

Polycyclic Groups

A group is called **polycyclic** if there exists a polycyclic series through the group; i.e. a subnormal series of finite length

with cyclic factors $1 = G_0 \triangleleft G_1 \triangleleft \dots \triangleleft G_n = G$
 G_{i+1}/G_i is cyclic

Polycyclic Presentation

$$P = \langle a_1, \dots, a_n \mid a_j^{a_i} = w_{ij}, a_j^{a_i^{-1}} = v_{ij}, a_k^{r_k} = u_{kk} \rangle$$

$$1 \leq i < j \leq n, k \in I \subset \{1, \dots, n\}, r_i \in \mathbb{N}, i \in I$$

w_{ij}, v_{ij}, u_{ij} words in generators a_{j+1}, \dots, a_n

By induction:

$$\forall w \in P; w = a_1^{e_1} \dots a_n^{e_n} \text{ (normal form)}$$

$$e_i \in \mathbb{Z} \ \& \ 0 \leq e_i \leq r_i \text{ if } i \in I$$

Polycyclic Groups

Bruce Cooperstein, Geoffrey Mason



Polycyclic Groups:

Polycyclic Groups Daniel Segal, 2005-11-17 The theory of polycyclic groups is a branch of infinite group theory which has a rather different flavour from the rest of that subject This book is a comprehensive account of the present state of this theory As well as providing a connected and self contained account of the group theoretical background it explains in detail how deep methods of number theory and algebraic group theory have been used to achieve some very recent and rather spectacular advances in the subject Up to now most of this material has only been available in scattered research journals and some of it is new This book is the only unified account of these developments and will be of interest to mathematicians doing research in algebra and to postgraduate students studying that subject

Group and Ring Theoretic Properties of Polycyclic Groups B.A.F. Wehrfritz, 2009-11-28 Polycyclic groups are built from cyclic groups in a specific way They arise in many contexts within group theory itself but also more generally in algebra for example in the theory of Noetherian rings The first half of this book develops the standard group theoretic techniques for studying polycyclic groups and the basic properties of these groups The second half then focuses specifically on the ring theoretic properties of polycyclic groups and their applications often to purely group theoretic situations The book is intended to be a study manual for graduate students and researchers coming into contact with polycyclic groups where the main lines of the subject can be learned from scratch Thus it has been kept short and readable with a view that it can be read and worked through from cover to cover At the end of each topic covered there is a description without proofs but with full references of further developments in the area An extensive bibliography then concludes the book

Group and Ring Theoretic Properties of Polycyclic Groups B. A. F. Wehrfritz, 2010-04-17

Three Lectures on Polycyclic Groups J. E. Roseblade, Alfred W. Goldie, Bertram A. F. Wehrfritz, 1973

Three Lectures on Polycyclic Groups, 1970

The Theory of Infinite Soluble Groups John C. Lennox, Derek J. S. Robinson, 2004-08-19 The central concept in this monograph is that of a soluble group a group which is built up from abelian groups by repeatedly forming group extensions It covers all the major areas including finitely generated soluble groups soluble groups of finite rank modules over group rings algorithmic problems applications of cohomology and finitely presented groups whilst remaining fairly strictly within the boundaries of soluble group theory An up to date survey of the area aimed at research students and academic algebraists and group theorists it is a compendium of information that will be especially useful as a reference work for researchers in the field

Exercises in Cellular Automata and Groups Tullio Ceccherini-Silberstein, Michel Coornaert, 2023-11-01 This book complements the authors monograph Cellular Automata and Groups CAG Springer Monographs in Mathematics It consists of more than 600 fully solved exercises in symbolic dynamics and geometric group theory with connections to geometry and topology ring and module theory automata theory and theoretical computer science Each solution is detailed and entirely self contained in the sense that it only requires a standard undergraduate level background in abstract algebra and general topology together with results established in CAG and in

previous exercises It includes a wealth of gradually worked out examples and counterexamples presented here for the first time in textbook form Additional comments provide some historical and bibliographical information including an account of related recent developments and suggestions for further reading The eight chapter division from CAG is maintained Each chapter begins with a summary of the main definitions and results contained in the corresponding chapter of CAG The book is suitable either for classroom or individual use Foreword by Rostislav I Grigorchuk

Handbook of Computational Group Theory Derek F. Holt, Bettina Eick, Eamonn A. O'Brien, 2005-01-13 The origins of computation group theory CGT date back to the late 19th and early 20th centuries Since then the field has flourished particularly during the past 30 to 40 years and today it remains a lively and active branch of mathematics The Handbook of Computational Group Theory offers the first complete treatment of all the fundamental

