subgroups of the finite classical groups and present research into these groups as well as proving many new results. In particular, the authors develop a unified treatment of the theory of the 'geometric subgroups' of the classical groups, introduced by Aschbacher, and they answer the questions of maximality and conjugacy and obtain the precise shapes of these groups. Both authors are experts in the field and the book will be of considerable value not only to group theorists, but also to combinatorialists and geometers interested in these techniques and results. Graduate students will find it a very readable introduction to the topic and it will bring them to the very forefront of research in group theory.

The book provides an outline and modern overview of the classification of the finite simple groups. It primarily covers the "even case", where the main groups arising are Lie-type (matrix)

groups over a field of characteristic 2. The book thus completes a project begun by Daniel Gorenstein's 1983 book, which outlined the classification of groups of "noncharacteristic 2 type". However, this book provides much more. Chapter 0 is a modern overview of the logical structure of the entire classification. Chapter 1 is a concise but complete outline of the "odd case" with updated references, while Chapter 2 sets the stage for the remainder of the book with a similar outline of the "even case". The remaining six chapters describe in detail the fundamental results whose union completes the proof of the classification theorem. Several important subsidiary results are also discussed. In addition, there is a comprehensive listing of the large number of papers referenced from the literature. Appendices provide a brief but valuable modern introduction to many key ideas and techniques of the proof. Some improved arguments are developed, along with indications of new approaches to the entire classification--such as the second and third generation projects--although there is no attempt to cover them comprehensively. The work should appeal to a broad range of mathematicians--from those who just want an overview of the main ideas of the classification, to those who want a reader's guide to help navigate some of the major papers, and to those who may wish to improve the existing proofs.

Award-winning monograph of the Ferran Sunyer i Balaguer Prize 2001. Subgroup growth studies the distribution of subgroups of finite index in a group as a function of the index. In the last two decades this topic has developed into one of the most active areas of research in infinite group theory; this book is a systematic and comprehensive account of the substantial theory which has emerged. As well as determining the range of possible 'growth types', for finitely generated groups in general and for groups in particular classes such as linear groups,

a main focus of the book is on the tight connection between the subgroup growth of a group and its algebraic structure. A wide range of mathematical disciplines play a significant role in this work: as well as various aspects of infinite group theory, these include finite simple groups and permutation groups, profinite groups, arithmetic groups and Strong Approximation, algebraic and analytic number theory, probability, and p-adic model theory. Relevant aspects of such topics are explained in self-contained 'windows'.

Let p be a prime, G a finite Kp-group S a Sylow p-subgroup of G and Q a large subgroup of G in S (i.e., CG(Q)?Q and NG(U)?NG(Q) for 1?U?CG(Q)). Let L be any subgroup of G with S?L, Op(L)?1 and Q?L. In this paper the authors determine the action of L on the largest elementary abelian normal p-reduced p-subgroup YL of L.