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KEY=CIRCLES - LUCA WHITEHEAD

Introduction to Functional Equations

Theory and Problem-solving Strategies for Mathematical Competitions and Beyond

American Mathematical Soc. 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.

A Decade of the Berkeley Math Circle

The American Experience

American Mathematical Soc. 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.

Statistical Methods for Climate Scientists

Cambridge University Press An accessible introduction to statistical methods for students in the climate sciences.

Computational Physics - A Practical Introduction to

Computational Physics and Scientific Computing (using C++), Vol. II

Lulu.com This book is an introduction to the computational methods used in physics and other related scientific fields. It is addressed to an audience that has already been exposed to the introductory level of college physics, usually taught during the first two years of an undergraduate program in science and engineering. It assumes no prior knowledge of numerical analysis, programming or computers and teaches whatever is necessary for the solution of the problems addressed in the text. C++ is used for programming the core programs and data analysis is performed using the powerful tools of the GNU/Linux environment. All the necessary software is open source and freely available. The book starts with very simple problems in particle motion and ends with an in-depth discussion of advanced techniques used in Monte Carlo simulations in statistical mechanics. The level of instruction rises slowly, while discussing problems like the diffusion equation, electrostatics on the plane, quantum mechanics and random walks.

Computational Physics - A Practical Introduction to Computational Physics and Scientific Computing (using C++), Vol. I

Lulu.com This book is an introduction to the computational methods used in physics and other related scientific fields. It is addressed to an audience that has already been exposed to the introductory level of college physics, usually taught during the first two years of an undergraduate program in science and engineering. It assumes no prior knowledge of numerical analysis, programming or computers and teaches whatever is necessary for the solution of the problems addressed in the text. C++ is used for programming the core programs and data analysis is performed using the powerful tools of the GNU/Linux environment. All the necessary software is open source and freely available. The book starts with very simple problems in particle motion and ends with an in-depth discussion of advanced techniques

used in Monte Carlo simulations in statistical mechanics. The level of instruction rises slowly, while discussing problems like the diffusion equation, electrostatics on the plane, quantum mechanics and random walks.

Second Order Elliptic Equations and Elliptic Systems

Contemporary Mathematics

American Mathematical Soc. This volume contains the proceedings of the AMS Special Session on Nonstandard Finite-Difference Discretizations and Nonlinear Oscillations, in honor of Ronald Mickens's 70th birthday, held January 9-10, 2013, in San Diego, CA. Included are papers on design and analysis of discrete-time and continuous-time dynamical systems arising in the natural and engineering sciences, in particular, the design of robust nonstandard finite-difference methods for solving continuous-time ordinary and partial differential equation models, the analytical and numerical study of models that undergo nonlinear oscillations, as well as the design of deterministic and stochastic models for epidemiological and ecological processes. Some of the specific topics covered in the book include the analysis of deterministic and stochastic SIR-type models, the assessment of cost-effectiveness of vaccination problems, finite-difference methods for oscillatory dynamical systems (including the Schrödinger equation and Brusselator system), the design of exact and elementary stable finite-difference methods, the study of a two-patch model with Allee effects and disease-modified fitness, the study of the delay differential equation model with application to circadian rhythm and the application of some special functions in the solutions of some problems arising in the natural and engineering sciences. A notable feature of the book is the collection of some relevant open problems, intended to help guide the direction of future research in the area.

Mathematical Circles

(Russian Experience)

American Mathematical Soc. 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.

Math from Three to Seven

The Story of a Mathematical Circle for Preschoolers

American Mathematical Soc. 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).

Critical Issues in Mathematics Education

IAP The word "critical" in the title of this collection has three meanings, all of which are relevant. One meaning, as applied to a situation or problem, is "at a point of crisis". A second meaning is "expressing adverse or disapproving comments or judgments". A third is related to the verb "to critique", meaning "to analyze the merits and faults of". The authors contributing to this book pose challenging questions, from multiple perspectives, about the roles of mathematics in society and the implications for education. Traditional reasons for teaching mathematics include: preparing a new generation of mathematics researchers and a cadre of technically competent users of mathematics; training students to think logically; and because mathematics is as much part of cultural heritage as literature or music. These reasons remain valid, though open to critique, but a deeper analysis is required that recognizes the roles of mathematics in framing many aspects of contemporary society, that will connect mathematics education to the lived experiences of students, their communities, and society in general, and that acknowledges the global ethical responsibilities of mathematicians and mathematics educators. The book is organized in four sections (1) Mathematics education: For what and why? (2) Globalization and cultural diversity, (3) Mathematics, education, and society and (4) Social justice in, and through, mathematics education The chapters address fundamental issues such as the relevance of school mathematics in people's lives; creating a sense of agency for the field of mathematics education, and redefining the relationship between mathematics as discipline, mathematics as school subject and mathematics as part of people's lives.

