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Principles and Techniques in Combinatorics
Mathematical Olympiad Challenges Topics in
Functional Equations *The Phobia of the Modern
World: Nomophobia* A Primer for Mathematics
Competitions Applied Mechanics Reviews
Mathematical Circles The Stanford Mathematics
Problem Book Solving Problems in Geometry Lecture
Notes on Mathematical Olympiad Courses 50 Jahre
Bundeswettbewerb Mathematik How to Solve Problems
Memoir *Number Theory Lines and Curves* A First
Step to Mathematical Olympiad Problems Principles
and Techniques in Combinatorics Cretaceous

Stratigraphy Global Corruption Report 2006 *The Cauchy-Schwarz Master Class* **Functional Equations in Mathematical Olympiads (2017 - 2018)**

Papers presented at the International Cretaceous Seminar held in Jan. 1998 in Madras, India. "102 Combinatorial Problems" consists of carefully selected problems that have been used in the training and testing of the USA International Mathematical Olympiad (IMO) team. Key features: *

- * Provides in-depth enrichment in the important areas of combinatorics by reorganizing and enhancing problem-solving tactics and strategies
- * Topics include: combinatorial arguments and identities, generating functions, graph theory, recursive relations, sums and products, probability, number theory, polynomials, theory of equations, complex numbers in geometry, algorithmic proofs, combinatorial and advanced geometry, functional equations and classical inequalities

The book is systematically organized, gradually building combinatorial skills and techniques and broadening the student's view of mathematics. Aside from its practical use in training teachers and students engaged in mathematical competitions, it is a source of enrichment that is bound to stimulate interest in a variety of mathematical areas that are tangential to combinatorics. Based on Stanford University's well-known competitive exam, this excellent mathematics workbook offers students at both high school and college levels a

complete set of problems, hints, and solutions. 1974 edition. Dieses Buch wird alle Liebhaber der Mathematik (und die es werden wollen) durch eine Fülle von reizvollen und unterhaltsamen Problemstellungen aus Algebra, Geometrie, Kombinatorik und Zahlentheorie begeistern. Vierzig ausgewählte Aufgaben aus 50 Jahren Bundeswettbewerb Mathematik werden mit ausführlichen Lösungen, Einblicken in das mathematische Umfeld und inhaltlichen Variationen reich illustriert präsentiert. Von der Mathematik geht für viele seit jeher eine besondere Faszination aus. Wer tiefer in sie eindringt, entdeckt ihre Schönheit, ihre Eleganz und ihre unendliche Vielfalt und stößt immer wieder auf überraschende Resultate. Hiermit bereits bei Schülerinnen und Schülern Interesse zu wecken, ist eines der Anliegen des Bundeswettbewerbs Mathematik. Mit seinen außergewöhnlichen Aufgaben regt er seit nunmehr einem halben Jahrhundert Jugendliche an, sich intensiv mit elementarer Mathematik auf höherem Niveau zu beschäftigen und Erfahrungen im Problemlösen zu sammeln. Anhand von ausgewählten und besonders ansprechenden Problemstellungen dokumentiert dieses Buch deren Reiz und beleuchtet ihren jeweiligen mathematischen Hintergrund. Darüber hinaus sind alle Aufgaben, die seit dem ersten Lauf des Bundeswettbewerbs Mathematik im Schuljahr 1970/71 gestellt worden sind, vollständig enthalten. Many books have been written on the theory of functional equations, but very few help readers

solve functional equations in mathematics competitions and mathematical problem solving. This book fills that gap. Each chapter includes a list of problems associated with the covered material. These vary in difficulty, with the easiest being accessible to any high school student who has read the chapter carefully. The most difficult will challenge students studying for the International Mathematical Olympiad or the Putnam Competition. An appendix provides a springboard for further investigation of the concepts of limits, infinite series and continuity. This introductory textbook takes a problem-solving approach to number theory, situating each concept within the framework of an example or a problem for solving. Starting with the essentials, the text covers divisibility, unique factorization, modular arithmetic and the Chinese Remainder Theorem, Diophantine equations, binomial coefficients, Fermat and Mersenne primes and other special numbers, and special sequences. Included are sections on mathematical induction and the pigeonhole principle, as well as a discussion of other number systems. By emphasizing examples and applications the authors motivate and engage readers. This book discusses about the basic topics on inequalities and their applications. These include the arithmetic mean-geometric mean inequality, Cauchy-Schwarz inequality, Chebyshev inequality, rearrangement inequality, convex and concave functions and Muirhead's theorem. The book contains over 400

