

Amc 12 Problems And Solutions

This book consists only of author-created problems with author-prepared solutions (never published before) and it is intended as a teacher's manual of mathematics, a self-study handbook for high-school students and mathematical competitors interested in AMC 10 (American Mathematics Competitions). The book teaches problem solving strategies and aids to improve problem solving skills. The book includes a list of the most useful theorems and formulas for AMC 10, it also includes 12 sets of author-created AMC 10 type practice tests (300 author-created AMC 10 type problems and their detailed solutions). National Math Competition Preparation (NMCP) program of RSM used part of these 12 sets of practice tests to train students for AMC 10, as a result 75 percent of NMCP high school students qualified for AIME. The authors provide both a list of answers for all 12 sets of author-created AMC 10 type practice tests and author-prepared solutions for each problem. About the authors: Hayk Sedrakyan is an IMO medal winner, professional mathematical Olympiad coach in greater Boston area, Massachusetts, USA. He is the Dean of math competition preparation department at RSM. He has been a Professor of mathematics in Paris and has a PhD in mathematics (optimal control and game theory) from the UPMC - Sorbonne University, Paris, France. Hayk is a Doctor of mathematical sciences in USA, France, Armenia and holds three master's degrees in mathematics from institutions in Germany, Austria, Armenia and has spent a small part of his PhD studies in Italy. Hayk Sedrakyan has worked as a scientific researcher for the European Commission (sadco project) and has been one of the Team Leaders at Harvard-MIT Mathematics Tournament (HMMT). He took part in the International Mathematical Olympiads (IMO) in United Kingdom, Japan and Greece. Hayk has been elected as the President of the students' general assembly and a member of the management board of Cite Internationale Universitaire de Paris (10,000 students, 162 different nationalities) and the same year they were nominated for the Nobel Peace Prize. Nairi Sedrakyan is involved in national and international mathematical Olympiads having been the President of Armenian Mathematics Olympiads and a member of the IMO problem selection committee. He is the author of the most difficult problem ever proposed in the history of the International Mathematical Olympiad (IMO), 5th problem of 37th IMO. This problem is considered to be the hardest problems ever in the IMO because none of the members of the strongest teams (national Olympic teams of China, USA, Russia) succeeded to solve it correctly and because national Olympic team of China (the strongest team in the IMO) obtained a cumulative result equal to 0 points and was ranked 6th in the final ranking of the countries instead of the usual 1st or 2nd place. The British 2014 film X+Y, released in the USA as A Brilliant Young Mind, inspired by the film Beautiful Young Minds (focuses on an English mathematical genius chosen to represent the United Kingdom at the IMO) also states that this problem is the hardest problem ever proposed in the history of the IMO (minutes 9:40-10:30). Nairi Sedrakyan's students (including his son Hayk Sedrakyan) have received 20 medals in the International Mathematical Olympiad (IMO), including Gold and Silver medals.

"...offer[s] a challenging exploration of problem solving mathematics and preparation for programs such as MATHCOUNTS and the American Mathematics Competition."--Back cover

This book contains the curriculum materials of the Math Challenge courses at Areteem Institute. The math competitions for middle and high school students generally do not involve college mathematics such as calculus and linear algebra. There are four main topics covered in the competitions: Number Theory, Algebra, Geometry, and Combinatorics. The problems in the math competitions are usually challenging problems for which conventional methods are not sufficient, and students are required to use more creative ways to combine the methods they have learned to solve these problems. This book covers these topics, along with fundamental concepts required and problem solving strategies useful for solving problems in the math competitions such as AMC 10 & 12, ARML, and ZIML Division JV. For information about Areteem Institute, visit <http://www.areteem.org>.

The Contest Problem Book VI contains 180 challenging problems from the six years of the American High School Mathematics Examinations (AHSME), 1989 through 1994, as well as a selection of other problems. A Problems Index classifies the 180 problems in the book into subject areas: algebra, complex numbers, discrete mathematics, number theory, statistics, and trigonometry.

This volume is a republication and expansion of the much-loved Wohascum County Problem Book, published in 1993. The original 130 problems have been retained and supplemented by an additional 78 problems. The puzzles contained within, which are accessible but never routine, have been specially selected for their mathematical appeal, and detailed solutions are provided. The reader will encounter puzzles involving calculus, algebra, discrete mathematics, geometry and number theory, and the volume includes an appendix identifying the prerequisite knowledge for each problem. A second appendix organises the problems by subject matter so that readers can focus their attention on particular types of problems if they wish. This collection will provide enjoyment for seasoned problem solvers and for those who wish to hone their skills.

