

Discrete Mathematics Using Latin Squares

Charles F. Laywine
Gary L. Mullen

Wiley-Interscience Series in Discrete Mathematics and Optimization

Discrete Mathematics Using Latin Squares

Edmund K. Burke, Graham Kendall



Discrete Mathematics Using Latin Squares:

Discrete Mathematics Using Latin Squares Charles F. Laywine, Gary L. Mullen, 1998-09-17 Over the past two decades research in the theory of Latin Squares has been growing at a fast pace and new significant developments have taken place This book offers a unique approach to various areas of discrete mathematics through the use of Latin Squares

Latin Squares József Dénes, A. Donald Keedwell, 1991-01-24 In 1974 the editors of the present volume published a well received book entitled Latin Squares and their Applications It included a list of 73 unsolved problems of which about 20 have been completely solved in the intervening period and about 10 more have been partially solved The present work comprises six contributed chapters and also six further chapters written by the editors themselves As well as discussing the advances which have been made in the subject matter of most of the chapters of the earlier book this new book contains one chapter which deals with a subject r orthogonal latin squares which did not exist when the earlier book was written The success of the former book is shown by the two or three hundred published papers which deal with questions raised by it

Latin Squares and Their Applications A. Donald Keedwell, József Dénes, 2015-07-28 Latin Squares and Their Applications Second edition offers a long awaited update and reissue of this seminal account of the subject The revision retains foundational original material from the frequently cited 1974 volume but is completely updated throughout As with the earlier version the author hopes to take the reader from the beginnings of the subject to the frontiers of research By omitting a few topics which are no longer of current interest the book expands upon active and emerging areas Also the present state of knowledge regarding the 73 then unsolved problems given at the end of the first edition is discussed and commented upon In addition a number of new unsolved problems are proposed Using an engaging narrative style this book provides thorough coverage of most parts of the subject one of the oldest of all discrete mathematical structures and still one of the most relevant However in consequence of the huge expansion of the subject in the past 40 years some topics have had to be omitted in order to keep the book of a reasonable length Latin squares or sets of mutually orthogonal latin squares MOLS encode the incidence structure of finite geometries they prescribe the order in which to apply the different treatments in designing an experiment in order to permit effective statistical analysis of the results they produce optimal density error correcting codes they encapsulate the structure of finite groups and of more general algebraic objects known as quasigroups As regards more recreational aspects of the subject latin squares provide the most effective and efficient designs for many kinds of games tournaments and they are the templates for Sudoku puzzles Also they provide a number of ways of constructing magic squares both simple magic squares and also ones with additional properties Retains the organization and updated foundational material from the original edition Explores current and emerging research topics Includes the original 73 Unsolved Problems with the current state of knowledge regarding them as well as new Unsolved Problems for further study

Orthogonal Latin Squares Based on Groups Anthony B. Evans, 2018-08-17 This monograph presents a unified exposition

of latin squares and mutually orthogonal sets of latin squares based on groups Its focus is on orthomorphisms and complete mappings of finite groups while also offering a complete proof of the Hall Paige conjecture The use of latin squares in constructions of nets affine planes projective planes and transversal designs also motivates this inquiry The text begins by introducing fundamental concepts like the tests for determining whether a latin square is based on a group as well as orthomorphisms and complete mappings From there it describes the existence problem for complete mappings of groups building up to the proof of the Hall Paige conjecture The third part presents a comprehensive study of orthomorphism graphs of groups while the last part provides a discussion of Cartesian projective planes related combinatorial structures and a list of open problems Expanding the author's 1992 monograph *Orthomorphism Graphs of Groups* this book is an essential reference tool for mathematics researchers or graduate students tackling latin square problems in combinatorics Its presentation draws on a basic understanding of finite group theory finite field theory linear algebra and elementary number theory more advanced theories are introduced in the text as needed

[The Zen Of Magic Squares,Circles And Stars](#) M K Joseph, [Algorithmic Algebraic Combinatorics and Gröbner Bases](#) Mikhail Klin,Gareth A. Jones,Aleksandar Jurisic,Mikhail Muzychuk,Iliia Ponomarenko,2009-12-24 This collection of tutorial and research papers introduces readers to diverse areas of modern pure and applied algebraic combinatorics and finite geometries There is special emphasis on algorithmic aspects and the use of the theory of Gröbner bases