problems with their solutions. A chapter on geometric inequalities is a special feature of this book. Most of these problems are from International Mathematical Olympiads and from many national mathematical Olympiads. The book is intended to help students who are preparing for various mathematical competitions. It is also a good source book for graduate students who are consolidating their knowledge of inequalities and their applications. Papers presented at the International Cretaceous Seminar held in Jan. 1998 in Madras, India. In the modern world, the mobile phone has become an indispensable part of modern life. On the one hand, the mobile phone allows maintaining interpersonal contacts and fulfilling work or school duties regardless of time and location. It enables individuals to plan their daily routines and their free times. On the other hand, a mobile phone is a tool that can cause several psychological and physical problems. Nomophobia, which is considered the phobia of the modern era, is only one of these problems. In the simplest terms, nomophobia is the fear of being without a mobile phone and the intense anxiety and distress experienced in the absence of a mobile phone. Although technological addictions such as smartphone addiction and internet addiction have been studied extensively in the psychology literature, it is striking that nomophobia is a neglected psychological problem. However, nomophobia is emerging as a common phenomenon among young adults, as most young

adults use the mobile phone for about 5 hours a day. Some users define the mobile phone as a friend and the meaning of life. More importantly, prevalence studies have revealed that about half of young adults suffer from nomophobia. Since nomophobia causes many serious consequences such as physical pain, social problems and a decrease in academic achievement, nomophobia studies are important and beneficial especially for the younger generation. This book has been written to emphasize the importance of nomophobia and to provide detailed information about the diagnosis, treatment, prevalence, predictors and symptoms of nomophobia. In addition, this book aimed to conceptualize nomophobia theoretically. Also, based on the theoretical conceptualization, psychological structures that can cause nomophobia have been identified. The theoretical conceptualization has been tested and validated using scientific methods. This book, which contains a comprehensive literature review and scientific research, can shed light on researchers for future nomophobia studies. I also believe that this book will make valuable contributions to the clinical field by providing a better understanding of the factors that should be considered in prevention programs and treatment interventions developed for nomophobia. I hope that scholars, clinicians, and students from a variety of disciplines will find my efforts helpful. Lastly, I would like to express my deepest gratitude to my supervisor Prof. Dr.

Özden Yalçınkaya Alkar for her constant support, advice, and understanding during my doctoral process. Dr. Özge ENEZ ABOUT AUTHOR: Özge Enez, PhD, graduated from Istanbul University, Department of Psychology in 2009. Özge completed her master's degree in clinical psychology at Queen Mary, University of London in 2013 and her doctorate in psychology at Ankara Yıldırım Beyazıt University in 2021. Since 2014, she is a faculty member at the Department of Guidance and Psychological Counselling, Giresun University, Turkey. Özge has extensive experience in teaching at the university. Since 2014, she has been teaching undergraduate courses such as Child Psychology, Interpersonal Communication, Developmental Psychology, Psychological Counseling Skills. Her research area is Clinical Psychology and her research interests are smartphone addiction, nomophobia, grief, death, psychopathology, and emotions. A unique collection of competition problems from over twenty major national and international mathematical competitions for high school students. Written for trainers and participants of contests of all levels up to the highest level, this will appeal to high school teachers conducting a mathematics club who need a range of simple to complex problems and to those instructors wishing to pose a "problem of the week", thus bringing a creative atmosphere into the classrooms. Equally, this is a must-have for individuals interested in solving difficult and

