Programming And Mathematical Thinking

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Toward Zero-defect Programming Manning Publications
The columnist for Slate's popular "Do the Math" celebrates the logical, illuminating nature of math in today's world, sharing in accessible language mathematical approaches that demystify complex and everyday problems.
Coding in Python and Elements of Discrete Mathematics Basic Books
This textbook invites readers to explore mathematical thinking by finding the beauty in the subject. With an accessible tone and stimulating puzzles, the author will convince curious non-mathematicians to continue their studies in the area. It has an expansive scope, covering everything from probability and graph theory to infinities and Newton’s method. Many examples of proofs appear as well, offering readers the opportunity to explore these topics with the amount of rigor that suits them. Programming exercises in Python are also included to show how math behaves in action. Mathematical Thinking is an ideal textbook for transition courses aimed at undergraduates moving from lower level to more advanced topics, as well as for math recruitment and invitational courses at the freshman or sophomore level. It may also be of interest in computer science departments and can be used as a supplemental text for courses in discrete mathematics and graph theory.
A Programmer's Introduction to Mathematics Addison-Wesley Professional
Aimed at teaching mathematics students how to program using their knowledge of mathematics, the entire books emphasis is on "how to think" when programming. Three methods for constructing an algorithm or a program are used: manipulation and enrichment of existing code; use of recurrent sequences; deferral of code writing, in order to deal with one difficulty at a time. Many theorems are mathematically proved and programmed, and the text concludes with an explanation of how a compiler works and how to compile "by hand" little programs. Intended for anyone who thinks mathematically and wants to program and play with mathematics.
Writing in Software Development Cambridge University Press
Never HIGHLIGHT a Book Again Includes all testable terms, concepts, persons, places, and events. Cram101 Just the FACTS101 studyguides gives all of the outlines, highlights, and quizzes for your textbook with optional online comprehensive practice tests. Only Cram101 is Textbook Specific. Accompanies: 9780982477540. This item is printed on demand.
The Math Gene IGI Global
Learn math by getting creative with code! Use the Python programming language to transform learning high school-level math topics like algebra, geometry, trigonometry, and calculus! Math Adventures with Python will show you how to harness the power of programming to keep math relevant and fun. With the aid of the Python programming language, you'll learn how to visualize solutions to a range of math problems as you use code to explore key mathematical concepts like algebra, trigonometry, matrices, and cellular automata. Once you've learned the programming basics like loops and variables, you'll write your own programs to solve equations quickly, make cool things like an interactive rainbow grid, and automate

tedious tasks like factoring numbers and finding square roots. You'll learn how to write functions to draw and manipulate shapes, create oscillating sine waves, and solve equations graphically. You'll also learn how to: - Draw and transform 2D and 3D graphics with matrices - Make colorful designs like the Mandelbrot and Julia sets with complex numbers - Use recursion to create fractals like the Koch snowflake and the Sierpinski triangle - Generate virtual sheep that graze on grass and multiply autonomously - Crack secret codes using genetic algorithms As you work through the book's numerous examples and increasingly challenging exercises, you'll code your own solutions, create beautiful visualizations, and see just how much more fun math can be!

Coding + Math Springer

This new edition of the popular book No Fear Coding offers current research, updated tools and more cross-curricular connections for K-5 teachers to integrate into their classes. Coding has become an essential skill for finding solutions to everyday problems, while computational thinking (CT) teaches reasoning and creativity, and offers an innovative approach to demonstrating content knowledge and seeing mathematical processes in action. No Fear Coding introduced many K-5 educators to ways to bring coding into their curriculum by embedding computational thinking skills into activities for different content areas. This second edition features updated tools—including programmable robots and other physical computing devices—as well as new activities aligned to the ISTE Standards for Students and Computational Thinking Competencies. Also new in this edition: • New tools for teaching coding—including physical computing devices, block-based programming and AR/VR— along with methods for introducing, tutorials and lesson plans. • Teachable examples and activities that illustrate CT concepts—decomposition, pattern recognition, abstraction and algorithmic thinking. • Resources for deeper understanding and discussion questions for professional development and reflection on the practice of teaching coding and CT. • Tips on demystifying basic coding concepts so that teachers are comfortable teaching these concepts to their students. No Fear Coding, Second Edition will help build students’ coding and CT knowledge to prepare them for the middle grades and beyond.