A Moscow Math Circle

Week-by-week Problem Sets

American Mathematical Soc. 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.

Functional Equations and How to Solve Them

Springer Science & Business Media 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.

Mathematical Circle Diaries, Year 1

Complete Curriculum for Grades 5 to 7

American Mathematical Soc. 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.

Euclidean Geometry

A Guided Inquiry Approach

American Mathematical Soc. Geometry has been an essential element in the study of mathematics since antiquity. Traditionally, we have also learned formal reasoning by studying Euclidean geometry. In this book, David Clark develops a modern axiomatic approach to this ancient subject, both in content and presentation. Mathematically, Clark has chosen a new set of axioms that draw on a modern understanding of set theory and logic, the real number continuum and measure theory, none of which were available in Euclid's time. The result is a development of the standard content of Euclidean geometry with the mathematical precision of Hilbert's foundations of geometry. In particular, the book covers all the topics listed in the Common Core State Standards for high school synthetic geometry. The presentation uses a guided inquiry, active learning pedagogy. Students benefit from the axiomatic development because they themselves solve the problems and prove the theorems with the instructor serving as a guide and mentor. Students are thereby empowered with the knowledge that they can solve problems on their own

without reference to authority. This book, written for an undergraduate axiomatic geometry course, is particularly well suited for future secondary school teachers. 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.

PISA Take the Test Sample Questions from OECD's PISA Assessments

Sample Questions from OECD's PISA Assessments

OECD Publishing This book presents all the publicly available questions from the PISA surveys. Some of these questions were used in the PISA 2000, 2003 and 2006 surveys and others were used in developing and trying out the assessment.

Math Circle by the Bay: Topics for Grades 1–5

American Mathematical Soc. 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.

Lectures on Functional Equations and Their Applications

Courier Corporation Numerous detailed proofs highlight this treatment of functional equations. Starting with equations that can be solved by simple substitutions, the book then moves to equations with several unknown functions and methods of reduction to differential and integral equations. Also includes composite equations, equations with several unknown functions of several variables, vector and matrix equations, more. 1966 edition.

Mathematics via Problems

Part 1: Algebra

American Mathematical Society, Mathematical Sciences Research Institute This book is a translation from Russian of Part I of the book **Mathematics Through Problems: From Olympiads and Math Circles to Profession**. The other two parts, **Geometry and Combinatorics**, will be published soon. The main goal of this book is to develop important parts of mathematics through problems. The author tries 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 the sophisticated world of topics such as group theory, Galois theory, and so on, thus building a bridge (by showing that there is no gap) between standard high school exercises and more intricate and abstract concepts in mathematics. Definitions and/or references for material that is not standard in the school curriculum are included. However, many topics in the book are difficult when you start learning them from scratch. To help with this, 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 author 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.

Living Proof

Stories of Resilience Along the Mathematical Journey

Wow! This is a powerful book that addresses a long-standing elephant in the mathematics room. Many people learning math ask ``Why is math so hard for me while everyone else understands it?" and ``Am I good enough to succeed in math?" In answering these questions the book shares personal stories from many now-accomplished mathematicians affirming that ``You are not alone; math is hard for everyone" and ``Yes; you are good enough." Along the way the book addresses other issues such as biases and prejudices that mathematicians encounter, and it provides inspiration and emotional support for mathematicians ranging from the experienced professor to the struggling mathematics student. --Michael Dorff, MAA President This book is a remarkable collection of personal reflections on what it means to be, and to become, a mathematician. Each story reveals a unique and refreshing understanding of the barriers erected by our cultural focus on ``math is hard." Indeed, mathematics is hard, and so are many other things--as Stephen Kennedy points out in his cogent introduction. This collection of essays offers inspiration to students of mathematics and to mathematicians at every career stage. --Jill Pipher, AMS President This book is published in cooperation with the Mathematical Association of America.