The matter is presented in a manner which is well within capacity of undergraduate students to understand. The book is divided into ten chapters, each containing brief explanations of concepts and formulae relevant for the problem set that follows. Moreover, the hints and solutions given for each question have very student-friendly features that will help students in their efforts to study the subject independently. Collection of nearly 200 unusual problems dealing with congruence and parallelism, the Pythagorean theorem, circles, area relationships, Ptolemy and the cyclic quadrilateral, collinearity and concurrency and more. Arranged in order of difficulty. Detailed solutions.

"In 2000, the Mathematical Association of America initiated the American Mathematics Competitions 10 (AMC 10) for students up to grade 10. The Contest Problem Book VIII is the first collection of problems from that competition, covering the years 2000-2007. J. Douglas Fairies and David Wells were the joint directors of the AMC 10 and AMC 12 during that period, and have assembled this book of problems and solutions." "There are 350 problems from the first 14 contests included in this collection. A Problem Index at the back of the book classifies the problems into the following major subject areas: Algebra and Arithmetic, Sequences and Series, Triangle Geometry, Circle Geometry, Quadrilateral Geometry, Polygon Geometry, Coordinate Geometry, Solid Geometry, Counting, Discrete Probability, Statistics, Number Theory, and Logic. The major subject areas are then broken down into subcategories for ease of reference. The problems are cross-referenced when they represent several subject areas."--BOOK JACKET.

Motivated and enlightening solutions to the 2012 AMC 10A by former AMC (AHSME) two-time perfect scorer Mathew Crawford.

This is the seventh book of problems and solutions from the Mathematics Competitions. Contest Problem Book VII chronicles 275 problems from the American Mathematics Contests (AMC 12 and AMC 10 for the years 1995 through 2000, including the 50th Anniversary AHSME issued in 1999). Twenty-three additional problems with solutions are included. A Problem Index classifies the 275 problems in to the following subject areas: Algebra, Complex Numbers, Discrete Mathematics (including Counting Problems), Logic, and Discrete Probability, Geometry (including Three Dimensional Geometry), Number Theory (including Divisibility, Representation, and Modular Arithmetic), Statistics, and Trigonometry. For over 50 years many excellent exams have been prepared by individuals throughout our mathematical community in the hope that all secondary school students will have an opportunity to participate in these problem solving and enriching mathematics experiences. The American Mathematics Contests are intended for everyone from the average student at a typical school who enjoys mathematics to the very best student at the most special school.

* Problem-solving tactics and practical test-taking techniques provide in-depth enrichment and preparation for various math competitions * Comprehensive introduction to trigonometric functions, their relations and functional properties, and their applications in the Euclidean plane and solid geometry * A cogent problem-solving resource for advanced high school students, undergraduates, and mathematics teachers engaged in competition training

Each month during the school year, Areteem Institute hosts the online Zoom International Math League (ZIML) competitions. Students can compete in one of five divisions based on their age and mathematical level. The ZIML monthly contests are held at <https://ziml.areteem.org>. Varsity The top division. Covers material on the level of the last 10 questions on the AMC 12 and AIME level. This division is open to all age levels. Junior Varsity The second highest competition division. Covers material at the AMC 10/12 level and State/National MathCounts level. Note that material such as complex numbers, advanced trigonometry, and logarithms are not required at this level. This division is open to all age levels. High School (Division H) This division focuses on material from a standard high school curriculum. It covers topics up to and including pre-calculus. This division will serve as excellent practice for students preparing for the math portions of the SAT or ACT. This division is open to all age levels. Middle School (Division M) This division focuses on problem solving using math concepts from a standard middle school math curriculum. Covers material on the level of AMC 8 and School/Chapter MathCounts. This division is open to all students who have not started grade 9. Upper Elementary (Division E) This division focuses on advanced problem solving with mathematical concepts from upper elementary school. Covers material at a level comparable to MOEMS Division E. This division is open to all students who have not started grade 6. This book is suitable for middle school and high school students who want to challenge themselves with math problems that require in-depth problem-solving skills. It contains the problems, answers, and full solutions from the nine ZIML Varsity Division Competitions held during the 2016-2017 School Year. The general difficulty of the problems are comparable to hard AMC 12 and AIME problems. No knowledge of calculus is required for solving the problems. The book is divided into three parts: The complete Varsity Division ZIML Competitions (20 questions per competition) from October 2016 to June 2017. The solutions for each of the competitions, including detailed work and helpful tricks. An appendix including the topics and knowledge points covered for Varsity Division, a glossary including common mathematical terms, and answer keys for each of the competitions so students can easily check their work. The questions found on the ZIML competitions are meant to test your problem solving skills and train you to apply the knowledge you know to many different applications. We hope you enjoy the problems!

