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A Decade of the Berkeley Math Circle A Moscow Math Circle Math Circles for Elementary School Students Mathematical Circle Diaries, Year 1 Math from Three to Seven Mathematical Circles A Decade of the Berkeley Math Circle Math Circle by the Bay: Topics for Grades 1–5 Math Circle by the Bay Circle in a Box Inspiring Mathematics: Lessons from the Navajo Nation Math Circles Playing with Math Mathematical Circle Diaries, Year 2: Complete Curriculum for Grades 6 to 8 Understanding and Doing Math - Circle 1 Math Renaissance Circle! Sphere! Breaking Numbers Into Parts, Second Edition, Part 1 Inspiring Mathematics Mathematical Treks: From Surreal Numbers to Magic Circles Out of the Labyrinth How Round Is Your Circle? Circles: A Mathematical View Mathematics via Problems: Part 2: Geometry Groups of Circle Diffeomorphisms Mathematical Circles Open Research Forum Report 2018-1 The Original Collection of Math Contests Moebius Noodles Cubic Forms and the Circle Method Orthogonal Polynomials on the Unit Circle Contributions to Mathematics Introduction to Circle Packing The Circle The ARML Power Contest Great Circle of Mysteries The Nothing that Is Can You See a Circle? (Nature Numbers) S.M.A.R.T. Circle Overview New Approaches to Circle Packing in a Square Circle-valued Morse Theory

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'How Round is your Circle?' includes chapters on: hard lines; how to draw a straight line; four-bar variations; building the world's first rules; dividing the circle; falling aprat; follow my leader; all approximations are rational; all a matter of balance; and finding some equilibrium. This visionary and engaging book provides a mathematical perspective on the fundamental ideas of numbers, space, life, evolution, the brain and the mind. The author suggests how a development of mathematical concepts in the spirit of category theory may lead to unravelling the mystery of the human mind and the design of universal learning algorithms. The book is divided into two parts, the first of which describes the ideas of great mathematicians and scientists, those who saw sparks of light in the dark sea of unknown. The second part, Memorandum Ergo, reflects on how mathematics can contribute to the understanding of the mystery of thought. It argues that the core of the human mind is a structurally elaborated object that needs a creation of a broad mathematical context for its understanding. Readers will discover the main properties of the expected mathematical objects within this context, called ERGO-SYSTEMS, and readers will see how these “systems” may serve as prototypes for design of universal learning computer programs. This is a work of great, poetical insight and is richly illustrated. It is a highly attractive read for all those who welcome a mathematical and scientific way of thinking about the world. Math circles provide a setting in which mathematicians work with secondary school students who are interested in mathematics. This form of outreach, which has existed for decades in Russia, Bulgaria, and other countries, is now rapidly spreading across the United States as well. The first part of this book offers helpful advice on all aspects of math circle operations, culled from conversations with over a dozen directors of successful math circles. Topics include creative means for getting the word out to students, sound principles for selecting effective speakers, guidelines for securing financial support, and tips for designing an exciting math circle session. The purpose of this discussion is to enable math circle coordinators to establish a thriving group in which students can experience the delight of mathematical investigation. The second part of the book outlines ten independent math circle sessions, covering a variety of topics and difficulty levels. Each chapter contains detailed presentation notes along with a useful collection of problems and solutions. This book will be an indispensable resource for any individual involved with a math circle or anyone who would like to see one begin in his or her community. Sam Vandervelde teaches at St. Lawrence University. He launched the Stanford Math Circle and also writes and coordinates the Mandelbrot Competition, a math contest for high schools. 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. Titles in this series are co-published with the Mathematical Sciences Research Institute (MSRI). Open Research Forum Report 2018-1 A symbol for what is not there, an emptiness that increases any number it's added to, an inexhaustible and indispensable paradox. As we enter the year 2000, zero is once again making its presence felt. Nothing itself, it makes possible a myriad of calculations. Indeed, without zero mathematics as we know it would not exist. And without mathematics our understanding of the universe would be vastly impoverished. But where did this nothing, this hollow circle, come from? Who created it? And what, exactly, does it mean? Robert Kaplan's The Nothing That Is: A Natural History of Zero begins as a mystery story, taking us back to Sumerian times, and then to Greece and India, piecing together the way the idea of a symbol for nothing evolved. Kaplan shows us just how handicapped our ancestors were in trying to figure large sums without the aid of the zero. (Try multiplying CLXIV by XXIV). Remarkably, even the Greeks, mathematically brilliant as they were, didn't have a zero--or did they? We follow the trail to the East where, a millennium or two ago, Indian mathematicians took another crucial step. By treating zero for the first time like any other number, instead of a unique symbol, they allowed huge new leaps forward in computation, and also in our understanding of how mathematics itself works. In the Middle Ages, this mathematical knowledge swept across western Europe via Arab traders. At first it was called "dangerous Saracen magic" and considered the Devil's work, but it wasn't long before merchants and bankers saw how handy this magic was, and used it to develop tools like double-entry bookkeeping. Zero quickly became