challenging problems. Each chapter starts with typical examples illustrating the central concepts and is followed by a number of carefully selected problems and their solutions. Most of the solutions are complete, but some merely point to the road leading to the final solution. In addition to being a valuable resource of mathematical problems and solution strategies, this is the most complete training book on the market. A textbook suitable for undergraduate courses. The materials are presented very explicitly so that students will find it very easy to read. A wide range of examples, about 500 combinatorial problems taken from various mathematical competitions and exercises are also included. The solutions to each problem are written from a first principles approach, which would further augment the understanding of the important and recurring concepts in each chapter. Moreover, the solutions are written in a relatively self-contained manner, with very little knowledge of undergraduate mathematics assumed. In that regard, the solutions manual appeals to a wide range of readers, from secondary school and junior college students, undergraduates, to teachers and professors. Examples help explain the seven basic mathematical problem-solving methods, including inference, classification of action sequences, working backward, and contradiction. The techniques presented here are useful for solving mathematical contest problems in algebra and

analysis. Most of the examples and exercises that appear in the book originate from mathematical Olympiad competitions around the world. In the first four chapters the authors cover material for competitions at high school level. The level advances with the chapters. The topics explored include polynomials, functional equations, sequences and an elementary treatment of complex numbers. The final chapters provide a comprehensive list of problems posed at national and international contests in recent years, and solutions to all exercises and problems presented in the book. It helps students in preparing for national and international mathematical contests from high school level to more advanced competitions and will also be useful for their first year of mathematical studies at the university. It will be of interest to teachers in college and university level, and trainers of the mathematical Olympiads. This is a challenging problem-solving book in Euclidean geometry, assuming nothing of the reader other than a good deal of courage. Topics covered included cyclic quadrilaterals, power of a point, homothety, triangle centers; along the way the reader will meet such classical gems as the nine-point circle, the Simson line, the symmedian and the mixtilinear incircle, as well as the theorems of Euler, Ceva, Menelaus, and Pascal. Another part is dedicated to the use of complex numbers and barycentric coordinates, granting the reader both a traditional and computational viewpoint of the

material. The final part consists of some more advanced topics, such as inversion in the plane, the cross ratio and projective transformations, and the theory of the complete quadrilateral. The exposition is friendly and relaxed, and accompanied by over 300 beautifully drawn figures. The emphasis of this book is placed squarely on the problems. Each chapter contains carefully chosen worked examples, which explain not only the solutions to the problems but also describe in close detail how one would invent the solution to begin with. The text contains a selection of 300 practice problems of varying difficulty from contests around the world, with extensive hints and selected solutions. This book is especially suitable for students preparing for national or international mathematical olympiads or for teachers looking for a text for an honor class. Appealing to everyone from college-level majors to independent learners, *The Art and Craft of Problem Solving*, 3rd Edition introduces a problem-solving approach to mathematics, as opposed to the traditional exercises approach. The goal of *The Art and Craft of Problem Solving* is to develop strong problem solving skills, which it achieves by encouraging students to do math rather than just study it. Paul Zeitz draws upon his experience as a coach for the international mathematics Olympiad to give students an enhanced sense of mathematics and the ability to investigate and solve problems. This volume covers the topic in functional equations

in a broad sense and is written by authors who are in this field for the past 50 years. It contains the basic notions of functional equations, the methods of solving functional equations, the growth of functional equations in the last four decades and an extensive reference list on fundamental research papers that investigate the stability results of different types of functional equations and functional inequalities. This volume starts by taking the reader from the fundamental ideas to higher levels of results that appear in recent research papers. Its step-by-step expositions are easy for the reader to understand and admire the elegant results and findings on the stability of functional equations. Request Inspection Copy TI has once again shown its ability to combine research and policy analysis not just to shine a light on the deeply embedded problems of corruption ... but to propose progressive solutions. Former World Bank President James Wolfensohn on the Global Corruption Report In the health sector, corruption is a matter of life or death. It can take many forms: from medical professionals who sell medicines or services that should be freely available, to high-level government officials who embezzle money from health budgets, to pharmaceutical companies that buy influence over research agendas. The impact of corruption is always felt by the end user -- the sick person who is forced to pay over the odds or who is given unsafe, counterfeit