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.

This guide covers the story of trigonometry. It is a swift overview, but it is complete in the context of the content discussed in beginning and advanced high-school courses. The purpose of these notes is to supplement and put into perspective the material of any course on the subject you may have taken or are currently taking. (These notes will be tough going for those encountering trigonometry for the very first time!)

AMC 12 Preparation Book

Any high school student preparing for the American Mathematics Competitions should get their hands on a copy of this book! A major aspect of mathematical training and its benefit to society is the ability to use logic to solve problems. The American Mathematics Competitions (AMC) have been given for more than fifty years to millions of high school students. This book considers the basic ideas behind the solutions to the majority of these problems, and presents examples and exercises from past exams to illustrate the concepts. Anyone taking the AMC exams or helping students prepare for them will find many useful ideas here. But people generally interested in logical problem solving should also find the problems and their solutions interesting. This book will promote interest in mathematics by providing students with the tools to attack problems that occur on mathematical problem-solving exams, and specifically to level the playing field for those who do not have access to the enrichment programs that are common at the top academic high schools. The book can be used either for self-study or to give people who want to help students prepare for mathematics exams easy access to topic-oriented material and samples of problems based on that material. This is useful for teachers who want to hold special sessions for students, but it is equally valuable for parents who have children with mathematical interest and ability. As students' problem solving abilities improve, they will be able to comprehend more difficult concepts requiring greater mathematical ingenuity. They will be taking their first steps towards becoming math Olympians!

This third volume of problems from the William Lowell Putnam Competition is unlike the previous two in that it places the problems in the context of important mathematical themes. The authors highlight connections to other problems, to the curriculum and to more advanced topics. The best problems contain kernels of sophisticated ideas related to important current research, and yet the problems are accessible to undergraduates. The solutions have been compiled from the American Mathematical Monthly, Mathematics Magazine and past competitors.

Multiple solutions enhance the understanding of the audience, explaining techniques that have relevance to more than the problem at hand. In addition, the book contains suggestions for further reading, a hint to each problem, separate from the full solution and background information about the competition. The book will appeal to students, teachers, professors and indeed anyone interested in problem solving as a gateway to a deep understanding of mathematics.

This book consists only of author-created problems with author-prepared solutions (never published before) and it is intended as a teacher's manual of mathematics, a self-study handbook for high-school students and mathematical competitors interested in AMC 12 (American Mathematics Competitions). The book teaches problem solving strategies and aids to improve problem solving skills. The book includes a list of the most useful theorems and formulas for AMC 12, it also includes 14 sets of author-created AMC 12 type practice tests (350 author-created AMC 12 type problems and their detailed solutions). National Math Competition Preparation (NMCP) program of RSM used part of these 14 sets of practice tests to train students for AMC 12, as a result 75 percent of NMCP high school students qualified for AIME. The authors provide both a list of answers for all 14 sets of author-created AMC 12 type practice tests and author-prepared solutions for each problem. About the authors: Hayk Sedrakyan is an IMO medal winner, professional mathematical Olympiad coach in greater Boston area, Massachusetts, USA. He is the Dean of math competition preparation department at RSM. He has been a Professor of mathematics in Paris and has a PhD in mathematics (optimal control and game theory) from the UPMC - Sorbonne University, Paris, France. Hayk is a Doctor of mathematical sciences in USA, France, Armenia and holds three master's degrees in mathematics from institutions in Germany, Austria, Armenia and has spent a small part of his PhD studies in Italy. Hayk Sedrakyan has worked as a scientific researcher for the European Commission (sadco project) and has been one of the Team Leaders at Harvard-MIT Mathematics Tournament (HMMT). He took part in the International Mathematical Olympiads (IMO) in United Kingdom, Japan and Greece. Hayk has been elected as the President of the students' general assembly and a member of the management board of Cite Internationale Universitaire de Paris (10,000 students, 162 different nationalities) and the same year they were nominated for the Nobel Peace Prize. Nairi Sedrakyan is involved in national and international mathematical Olympiads having been the President of Armenian Mathematics Olympiads and a member of the IMO problem selection committee. He is the author of the most difficult problem ever proposed in the history of the International Mathematical Olympiad (IMO), 5th problem of 37th IMO. This problem is considered to be the hardest problems ever in the IMO because none of the members of the strongest teams (national Olympic teams of China, USA, Russia) succeeded to solve it correctly and because national Olympic team of China (the strongest team in the IMO) obtained a cumulative result equal to 0 points and was ranked 6th in the final ranking of the countries instead of the usual 1st or 2nd place. The British 2014 film X+Y, released in the USA as A Brilliant Young Mind, inspired by the film Beautiful Young Minds (focuses on an English mathematical genius chosen to represent the United Kingdom at the IMO) also states that this problem is the hardest problem ever proposed in the history of the IMO (minutes 9:40-10:30). Nairi Sedrakyan's students (including his son Hayk Sedrakyan) have received 20 medals in the International Mathematical Olympiad (IMO), including Gold and Silver medals.