an essential part of increasingly sophisticated equations, and with the invention of calculus, one could say it was a linchpin of the scientific revolution. And now even deeper layers of this thing that is nothing are coming to light: our computers speak only in zeros and ones, and modern mathematics shows that zero alone can be made to generate everything. Robert Kaplan serves up all this history with immense zest and humor; his writing is full of anecdotes and asides, and quotations from Shakespeare to Wallace Stevens extend the book's context far beyond the scope of scientific specialists. For Kaplan, the history of zero is a lens for looking not only into the evolution of mathematics but into very nature of human thought. He points out how the history of mathematics is a process of recursive abstraction: how once a symbol is created to represent an idea, that symbol itself gives rise to new operations that in turn lead to new ideas. The beauty of mathematics is that even though we invent it, we seem to be discovering something that already exists. The joy of that discovery shines from Kaplan's pages, as he ranges from Archimedes to Einstein, making fascinating connections between mathematical insights from every age and culture. A tour de force of science history, The Nothing That Is takes us through the hollow circle that leads to infinity. The main part of this book describes the first semester of the existence of a successful and now highly popular program for elementary school students at the Berkeley Math Circle. The topics discussed in the book introduce the participants to the basics of many important areas of modern mathematics, including logic, symmetry, probability theory, knot theory, cryptography, fractals, and number theory. Each chapter in the first part of this book consists of two parts. It starts with generously illustrated sets of problems and hands-on activities. This part is addressed to young readers who can try to solve problems on their own or to discuss them with adults. The second part of each chapter is addressed to teachers and parents. It includes comments on the topics of the lesson, relates those topics to discussions in other chapters, and describes the actual reaction of math circle participants to the proposed activities. The supplementary problems that were discussed at workshops of Math Circle at Kansas State University are given in the second part of the book. The book is richly illustrated, which makes it attractive to its young audience. 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. Titles in this series are co-published with the Mathematical Sciences Research Institute (MSRI). This two-part book is a comprehensive overview of the theory of probability measures on the unit circle, viewed especially in terms of the orthogonal polynomials defined by those measures. A major theme involves the connections between the Verblunsky coefficients (the coefficients of the recurrence equation for the orthogonal polynomials) and the measures, an analog of the spectral theory of one-dimensional Schrodinger operators. Among the topics discussed along the way are the asymptotics of Toeplitz determinants (Szego's theorems), limit theorems for the density of the zeros of orthogonal polynomials, matrix representations for multiplication by z (CMV matrices), periodic Verblunsky coefficients from the point of view of meromorphic functions on hyperelliptic surfaces, and connections between the theories of orthogonal polynomials on the unit circle and on the real line. The ARML (American Regions Math League) Power Contest is truly a unique competition in which a team of students is judged on its ability to discover a pattern, express the pattern in precise mathematical language, and provide a logical proof of its conjectures. Just as a team of students can be self-directed to solve each problem set, a teacher, math team coach, or math circle leader could take these ideas and questions and lead students into problem solving and mathematical discovery. This book contains thirty-seven interesting and engaging problem sets from the ARML Power Contests from 1994 to 2013. They are generally extensions of the high school mathematics classroom and often connect two remote areas of mathematics. Additionally, they provide meaningful problem situations for both the novice and the veteran mathlete. Thomas Kilkelly has been a mathematics teacher for forty-three years. During that time he has been awarded several teaching honors and has coached many math teams to state and national championships. He has always been an advocate for more discovery, integration, and problem solving in the mathematics classroom. 