

Lecture Notes On Mathematical Olympiad Courses Fo

Olympiad mathematics is not a collection of techniques of solving mathematical problems but a system for advancing mathematical education. This book is based on the lecture notes of the mathematical Olympiad training courses conducted by the author in Singapore. Its scope and depth not only covers and exceeds the usual syllabus, but introduces a variety concepts and methods in modern mathematics. In each lecture, the concepts, theories and methods are taken as the core. The examples are served to explain and enrich their intention and to indicate their applications. Besides, appropriate number of test questions is available for reader's practice and testing purpose. Their detailed solutions are also conveniently provided. The examples are not very complicated so that readers can easily understand. There are many real competition questions included which students can use to verify their abilities. These test questions are from many countries, e.g. China, Russia, USA, Singapore, etc. In particular, the reader can find many questions from China, if he is interested in understanding mathematical Olympiad in China. This book serves as a useful textbook of mathematical Olympiad courses, or as a reference book for related teachers and researchers.

Challenge And Thrill Of Pre-College Mathematics Is An Unusual Enrichment Text For Mathematics Of Classes 9, 10, 11 And 12 For Use By Students And Teachers Who Are Not Content With The Average Level That Routine Text Dare Not Transcend In View Of Their Mass Clientele. It Covers Geometry, Algebra And Trigonometry Plus A Little Of Combinatorics, Number Theory And Probability. It Is Written Specifically For The Top Half Whose Ambition Is To Excel And Rise To The Peak Without Finding The Journey A Forced Uphill Task.The Undercurrent Of The Book Is To Motivate The Student To Enjoy The Pleasures Of A Mathematical Pursuit And Of Problem Solving. More Than 300 Worked Out Problems (Several Of Them From National And International Olympiads) Share With The Student The Strategy, The Excitement, Motivation, Modeling, Manipulation, Abstraction, Notation And Ingenuity That Together Make Mathematics. This Would Be The Starting Point For The Student, Of A Life-Long Friendship With A Sound Mathematical Way Of Thinking.There Are Two Reasons Why The Book Should Be In The Hands Of Every School Or College Student. (Whether He Belongs To A Mathematics Stream Or Not) One, If He Likes Mathematics And, Two, If He Does Not Like Mathematics- The Former, So That The Cramped Robot-Type Treatment In The Classroom Does Not Make Him Into The Latter; And The Latter So That By The Time He Is Halfway Through The Book, He Will Invite Himself Into The Former.

Vietnam has actively organized the National Competition in Mathematics and since 1962, the Vietnamese Mathematical Olympiad (VMO). On the global stage, Vietnam has also competed in the International Mathematical Olympiad (IMO) since 1974 and constantly emerged as one of the top ten. To inspire and further challenge readers, we have gathered in this book selected problems of the VMO from 1962 to 2008. A number of Selection Test problems are also included to aid in the formation and training of a national team for IMO. The book is highly useful for high school students and teachers, coaches and instructors preparing for mathematical olympiads, as well as non-experts simply interested in having the edge over their opponents in mathematical competitions.

Everything you need to know about the 2016-2017 ACT test, with real full-length practice tests from the makers of the ACT! The Official ACT Prep Guide 2016-2017 is the bestselling resource for students gearing up for the ACT test. This comprehensive guide walks you through the entire test experience, from registration through results, with expert advice straight from the test's creators. You'll find effective test-taking strategies, tips for boosting your score on the English, math, reading, and science tests, and detailed information on the enhanced optional writing test. Three new full-length practice tests help you assess your readiness so you can spot weak areas well in advance, and the ACT experts provide valuable advice on preparing both mentally and physically so you can manage anxiety and be fully confident on test day. You also get free online bonus content to help you start college on the right foot, including tips for preparing an application that gets noticed, getting into your first-choice school, being a successful student, and much more. The 2016-2017 version of the ACT guide includes a number of changes, including reading test sections with two shorter prose passages and the enhanced writing test's prompts. This guide provides a preview of what to expect for the entire exam, so you can go into the test feeling fully prepared and ready to excel. Get insider tips and strategies from the exam's creators Improve your score in all five content areas, including the optional writing test Practice with full-length test forms taken from the actual ACT Gear up for college with bonus online advice for a successful first year The ACT is different from other standardized tests. It tests your accumulated skills and knowledge, so sheer memorization and vocabulary lists are unproductive prep strategies. For preparation strategies that actually make a difference in your score—and beyond—go straight to the source with The Official ACT Prep Guide 2016-2017.