In Code MIT Press

A hands-on, problem-based introduction to building algorithms and data structures to solve problems with a computer. Algorithmic Thinking will teach you how to solve challenging programming problems and design your own algorithms. Daniel Zingaro, a master teacher, draws his examples from world-class programming competitions like USACO and IOI. You'll learn how to classify problems, choose data structures, and identify appropriate algorithms. You'll also learn how your choice of data structure, whether a hash table, heap, or tree, can affect runtime and speed up your algorithms; and how to adopt powerful strategies like recursion, dynamic programming, and binary search to solve challenging problems. Line-by-line breakdowns of the code will teach you how to use algorithms and data structures like: The breadth-first search algorithm to find the optimal way to play a board game or find the best way to translate a book Dijkstra's algorithm to determine how many mice can exit a maze or the number of fastest routes between two locations The union-find data structure to answer questions about connections in a social network or determine who are friends or enemies The heap data structure to determine the amount of money given away in a promotion The hash-table data structure to determine whether snowflakes are unique or identify compound words in a dictionary NOTE: Each problem in this book is available on a programming-judge website. You'll find the site's URL and problem ID in the description. What's better than a free correctness check?

Essential Computational Thinking Cambridge University Press

Programming Language Pragmatics, Fourth Edition, is the most comprehensive programming language textbook available today. It is distinguished and acclaimed for its integrated treatment of language design and implementation, with an emphasis on the fundamental tradeoffs that continue to drive software development. The book provides readers with a solid foundation in the syntax, semantics, and pragmatics of the full range of programming languages, from traditional languages like C to the latest in functional, scripting, and object-oriented programming. This fourth edition has been heavily revised throughout, with expanded coverage of type systems and functional programming, a unified treatment of polymorphism, highlights of the newest language standards, and examples featuring the ARM and x86 64-bit architectures. Updated coverage of the latest developments in programming language design, including C & C++11, Java 8, C# 5, Scala, Go, Swift, Python 3, and HTML 5 Updated treatment of functional programming, with extensive coverage of OCaml New chapters devoted to type systems and composite types Unified and updated treatment of polymorphism in all its forms New examples featuring the ARM and x86 64-bit architectures

Thnking Mathematically Princeton University Press

An introduction to computational complexity theory, its connections and interactions with mathematics, and its central role in the natural and social sciences, technology, and philosophy Mathematics and Computation provides a broad, conceptual overview of computational complexity theory—the mathematical study of efficient computation. With important practical applications to computer science and industry, computational complexity theory has evolved into a highly interdisciplinary field, with strong links to most mathematical areas and to a growing number of scientific endeavors. Avi Wigderson takes a sweeping survey of complexity theory, emphasizing the field’s insights and challenges. He explains the ideas and motivations leading to key models, notions, and results. In particular, he looks at algorithms and complexity, computations and proofs, randomness and interaction, quantum and arithmetic computation, and cryptography and learning, all as parts of a cohesive whole with numerous cross-influences. Wigderson illustrates the immense breadth of the field, its beauty and richness, and its diverse and growing interactions with other areas of mathematics. He ends with a comprehensive look at the theory of computation, its methodology and aspirations, and the unique and fundamental ways in which it has shaped and will further shape science, technology, and society. For further reading, an extensive bibliography is provided for all topics covered. Mathematics and Computation is useful for undergraduate and graduate students in mathematics, computer science, and related fields, as well as researchers and teachers in these fields. Many parts require little background, and serve as an invitation to newcomers seeking an introduction to the theory of computation. Comprehensive coverage of computational complexity theory, and beyond High-level, intuitive exposition, which brings conceptual clarity to this central and dynamic scientific discipline Historical accounts of the evolution and motivations of central concepts and models A broad view of the theory of computation's influence on science, technology, and society Extensive bibliography