Collection of miniature mathematical puzzles for students and general readers.

Based on Stanford University's well-known competitive exam, this excellent mathematics workbook offers students at both high school and college levels a complete set of problems, hints, and solutions. 1974 edition.

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.

Over 300 unusual problems, ranging from easy to difficult, involving equations and inequalities, Diophantine equations, number theory, quadratic equations, logarithms, more. Detailed solutions, as well as brief answers, for all problems are provided.

This is the ninth book of problems and solutions from the American Mathematics Competitions (AMC) contests.

Forty-eight challenging problems from the oldest high school mathematics competition in the world. This book is a continuation of Hungarian Problem Book III and takes the contest from 1944 through to 1963. This book is intended for beginners, although the experienced student will find much here.

A textbook suitable for undergraduate courses. The materials are presented very explicitly so that students will find it very easy to read. A wide range of examples, about 500 combinatorial problems taken from various mathematical competitions and exercises are also included. This book, written by an accomplished female mathematician, is the second to explore nonstandard mathematical problems – those that are not directly solved by standard mathematical methods but instead rely on insight and the synthesis of a variety of mathematical ideas. It promotes mental activity as well as greater mathematical skills, and is an ideal resource for successful preparation for the mathematics Olympiad. Numerous strategies and techniques are presented that can be used to solve intriguing and challenging problems of the type often found in competitions. The author uses a friendly, non-intimidating approach to emphasize connections between different fields of mathematics and often proposes several different ways to attack the same problem. Topics covered include functions and their properties, polynomials, trigonometric and transcendental equations and inequalities, optimization, differential equations, nonlinear systems, and word problems. Over 360 problems are included with hints, answers, and detailed solutions. Methods of Solving Nonstandard Problems will interest high school and college students, whether they are preparing for a math competition or looking to improve their mathematical skills, as well as anyone who enjoys an intellectual challenge and has a special love for mathematics. Teachers and college professors will be able to use it as an extra resource in the classroom to augment a conventional course of instruction in order to stimulate abstract thinking and inspire original thought.

Ideal for self-instruction as well as for classroom use, this text improves understanding and problem-solving skills in analysis, analytic geometry, and higher algebra. Over 1,200 problems, with hints and complete solutions. 1963 edition.

While the books in this series are primarily designed for AMC competitors, they contain the most essential and indispensable concepts used throughout middle and high school mathematics. Some featured topics include key concepts such as equations, polynomials, exponential and logarithmic functions in Algebra, various synthetic and analytic methods used in Geometry, and important facts in Number Theory. The topics are grouped in lessons focusing on fundamental concepts. Each lesson starts with a few solved examples followed by a problem set meant to illustrate the content presented. At the end, the solutions to the problems are discussed with many containing multiple methods of approach. I recommend these books to not only contest participants, but also to young, aspiring mathletes in middle school who wish to consolidate their mathematical knowledge. I have personally used a few of the books in this collection to prepare some of my students for the AMC contests or to form a foundation for others. By Dr. Titu Andreescu US IMO Team Leader (1995 – 2002) Director, MAA American Mathematics Competitions (1998 – 2003) Director, Mathematical Olympiad Summer Program (1995 – 2002) Coach of the US IMO Team (1993 – 2006) Member of the IMO Advisory Board (2002 – 2006) Chair of the USAMO Committee (1996 – 2004) I love this book! I love the style, the selection of topics and the choice of problems to illustrate the ideas discussed. The topics are typical contest problem topics: divisors, absolute value, radical expressions, Veita's Theorem, squares, divisibility, lots of geometry, and some trigonometry. And the problems are delicious. Although the book is intended for high school students aiming to do well in national and state math contests like the American Mathematics Competitions, the problems are accessible to very strong middle school students. The book is well-suited for the teacher-coach