The Shape of Inner Space

String Theory and the Geometry of the Universe's Hidden Dimensions

Il Saggiatore Argues that geometry is fundamental to string theory--which posits that we live in a 10-dimensional existence--as well as the very nature of the universe, and explains where mathematics will take string theory next.

Testimonios: Stories of Latinx and Hispanic Mathematicians

American Mathematical Soc. Testimonios brings together first-person narratives from the vibrant, diverse, and complex Latinx and Hispanic mathematical community. Starting with childhood and family, the authors recount their own individual stories, highlighting their upbringing, education, and career paths. Their particular stories, told in their own voices, from their own perspectives, give visibility to some of the experiences of Latinx/Hispanic mathematicians. Testimonios seeks to inspire the next generation of Latinx and Hispanic mathematicians by featuring the stories of people like them, holding a mirror up to our own community. It also aims to provide a window for mathematicians (and aspiring mathematicians) from all ethnicities, with the hope of inspiring a better understanding of the diversity of the mathematical community.

The Number Sense

How the Mind Creates Mathematics, Revised and

Updated Edition

OUP USA "Our understanding of how the human brain performs mathematical calculations is far from complete. In *The Number Sense*, Stanislas Dehaene offers readers an enlightening exploration of the mathematical mind. Using research showing that human infants have a rudimentary number sense, Dehaene suggests that this sense is as basic as our perception of color, and that it is wired into the brain. But how then did we leap from this basic number ability to trigonometry, calculus, and beyond? Dehaene shows that it was the invention of symbolic systems of numerals that started us on the climb to higher mathematics. Tracing the history of numbers, we learn that in early times, people indicated numbers by pointing to part of their bodies, and how Roman numerals were replaced by modern numbers. On the way, we also discover many fascinating facts: for example, because Chinese names for numbers are short, Chinese people can remember up to nine or ten digits at a time, while English-speaking people can only remember seven. A fascinating look at the crossroads where numbers and neurons intersect, *The Number Sense* offers an intriguing tour of how the structure of the brain shapes our mathematical abilities, and how math can open up a window on the human mind"--Provided by publisher.

Circle in a Box

American Mathematical Soc. 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).

The Survival of a Mathematician From Tenure-track to Emeritus

American Mathematical Soc. "One of the themes of the book is how to have a fulfilling professional life. In order to achieve this goal, Krantz discusses keeping a vigorous scholarly program going and finding new challenges, as well as dealing with the everyday tasks of research, teaching, and administration." "In short, this is a survival manual for the professional mathematician - both in academics and in industry and government agencies. It is a sequel to the author's *A Mathematician's Survival Guide*."--BOOK JACKET.

TriMathlon

A Workout Beyond the School Curriculum

CRC Press Swim, Run, and Bike your way to math success! Judith and Paul Sally, accomplished mathematicians and experienced teachers, offer a challenging athletic workout to the minds of their young readers through exercises in areas of number theory and geometry that extend beyond the realm of basic mathematics in the school curriculum. The activities in the book present readers with a dynamic and fresh perspective on mathematics, encouraging active and energetic responses leading to a level of thinking that carries over into college mathematics. The book's novel games coach the players to experience the satisfaction and confidence that accompany meaningful investigations of mathematical ideas. This book will provide a stimulus to make scientific competition as much a part of our educational

culture as the athletic activities to which we are accustomed.

Titu Andreescu and Mark Saul

American Mathematical Soc. This book starts with simple arithmetic inequalities and builds to sophisticated inequality results such as the Cauchy-Schwarz and Chebyshev inequalities. Nothing beyond high school algebra is required of the student. The exposition is lean. Most of the learning occurs as the student engages in the problems posed in each chapter. And the learning is not “linear”. The central topic of inequalities is linked to others in mathematics. Often these topics relate to much more than algebraic inequalities. There are also “secret” pathways through the book. Each chapter has a subtext, a theme which prepares the student for learning other mathematical topics, concepts, or habits of mind. For example, the early chapters on the arithmetic mean/geometric mean inequality show how very simple observations can be leveraged to yield useful and interesting results. Later chapters give examples of how one can generalize a mathematical statement. The chapter on the Cauchy-Schwarz inequality provides an introduction to vectors as mathematical objects. And there are many other secret pathways that the authors hope the reader will discover—and follow. 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.