medicines. The 2006 edition of Transparency International's Global Corruption Report shows the impact that corruption has on health care in rich and poor countries. From high-level bribery in Costa Rica to informal payments in Hungary, case studies from around the world explore the characteristics of the health sector that make it so prone to corruption. In a special section dedicated to corruption in HIV/AIDS, the report warns that the large sums being poured into fighting the world's deadliest diseases need to be safeguarded against abuse. There is also a detailed analysis of the problems of the pharmaceutical system. The report also offers an annual round-up of worldwide developments and tracks major trends in more than 40 countries. The Global Corruption Report 2006 is the only report of its kind, and is an essential reference source for anyone who wants the latest research on how corruption affects everything from health to education and the oil and gas industries. See also A SECOND STEP TO MATHEMATICAL OLYMPIAD PROBLEMS The International Mathematical Olympiad (IMO) is an annual international mathematics competition held for pre-collegiate students. It is also the oldest of the international science olympiads, and competition for places is particularly fierce. This book is an amalgamation of the first 8 of 15 booklets originally produced to guide students intending to contend for placement on their country's IMO team. The material contained in this book provides an

introduction to the main mathematical topics covered in the IMO, which are: Combinatorics, Geometry and Number Theory. In addition, there is a special emphasis on how to approach unseen questions in Mathematics, and model the writing of proofs. Full answers are given to all questions. Though A First Step to Mathematical Olympiad Problems is written from the perspective of a mathematician, it is written in a way that makes it easily comprehensible to adolescents. This book is also a must-read for coaches and instructors of mathematical competitions. What kind of book is this? It is a book produced by a remarkable cultural circumstance in the former Soviet Union which fostered the creation of groups of students, teachers, and mathematicians called "mathematical circles". The work is predicated on the idea that studying mathematics can generate the same enthusiasm as playing a team sport - without necessarily being competitive. This book is intended for both students and teachers who love mathematics and want to study its various branches beyond the limits of school curriculum. Challenge And Thrill Of Pre-College Mathematics Is An Unusual Enrichment Text For Mathematics Of Classes 9, 10, 11 And 12 For Use By Students And Teachers Who Are Not Content With The Average Level That Routine Text Dare Not Transcend In View Of Their Mass Clientele. It Covers Geometry, Algebra And Trigonometry Plus A Little Of Combinatorics. Number Theory And Probability. It Is Written

Specifically For The Top Half Whose Ambition Is To Excel And Rise To The Peak Without Finding The Journey A Forced Uphill Task. The Undercurrent Of The Book Is To Motivate The Student To Enjoy The Pleasures Of A Mathematical Pursuit And Of Problem Solving. More Than 300 Worked Out Problems (Several Of Them From National And International Olympiads) Share With The Student The Strategy, The Excitement, Motivation, Modeling, Manipulation, Abstraction, Notation And Ingenuity That Together Make Mathematics. This Would Be The Starting Point For The Student, Of A Life-Long Friendship With A Sound Mathematical Way Of Thinking. There Are Two Reasons Why The Book Should Be In The Hands Of Every School Or College Student, (Whether He Belongs To A Mathematics Stream Or Not) One, If He Likes Mathematics And, Two, If He Does Not Like Mathematics- The Former, So That The Cramped Robot-Type Treatment In The Classroom Does Not Make Him Into The Latter; And The Latter So That By The Time He Is Halfway Through The Book, He Will Invite Himself Into The Former. Hundreds of beautiful, challenging, and instructive problems from algebra, geometry, trigonometry, combinatorics, and number theory Historical insights and asides are presented to stimulate further inquiry Emphasis is on creative solutions to open-ended problems Many examples, problems and solutions, with a user-friendly and accessible style Enhanced motivation References This lively, problem-oriented text, first