interested in sets of problems on a given topic. Each section begins with several substantial solved examples followed by a varied list of problems ranging from easily accessible to very challenging. Solutions are provided for all the problems. In many cases, several solutions are provided. By Professor Harold Reiter Chair of MATHCOUNTS Question Writing Committee. Chair of SAT II Mathematics committee of the Educational Testing Service Chair of the AMC 12 Committee (and AMC 10) 1993 to 2000.

This is the seventh book of problems and solutions from the Mathematics Competitions (published by the MAA). Contest Problem Book VII chronicles 275 problems from the American Mathematics Contests AMC 12 and AMC 10 for the years 1995 through 2000, including the 50th Anniversary AHSME issued in 1999. Twenty-three additional problems with solutions are included. A Problem Index classifies the 275 problems in to the following subject areas: Algebra, Complex Numbers, Discrete Mathematics (including Counting Problems), Logic, and Discrete Probability, Geometry (including Three Dimensional Geometry), Number Theory (including Divisibility, Representation, and Modular Arithmetic), Statistics, and Trigonometry. For over 50 years many excellent exams have been prepared by individuals throughout our mathematical community in the hope that all secondary school students will have an opportunity to participate in these problem solving and enriching mathematics experiences. The American Mathematics Contests are intended for everyone from the average student at a typical school who enjoys mathematics to the very best student at the most special school.

A playful, readable, and thorough guide to precalculus, this book is directed at readers who would like a holistic look at the high school curriculum material on functions and their graphs. Tanton provides a coherent guided tour of exploration and discovery of a rich mathematical landscape. The exploration is presented through problems selected from the history of the Mathematical Association of America's American Mathematics Competition (AMC). Secondary school teachers looking for supplementary and enrichment materials will find this a rich resource, which aligns with national curriculum standards. High school and college calculus and precalculus students will discover an approachable and thought-provoking review, preview, and overview of these central mathematical ideas. Students preparing for the AMC should find it especially helpful. Active reading, with pencil in hand, will result in a deep appreciation and understanding of the properties of functions. James Tanton is the MAA's mathematician-at-large. A research mathematician with experience teaching at both the college and high school levels, he now works to encourage and aid all mathematics instructors to teach--and all mathematics students to learn--joyously and effectively.

A large range of problems drawn from mathematics olympiads from around the world.

This book is a celebration of mathematical problem solving at the level of the high school American Invitational Mathematics Examination. There is no other book on the market focused on the AIME. It is intended, in part, as a resource for comprehensive study and practice for the AIME competition for students, teachers, and mentors. After all, serious AIME contenders and competitors should seek a lot of practice in order to succeed. However, this book is also intended for anyone who enjoys solving problems as a recreational pursuit. The AIME contains many problems that have the power to foster enthusiasm for mathematics – the problems are fun, engaging, and addictive. The problems found within these pages can be used by teachers who wish to challenge their students, and they can be used to foster a community of lovers of mathematical problem solving! There are more than 250 fully-solved problems in the book, containing examples from AIME competitions of the 1980's, 1990's, 2000's, and 2010's. In some cases, multiple solutions are presented to highlight variable approaches. To help problem-solvers with the exercises, the author provides two levels of hints to each exercise in the book, one to help stuck starters get an idea how to begin, and another to provide more guidance in navigating an approach to the solution.