Planning, Construction, and Statistical Analysis of Comparative Experiments Francis G. Giesbrecht,Marcia L. Gumpertz,2011-09-26 A valuable guide to conducting experiments and analyzing data across a wide range of applications Experimental design is an important component of the scientific method This book provides guidance on planning efficient investigations It compiles designs for a wide range of experimental situations not previously found in accessible form Focusing on applications in the physical engineering biological and social sciences *Planning Construction and Statistical Analysis of Comparative Experiments* is a valuable guide to designing experiments and correctly analyzing and interpreting the results The authors draw on their years of experience in the classroom and as statistical consultants to research programs on campus in government and in industry The object is always to strike the right balance between mathematical necessities and practical constraints Serving both as a textbook for students of intermediate statistics and a hands on reference for active researchers the text includes A wide range of applications including agricultural sciences animal and biomedical sciences and industrial engineering studies General formulas for estimation and hypothesis testing presented in a unified and simplified manner Guidelines for evaluating the power and efficiency of designs that are not perfectly balanced New developments in the design of fractional factorials with non prime numbers of levels in mixed level fractional factorials Detailed coverage on the construction of plans and the relationship among categories of designs Thorough coverage of balanced lattice cyclic and alpha designs Strategies for sequences of fractional factorials Data sets and SAS code on a companion web site An ideal handbook for the investigator

planning a research program the text comes complete with detailed plans of experiments and alternative approaches for added flexibility

Search Methodologies Edmund K. Burke, Graham Kendall, 2006-03-20 This book is a tutorial survey of the methodologies that are at the confluence of several fields Computer Science Mathematics and Operations Research It provides a carefully structured and integrated treatment of the major technologies in optimization and search methodology The chapter authors are drawn from across Computer Science and Operations Research and include some of the world's leading authorities in their field It can be used as a textbook or a reference book to learn and apply these methodologies to a wide range of today's problems

Elements of Quasigroup Theory and Applications Victor Shcherbacov, 2017-05-12 This book provides an introduction to quasigroup theory along with new structural results on some of the quasigroup classes Many results are presented with some of them from mathematicians of the former USSR These included results have not been published before in the western mathematical literature In addition many of the achievements obtained with regard to applications of quasigroups in coding theory and cryptology are described

Cryptocoding Based on Quasigroups Daniela Mechkaroska, Aleksandra Popovska-Mitrovikj, Verica Bakeva, 2024-01-12 This book presents the concept of cryptocoding which arises from the need to obtain secure and accurate transmission Therefore it is necessary to improve constantly existing and develop new algorithms that will ensure accurate and secure data transfer This leads to the intensive development of coding theory and cryptography as scientific fields which solve these problems To ensure efficient and secure data transmission at the same time the concept of cryptocoding is developed such that the coding and encryption processes are merged into one process Cryptocodes provide correction of a certain number of errors in the transmitted message and data confidentiality using only one algorithm The main research in this field is to define new algorithms for coding that detects and corrects errors random codes stream ciphers block ciphers pseudo random generators hash functions etc This monograph examines an application of quasigroups for designing error correcting cryptocodes called Random Codes Based on Quasigroups RCBQ These codes are a combination of cryptographic algorithms and error correcting codes and depend on several parameters Some modifications new coding decoding algorithms of RCBQ for improving their performances for transmission ordinary messages images and audio files through a binary symmetric channel Gaussian channel and burst channels are considered Also authors propose and analyze filter for visually enhance of the decoded images and improving the quality of decoded audio files

Finite Geometries and Combinatorial Designs Earl Sidney Kramer, 1990 The proceedings of an AMS special session on finite geometries and combinatorial designs Topics range over finite geometry combinatorial designs their automorphism groups and related structures