Introduction to Mathematical Thinking

Lecture Notes On Mathematical Olympiad Courses: For Senior Section - Volume 1

The Official ACT Prep Guide, 2016 - 2017

Numbers and Functions

(Almost) Impossible Integrals, Sums, and Series

In China, lots of excellent maths students takes an active part in various maths contests and the best six senior high school students will be selected to form the IMO National Team to compete in the International Mathematical Olympiad. In the past ten years they have achieved outstanding results — they have won the first place almost every year.The author is one of the senior coaches of China's IMO National Team, he is the headmaster of Shanghai senior high school which is one of the best high schools of China. In the past ten years the school have won the IMO gold medals almost every year.The author attempts to use some common characteristics of sequence and mathematical induction to fundamentally connect Math Olympiad problems to particular branches of mathematics. In doing so, he highlights the beauty and joy involved with math exploration and at the same time, attempts to arouse readers' interest of learning math and invigorate their courage to challenge themselves with difficult problems.

Annotation. This text provides basic knowledge on how to solve combinatorial problems in mathematical competitions, and also introduces important solutions to combinatorial problems and some typical problems with often-used solutions.

Number theory is an important research field of mathematics. In mathematical competitions, problems of elementary number theory occur frequently. These problems use little knowledge and have many variations. They are flexible and diverse. In this book, the author introduces basic concepts and methods in elementary number theory via problems in mathematical competitions. Readers are encouraged to try to solve the problems by themselves before they read the given solutions of examples. Only in this way can they truly appreciate the beauty of solving.

Trigonometric Functions and Complex Numbers covers the followings areas in the International Mathematical Olympiad (IMO) and other mathematical competitions. Trigonometric identity, graphs and properties of trigonometric equations, inverse trigonometric functions, trigonometric equations, solutions of triangles, trigonometric substitution and trigonometric inequality:The concept and operation of complex numbers, trigonometric form of a complex number, complex number and equation. The contents are essential for the students who want to improve in these areas. Request Inspection Copy

Putnam and Beyond

For Junior Section

Geometric Inequalities

The Singapore Journey

Mathematics Education

In China, lots of excellent maths students take an active interest in various maths contests and the best six senior high school students will be selected to form the IMO National Team to compete in the International Mathematical Olympiad. In the past ten years China's IMO Team has achieved outstanding results — they won the first place almost every year. The authors are coaches of China's IMO National Team, whose students have won many gold medals many times in IMO. This book is part of the Mathematical Olympiad Series which discusses several aspects related to maths contests, such as algebra, number theory, combinatorics, graph theory and geometry. The book explains many basic techniques for proving inequalities such as direct comparison, method of magnifying and reducing, substitution method, construction method, and so on.

In 1736, the mathematician Euler invented graph theory while solving the Konigsberg seven-bridge problem. Over 200 years later, graph theory remains the skeleton content of discrete mathematics, which serves as a theoretical basis for computer science and network information science. This book introduces some basic knowledge and the primary methods in graph theory by many interesting problems and games.

The International Mathematical Olympiad (IMO) is an annual international mathematics competition held for pre-collegiate students. It is also the oldest of the international science olympiads, and competition for places is particularly fierce. This book is an amalgamation of the booklets originally produced to guide students intending to contend for placement on their country's IMO team. See also A First Step to Mathematical Olympiad Problems which was published in 2009. The material contained in this book provides an introduction to the main mathematical topics covered in the IMO, which are: Combinatorics, Geometry and Number Theory. In addition, there is a special emphasis on how to approach unseen questions in Mathematics, and model the writing of proofs. Full answers are given to all questions. Though A Second Step to Mathematical Olympiad Problems is written from the perspective of a mathematician, it is written in a way that makes it easily comprehensible to adolescents. This book is also a must-read for coaches and instructors of mathematical competitions.

This text on mathematical problem solving provides a comprehensive outline of "problemsolving-ology," concentrating on strategy and tactics. It discusses a number of standard mathematical subjects such as combinatorics and calculus from a problem solver's perspective.

