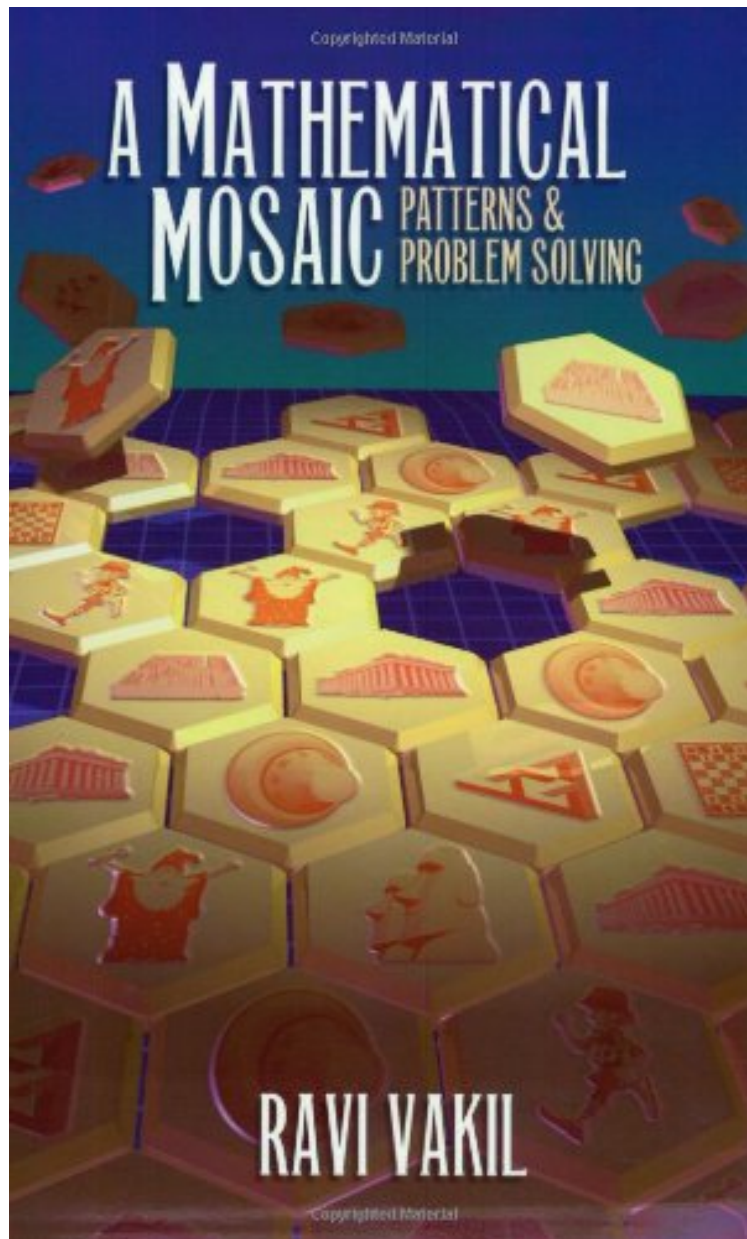


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A Mathematical Mosaic: Patterns Problem Solving

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Ravi Vakil : A Mathematical Mosaic: Patterns Problem Solving before purchasing it in order to gage whether or not it would be worth my time, and all praised A Mathematical Mosaic: Patterns Problem Solving:

12 of 14 people found the following review helpful. A rare beauty !By NishantThe author himself is renowned in math

circles for his various achievements like gold medals at IMO ! and 4 times Putnam fellow ! No wonder this book is such beautiful rarity. I was totally impressed by the handling of the topics and the problem-solving approaches the author has chosen to explain. I recommend this book to anyone who is interested in accelerating his knowledge in maths for a competitive exam like ARML, USMO, IMO etc. Definitely not for fire-side reading so it aint worth your time if you have only casual interest in maths. This book is intended for serious kids. I'd given it 10 stars for such marvelous insight. 10 of 11 people found the following review helpful. Insightful, interesting, excellent! By John Zhu

Ravi Vakil gives a delightful introduction of some of the more interesting yet enigmatic areas of mathematics. Most of us are not too familiar with the cardinality of numbers or Galois Theory. However, the author presents these fascinating topics in such a lucid and insightful manner, that one becomes easily engrossed. Also, I particularly enjoyed reading the profiles of the young mathematicians - it was quite inspiring! Furthermore, the problems at the end of each section are thought provoking; many do not have complete solutions, and thus encourage the reader to think hard about them. As the title implies, it is NOT a textbook, but rather a compilation of scattered "lectures." It is a great book for the talented math reader, and students who want to explore some mathematics outside the general curriculum. 24 of 30 people found the following review helpful. Excellent --- for middle school to very early high school