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. Titles in this series are co-published with the Mathematical Sciences Research Institute (MSRI). Mathematical circles, with their question-driven approach and emphasis on problem solving, expose students to the type of mathematics that stimulates the development of logical thinking, creativity, analytical abilities, and mathematical reasoning. These skills, while scarcely introduced at school, are in high demand in the modern world. This book, a sequel to Mathematical Circle Diaries, Year 1, teaches how to think and solve problems in mathematics. The material, distributed among twenty-nine weekly lessons, includes detailed lectures and discussions, sets of problems with solutions, and contests and games. In addition, the book shares some of the know-how of running a mathematical circle. The book covers a broad range of problem-solving strategies and proofing techniques, as well as some more advanced topics that go beyond the limits of a school curriculum. The topics include invariants, proofs by contradiction, the Pigeonhole principle, proofs by coloring, double counting, combinatorics, binary numbers, graph theory, divisibility and remainders, logic, and many others. When students take science and computing classes in high school and college, they will be better prepared for both the foundations and advanced material. The book contains everything that is needed to run a successful mathematical circle for a full year. This book, written by an author actively involved in teaching mathematical circles for fifteen years, is intended for teachers, math coaches, parents, and math enthusiasts who are interested in teaching math that promotes critical thinking. Motivated students can work through this book on their own. 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 is a translation from Russian of Part II of the book Mathematics Through Problems: From Olympiads and Math Circles to Profession. Part I, Algebra, was recently published in the same series. Part III, Combinatorics, will be published soon. The main goal of this book is to develop important parts of mathematics through problems. The authors tried to put together sequences of problems that allow high school students (and some undergraduates) with strong interest in mathematics to discover and recreate much of elementary mathematics and start edging into more sophisticated topics such as projective and affine geometry, solid geometry, and so on, thus building a bridge between standard high school exercises and more intricate notions in geometry. Definitions and/or references for material that is not standard in the school curriculum are included. To help students that might be unfamiliar with new material, problems are carefully arranged to provide gradual introduction into each subject. Problems are often accompanied by hints and/or complete solutions. The book is based on classes taught by the authors at different times at the Independent University of Moscow, at a number of Moscow schools and math circles, and at various summer schools. It can be used by high school students and undergraduates, their teachers, and organizers of summer camps and math circles. 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. The people of the Navajo Nation know mathematics education for their children is essential. They were joined by mathematicians familiar with ways to deliver problems and a pedagogy that, through exploration, shows the art, joy and beauty in mathematics. This combined effort produced a series of Navajo Math Circles—interactive mathematical explorations—across the Navajo Reservation. This book contains the mathematical details of that effort. Between its covers is a thematic rainbow of problem sets that were used in Math Circle sessions on the Reservation. The problem sets are good for puzzling over and exploring the mathematical ideas within. They will help nurture curiosity and confidence in students. The problems come with suggestions for pacing, for adjusting the problems to be more or less challenging, and for different approaches to solving them. This book is a wonderful resource for any teacher wanting to enrich the mathematical lives of students and for anyone curious about mathematical thinking

outside the box. 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. The people of the Navajo Nation know mathematics education for their children is essential. They were joined by mathematicians familiar with ways to deliver problems and a pedagogy that, through exploration, shows the art, joy and beauty in mathematics. This combined effort produced a series of Navajo Math Circles--interactive mathematical explorations--across the Navajo Reservation. This book contains the mathematical details of that effort. Between its covers is a thematic rainbow of problem sets that were used in Math Circle sessions on the Reservation. The problem sets are good for puzzlin. In recent years scholars from a variety of branches of mathematics have made several significant developments in the theory of group actions. Groups of Circle Diffeomorphisms systematically explores group actions on the simplest closed manifold, the circle. As the group of circle diffeomorphisms is an important subject in modern mathematics, this book will be of interest to those doing research in group theory, dynamical systems, low dimensional geometry and topology, and foliation theory. The book is mostly self-contained and also includes numerous complementary exercises, making it an excellent textbook for undergraduate and graduate students. The series is devoted to the publication of monographs and high-level textbooks in mathematics, mathematical methods and their applications. Apart from covering important areas of current interest, a major aim is to make topics of an interdisciplinary nature accessible to the non-specialist. The works in this series are addressed to advanced students and researchers in mathematics and theoretical physics. In addition, it can serve as a guide for lectures and seminars on a graduate level. The series de Gruyter Studies in Mathematics was founded ca. 30 years ago by the late Professor Heinz Bauer and Professor Peter Gabriel with the aim to establish a series of monographs and textbooks of high standard, written by scholars with an international reputation presenting current fields of research in pure and applied