Sequences And Mathematical Induction:in Mathematical Olympiad And Competitions (2nd Edition)

Solving Problems in Geometry

Challenge and Thrill of Pre-College Mathematics

A Collection of Problems Suggested for The International Mathematical Olympiads: 1959-2009 Second Edition

For Junior SectionVolume 2

See also A SECOND STEP TO MATHEMATICAL OLYMPIAD PROBLEMS The International Mathematical Olympiad (IMO) is an annual international mathematics competition held for pre-collegiate students.

It is also the oldest of the international science olympiads, and competition for places is particularly fierce. This book is an amalgamation of the first 8 of 15 booklets originally produced to guide students intending to contend for placement on their country's IMO team. The material contained in this book provides an introduction to the main mathematical topics covered in the IMO, which are: Combinatorics, Geometry and Number Theory. In addition, there is a special emphasis on how to approach unseen questions in Mathematics, and model the writing of proofs. Full answers are given to all questions. Though A First Step to Mathematical Olympiad Problems is written from the perspective of a mathematician, it is written in a way that makes it easily comprehensible to adolescents. This book is also a must-read for coaches and instructors of mathematical competitions.

This is a challenging problem-solving book in Euclidean geometry, assuming nothing of the reader other than a good deal of courage. Topics covered included cyclic quadrilaterals, power of a point, homothety, triangle centers; along the way the reader will meet such classical gems as the nine-point circle, the Simson line, the symmedian and the mixtilinear incircle, as well as the theorems of Euler, Ceva, Menelaus, and Pascal. Another part is dedicated to the use of complex numbers and barycentric coordinates, granting the reader both a traditional and computational viewpoint of the material. The final part consists of some more advanced topics, such as inversion in the plane, the cross ratio and projective transformations, and the theory of the complete quadrilateral. The exposition is friendly and relaxed, and accompanied by over 300 beautifully drawn figures. The emphasis of this book is placed squarely on the problems. Each chapter contains carefully chosen worked examples, which explain not only the solutions to the problems but also describe in close detail how one would invent the solution to begin with. The text contains a selection of 300 practice problems of varying difficulty from contests around the world, with extensive hints and selected solutions. This book is especially suitable for students preparing for national or international mathematical olympiads or for teachers looking for a text for an honor class.

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This book contains a multitude of challenging problems and solutions that are not commonly found in classical textbooks. One goal of the book is to present these fascinating mathematical problems in a new and engaging way and illustrate the connections between integrals, sums, and series, many of which involve zeta functions, harmonic series, polylogarithms, and various other special functions and constants. Throughout the book, the reader will find both classical and new problems, with numerous original problems and solutions coming from the personal research of the author. Where classical problems are concerned, such as those given in Olympiads or proposed by famous mathematicians like Ramanujan, the author has come up with new, surprising or unconventional ways of obtaining the desired results. The book begins with a lively foreword by renowned author Paul Nahin and is accessible to those with a good knowledge of calculus from undergraduate students to researchers, and will appeal to all mathematical puzzlers who love a good integral or series.

The Art and Craft of Problem Solving

Bridge to Abstract Mathematics

Combinatorial Problems in Mathematical Competitions

In Mathematical Olympiad and Competitions

Probability and Expectation

The International Mathematical Olympiad (IMO) is a very important competition for high school students. China has taken part in the IMO 31 times since 1985 and has won the top ranking for countries 19 times, with a multitude of gold medals for individual students. The six students China has sent every year were selected from 60 students among approximately 300 students who took part in the annual China Mathematical Competition during the winter months.This book includes the problems and solutions of the most important mathematical competitions from 2010 to 2014 in China, such as China Mathematical Competition, China Mathematical Olympiad, China Girls' Mathematical Olympiad. These problems are almost exclusively created by the experts who are engaged in mathematical competition teaching and researching. Some of the solutions are from national training team and national team members, their wonderful solutions being the feature of this book. This book is useful to mathematics fans, middle school students engaged in mathematical competition, coaches in mathematics teaching and teachers setting up math elective courses.