Written for the gifted math student, the new math coach, the teacher in search of problems and materials to challenge exceptional students, or anyone else interested in advanced mathematical problems. Competition Math contains over 700 examples and problems in the areas of Algebra, Counting, Probability, Number Theory, and Geometry. Examples and full solutions present clear concepts and provide helpful tips and tricks. "I wish I had a book like this when I started my competition career." Four-Time National Champion MATHCOUNTS coach Jeff Boyd "This book is full of juicy questions and ideas that will enable the reader to excel in MATHCOUNTS and AMC competitions. I recommend it to any students who aspire to be great problem solvers." Former AHSME Committee Chairman Harold Reiter

Every mathematician (beginner, amateur, and professional alike) thrills to find simple, elegant solutions to seemingly difficult problems. Such happy resolutions are called "aha! solutions," a phrase popularized by mathematics and science writer Martin Gardner. Aha! solutions are surprising, stunning, and scintillating: they reveal the beauty of mathematics. This book is a collection of problems with aha! solutions. The problems are at the level of the college mathematics student, but there should be something of interest for the high school student, the teacher of mathematics, the "math fan," and anyone else who loves mathematical challenges. This collection includes one hundred problems in the areas of arithmetic, geometry, algebra, calculus, probability, number theory, and combinatorics. The problems start out easy and generally get more difficult as you progress through the book. A few solutions require the use of a computer. An important feature of the book is the bonus discussion of related mathematics that follows the solution of each problem. This material is there to entertain and inform you or point you to new questions. If you don't remember a mathematical definition or concept, there is a Toolkit in the back of the book that will help.

10 practice tests (250 problems) for students who are preparing for high school mathematics contests such as American Mathematics Competitions (AMC-10/12), MathCON Finals, and Math Leagues. It contains 10 practice tests and their full detailed solutions. The authors, Sinan Kanbir and Richard Spence, have extensive experience of math contests preparation and teaching. Dr. Kanbir is the author and co-author of four research and teaching books and several publications about teaching and learning mathematics. He is an item writer of Central Wisconsin Math League (CWML), MathCON, and the Wisconsin section of the MAA math contest. Richard Spence has experience competing in contests including MATHCOUNTS®, AMC 10/12, AIME, USAMO, and teaches at various summer and winter math camps. He is also an item writer for MathCON.

Each month during the school year, Areteem Institute hosts the online Zoom International Math League (ZIML) competitions. Students can compete in one of five divisions based on their age and mathematical level. The ZIML monthly contest are held at <https://ziml.areteem.org>. Varsity: The top division. Covers material on the level of the last 10 questions on the AMC 12 and AIME level. This division is open to all age levels. Junior Varsity: The second highest competition division. Covers material at the AMC 10/12 level and State/National MathCounts level. Note that material such as complex numbers, advanced trigonometry, and logarithms are not required at this level. This division is open to all age levels. High School (Division H): This division focuses on material from a standard high school curriculum. It covers topics up to and including pre-calculus. This division will serve as excellent practice for students preparing for the

math portions of the SAT or ACT. This division is open to all age levels. Middle School (Division M): This division focuses on problem solving using math concepts from a standard middle school math curriculum. Covers material on the level of AMC 8 and School/Chapter MathCounts. This division is open to all students who have not started grade 9. Upper Elementary (Division E): This division focuses on advanced problem solving with mathematical concepts from upper elementary school. Covers material at a level comparable to MOEMS Division E. This division is open to all students who have not started grade 6. This book is suitable for high school students. It contains the problems, answers, and full solutions from the nine ZIML Varsity Division Competitions held during the 2016-2017 School Year. The general difficulty of the problems are comparable to hard AMC 12 and AIME problems. No knowledge of calculus is required for solving the problems. The book is divided into three parts: The complete Varsity Division ZIML Competitions (20 questions per competition) from October 2016 to June 2017. The solutions for each of the competitions, including detailed work and helpful tricks. An appendix including the topics and knowledge points covered for Varsity Division, a glossary including common mathematical terms, and answer keys for each of the competitions so students can easily check their work. The questions found on the ZIML competitions are meant to test your problem solving skills and train you to apply the knowledge you know to many different applications. We hope you enjoy the problems!

Introductory Combinatorics emphasizes combinatorial ideas, including the pigeon-hole principle, counting techniques, permutations and combinations, Polya counting, binomial coefficients, inclusion-exclusion principle, generating functions and recurrence relations, and combinatorial structures (matchings, designs, graphs). Written to be entertaining and readable, this book's lively style reflects the author's joy for teaching the subject. It presents an excellent treatment of Polya's Counting Theorem that doesn't assume the student is familiar with group theory. It also includes problems that offer good practice of the principles it presents. The third edition of Introductory Combinatorics has been updated to include new material on partially ordered sets, Dilworth's Theorem, partitions of integers and generating functions. In addition, the chapters on graph theory have been completely revised.

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