mathematics. While the editorial board of the Studies has changed with the years, the aspirations of the Studies are unchanged. In times of rapid growth of mathematical knowledge carefully written monographs and textbooks written by experts are needed more than ever, not least to pave the way for the next generation of mathematicians. In this sense the editorial board and the publisher of the Studies are devoted to continue the Studies as a service to the mathematical community. Please submit any book proposals to Niels Jacob. Caldecott Honor winner Grace Lin celebrates math for every kid, everywhere! Manny and his friends Olivia and Mei blow bubbles in this playful introduction to geometry. Manny's wand is a circle. Olivia's wand is a square. Mei's wand is a heart. What shape will their bubbles be? (Surprise! They're all spheres.) Storytelling Math celebrates children using math in their daily adventures as they play, build, and discover the world around them. Joyful stories and hands-on activities make it easy for kids and their grown-ups to explore everyday math together. Developed in collaboration with math experts at STEM education nonprofit TERC, under a grant from the Heising-Simons Foundation. The circle has fascinated mathematicians since ancient times. This entertaining book describes in layperson’s terms the many intriguing properties of this fundamental shape. If math has intimidated you, this may be the ideal book to help you appreciate the discipline through one of its most important elements. The authors begin with a brief review of the basic properties of the circle and related figures. They then show the many ways in which the circle manifests itself in the field of geometry—leading to some amazing relationships and truly important geometric theorems. In addition, they explore remarkable circle constructions and demonstrate how all constructions in geometry that usually require an unmarked straightedge and a compass can also be done with the compass alone. Among other things, the reader will learn that circles can generate some unusual curves – many even quite artistic. Finally, the role of circles in art and architecture and a discussion of the circle’s place on the sphere bring "full circle" this presentation of a key element of geometry. The book teaches kindergarten and 1st grade students to break (positive integral) numbers into parts in all the possible ways. The book uses the developed technique to explain (prove) commutativity of addition of positive integers. The book also explores the concepts of digits and numbers, odd and even numbers, operations (functions), and inverse operations in an age-appropriate fashion. The book was tried and tested at Los Angeles Math Circle (LAMC), a free Sunday math school for mathematically inclined children run by UCLA Department of Mathematics. The book was used as a basis for a year-long enhancement math course at a variety of other locations, from math circles and after-school programs to a full-fledged elementary school. The second edition of the book is a feedback-based improvement of the first edition. It has two extra chapters, more than sixty extra problems, solutions to harder problems, ten quizzes, and more. The second edition has two parts. This book is Part 1. This book presents an overview of recent results achieved in solving the circle packing problem. It provides the reader with a comprehensive view of both theoretical and computational achievements. Illustrations of problem solutions are shown, elegantly displaying the results obtained. Publisher Description Moscow has a rich tradition of successful math circles, to the extent that many other circles are modeled on them. This book presents materials used during the course of one year in a math circle organized by mathematics faculty at Moscow State University, and also used at the mathematics magnet school known as Moscow School Number 57. Each problem set has a similar structure: it combines review material with a new topic, offering problems in a range of difficulty levels. This time-tested pattern has proved its effectiveness in engaging all students and helping them master new material while building on earlier knowledge. The introduction describes in detail how the math circles at Moscow State University are run. Dorichenko describes how the early sessions differ from later sessions, how to choose problems, and what sorts of difficulties may arise when running a circle. The book also includes a selection of problems used in the competition known as the Mathematical Maze, a mathematical story based on actual lessons with students, and an addendum on the San Jose Mathematical Circle, which is run in the Russian style. 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. Early middle school is a great time for children to start their mathematical circle education. This time is a period of curiosity and openness to learning. The thinking habits and study skills acquired by children at this age stay with them for a lifetime. Mathematical circles, with their question-driven approach and emphasis on creative problem-solving, have been rapidly gaining popularity in the United States. The circles expose children to the type of mathematics that stimulates development of logical thinking, creativity, analytical abilities and mathematical reasoning. These skills, while scarcely touched upon at school, are in high demand in the modern world. This book contains everything that is needed to run a successful mathematical circle for a full year. The materials, distributed among 29 weekly lessons, include detailed lectures and discussions, sets of problems with solutions, and contests and games. In addition, the book shares some of the know-how of running a mathematical circle. The curriculum, which is based on the rich and long-standing Russian math circle tradition, has been modified and adapted for teaching in the United States. For the past decade, the author has been actively involved in teaching a number of mathematical circles in the Seattle area. This book is based on her experience and on the compilation of materials from these circles. The material is intended for students in grades 5 to 7. It can be used by teachers and parents with various levels of expertise who are interested in teaching mathematics with the emphasis on critical thinking. Also, this book will be of interest to mathematically motivated children. 