Trouble in the Barker's Class

In China, lots of excellent maths students take an active interest in various maths contests and the best six senior high school students will be selected to form the IMO National Team to compete in the International Mathematical Olympiad. In the past ten years China's IMO Team has achieved outstanding results -- they won the first place almost every year. The author is one of the coaches of China's IMO National Team, whose students have won many gold medals many times in IMO. This book is part of the Mathematical Olympiad Series which discusses several aspects related to maths contests, such as algebra, number theory, combinatorics, graph theory and geometry. The book elaborates on Geometric Inequality problems such as inequality for the inscribed quadrilateral, the area inequality for special polygons, linear geometric inequalities, etc.

The International Mathematical Olympiad (IMO) is a competition for high school students. China has taken part in the IMO 21 times since 1985 and has won the top ranking for countries 14 times, with a multitude of golds for individual students. The six students China has sent every year were selected from 20 to 30 students among approximately 130 students who took part in the annual China Mathematical Competition during the winter months. This volume comprises a collection of original problems with solutions that China used to train their Olympiad team in the years from 2006 to 2008. Mathematical Olympiad problems with solutions for the years 2002?2006 appear in an earlier volume, Mathematical Olympiad in China.

Insights and Strategies

Euclidean Geometry in Mathematical Olympiads

Lecture Notes on Mathematical Olympiad Courses

Graph Theory

A Second Step to Mathematical Olympiad Problems

This book gives an extensive survey of many important topics in the theory of Hamilton–Jacobi equations with particular emphasis on modern approaches and viewpoints. Firstly, the basic well-posedness theory of viscosity solutions for first-order Hamilton–Jacobi equations is covered, followed by a very active research topic since the late 1980s but not covered in any standard textbook, is discussed in depth. Afterwards, dynamical properties of solutions, the Aubry–Mather theory, and weak Kolmogorov–Arnold–Moser (KAM) theory are studied. Both dynamical and PDE approaches are presented. Connections between homogenization, dynamical aspects, and the optimal rate of convergence in homogenization theory are given as well. The book is self-contained and is useful for a course or for references. It can also serve as a gentle introductory reference to the theory. The International Mathematical Olympiad (IMO) is a competition for high school students. China has taken part in the IMO 21 times since 1985 and has won the top ranking for countries 14 times, with a multitude of golds for individual students. The six students China has sent every year were selected from 20 to 30 students among approximately 130 students who took part in the annual China Mathematical Competition during the winter months. This volume of comprises a collection of original problems with solutions that China used to train their Olympiad team in the years from 2009 to 2013. Mathematical Olympiad problems with solutions for the years 2002?2006 appear in an earlier volume, Mathematical Olympiad in China."

A Bridge to Abstract Mathematics will prepare the mathematical novice to explore the universe of abstract mathematics. Mathematics is a science that concerns theorems that must be proved within the constraints of a logical system of axioms and definitions rather than theorems. Readers will learn how to read mathematics beyond popular computational calculus courses. Moreover, readers will learn how to construct their own proofs. The book is intended as the primary text for an introductory course in proving theorems, as well as for self-study or as a reference. The book is self-contained and is useful for a course or for references. It can also serve as a gentle introductory reference to the theory. The International Mathematical Olympiad (IMO) is a competition for high school students. China has taken part in the IMO 21 times since 1985 and has won the top ranking for countries 14 times, with a multitude of golds for individual students. The six students China has sent every year were selected from 20 to 30 students among approximately 130 students who took part in the annual China Mathematical Competition during the winter months. This volume of comprises a collection of original problems with solutions that China used to train their Olympiad team in the years from 2009 to 2013. Mathematical Olympiad problems with solutions for the years 2002?2006 appear in an earlier volume, Mathematical Olympiad in China."

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Problems of Number Theory in Mathematical Competitions

Problems and Solutions

For Junior Section Vol. 2

Trigonometric Functions and Complex Numbers

For Senior Section

This book will help those wishing to teach a course in technical writing, or who wish to write themselves.

This volume aims to collect new ideas presented in the form of 4 page papers dedicated to mathematical and statistical methods in actuarial sciences and finance. The cooperation between mathematicians and statisticians working in insurance and finance is a very fruitful field and provides interesting scientific products in theoretical models and practical applications, as well as in scientific discussion of problems of national and international interest. This work reflects the results discussed at the biennial conference on Mathematical and Statistical Methods for Actuarial Sciences and Finance (MAF), born at the University of Salerno in 2004.