Geometry in Problems

American Mathematical Soc. Classical Euclidean geometry, with all its triangles, circles, and inscribed angles, remains an excellent playground for high-school mathematics students, even if it looks outdated from the professional mathematician's viewpoint. It provides an excellent choice of elegant and natural problems that can be used in a course based on problem solving. The book contains more than 750 (mostly) easy but nontrivial problems in all areas of plane geometry and solutions for most of them, as well as additional problems for self-study (some with hints). Each chapter also provides concise reminders of basic notions used in the chapter, so the book is almost self-contained (although a good textbook and competent teacher are always recommended). More than 450 figures illustrate the problems and their solutions. The book can be used by motivated high-school students, as well as their teachers and parents. After solving the problems in the book the student will have mastered the main notions and methods of plane

geometry and, hopefully, will have had fun in the process. 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. What a joy! Shen's "Geometry in Problems" is a gift to the school teaching world. Beautifully organized by content topic, Shen has collated a vast collection of fresh, innovative, and highly classroom-relevant questions, problems, and challenges sure to enliven the minds and clever thinking of all those studying Euclidean geometry for the first time. This book is a spectacular resource for educators and students alike. Users will not only sharpen their mathematical understanding of specific topics but will also sharpen their problem-solving wits and come to truly own the mathematics explored. Also, Math Circle leaders can draw much inspiration for session ideas from the material presented in this book. --James Tanton, Mathematician-at-Large, Mathematical Association of America We learn mathematics best by doing mathematics. The author of this book recognizes this principle. He invites the reader to participate in learning plane geometry through carefully chosen problems, with brief explanations leading to much activity. The problems in the book are sometimes deep and subtle: almost everyone can do some of them, and almost no one can do all. The reader comes away with a view of geometry refreshed by experience. --Mark Saul, Director of Competitions, Mathematical Association of America

The Art and Craft of Problem Solving

Wiley Global Education 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.

Fascinating Mathematical People

Interviews and Memoirs

Princeton University Press Top mathematicians talk about their work and lives **Fascinating Mathematical People** is a collection of informal interviews and memoirs of sixteen prominent members of the mathematical community of the twentieth century, many still active. The candid portraits collected here demonstrate that while these men and women vary widely in terms of their backgrounds, life stories, and worldviews, they all share a deep and abiding sense of wonder about mathematics. Featured here—in their own words—are major research mathematicians whose cutting-edge discoveries have advanced the frontiers of the field, such as Lars Ahlfors, Mary Cartwright, Dusa McDuff, and Atle Selberg. Others are leading mathematicians who have also been highly influential as teachers and mentors, like Tom Apostol and Jean Taylor. Fern Hunt describes what it was like to be among the first black women to earn a PhD in mathematics. Harold Bacon made trips to Alcatraz to help a prisoner learn calculus. Thomas Banchoff, who first became interested in the fourth dimension while reading a Captain Marvel comic, relates his fascinating friendship with Salvador Dalí and their shared passion for art, mathematics, and the profound connection between the two. Other mathematical people found here are Leon Bankoff, who was also a Beverly Hills dentist; Arthur Benjamin, a part-time professional magician; and Joseph Gallian, a legendary mentor of future mathematicians, but also a world-renowned expert on the Beatles. This beautifully illustrated collection includes many photographs never before published, concise introductions by the editors to each person, and a foreword by Philip J. Davis.

Mathematics via Problems: Part 2: Geometry

American Mathematical Soc. 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 Mathematical Sciences in 2025

National Academies Press The mathematical sciences are part of nearly all aspects of everyday life-the discipline has underpinned such beneficial modern capabilities as Internet search, medical imaging, computer animation, numerical weather predictions, and all types of digital communications. The Mathematical Sciences in 2025 examines the current state of the mathematical sciences and explores the changes needed for the discipline to be in a strong position and able to maximize its contribution to the nation in 2025. It finds the vitality of the discipline excellent and that it contributes in expanding ways to most areas of science and engineering, as well as to the nation as a whole, and recommends that training for future generations of mathematical scientists should be re-assessed in light of the increasingly cross-disciplinary nature of the mathematical sciences. In addition, because of the valuable interplay between ideas and people from all parts of the mathematical sciences, the report emphasizes that universities and the government need to continue to invest in the full spectrum of the mathematical sciences in order for the whole enterprise to continue to flourish long-term.

