A Gentle Introduction to the American Invitational Mathematics Exam
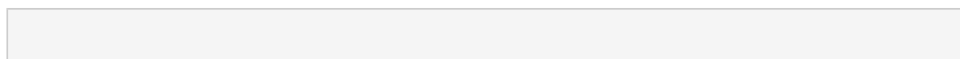
By Scott A. Annin

A Gentle Introduction to the American Invitational Mathematics Exam By Scott A. Annin

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.

Topics include algebra, combinatorics, probability, number theory, sequences and series, logarithms, trigonometry, complex numbers, polynomials, and geometry. Many AIME problems involve using several of these mathematical disciplines simultaneously. To make the book indeed gentle, the author has prepared well-motivated, detailed, clear solutions to all examples and exercises in the book. He has not always opted for the shortest solution, but rather, he has presented solutions that a typical student might say I could have come up with that! The book avoids excessive reliance on heavy machinery, deep theorems, or undue abstraction.

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Editorial Review

Review

Scott A. Annin's *A Gentle Introduction to the American Invitational Mathematics Exam* provides assistance for students preparing for the American Invitational Mathematics Examination (AIME) and for those who are mentoring such students. Following a description of the examination, the book has nine chapters that discuss basic information from the topics found in high school mathematics that are of particular value for success on the AIME. Each chapter contains illustrative problems, taken primarily from past American Mathematics Competition (AMC) problems and AIME problems and a set of problems for the reader to solve. The last two chapters of the book contain two levels of hints for the problems as well as full solutions. If I were taking the examination or helping someone prepare for it, I would use this book.

The table of contents provides an outline of the topics that Annin considers. Generally information is presented without detailed developments, appropriate for his purposes. Definitions and theorems are given in a concise fashion. Readers are encouraged to look in standard high school texts for more information if it would be difficult to summarize everything within a particular topic.

Of course, a challenge for Annin is to decide what information can be covered in a brief manner that will be of value to the student--after all, he needs to provide the problem-worthy techniques and topics from all of high school mathematics in very few pages. Annin's experience leading workshops for AIME contestants guides his decisions, and it seems to me that his selections are quite appropriate.

The solutions Annin provides to the example problems in the text are insightful and valuable to contestants. The problems offered for the readers to solve are interesting and of increasing difficulty in each section. The hints are on target, and the complete solutions to the problems are also done well.

The author suggests the book will be valuable for someone who enjoys solving problems. It's true that most of the problems require some insight and cleverness. Many also require a good bit of calculation or case analysis--one good idea might suffice to suggest a solution, but to complete the problem can take a page or two of computation.

I plan to consider the use of this book in a capstone course for mathematics secondary education majors. The problems in the book often require the integration of materials from a variety of topics in high school mathematics. For example, a solution to a problem might well require ideas from geometry, combinatorics, and number theory. I expect that almost all preservice teachers will find the problems on an AIME both interesting and challenging.

Thank you, Dr. Annin, for writing this book. It will serve the community well. --Joel Haack, MAA Reviews

About the Author

Scott A. Annin received his B.S. in mathematics and physics from the University of Nebraska in 1995. He earned his Ph.D. in mathematics from the University of California at Berkeley in 2002, specializing in noncommutative algebra. He has been a professor at California State University in Fullerton ever since. Annin has received several teaching awards at Fullerton, including university-wide honors in 2008 and 2015. In 2009, he received the Mathematical Association of America s Henry L. Alder Award for Outstanding Teaching by a Beginning Faculty Member in Mathematics. In addition to being a former AIME contestant himself (while a student at Lincoln East High School in Lincoln, Nebraska), Annin had led workshops for

many AIME contestants. He has also increased awareness of the AMC program among high school teachers at both the state and national levels at math education and MAA meetings. Annin has also co-authored the widely used undergraduate mathematics text *Differential Equations and Linear Algebra* with Stephen Goode.

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