The book is based on lecture notes of a course 'from elementary number theory to an introduction to matrix theory' given at the Technion to gifted high school students. It is problem based, and covers topics in undergraduate mathematics that can be introduced in high school through solving challenging problems. These topics include Number theory, Set Theory, Group Theory, Matrix Theory, and applications to cryptography and search engines.

In the twenty-first century, everyone can benefit from being able to think mathematically. This is not the same as "doing math." The latter usually involves the application of formulas, procedures, and symbolic manipulations; mathematical thinking is a powerful way of thinking about things in the world -- logically, analytically, quantitatively, and with precision. It is not a natural way of thinking, but it can be learned. Mathematicians, scientists, and engineers need to "do math," and it takes many years of college-level education to learn all that is required. Mathematical thinking is valuable to everyone, and can be mastered in about six weeks by anyone who has completed high school mathematics. Mathematical thinking does not have to be about mathematics at all, but parts of mathematics provide the ideal target domain to learn how to think that way, and that is the approach taken by this short but valuable book. The book is written primarily for first and second year students of science, technology, engineering, and mathematics (STEM) at colleges and universities, and for high school students intending to study a STEM subject at university. Many students encounter difficulty going from high school math to college-level mathematics. Even if they did well at math in school, most are knocked off course for a while by the shift in emphasis, from the K-12 focus on mastering procedures to the "mathematical thinking" characteristic of much university mathematics. Though the majority survive the transition, many do not. To help them make the shift, colleges and universities often have a "transition course." This book could serve as a textbook or a supplementary source for such a course. Because of the widespread applicability of mathematical thinking, however, the book has been kept short and written in an engaging style, to make it accessible to anyone who seeks to extend and improve their analytic thinking skills. Going beyond a basic grasp of analytic thinking that everyone can benefit from, the STEM student who truly masters mathematical thinking will find that college-level mathematics goes from being confusing, frustrating, and at times seemingly impossible, to making sense and being hard but doable. Dr. Keith Devlin is a professional mathematician at Stanford University and the author of 31 previous books and over 80 research papers. His books have earned him many awards, including the Pythagoras Prize, the Carl Sagan Award, and the Joint Policy Board for Mathematics Communications Award. He is known to millions of NPR listeners as "the Math Guy" on Weekend Edition with Scott Simon. He writes a popular monthly blog "Devlin's Angle" for the Mathematical Association of America, another blog under the name "profkeithdevlin", and also blogs on various topics for the Huffington Post.

A First Step to Mathematical Olympiad Problems

Maths Olympiad (Beginner P3 & P4) Unleash The Maths Olympian In You!

Methods and Techniques for Proving Inequalities

Lecture Notes On Mathematical Olympiad Courses: For Senior Section - Volume 2

Mathematical and Statistical Methods for Actuarial Sciences and Finance

New mathematics often comes about by probing what is already known. Mathematicians will change the parameters in a familiar calculation or explore the essential ingredients of a classic proof. Almost magically, new ideas emerge from this process. This book examines elementary functions, such as those encountered in calculus courses, from this point of view of experimental mathematics. The focus is on exploring the connections between these functions and topics in number theory and combinatorics. There is also an emphasis throughout the book on how current mathematical software can be used to discover and prove interesting properties of these functions. The book provides a transition between elementary mathematics and more advanced topics, trying to make this transition as smooth as possible. Many topics occur in the book, but they are all part of a bigger picture of mathematics. By delving into a variety of them, the reader will develop this broad view. The large collection of problems is an essential part of the book. The problems vary from routine verifications of facts used in the text to the exploration of open questions.

"The IMO Compendium" is the ultimate collection of challenging high-school-level mathematics problems and is an invaluable resource not only for high-school students preparing for mathematics competitions, but for anyone who loves and appreciates mathematics. The International Mathematical Olympiad (IMO), nearing its 50th anniversary, has become the most popular and prestigious competition for high-school students interested in mathematics. Only six students from each participating country are given the honor of participating in this competition every year. The IMO represents not only a great opportunity to tackle interesting and challenging mathematics problems, it also offers a way for high school students to measure up with students from the rest of the world. Until the first edition of this book appearing in 2006, it has been almost impossible to obtain a complete collection of the problems proposed at the IMO in book form. "The IMO Compendium" is the result of a collaboration between four former IMO participants from Yugoslavia, now Serbia and Montenegro, to rescue these problems from old and scattered manuscripts, and produce the ultimate source of IMO practice problems. This book attempts to gather all the problems and solutions appearing on the IMO through 2009. This second edition contains 143 new problems, picking up where the 1959-2004 edition has left off.