By A Customer I understand that Ravi Vakil has a great record in the IMO and Putnam competitions. When I read the reviews and the back cover on a web site which explicitly stated: "Reveals some of [Vakil's] most powerful problem solving strategies," -- Well, of course I bought it immediately. Unfortunately most of the things in the book are quite elementary as far as problem solving goes. It is meant as an exposure for people who haven't seen these things so far (particularly talented jr high /middle school and early high school). Of course you will find some very interesting facts in here (and the rare mistakes-- Euler's Formula being called DeMoivre's Theorem) and will leave many young students in awe as Mr. Vakil shows off some beautiful mathematics. It is a good book, but I gave it only 3 stars because I expected much more (much more "powerful" stuff as the backcover said). If your a very experienced problem solver you will find many of the things in this book trivial (you will find some gems though), but if your a beginner with some talent, then you will love this book.

A Mathematical Mosaic: Patterns Problem Solving by Ravi Vakil is a must for teachers seeking to challenge their best students, and for students preparing for mathematics competitions. In this exciting book, Vakil, a preeminent winner of International Mathematics Olympiads, develops some of the powerful problem-solving ideas underpinning the major branches of mathematics and weaves them into a mosaic that reveals their interconnections. The mathematics is presented at the level of the capable high school mathematics student, but there is much substance for the advanced undergraduate and the intelligent lay reader. You will find this book an invaluable source of enrichment problems and ideas. The style is informal, friendly, and often humorous. In this book, Vakil profiles seven other mathematics olympiad winners including Noam Elkies, the youngest professor to receive tenure at Harvard.

Ravi Vakil has put together a collection of wonderful topics from number theory through combinatorics to game theory in a fashion that seventh- and eighth-grade students can handle yet high school students will find challenging. His book is divided into two parts. Part 1 introduces to the young reader a number of mathematics topics that will be very useful in part 2. For example, in the first section, "Number Theory," such topics as calculating tricks, divisibility rules with proofs of why they work, and magic squares are investigated fully and clearly. In part 2, many of the earlier topics are revisited, but the level of difficulty is increased. In 'Number Theory Revisited,' an in-depth study of rational and irrational numbers, a fascinating painted-school-lockers problem, and other topics challenge students in an entertaining manner. Perhaps the best features of the book, however, are the historical digressions on great mathematicians and short personal profiles of some contemporaries of the author. These glimpses into the lives of young male and female mathematicians make this book very much worth its price. Without a doubt, this book is a must for any library, teacher's reference, or student's amusement. -John Cocharo, Saint Mark's School of Texas, 10600 Preston Rd., Dallas, TX 75230-4000. -- The Mathematics Teacher, Vol 89, #7. October 1996 ed by Andre Toom

There are different books on my shelf. Some are large like dinosaurs: these are textbooks. Others are much smaller, but their educational value may be greater. For example, Kordemsky's book [3] contributed a lot to Russian childrens' interest in mathematics although its English edition fits in a hand. The book I am going to discuss fits in a coat pocket, but it speaks in an interesting and understandable way about number theory, combinatorics, game theory, geometry, and calculus, to say nothing about magic tricks, puzzles and other digressions. What is most important is that whenever Vakil starts to discuss something, he never leaves the reader without a piece of exact, rigorous knowledge. This is a book about mathematics, not about its fuzzy placebo.

Ravi Vakil received several olympiad prizes and now is an instructor at Princeton University. This is his first book, and in it he tries to share his expertise with his readers. He tries to encourage! ! curiosity, a sense of beauty, and the love of knowledge. This is a book I would like to have read as a boy. Why? Because it addresses the normal curiosity of children. It contains many good problems, facts, and stories. It is a mixture of just those ingredients which are most useful for children. Vakil enjoys ideas that seem simple if you already know them, but may seem paradoxical if you don't. One of them is presented as a card trick (p. 44): I