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 is the first in a series of math books intended for those who have completed at least secondary school mathematics and have acquired: certain calculating skills: dissatisfaction with their understanding of what they are calculating. We will start our journey with numbers. Numbers are the oldest mathematical idea, but still also the most important one. We will go through the basics of numbers in a way that will give you the confidence to really understand numbers and really know how to apply them, You will also

learn all the essential elements of mathematics through the example of the world of numbers. The example of numbers will be used to illustrate what mathematical objects are and how they are applied, and what mathematical tools we use in their description and application. Humanity needed millennia to develop the world of numbers and methods for their description and application. While growing up you are expected to pass through this history briefly in a dozen years of education. On the basis of the experience of the whole of human civilisation and your education, we are now in the position to acquire, in several weeks, knowledge about numbers at a more mature level. You can find out more about the book on the web page https: //understandingmath.academy/math-circles/math-circle-1 and on Facebook https: //www.facebook.com/profile.php?id=100067655929545 The Hardy–Littlewood circle method was invented over a century ago to study integer solutions to special Diophantine equations, but it has since proven to be one of the most successful all-purpose tools available to number theorists. Not only is it capable of handling remarkably general systems of polynomial equations defined over arbitrary global fields, but it can also shed light on the space of rational curves that lie on algebraic varieties. This book, in which the arithmetic of cubic polynomials takes centre stage, is aimed at bringing beginning graduate students into contact with some of the many facets of the circle method, both classical and modern. This monograph is the winner of the 2021 Ferran Sunyer i Balaguer Prize, a prestigious award for books of expository nature presenting the latest developments in an active area of research in mathematics. This book is based on selected topics that the authors taught in math circles for elementary school students at the University of California, Berkeley; Stanford University; Dominican University (Marin County, CA); and the University of Oregon (Eugene). It is intended for people who are already running a math circle or who are thinking about organizing one. It can be used by parents to help their motivated, math-loving kids or by elementary school teachers. We also hope that bright fourth or fifth graders will be able to read this book on their own. The main features of this book are the logical sequence of the problems, the description of class reactions, and the hints given to kids when they get stuck. This book tries to keep the balance between two goals: inspire readers to invent their own original approaches while being detailed enough to work as a fallback in case the teacher needs to prepare a lesson on short notice. It introduces kids to combinatorics, Fibonacci numbers, Pascal's triangle, and the notion of area, among other things. The authors chose topics with deep mathematical context. These topics are just as engaging and entertaining to children as typical “recreational math” problems, but they can be developed deeper and to more advanced levels. 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 is a captivating account of a professional mathematician's experiences conducting a math circle for preschoolers in his apartment in Moscow in the 1980s. As anyone who has taught or raised young children knows, mathematical education for little kids is a real mystery. What are they capable of? What should they learn first? How hard should they work? Should they even "work" at all? Should we push them, or just let them be? There are no correct answers to these questions, and the author deals with them in classic math-circle style: he doesn't ask and then answer a question, but shows us a problem--be it mathematical or pedagogical--and describes to us what happened. His book is a narrative about what he did, what he tried, what worked, what failed, but most important, what the kids experienced. This book does not purport to show you how to create precocious high achievers. It is just one person's story about things he tried with a half-dozen young children. Mathematicians, psychologists, educators, parents, and everybody interested in the intellectual development in young children will find this book to be an invaluable, inspiring resource. 