published in 2004, is designed to coach readers toward mastery of the most fundamental mathematical inequalities. With the Cauchy-Schwarz inequality as the initial guide, the reader is led through a sequence of fascinating problems whose solutions are presented as they might have been discovered - either by one of history's famous mathematicians or by the reader. The problems emphasize beauty and surprise, but along the way readers will find systematic coverage of the geometry of squares, convexity, the ladder of power means, majorization, Schur convexity, exponential sums, and the inequalities of Hölder, Hilbert, and Hardy. The text is accessible to anyone who knows calculus and who cares about solving problems. It is well suited to self-study, directed study, or as a supplement to courses in analysis, probability, and combinatorics. Functional equations, which are a branch of algebraic problems used in mathematical competitions, appear in recent olympiads very frequently. The current book is the first volume in a series of books on collections of solved problems in functional equations. This volume contains 175 problems on the subject, including those used in latest mathematical olympiads (2017 - 2018) around the world. The basic concepts of functional equations and techniques of problem solving have been briefly discussed in the preamble of the book. This book focuses on the calculus of variations, including fundamental theories and applications. This textbook is

intended for graduate and higher-level college and university students, introducing them to the basic concepts and calculation methods used in the calculus of variations. It covers the preliminaries, variational problems with fixed boundaries, sufficient conditions of extrema of functionals, problems with undetermined boundaries, variational problems of conditional extrema, variational problems in parametric forms, variational principles, direct methods for variational problems, variational principles in mechanics and their applications, and variational problems of functionals with vector, tensor and Hamiltonian operators. Many of the contributions are based on the authors' research, addressing topics such as the extension of the connotation of the Hilbert adjoint operator, definitions of the other three kinds of adjoint operators, the extremum function theorem of the complete functional, unified Euler equations in variational methods, variational theories of functionals with vectors, modulus of vectors, arbitrary order tensors, Hamiltonian operators and Hamiltonian operator strings, reconciling the Euler equations and the natural boundary conditions, and the application range of variational methods. The book is also a valuable reference resource for teachers as well as science and technology professionals. This unique approach to combinatorics is centered around unconventional, essay-type combinatorial examples, followed by a number of carefully

selected, challenging problems and extensive discussions of their solutions. Topics encompass permutations and combinations, binomial coefficients and their applications, bijections, inclusions and exclusions, and generating functions. Each chapter features fully-worked problems, including many from Olympiads and other competitions, as well as a number of problems original to the authors; at the end of each chapter are further exercises to reinforce understanding, encourage creativity, and build a repertory of problem-solving techniques. The authors' previous text, "102 Combinatorial Problems," makes a fine companion volume to the present work, which is ideal for Olympiad participants and coaches, advanced high school students, undergraduates, and college instructors. The book's unusual problems and examples will interest seasoned mathematicians as well. "A Path to Combinatorics for Undergraduates" is a lively introduction not only to combinatorics, but to mathematical ingenuity, rigor, and the joy of solving puzzles. Mathematical Olympiad Challenges is a rich collection of problems put together by two experienced and well-known professors and coaches of the U.S. International Mathematical Olympiad Team. Hundreds of beautiful, challenging, and instructive problems from algebra, geometry, trigonometry, combinatorics, and number theory were selected from numerous mathematical competitions and journals. An important feature

of the work is the comprehensive background material provided with each grouping of problems. The problems are clustered by topic into self-contained sections with solutions provided separately. All sections start with an essay discussing basic facts and one or two representative examples. A list of carefully chosen problems follows and the reader is invited to take them on. Additionally, historical insights and asides are presented to stimulate further inquiry. The emphasis throughout is on encouraging readers to move away from routine exercises and memorized algorithms toward creative solutions to open-ended problems. Aimed at motivated high school and beginning college students and instructors, this work can be used as a text for advanced problem-solving courses, for self-study, or as a resource for teachers and students training for mathematical competitions and for teacher professional development, seminars, and workshops. Olympiad mathematics is not a collection of techniques of solving mathematical problems but a system for advancing mathematical education. This book is based on the lecture notes of the mathematical Olympiad training courses conducted by the author in Singapore. Its scope and depth not only covers and exceeds the usual syllabus, but introduces a variety concepts and methods in modern mathematics. In each lecture, the concepts, theories and methods are taken as the core. The examples are served to explain and enrich their

