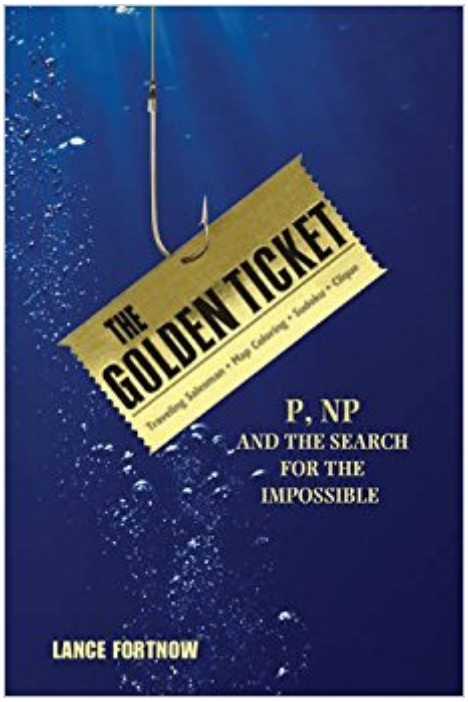
The Golden Ticket: P, NP, And The Search For The Impossible



Synopsis

The P-NP problem is the most important open problem in computer science, if not all of mathematics. Simply stated, it asks whether every problem whose solution can be quickly checked by computer can also be quickly solved by computer. The Golden Ticket provides a nontechnical introduction to P-NP, its rich history, and its algorithmic implications for everything we do with computers and beyond. Lance Fortnow traces the history and development of P-NP, giving examples from a variety of disciplines, including economics, physics, and biology. He explores problems that capture the full difficulty of the P-NP dilemma, from discovering the shortest route through all the rides at Disney World to finding large groups of friends on Facebook. The Golden Ticket explores what we truly can and cannot achieve computationally, describing the benefits and unexpected challenges of this compelling problem.

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Customer Reviews

Starred Review In 1956, mathematician Kurt GÃƒÂ¶del wrote to computer scientist John von Neumann speculating about how Ã¢â ¬Å“the mental work of a mathematician . . . could be completely replaced by a machine.Ã¢â ¬Â• In GÃƒÂ¶delÃ¢â ¬â„¢s speculation, Fortnow finds the kernel of what may be the most important mathematical problem of all time. That as-yet-unsolved problemÃ¢â ¬â •identified by mathematicians as the P-NP problemÃ¢â ¬â •raises fundamental questions about just how far society can ride the technological wave triggered by the computer revolution. Fortnow unfolds a fascinating dual-track story of how this problem first emerged,

Western researchers encountering it while trying to maximize computer efficiency, Russian analysts confronting it while puzzling over the persistent need for perebor (Ã¢â ¬Å“brute force searchÃ¢â ¬Â•). Readers watch as the P-NP problem attracts investigators in cryptography, biology, quantum physics, and social networkingÃ¢â ¬â •and frustrates them all. Fortnow allows nonspecialist readers to glimpse the conceptual difficulties here (try Ã¢â ¬Å“nondeterministic polynomial time,Ã¢â ¬Â• for example). But he mercifully frames his discussion largely in nontechnical terms. Even readers averse to mathematics will share in the intellectual stimulation of pondering a riddle compelling us to ask what we should hope forÃ¢â ¬â •and fearÃ¢â ¬â •in replacing human brains with computer algorithms. A provocative reminder of the real-world consequences of a theoretical enigma. --Bryce Christensen

One of .comÃ¢â ¬â„¢s 2013 Best Science BooksOne of Choice's Outstanding Academic Titles for 2013Honorable Mention for the 2013 PROSE Award in Popular Science & Mathematics, Association of American Publishers"As Fortnow describes. . . P versus NP is Ã¢â ¬Ëœone of the great open problems in all of mathematics' not only because it is extremely difficult to solve but because it has such obvious practical applications. It is the dream of total ease, of the confidence that there is an efficient way to calculate nearly everything, Ã¢â ¬Ëœfrom cures to deadly diseases to the nature of the universe,' even Ã¢â ¬Ëœan algorithmic process to recognize greatness.'. . . To postulate that P Ã¢â Â NP, as Fortnow does, is to allow for a world of mystery, difficulty, and frustration--but also of discovery and inquiry, of pleasures pleasingly delayed."--Alexander Nazaryan, New Yorker"Fortnow effectively initiates readers into the seductive mystery and importance of P and NP problems."--Publishers Weekly"Fortnow's book is just the ticket for bringing one of the major theoretical problems of our time to the level of the average citizen--and yes, that includes elected officials."--Veit Elser, Science"Without bringing formulas or computer code into the narrative, Fortnow sketches the history of this class of questions, convincingly demonstrates their surprising equivalence, and reveals some of the most far-reaching implications that a proof of P = NP would bring about. These might include tremendous advances in biotechnology (for instance, more cures for cancer), information technology, and even the arts. Verdict: Through story and analogy, this relatively slim volume manages to provide a thorough, accessible explanation of a deep mathematical question and its myriad consequences. An engaging, informative read for a broad audience."--J.J.S. Boyce, Library Journal"A provocative reminder of the real-world consequences of a theoretical enigma."--Booklist"The definition of this problem is tricky and technical, but in The Golden Ticket, Lance Fortnow cleverly sidesteps the issue with a boiled-down