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. Titles in this series are co-published with the Mathematical Sciences Research Institute (MSRI). Many mathematicians have been drawn to mathematics through their experience with math circles: extracurricular programs exposing teenage students to advanced mathematical topics and a myriad of problem solving techniques and inspiring in them a lifelong love for mathematics. Founded in 1998, the Berkeley Math Circle (BMC) is a pioneering model of a U.S. math circle, aspiring to prepare our best young minds for their future roles as mathematics leaders. Over the last decade, 50 instructors--from university professors to high school teachers to business tycoons--have shared their passion for mathematics by delivering more than 320 BMC sessions full of mathematical challenges and wonders. Based on a dozen of these sessions, this book encompasses a wide variety of enticing mathematical topics: from inversion in the plane to circle geometry; from combinatorics to Rubik's cube and abstract algebra; from number theory to mass point theory; from complex numbers to game theory via invariants and monovariants. The treatments of these subjects encompass every significant method of proof and emphasize ways of thinking and reasoning via 100 problem solving techniques. Also featured are 300 problems, ranging from beginner to intermediate level, with occasional peaks of advanced problems and even some open questions. The book presents possible paths to studying mathematics and inevitably falling in love with it, via teaching two important skills: thinking creatively while still ``obeying the rules,'' and making connections between problems, ideas, and theories. The book encourages you to apply the newly acquired knowledge to problems and guides you along the way, but rarely gives you ready answers. ``Learning from our own mistakes'' often occurs through discussions of non-proofs and common problem solving pitfalls. The reader has to commit to mastering the new theories and techniques by ``getting your hands dirty'' with the problems, going back and reviewing necessary problem solving techniques and theory, and persistently moving forward in the book. The mathematical world is huge: you'll never know everything, but you'll learn where to find things, how to connect and use them. The rewards will be substantial. 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. In Nature Numbers, math is beautiful, recognizable, and all around us! Highly engaging pictures of animals and nature scenes, along with cool chalk illustrations, are used to introduce basic math concepts and encourage kids to see a world of numbers all around them. K-2 math concepts include learning about shapes. This book explores shapes in nature with amazing nature pictures and chalk illustrations! "Math Renaissance is a book for teachers and parents of children ages five and up. The co-authors Rodi and Rachel Steinig share their insights as mother and daughter, co-teachers, and co-learners ... The book shifts mathematics education toward inquiry, discovery, conceptual understanding, and lasting joy."--Page 4 of cover “In this sparkling narrative, mathematics is indeed set free.” -Michael Shermer, author of The Believing Brain In classrooms around the world, Robert and Ellen Kaplan's pioneering Math Circle program, begun at Harvard, has introduced students ages six to sixty to the pleasures of mathematics, exploring topics that range from Roman numerals to quantum mechanics. In Out of the Labyrinth, the Kaplans reveal the secrets of their highly successful approach, which embraces the exhilarating joy of math's “accessible mysteries.” Stocked with puzzles, colorful anecdotes, and insights from the authors' own teaching experience, Out of the Labyrinth is both an engaging and practical guide for parents and educators, and a treasure chest of mathematical discoveries. For any reader who has felt the excitement of mathematical discovery-or tried to convey it to someone else-this volume will be a delightful and valued companion. This book provides an overview of how to run a Mathematical “Circle,” i.e., an organization that discovers and nurtures young mathematical talents through meaningful extra-curricular activities. This is the first volume in a trilogy describing in particular the S.M.A.R.T. Circle project, which was founded in Edmonton, Canada in 1981. The acronym S.M.A.R.T. stands for Saturday Mathematical Activities, Recreations & Tutorials. This book, Volume I, offers a sampling of many aspects, including projects and mini-courses. Volume II, which consists of student projects, addresses the purpose of the Circle, and Volume III, consisting of mini-courses, explains what actually takes place in the Circle. All three volumes provide a wealth of resources (mathematical problems, quizzes and games, together with their solutions). The

books will be of interest to self-motivated students who want to conduct independent research, teachers who work with these students, and teachers who are currently running or planning to run Mathematical Circles of their own. The Original Collection of Math Contests: Lessons and Problems for Elementary School, authored and edited by volunteers of the Orange County Math Circle, contains six topical lessons and two full years of OCMC's Thanksgiving Tournament for grades 3 through 6. With over 400 problems with full solutions, this book is a great resource for elementary schoolers looking to get started with competition math, sharpen their skills, or simply enjoy the process of learning. Many mathematicians have been drawn to mathematics through their experience with math circles. The Berkeley Math Circle (BMC) started in 1998 as one of the very first math circles in the U.S. Over the last decade and a half, 100 instructors--university professors, business tycoons, high school teachers, and more--have shared their passion for mathematics by delivering over 800 BMC sessions on the UC Berkeley campus every week during the school year. This