Maxima and Minima with Applications Wilfred Kaplan, 2011-10-14 This new work by Wilfred Kaplan the distinguished author of influential mathematics and engineering texts is destined to become a classic Timely concise and content driven it provides an intermediate level treatment of maxima minima and optimization Assuming only a background in calculus and some linear algebra Professor Kaplan presents topics in order of difficulty In

four short chapters he describes basic concepts and geometric aspects of maxima and minima progresses to problems with side conditions introduces optimization and programming and concludes with an in depth discussion of research topics involving the duality theorems of Fenchel and Rockafellar Throughout the text the subject of convexity is gradually developed from its theoretical underpinnings to problems and finally to its role in applications Other features include A strong emphasis on practical applications of maxima and minima An impressive array of supporting topics such as numerical analysis An ample number of examples and problems More than 60 illustrations highlighting the text Algorithms to reinforce concepts An appendix reviewing the prerequisite linear algebra Maxima and Minima with Applications is an ideal text for upper undergraduate and graduate students taking courses in operations research management general engineering and applied mathematics It can also be used to supplement courses on linear and nonlinear optimization This volume s broad scope makes it an excellent reference for professionals wishing to learn more about cutting edge topics in optimization and mathematical programming

Combinatorics Advances

Charles J. Colbourn, Ebdollah Sayed Mahmoodian, 2013-12-01 On March 28 31 1994 Farvardin 8 11 1373 by Iranian calendar the Twenty fifth Annual Iranian Mathematics Conference AIMC25 was held at Sharif University of Technology in Tehran Islamic Republic of Iran Its sponsors included the Iranian Mathematical Society and the Department of Mathematical Sciences at Sharif University of Technology Among the keynote speakers were Professor Dr Andreas Dress and Professor Richard K Guy Their plenary lectures on combinatorial themes were complemented by invited and contributed lectures in a Combinatorics Session This book is a collection of refereed papers submitted primarily by the participants after the conference The topics covered are diverse spanning a wide range of combinatorics and allied areas in discrete mathematics Perhaps the strength and variety of the papers here serve as the best indications that combinatorics is advancing quickly and that the Iranian mathematics community contains very active contributors We hope that you find the papers mathematically stimulating and look forward to a long and productive growth of combinatorial mathematics in Iran

The Zen of Magic Squares, Circles, and Stars Clifford A. Pickover, 2011-11-28

Humanity s love affair with mathematics and mysticism reached a critical juncture legend has it on the back of a turtle in ancient China As Clifford Pickover briefly recounts in this enthralling book the most comprehensive in decades on magic squares Emperor Yu was supposedly strolling along the Yellow River one day around 2200 B C when he spotted the creature its shell had a series of dots within squares To Yu s amazement each row of squares contained fifteen dots as did the columns and diagonals When he added any two cells opposite along a line through the center square like 2 and 8 he always arrived at 10 The turtle unwitting inspirer of the Yu square went on to a life of courtly comfort and fame Pickover explains why Chinese emperors Babylonian astrologer priests prehistoric cave people in France and ancient Mayans of the Yucatan were convinced that magic squares arrays filled with numbers or letters in certain arrangements held the secret of the universe Since the dawn of civilization he writes humans have invoked such patterns to ward off evil and bring good fortune Yet who would have

guessed that in the twenty first century mathematicians would be studying magic squares so immense and in so many dimensions that the objects defy ordinary human contemplation and visualization Readers are treated to a colorful history of magic squares and similar structures their construction and classification along with a remarkable variety of newly discovered objects ranging from ornate inlaid magic cubes to hypercubes Illustrated examples occur throughout with some patterns from the author s own experiments The tesseracts circles spheres and stars that he presents perfectly convey the age old devotion of the math minded to this Zenlike quest Number lovers puzzle aficionados and math enthusiasts will treasure this rich and lively encyclopedia of one of the few areas of mathematics where the contributions of even nonspecialists count **Canadian Journal of Mathematics** ,1991 **CRC Handbook of Combinatorial Designs**