intension and to indicate their applications. Besides, appropriate number of test questions is available for reader's practice and testing purpose. Their detailed solutions are also conveniently provided. The examples are not very complicated so that readers can easily understand. There are many real competition questions included which students can use to verify their abilities. These test questions are from many countries, e.g. China, Russia, USA, Singapore, etc. In particular, the reader can find many questions from China, if he is interested in understanding mathematical Olympiad in China. This book serves as a useful textbook of mathematical Olympiad courses, or as a reference book for related teachers and researchers.

Errata(s). Errata. Sample Chapter(s). Lecture 1: Operations on Rational Numbers (145k). Request Inspection Copy.

Contents: .: Operations on Rational Numbers; Linear Equations of Single Variable; Multiplication Formulae; Absolute Value and Its Applications; Congruence of Triangles; Similarity of Triangles; Divisions of Polynomials; Solutions to Testing Questions; and other chapters.

Readership: Mathematics students, school teachers, college lecturers, university professors; mathematics enthusiasts

This new volume of the Mathematical Olympiad Series focuses on the topic of geometry. Basic and advanced theorems commonly seen in Mathematical Olympiad are introduced and illustrated with

plenty of examples. Special techniques in solving various types of geometrical problems are also introduced, while the authors elaborate extensively on how to acquire an insight and develop strategies in tackling difficult geometrical problems. This book is suitable for any reader with elementary geometrical knowledge at the lower secondary level. Each chapter includes sufficient scaffolding and is comprehensive enough for the purpose of self-study. Readers who complete the chapters on the basic theorems and techniques would acquire a good foundation in geometry and may attempt to solve many geometrical problems in various mathematical competitions. Meanwhile, experienced contestants in Mathematical Olympiad competitions will find a large collection of problems pitched at competitions at the international level, with opportunities to practise and sharpen their problem-solving skills in geometry. This book is intended for the Mathematical Olympiad students who wish to prepare for the study of inequalities, a topic now of frequent use at various levels of mathematical competitions. In this volume we present both classic inequalities and the more useful inequalities for confronting and solving optimization problems. An important part of this book deals with geometric inequalities and this fact makes a big difference with respect to most of the books that deal with this topic in the mathematical olympiad. The book has been organized in four chapters which have

each of them a different character. Chapter 1 is dedicated to present basic inequalities. Most of them are numerical inequalities generally lacking any geometric meaning. However, where it is possible to provide a geometric interpretation, we include it as we go along. We emphasize the importance of some of these inequalities, such as the inequality between the arithmetic mean and the geometric mean, the Cauchy-Schwarz inequality, the rearrangement inequality, the Jensen inequality, the Muirhead theorem, among others. For all these, besides giving the proof, we present several examples that show how to use them in mathematical olympiad problems. We also emphasize how the substitution strategy is used to deduce several inequalities. The importance of mathematics competitions has been widely recognised for three reasons: they help to develop imaginative capacity and thinking skills whose value far transcends mathematics; they constitute the most effective way of discovering and nurturing mathematical talent; and they provide a means to combat the prevalent false image of mathematics held by high school students, as either a fearsomely difficult or a dull and uncreative subject. This book provides a comprehensive training resource for competitions from local and provincial to national Olympiad level, containing hundreds of diagrams, and graced by many light-hearted cartoons. It features a large collection of what mathematicians call "beautiful" problems - non-