second volume of the book series is based on a dozen of these sessions, encompassing a variety of enticing and stimulating mathematical topics, some new and some continuing from Volume I: from dismantling Rubik's Cube and randomly putting it back together to solving it with the power of group theory;from raising knot-eating machines and letting Alexander the Great cut the Gordian Knot to breaking through knot theory via the Jones polynomial;from entering a seemingly hopeless infinite raffle to becoming friendly with multiplicative functions in the land of Dirichlet, Möbius, and Euler;from leading an army of jumping fleas in an old problem from the International Mathematical Olympiads to improving our own essay-writing strategies;from searching for optimal paths on a hot summer day to questioning whether Archimedes was on his way to discovering trigonometry 2000 years ago Do some of these scenarios sound bizarre, having never before been associated with mathematics? Mathematicians love having fun while doing serious mathematics and that love is what this book intends to share with the reader. Whether at a beginner, an intermediate, or an advanced level, anyone can find a place here to be provoked to think deeply and to be inspired to create. 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. Titles in this series are co-published with the Mathematical Sciences Research Institute (MSRI). This book is based on selected topics that the authors taught in math circles for elementary school students at the University of California, Berkeley; Stanford University; Dominican University (Marin County, CA); and the University of Oregon (Eugene). It is intended for people who are already running a math circle or who are thinking about organizing one. It can be used by parents to help their motivated, math-loving kids or by elementary school teachers. We also hope that bright fourth or fifth graders will be able to read this book on their own. The main features of this book are the logica. This revised edition of a mathematical classic originally published in 1957 will bring to a new generation of students the enjoyment of investigating that simplest of mathematical figures, the circle. The author has supplemented this new edition with a special chapter designed to introduce readers to the vocabulary of circle concepts with which the readers of two generations ago were familiar. Readers of Circles need only be armed with paper, pencil, compass, and straight edge to find great pleasure in following the constructions and theorems. Those who think that geometry using Euclidean tools died out with the ancient Greeks will be pleasantly surprised to learn many interesting results which were only discovered in modern times. Novices and experts alike will find much to enlighten them in chapters dealing with the representation of a circle by a point in three-space, a model for non-Euclidean geometry, and the isoperimetric property of the circle. 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. Playing with Math: Stories from Math Circles, Homeschoolers, and Passionate Teachers brings together the stories of over thirty authors who share their math enthusiasm with their communities, families, or students. After every chapter is a puzzle, game, or activity to get you and your kids playing with math too. MATH CIRCLES: Julia and Maria conduct math circles with young children. Jamylle creates a math circle for African American middle-school students. Bob and Ellen take their math circle into a prison. Colleen discovers the power of games at her after-school math center. Sue opens her home up for families to play with math. Nancy creates a math festival. HOMESCHOOLERS: Julie learns from her kids how differently each child learns math. Jimmie hesitantly dips her toe in the water, and moves her daughter toward a living math approach. Tiff, the math hater, discovers beauty in math. PASSIONATE TEACHERS: Michelle teaches math with the help of three-toed dinosaurs, while Friedrich gets his help from vampires. Pilar begs parents to let their kids discover mathematical truths without being shown our grown-up shortcuts too quickly. WHO'S THIS BOOK FOR? Parents, grandparents, teachers, math enthusiasts, math-haters who don't want to pass their affliction on...Everyone! Thoughtful stories, puzzles, games, and activities will give you new insights. Join us - we're playing with math! These two books are the first volumes of articales published from 1970 to 1990 in the Russian journal, Kvant. The influence of the this magazine on mathematics and physics education in Russia is unmatched. Articles selected for these two volumes are written by leading Russian mathematicians and expositors. "How do you want your child to feel about math? Confident, curious and deeply connected? Then Moebius Noodles is for you. It offers advanced math activities to fit your child's personality, interests, and needs. Can you enjoy playful math with your child? Yes! The book shows you how to go beyond your own math limits and anxieties to do so. It opens the door to a supportive online community that will answer your questions and give you ideas along the way. Learn how you can create an immersive rich math environment for your baby. Find out ways to help your toddler discover deep math in everyday experiences. Play games that will develop your child's sense of happy familiarity with mathematics. A five-year-old once asked us, "Who makes math?" and jumped for joy at the answer, "You!" Moebius Noodles helps you take small, immediate steps toward the sense of mathematical power. You and your child can make math your own. Together, make your own math!"--Publisher's website.

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