Isolators in Polycyclic Groups [microform] Mohamed F. (Mohamed Fouad) Yousif, 1981 In this thesis we investigate the following class X of groups We say a group G is in X if G is soluble of finite rank and there exists a subgroup G_0 of finite index in G and a finite set of primes π_1 such that whenever π_1 is a subset of π a set of primes and K is less than or equal to G_0 then the set g belongs to G_0 if g^{π_1} belongs to K for some π_1 number m is a subgroup called the π_1 isolator of K in G_0 denoted by $K_{\pi_1}^{G_0}$ and $K_{\pi_1}^{G_0}$ is a π_1 number In Chapter 1 a summary of known results concerning the theory of isolators developed by P Hall 1 is presented From his results it follows that if G is finitely generated nilpotent by finite group then G is always in X In Chapter 2 the class of Fitting Isolated groups is defined and we give a proof to one of Rhemtulla and Hartley's fruitful results that every torsion free soluble group of finite rank has a Fitting Isolated subgroup of finite index this result is used in the investigation of the class X Denote by G over symbol H to the set g belongs to G if g^m belongs to H m is greater than or equal to 1 where H is less than or equal to G In Chapter 3 we show that if G is not nilpotent there is no reason to expect G over symbol H to be always a subgroup However it has been proved by Rhemtulla and Wehrfritz that every polycyclic group G has a subgroup G_0 of finite index such that G over symbol H is a subgroup for every H less than or equal to G_0 In Chapter 4 the main result of this thesis is given It is an example which shows that polycyclic metabelian groups already fail to be in X As a result of this example and a discussion with A Rhemtulla we conjecture that G is in X if and only if G is finitely generated nilpotent by finite group

The Santa Cruz Conference on Finite Groups Bruce Cooperstein, Geoffrey Mason, 1980

Applications of Group Theory in Cryptography Delaram Kahrobaei, Ramón Flores, Marialaura Noce, Maggie E. Habeeb, Christopher Battarbee, 2024-03-25 This book is intended as a comprehensive treatment of group based cryptography accessible to both mathematicians and computer scientists with emphasis on the most recent developments in the area To make it accessible to a broad range of readers the authors started with a treatment of elementary topics in group theory combinatorics and complexity theory as well as providing an overview of classical public key cryptography Then some algorithmic problems arising in group theory

are presented and cryptosystems based on these problems and their respective cryptanalyses are described. The book also provides an introduction to ideas in quantum cryptanalysis especially with respect to the goal of post quantum group based cryptography as a candidate for quantum resistant cryptography. The final part of the book provides a description of various classes of groups and their suitability as platforms for group based cryptography. The book is a monograph addressed to graduate students and researchers in both mathematics and computer science.

Classification of Polycyclic Groups J. F. Bowers, 1958

Encyclopaedia of Mathematics Michiel Hazewinkel, 2012-12-06 This ENCYCLOPAEDIA OF MATHEMATICS aims to be a reference work for all parts of mathematics. It is a translation with updates and editorial comments of the Soviet Mathematical Encyclopaedia published by Soviet Encyclopaedia Publishing House in five volumes in 1977-1985. The annotated translation consists of ten volumes including a special index volume. There are three kinds of articles in this ENCYCLOPAEDIA. First of all there are survey type articles dealing with the various main directions in mathematics where a rather fine subdivision has been used. The main requirement for these articles has been that they should give a reasonably complete up to date account of the current state of affairs in these areas and that they should be maximally accessible. On the whole these articles should be understandable to mathematics students in their first specialization years to graduates from other mathematical areas and depending on the specific subject to specialists in other domains of science, engineers and teachers of mathematics. These articles treat their material at a fairly general level and aim to give an idea of the kind of problems, techniques and concepts involved in the area in question. They also contain background and motivation rather than precise statements of precise theorems with detailed definitions and technical details on how to carry out proofs and constructions. The second kind of article of medium length contains more detailed concrete problems, results and techniques.

Encyclopaedia of Mathematics M. Hazewinkel, 2013-12-01

Central Extensions of Polycyclic Groups Werner Nickel, 1993

Infinite Groups 1994 Francesco De Giovanni, Martin L. Newell, 1996. 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.

Botanical Gazette, 1896

Finiteness Conditions and Generalized Soluble Groups Derek John Scott, Robinson, 1972. This book is a study of group theoretical properties of two disparate kinds: firstly finiteness conditions or generalizations of finiteness and secondly generalizations of solubility or nilpotence. Particularly interesting are the groups which possess properties of both types. This volume collects the most important results in the theory to present them in a compact and accessible form with improved and shortened proofs wherever possible. Readers should have a good basic knowledge of group theory, Abelian groups and the more familiar parts of commutative algebra and ring theory.

Injective Modules for Group Rings of Polycyclic Groups II. I.M.

Musson, University of Warwick, 1979

Group Rings, Crossed Products, and Galois Theory Donald S. Passman, 1986. For

readers with a basic graduate level background in algebra these ten articles provide a readable introduction to three major interrelated subjects of noncommutative algebra The theme is the interplay between group theory and ring theory dealing specifically with group rings crossed products and the Galois theory of rings The author has carefully included most definitions to keep the required background minimal Furthermore each article contains a selection of results on the given topic a limited number of proofs or sketches and at least a few open problems

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