Functions and Polynomials Problems and Solutions from

Mathematical Olympiads

Matholymps This book contains Functions and Polynomials problems and solutions from all Mathematical Olympiads and competitions around the world.

Awesome Math

Teaching Mathematics with Problem Based Learning

John Wiley & Sons Help your students to think critically and creatively through team-based problem solving instead of focusing on testing and outcomes. Professionals throughout the education system are recognizing that standardized testing is holding students back. Schools tend to view children as outcomes rather than as individuals who require guidance on thinking critically and creatively. **Awesome Math** focuses on team-based problem solving to teach discrete mathematics, a subject essential for success in the STEM careers of the future. Built on the increasingly popular growth mindset, this timely book emphasizes a problem-solving approach for developing the skills necessary to think critically, creatively, and collaboratively. In its current form, math education is a series of exercises: straightforward problems with easily-obtained answers. Problem solving, however, involves multiple creative approaches to solving meaningful and interesting problems. The authors, co-founders of the multi-layered educational organization **AwesomeMath**, have developed an innovative approach to teaching mathematics that will enable educators to: Move their students beyond the calculus trap to study the areas of mathematics most of them will need in the modern world Show students how problem solving will help them achieve their educational and career goals and form lifelong communities of support and collaboration Encourage and reinforce curiosity, critical thinking, and creativity in their students Get students into the growth mindset, coach math teams, and make math fun again Create lesson plans built on problem based learning and identify and develop educational resources in their schools **Awesome Math: Teaching Mathematics with Problem Based Learning** is a must-have resource for general education teachers and math specialists in grades 6 to 12, and resource specialists, special education teachers, elementary educators, and other primary education professionals.

Statistics and Data Analysis for Financial Engineering with R examples

Springer The new edition of this influential textbook, geared towards graduate or advanced undergraduate students, teaches the statistics necessary for financial engineering. In doing so, it illustrates concepts using financial markets and economic data, R Labs with real-data exercises, and graphical and analytic methods for modeling and diagnosing modeling errors. These methods are critical because financial engineers now have access to enormous quantities of data. To make use of this data, the powerful methods in this book for working with quantitative information, particularly about volatility and risks, are essential. Strengths of this fully-revised edition include major additions to the R code and the advanced topics covered. Individual chapters cover, among other topics, multivariate distributions, copulas, Bayesian computations, risk management, and cointegration. Suggested prerequisites are basic knowledge of statistics and probability, matrices and linear algebra, and calculus. There is an appendix on probability, statistics and linear algebra. Practicing financial engineers will also find this book of interest.

Math Circles for Elementary School Students

American Mathematical Soc. 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).

What's Happening in the Mathematical Sciences

American Mathematical Soc. Mathematicians like to point out that mathematics is universal. In spite of this, most people continue to view it as either mundane (balancing a checkbook) or mysterious (cryptography). This fifth volume of the What's Happening series contradicts that view by showing that mathematics is indeed found everywhere—in science, art, history, and our everyday lives. Here is some of what you'll find in this volume: **Mathematics and Science** **Mathematical biology: Mathematics was key to cracking the genetic code. Now, new mathematics is needed to understand the three-dimensional structure of the proteins produced from that code. Celestial mechanics and cosmology: New methods have revealed a multitude of solutions to the three-body problem. And other new work may answer one of cosmology's most fundamental questions: What is the size and shape of the universe? Mathematics and Everyday Life** **Traffic jams: New models are helping researchers understand where traffic jams come from—and maybe what to do about them! Small worlds: Researchers have found a short distance from theory to applications in the study of small world networks. Elegance in Mathematics** **Beyond Fermat's Last Theorem: Number theorists are reaching higher ground after Wiles' astounding 1994 proof: new developments in the elegant world of elliptic curves and modular functions. The Millennium Prize Problems: The Clay Mathematics Institute has offered a million dollars for solutions to seven important and difficult unsolved problems. These are just some of the topics of current interest that are covered in this latest volume of What's Happening in the Mathematical Sciences. The book has broad appeal for a wide spectrum of mathematicians and scientists, from high school students through advanced-level graduates and researchers.**