Math for Programmers Algonquin Books

"Mathematical thinking is not the same as 'doing math'--unless you are a professional mathematician. For most people, 'doing math' means the application of procedures and symbolic manipulations. Mathematical thinking, in contrast, is what the name reflects, a way of thinking about things in the world that humans have developed over three thousand years. It does not have to be about mathematics at all, which means that many people can benefit from learning this powerful way of thinking, not just mathematicians and scientists."--Back cover.

No Fear Coding Springer Nature

This book constitutes the refereed proceedings of the 10th European Conference on Technology Enhanced Learning, EC-TEL 2015, held in Toledo, Spain, in September 2015. The 27 full papers, 19 short papers, 9 demo papers and 23 posters were carefully reviewed and selected from 176 submissions. They address topics such as blended learning; self-regulated and self directed learning; reflective learning; intelligent learning systems; learning communities; learning design; learning analytics; learning assessment; personalization and adaptation; serious games; social media; massive open online courses (MOOCs); schools of the future.

Programming for Mathematicians Univ of California Press

The education system is constantly growing and developing as more ways to teach and learn are implemented into the classroom. Recently, there has been a growing interest in teaching computational thinking with schools all over the world introducing it to the curriculum due to its ability to allow students to become proficient at problem solving using logic, an essential life skill. In order to provide the best education possible, it is imperative that computational thinking strategies, along with programming skills and the use of robotics in the classroom, be implemented in order for students to achieve maximum thought processing skills and computer competencies. The Research Anthology on Computational Thinking, Programming, and Robotics in the Classroom is an all-encompassing reference book that discusses how computational thinking, programming, and robotics can be used in education as well as the benefits and difficulties of implementing these elements into the classroom. The book includes strategies for preparing educators to teach computational thinking in the classroom as well as design techniques for incorporating these practices into various levels of school curriculum and within a variety of subjects. Covering topics ranging from decomposition to robot learning, this book is ideal for educators, computer scientists, administrators, academicians, students, and anyone interested in learning more about how computational thinking, programming, and robotics can change the current education system.

Mathematical Reasoning Pearson Higher Ed

Programming and Mathematical Thinking

Good Math Birkhäuser

Did you know that games and puzzles have given birth to many of today's deepest mathematical subjects? Now, with Douglas Ensley and Winston Crawley's Introduction to Discrete Mathematics, you can explore mathematical writing, abstract structures, counting, discrete probability, and graph theory, through games, puzzles, patterns, magic tricks, and real-world problems. You will discover how new mathematical topics can be applied to everyday situations, learn how to work with proofs, and develop your problem-solving skills along the way. Online applications help improve your mathematical reasoning. Highly intriguing, interactive Flash-based applications illustrate key mathematical concepts and help you develop your ability to reason mathematically, solve problems, and work with proofs. Explore More icons in the text direct you to online activities at www.wiley.com/college/ensley. Improve your grade with the Student Solutions Manual. A supplementary Student Solutions Manual contains more detailed solutions to selected exercises in the text.

How Not to Be Wrong International Society for Technology in Education

Concepts of discrete mathematics can help clarify a programmer's thinking about software design problems and can make many solutions obvious. Starting at an elementary level, this book teaches about fundamental structures of discrete mathematics together with many simple but powerful programming techniques using those structures.