Charles J. Colbourn,2010-12-12 From experimental design to cryptography this comprehensive easy to access reference contains literally all the facts you need on combinatorial designs It includes constructions of designs existence results and properties of designs Organized into six main parts the CRC Handbook of Combinatorial Designs covers *Contemporary Design Theory* Jeffrey H. Dinitz,Douglas R. Stinson,1992-08-04 Foremost experts in their field have contributed articles resulting in a compilation of useful and timely surveys in this ever expanding field Each of these 12 original papers covers important aspects of design theory including several in areas that have not previously been surveyed Also contains surveys updating earlier ones where research is particularly active Mathematics and Computing Debdas Ghosh,Debasis Giri,Ram N. Mohapatra,Kouichi Sakurai,Ekrem Savas,Tanmoy Som,2018-09-28 This book discusses recent advances and research in applied mathematics statistics and their applications in computing It features papers presented at the fourth conference in the series organized at the Indian Institute of Technology Banaras Hindu University Varanasi India on 9 11 January 2018 on areas of current interest including operations research soft computing applied mathematical modelling cryptology and security analysis The conference has emerged as a powerful forum bringing together leading academic scientists experts from industry and researchers and offering a venue to discuss interact and collaborate to stimulate the advancement of mathematics and its applications in computer science The education of future consumers users producers developers and researchers of mathematics and its applications is an important challenge in modern society and as such mathematics and its application in computer science are of vital significance to all spectrums of the community as well as to mathematicians and computing professionals across different educational levels and disciplines With contributions by leading international experts this book motivates and creates interest among young researchers *The Probabilistic Method* Noga Alon,Joel H. Spencer,2015-10-28 Praise for the Third Edition Researchers of any kind of extremal combinatorics or theoretical computer science will welcome the new edition of this book MAA Reviews Maintaining a standard of excellence that establishes The Probabilistic Method as the leading reference on probabilistic methods in combinatorics the Fourth Edition continues to feature a clear writing style illustrative examples and illuminating exercises The new edition includes numerous updates to

reflect the most recent developments and advances in discrete mathematics and the connections to other areas in mathematics theoretical computer science and statistical physics Emphasizing the methodology and techniques that enable problem solving The Probabilistic Method Fourth Edition begins with a description of tools applied to probabilistic arguments including basic techniques that use expectation and variance as well as the more advanced applications of martingales and correlation inequalities The authors explore where probabilistic techniques have been applied successfully and also examine topical coverage such as discrepancy and random graphs circuit complexity computational geometry and derandomization of randomized algorithms Written by two well known authorities in the field the Fourth Edition features Additional exercises throughout with hints and solutions to select problems in an appendix to help readers obtain a deeper understanding of the best methods and techniques New coverage on topics such as the Local Lemma Six Standard Deviations result in Discrepancy Theory Property B and graph limits Updated sections to reflect major developments on the newest topics discussions of the hypergraph container method and many new references and improved results The Probabilistic Method Fourth Edition is an ideal textbook for upper undergraduate and graduate level students majoring in mathematics computer science operations research and statistics The Fourth Edition is also an excellent reference for researchers and combinatorists who use probabilistic methods discrete mathematics and number theory Noga Alon PhD is Baumritter Professor of Mathematics and Computer Science at Tel Aviv University He is a member of the Israel National Academy of Sciences and Academia Europaea A coeditor of the journal Random Structures and Algorithms Dr Alon is the recipient of the Polya Prize The G del Prize The Israel Prize and the EMET Prize Joel H Spencer PhD is Professor of Mathematics and Computer Science at the Courant Institute of New York University He is the cofounder and coeditor of the journal Random Structures and Algorithms and is a Sloane Foundation Fellow Dr Spencer has written more than 200 published articles and is the coauthor of Ramsey Theory Second Edition also published by Wiley

[Combinatorics of Symmetric Designs](#) Yury J. Ionin, Mohan S. Shrikhande, 2006-05-25 The aim of this book is to provide a unified exposition of the theory of symmetric designs with emphasis on recent developments The authors cover the combinatorial aspects of the theory giving particular attention to the construction of symmetric designs and related objects The last five chapters of the book are devoted to balanced generalized weighing matrices decomposable symmetric designs subdesigns of symmetric designs non embeddable quasi residual designs and Ryser designs Most results in these chapters have never previously appeared in book form The book concludes with a comprehensive bibliography of over 400 entries Researchers in all areas of combinatorial designs including coding theory and finite geometries will find much of interest here Detailed proofs and a large number of exercises make this book suitable as a text for an advanced course in combinatorial designs

Unveiling the Magic of Words: A Report on "**Discrete Mathematics Using Latin Squares**"

In some sort of defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their capability to kindle emotions, provoke contemplation, and ignite transformative change is truly awe-inspiring. Enter the realm of "**Discrete Mathematics Using Latin Squares**," a mesmerizing literary masterpiece penned by a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve into the book's central themes, examine its distinctive writing style, and assess its profound impact on the souls of its readers.

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