This new volume of the Mathematical Olympiad Series focuses on the topic of geometry. Basic and advanced theorems commonly seen in Mathematical Olympiad are introduced and illustrated with plenty of examples. Special techniques in solving various types of geometrical problems are also introduced, while the authors elaborate extensively on how to acquire an insight and develop strategies in tackling difficult geometrical problems. This book is suitable for any reader with elementary geometrical knowledge at the lower secondary level. Each chapter includes sufficient scaffolding and is comprehensive enough for the purpose of self-study. Readers who complete the chapters on the basic theorems and techniques would acquire a good foundation in geometry and may attempt to solve many geometrical problems in various mathematical competitions. Meanwhile, experienced contestants in Mathematical Olympiad competitions will find a large collection of problems pitched at competitions at the international level, with opportunities to practise and sharpen their problem-solving skills in geometry.

This book takes the reader on a journey through the world of college mathematics, focusing on some of the most important concepts and results in the theories of polynomials, linear algebra, real analysis, differential equations, coordinate geometry, trigonometry, elementary number theory, combinatorics, and probability. Preliminary material provides an overview of common methods of proof: argument by contradiction, mathematical induction, pigeonhole principle, ordered sets, and invariants. Each chapter systematically presents a single subject within which problems are clustered in each section according to the specific topic. The exposition is driven by nearly 1300 problems and examples chosen from numerous sources from around the world; many original contributions come from the authors. The source, author, and historical background are cited whenever possible. Complete solutions to all problems are given at the end of the book. This second edition includes new sections on quadratic polynomials, curves in the plane, quadratic fields, combinatorics of numbers, and graph theory, and added problems or theoretical expansion of sections on polynomials, matrices, abstract algebra, limits of sequences and functions, derivatives and their applications, Stokes' theorem, analytical geometry, combinatorial geometry, and counting strategies. Using the W.L. Putnam Mathematical Competition for undergraduates as an inspiring symbol to build an appropriate math background for graduate studies in pure or applied mathematics, the reader is eased into transitioning from problem-solving at the high school level to the university and beyond, that is, to mathematical research. This work may be used as a study guide for the Putnam exam, as a text for many different problem-solving courses, and as a source of problems for standard courses in undergraduate mathematics. Putnam and Beyond is organized for independent study by undergraduate and graduate students, as well as teachers and researchers in the physical sciences who wish to expand their mathematical horizons.

Problem Based Journey From Elementary Number Theory To An Introduction To Matrix Theory, A: The President Problems

Mathematical Olympiad in China (2009-2010)

Selected Problems of the Vietnamese Mathematical Olympiad (1962-2009)

Mathematical Writing

Mathematical Olympiad In China (2011-2014): Problems And Solutions

In China, lots of excellent students who are good at maths take an active part in various maths contests and the best six senior high school students will be selected to form the IMO National Team to compete in the International Mathematical Olympiad. In the past ten years China's IMO Team has achieved outstanding results - they have won the first place almost every year. The author is one of the senior coaches of China's IMO National Team, whose students have won many gold medals many times in IMO. This book is part of the Mathematical Olympiad Series which discusses several aspects related to maths contests, such as algebra, number theory, combinatorics, graph theory and geometry. This book will, in an interesting problem-solving way, explain what probability theory is: its concepts, methods and meanings; particularly, two important concepts - probability and mathematical expectation (briefly expectation) - are emphasized. It consists of 65 problems, appended by 107 exercises and their answers.

This is the ultimate collection of challenging high-school-level mathematics problems. It is the result of a two year long collaboration to rescue these problems from old and scattered manuscripts, and produce the definitive source of IMO practice problems in book form for the first time. This book attempts to gather all the problems and solutions appearing on the IMO and contains a grand total of 1900 problems. It is an invaluable resource for high-school students preparing for mathematics competitions, and for anyone who loves math.

Mathematical Olympiad in China (2007-2008)

Hamilton-Jacobi Equations: Theory and Applications

The IMO Compendium

From a Classical-experimental Mathematician's Point of View

A Collection of Problems Suggested for The International Mathematical Olympiads: 1959-2004