routine, provocative, fascinating, and challenging problems, often with elegant solutions. It features careful, systematic exposition of a selection of the most important topics encountered in mathematics competitions, assuming little prior knowledge. Geometry, trigonometry, mathematical induction, inequalities, Diophantine equations, number theory, sequences and series, the binomial theorem, and combinatorics - are all developed in a gentle but lively manner, liberally illustrated with examples, and consistently motivated by attractive "appetiser" problems, whose solution appears after the relevant theory has been expounded. Each chapter is presented as a "toolchest" of instruments designed for cracking the problems collected at the end of the chapter. Other topics, such as algebra, co-ordinate geometry, functional equations and probability, are introduced and elucidated in the posing and solving of the large collection of miscellaneous problems in the final toolchest. An unusual feature of this book is the attention paid throughout to the history of mathematics - the origins of the ideas, the terminology and some of the problems, and the celebration of mathematics as a multicultural, cooperative human achievement. As a bonus the aspiring "mathlete" may encounter, in the most enjoyable way possible, many of the topics that form the core of the standard school curriculum. Functions and their properties have been part of the rigorous

precollege curriculum for decades. And functional equations have been a favorite topic of the leading national and international mathematical competitions. Yet the subject has not received equal attention by authors at an introductory level. The majority of the books on the topic remain unreachable to the curious and intelligent precollege student. The present book is an attempt to eliminate this disparity. The book opens with a review chapter on functions, which collects the relevant foundational information on functions, plus some material potentially new to the reader. The next chapter presents a working definition of functional equations and explains the difficulties in trying to systematize the theory. With each new chapter, the author presents methods for the solution of a particular group of equations. Each chapter is complemented with many solved examples, the majority of which are taken from mathematical competitions and professional journals. The book ends with a chapter of unsolved problems and some other auxiliary material. The book is an invaluable resource for precollege and college students who want to deepen their knowledge of functions and their properties, for teachers and instructors who wish to enrich their curricula, and for any lover of mathematical problem-solving techniques. In the interest of fostering a greater awareness and appreciation of mathematics and its connections to other disciplines and everyday life, MSRI and the AMS are publishing books in

the Mathematical Circles Library series as a service to young people, their parents and teachers, and the mathematics profession. This book takes the reader on a journey through the world of college mathematics, focusing on some of the most important concepts and results in the theories of polynomials, linear algebra, real analysis, differential equations, coordinate geometry, trigonometry, elementary number theory, combinatorics, and probability. Preliminary material provides an overview of common methods of proof: argument by contradiction, mathematical induction, pigeonhole principle, ordered sets, and invariants. Each chapter systematically presents a single subject within which problems are clustered in each section according to the specific topic. The exposition is driven by nearly 1300 problems and examples chosen from numerous sources from around the world; many original contributions come from the authors. The source, author, and historical background are cited whenever possible. Complete solutions to all problems are given at the end of the book. This second edition includes new sections on quadratic polynomials, curves in the plane, quadratic fields, combinatorics of numbers, and graph theory, and added problems or theoretical expansion of sections on polynomials, matrices, abstract algebra, limits of sequences and functions, derivatives and their applications, Stokes' theorem, analytical geometry, combinatorial geometry, and counting strategies.

Using the W.L. Putnam Mathematical Competition for undergraduates as an inspiring symbol to build an appropriate math background for graduate studies in pure or applied mathematics, the reader is eased into transitioning from problem-solving at the high school level to the university and beyond, that is, to mathematical research. This work may be used as a study guide for the Putnam exam, as a text for many different problem-solving courses, and as a source of problems for standard courses in undergraduate mathematics. Putnam and Beyond is organized for independent study by undergraduate and graduate students, as well as teachers and researchers in the physical sciences who wish to expand their mathematical horizons. Broad appeal to undergraduate teachers, students, and engineers; Concise descriptions of properties of basic planar curves from different perspectives; useful handbook for software engineers; A special chapter---"Geometry on the Web"---will further enhance the usefulness of this book as an informal tutorial resource.; Good mathematical notation, descriptions of properties of lines and curves, and the illustration of geometric concepts facilitate the design of computer graphics tools and computer animation.; Video game designers, for example, will find a clear discussion and illustration of hard-to-understand trajectory design concepts.; Good supplementary text for geometry courses at the undergraduate and advanced high school levels

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