ask you to shuffle a deck of cards thoroughly. Then I ask for them back (face down). Carefully examining the backs of the cards, I separate them into two piles. I then claim that, through the power of magic, I've made sure that the number of black cards in the first pile is the number of red cards in the second pile! The explanation starts as follows: "While pretending to examine the backs of the cards, I was simply " Can you complete this explanation? I remember that as a boy I was quite fond of various tricks and had a notebook where I wrote as many of them as I could find. Although Vakil's book is intended to be recreative and facultative, it contains many facts that are indispensable for mathematical literacy, including: Criteria for divisibility. Those for 2, 3 and 7 are proved; other proofs are left for the reader (pp. 23, 29). Let $g(x)$ denote any polynomial in x . Then the remainder when $g(x)$ is divided by $x - a$ is $g(a)$. $\sqrt{2}$ is irrational (p. 121). There are infinitely many primes (p. 124). Heron's formula for the area of a triangle (p. 160) The harmonic series diverges (p. 180). Each of these facts is not only proved, but accompanied with several variations that are presented as problems or comments. Sometimes they lead into quite substantial mathematics. There are many "local" proofs, which also help to develop the readers' "proof sense." I like the following most: The "hypervolume" of a "four-dimensional sphere" of radius r is $H = (r^2)^2/2$. Can you use a method similar to that of Part 1 and Part 4 to find the "surface volume" (p. 81). This book contains several "personal profiles" of gifted youngsters with whom Vakil became acquainted at olympiads. Vakil writes several lines about how they found their way into mathematics, for example: "J. P.'s curiosity is typical of the young mathematicians profiled in this book" (p. 41), "It was at this time that Katy discovered the tremendous enjoyment she gains from solving problems" (p. 54). Vakil cites one talented student's advice: "Do math for math's sake, not because your parents will be proud of you, or because people will think you are smart" (p. 143). More than once Vakil stresses that mathematics is beautiful. In his preface he writes: "Math is a uniquely aesthetic discipline; mathematicians use words like beauty, depth, elegance, and power to describe excellent ideas" (p. 10). When starting to speak about combinatorics, he writes: "More important (to me, at least) is its aesthetic appeal" (p. 45). Before presenting the proof of irrationality of $\sqrt{2}$, he writes: "It is also extremely beautiful. Its elegance lies in its simplicity" (p. 121). Is Vakil alone in stressing the beauty of mathematics? By far not. He refers to G. H. Hardy who said similar things in his *A Mathematician's Apology*. (p. 120). Here is the last problem in the book: On a remote Norwegian mountain top, there is a huge checkerboard, 1000 squares wide and 1000 squares long, surrounded by steep cliffs to the north, south, east, and west. Each square is marked with an arrow pointing in one of the eight compass directions, so (with the possible exception of some squares on the edges) each square has an arrow pointing to one of its eight nearest neighbors. The arrows on squares sharing an edge differ by at most 45°. A lemming is placed randomly on one of the squares, and it jumps from square to square following the arrows. Prove that the poor creature will eventually plunge from a cliff to its death. Is this a "real-world" problem? Certainly not. There is no such checkerboard in the mountains of Norway. According to some educational theories, students should not be interested in this problem, but they are. In fact this problem was invented by a secondary-school student Kevin Purbhoo. Is Kevin abnormal? If he is, I am also. Bobrov's book [1], which mixes mathematics with fantasy, accompanied all my childhood, and I liked its fantastic element most! Vakil writes about this problem: "Although Kevin did not know at the time, this problem anticipates several subtle and important results in topology" This is typical of Vakil's book: recreational mathematics leads to deep and important ideas. It deserves many readers. There is a good-old editorial "Yes, Virginia, there is a Santa Claus" an answer to a girl named Virginia who asked the editor of the *New York Sun* in 1897, "Is there a Santa Claus?" It seems to me that some modern educators have lost the pathos of spirituality expressed there, which makes humans human. It is in human nature to be interested in abstractions. The human ability to think without and immediate material gratification is at the base of civilization. In this context, Vakil's book might be called "Yes, Virginia, Math is Beautiful." References 1. Sergey Bobrov, *The Magic Two Horn* (in Russian). Detgiz, Moscow-Leningrad, 1949. 2. Donald E. Knuth, *The Art of Computer Programming*, 2nd ed. Addison-Wesley, 1981. 3. Boris A Kordemsky, *The Moscow Puzzles*. English edition, translated by Albert Parry and edited by Martin Gardner, Charles Scribner's Sons. 1972. Reprinted, Dover Publications, 1992. -- American Mathematical Monthly, January 1998 About the Author Dr. Vakil is currently Professor of Mathematics at M.I.T. Ravi Vakil's preeminence in the world of mathematical competitions is evident in the long list of his many triumphs. To highlight just a few: 1988 USA Mathematical Olympiad placed first in North America International Mathematical Olympiad won two gold medals and one silver medal Putnam Mathematical Competition placed among the top five competitors in North America in each of his four undergraduate years.