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Introduction to representation theory. With historical interludes by Slava Gerovitch. (English) Zbl 1242.20001

Student Mathematical Library 59. Providence, RI: American Mathematical Society (AMS) (ISBN 978-0-8218-5351-1/pbk). vii, 228 p. (2011).

Representation theory is a very active direction in modern mathematics that studies realizations of mathematical objects via "classical" objects, for example, realization of groups using permutations or realization of algebras using linear operators. Methods and results from representation theory are used not only in more or less all branches of mathematics but also in numerous other areas of science, notably, theoretical physics, chemistry and biology.

The book under review is an introductory text to some basic parts of modern representation theory and originates from the course given by the first author to the remaining six authors within a framework of courses for high school students followed by an extended version of the course given by the first author at MIT.

The book is organized as follows: Chapter 2 addresses basic definitions like groups, algebras, ideals, representations, quotients, quivers, Lie algebras and duals. Chapter 3 introduces the main general results about representations, including the Jordan-Hölder Theorem, the Krull-Schmidt Theorem and the structure theorem for finite dimensional algebras. Chapter 4 is devoted to the classical part of the representation theory of finite groups, including Maschke's Theorem and the theory of characters. Chapter 5 continues exploring the area of the representation theory of finite groups and addresses the representation theory of the symmetric group, Schur-Weyl dualities and representations of the general linear group. Chapter 6 discusses representations of quivers, including Gabriel's Theorem and Gelfand-Ponomarev reflection functors. Chapter 7 provides some introduction to categories and functors. Chapter 8 is a brief introduction to homological algebra. Finally, Chapter 9 is about the structure theory for finite-dimensional algebras addressing such questions as lifting of idempotents, projective covers, Cartan matrix and Morita equivalence.

Reviewer: Volodymyr Mazorchuk (Uppsala)

MSC:

20-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to group theory
16-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to associative rings and algebras
17-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to nonassociative rings and algebras
00-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to mathematics in general
20C15	Ordinary representations and characters
16G20	Representations of quivers and partially ordered sets
17B10	Representations of Lie algebras and Lie superalgebras, algebraic theory (weights)
20G05	Representation theory for linear algebraic groups

Cited in **1** Review
Cited in **13** Documents

Keywords:

representations; characters; groups; categories; algebras; quivers; homology

Full Text: arXiv

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