Mathematical Thinking Skills Needed by First-year Programming Students Lulu.com

Computer science majors taking a non-programming-based course like discrete mathematics might ask 'Why do I need to learn this?' Written with these students in mind, this text introduces the mathematical foundations of computer science by providing a comprehensive treatment of standard technical topics while simultaneously illustrating some of the broad-ranging applications of that material throughout the field. Chapters on core topics from discrete structures – like logic, proofs, number theory, counting, probability, graphs – are augmented with around 60 'computer science connections' pages introducing their applications: for example, game trees (logic), triangulation of scenes in computer graphics (induction), the Enigma machine (counting), algorithmic bias (relations), differential privacy (probability), and paired kidney transplants (graphs). Pedagogical features include 'Why You Might Care' sections, quick-reference chapter guides and key terms and results summaries, problem-solving and writing tips, 'Taking it Further' asides with more technical details, and around 1700 exercises, 435 worked examples, and 480 figures.

Mathematical Thinking Elsevier

This book describes some basic principles that allow developers of computer programs (computer scientists, software engineers, programmers) to clearly think about the artifacts they deal with in their daily work: data types, programming languages, programs written in these languages that compute from given inputs wanted outputs, and programs that describe continuously executing systems. The core message is that clear thinking about programs can be expressed in a single universal language, the formal language of logic. Apart from its universal elegance and expressiveness, this “logical” approach to the formal modeling of and reasoning about computer programs has another advantage: due to advances in computational logic (automated theorem proving, satisfiability solving, model checking), nowadays much of this process can be supported by software. This book therefore accompanies its theoretical elaborations by practical demonstrations of various systems and tools that are based on respectively make use of the presented logical underpinnings.

Concrete Mathematics: A Foundation for Computer Science No Starch Press

The fundamental mathematical tools needed to understand machine learning include linear algebra, analytic geometry, matrix decompositions, vector calculus, optimization, probability and statistics. These topics are traditionally taught in disparate courses, making it hard for data science or computer science students, or professionals, to efficiently learn the mathematics. This self-contained textbook bridges the gap between mathematical

and machine learning texts, introducing the mathematical concepts with a minimum of prerequisites. It uses these concepts to derive four central machine learning methods: linear regression, principal component analysis, Gaussian mixture models and support vector machines. For students and others with a mathematical background, these derivations provide a starting point to machine learning texts. For those learning the mathematics for the first time, the methods help build intuition and practical experience with applying mathematical concepts. Every chapter includes worked examples and exercises to test understanding. Programming tutorials are offered on the book's web site.

Adventures of a Mathematician Pearson Education India

Toward Zero-Defect Programming describes current methods for writing (nearly) bug-free programs. These methods are based on practices developed at IBM and elsewhere under the name Cleanroom Software Engineering. The successful application of these methods in commercial projects over the past fifteen years has produced defect rates that are, at least, an order of magnitude lower than industry averages. Remarkably, this reduction in defects comes at no net cost; on the contrary, it is often accompanied by increased productivity and shorter overall development time. In a concise and well-illustrated presentation, Stavely shows how these methods can be applied in three key areas of software development: 1. specification, 2. verification, and 3. testing.

Introduction to Mathematical Thinking Penguin Press

Writing in Software Development Allan M. Stavely If you are a working programmer or a programming student, writing is a skill that you can't neglect. Writing is part of any software project, and good writing skills will make you more effective as a software developer. Writing can enhance your career prospects, too. Sure you can write code to someone else's spec, but what if you got to write the spec? Or the proposal for the project? Writing skills could even help you land your dream job in the first place. Like no other book on the market, this book talks about writing in all aspects of software development, including: -design documents -documentation in the code and vice versa -writing for review -requirements and specifications -the vision statement, project proposal and project history -webs of electronic documents This book tells you how to craft all these kinds of writing to make them as effective as they can be. Allan M. Stavely's career in software spans 35 years in education (Computer Science, New Mexico Tech), industry (IBM and HP in the US and UK), consulting and writing. He is the author of Toward Zero-Defect Programming (Addison Wesley). Contact him: al@nmt.edu The publisher will donate a portion of the price of this book to New Mexico Tech for scholarships.