The Death and Life of Great American Cities

Vintage Thirty years after its publication, *The Death and Life of Great American Cities* was described by *The New York Times* as "perhaps the most influential single work in the history of town planning....[It] can also be seen in a much

larger context. It is first of all a work of literature; the descriptions of street life as a kind of ballet and the bitingly satiric account of traditional planning theory can still be read for pleasure even by those who long ago absorbed and appropriated the book's arguments." Jane Jacobs, an editor and writer on architecture in New York City in the early sixties, argued that urban diversity and vitality were being destroyed by powerful architects and city planners. Rigorous, sane, and delightfully epigrammatic, Jacobs's small masterpiece is a blueprint for the humanistic management of cities. It is sensible, knowledgeable, readable, indispensable. The author has written a new foreword for this Modern Library edition.

Topics in Functional Equations

Third Edition

Toward the African Revolution

Political Essays

Grove Press Political essays, articles, and notes written between 1952 and 1961.

Lectures and Problems: A Gift to Young Mathematicians

American Mathematical Soc. Vladimir Arnold (1937-2010) was one of the great mathematical minds of the late 20th century. He did significant work in many areas of the field. On another level, he was keeping with a strong tradition in Russian mathematics to write for and to directly teach younger students interested in mathematics. This book contains some examples of Arnold's contributions to the genre. "Continued Fractions" takes a common enrichment topic in high school math and pulls it in directions that only a master of mathematics could envision. "Euler Groups" treats a similar enrichment topic, but it is rarely treated with the depth and imagination lavished on it in Arnold's text. He sets it in a mathematical context, bringing to bear numerous tools of the trade and expanding the topic way beyond its usual

treatment. In "Complex Numbers" the context is physics, yet Arnold artfully extracts the mathematical aspects of the discussion in a way that students can understand long before they master the field of quantum mechanics. "Problems for Children 5 to 15 Years Old" must be read as a collection of the author's favorite intellectual morsels. Many are not original, but all are worth thinking about, and each requires the solver to think out of his or her box. Dmitry Fuchs, a long-term friend and collaborator of Arnold, provided solutions to some of the problems. Readers are of course invited to select their own favorites and construct their own favorite solutions. In reading these essays, one has the sensation of walking along a path that is found to ascend a mountain peak and then being shown a vista whose existence one could never suspect from the ground. Arnold's style of exposition is unforgiving. The reader--even a professional mathematician--will find paragraphs that require hours of thought to unscramble, and he or she must have patience with the ellipses of thought and the leaps of reason. These are all part of Arnold's intent. 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.

Beyond Jihad

The Pacifist Tradition in West African Islam

Oxford University Press Over the course of the last 1400 years, Islam has grown from a small band of followers on the Arabian peninsula into a global religion of over a billion believers. How did this happen? The usual answer is that Islam spread by the sword - that believers waged jihad against rival tribes and kingdoms and forced them to convert. Lamin Sanneh argues that this is far from the case. *Beyond Jihad* examines the origin and evolution of the Muslim African pacifist tradition, beginning with an inquiry into Islam's beginnings and expansion in North Africa and its transmission across trans-Saharan trade routes to West Africa. The book focuses on the ways in which, without jihad, the religion spread and took hold, and what that assimilation process means for understanding the nature of religious and social change. At the heart of this process were clerics who used educational, religious, and legal scholarship to promote Islam. Once this clerical class emerged it offered continuity and stability in the midst of political changes and cultural shifts; it helped inhibit the spread of radicalism, and otherwise challenged it in specific jihad outbreaks. With its roots

in the Mali Empire and its policy of religious and inter-ethnic accommodation, and going beyond routes and kingdoms, pacifist teaching tracked a cumulative pathway for Islam in remote districts of the Mali Empire by instilling a patient, Sufi-inspired, and jihad-negating impulse into religious life and practice. Islam was successful in Africa, the book argues, not because of military might but because it was made African by Africans who adapted it to a variety of contexts.