version. P is the collection of problems we can solve quickly, NP is the collection of problems we would like to solve. If P = NP, computers can answer all the questions we pose and our world is changed forever. It is an oversimplification, but Fortnow, a computer scientist at Georgia Institute of Technology, Atlanta, knows his stuff and aptly illustrates why NP problems are so important."--Jacob Aron, New Scientist"Fortnow's book does a fine job of showing why the tantalizing question is an important one, with implications far beyond just computer science."--Rob Hardy, Commercial Dispatch"A great book. . . . [Lance Fortnow] has written precisely the book about P vs. NP that the interested layperson or IT professional wants and needs."--Scott Aaronson, Shtetl-Optimized blog"[The Golden Ticket] is a book on a technical subject aimed at a general audience. . . . Lance's mix of technical accuracy with evocative story telling works."--Michael Trick, Michael Trick's Operations Research Blog"Thoroughly researched and reviewed. Anyone from a smart high school student to a computer scientist is sure to get a lot of this book. The presentation is beautiful. There are few formulas but lots of facts."--Daniel Lemire's Blog"An entertaining discussion of the P versus NP problem."--Andrew Binstock, Dr. Dobb's"The Golden Ticketis an extremely accessible and enjoyable treatment of the most important question of theoretical computer science, namely whether P is equal to NP."--Choice"The book is accessible and useful for practically anyone from smart high school students to specialists. . . . [P]erhaps the interest sparked by this book will be the 'Golden Ticket' for further accessible work in this area. And perhaps P=NP will start to become as famous as E=mc2."--Michael Trick, INFORMS Journal of Computing"In any case, it is excellent to have a nontechnical book about the P versus NP question. The Golden Ticket offers an inspiring introduction for nontechnical readers to what is surely the most important open problem in computer science."--Leslie Ann Goldberg, LMS Newsletter"The Golden Ticket does a good job of explaining a complex concept in terms that a secondary-school student will understand--a hard problem in its own right, even if not quite NP."--Physics World"[The Golden Ticket] is fun to read and can be fully appreciated without any knowledge in (theoretical) computer science. Fortnow's efforts to make the difficult material accessible to non-experts should be commended."--Andreas Maletti, Zentralblatt MATH"This is a fabulous book for both educators and students at the secondary school level and above. It does not require any particular mathematical knowledge but, rather, the ability to think. Enjoy the world of abstract ideas as you experience an intriguing journey through mathematical thinking."--Gail Kaplan, Mathematics Teacher"Fortnow's book provides much of the background and personal information on the main characters involved in this problem--notably Steven Cook, with a cameo appearance by Kurt GÃƒÂ¶del--that one does not get in the more technical treatments. There is a lot of information in this book, and the serious computer science

student is sure to learn from it."--James M. Cargal, UMAP Journal

Everything is doing some computations. Everything in the whole universe. The computational flavours range from Math and Physics to Biology and Economics; bounded by our current science. Some computations are feasible within human timeframe (P - polynomial), some are not (NP-complete - non polynomial). For example, you can easily start a computation at home that will outlive yourself. What a messy universe! (Even light travels so slow here) The golden ticket to ÃƒÂ¢Ã â ¬Ã Å“paradiseÃƒÂ¢Ã â ¬Ã Â• is to proof that hard problems (NP) can be reduced to possible problems (P), then P = NP. Lance explores this magnificent challenge using several entertaning analogies (e.g., finding one ticket within many many chocolate bars). To conclude that, maybe, even ask if P=NP is completely nonsense but it is pushing us forward. Some of us are adventurous enough to try impossible things and civilization has been accumulating their results .

Having personally neglected computational theory for almost two decades since completing my doctorate in computer science, this read was a blast - not only reminding me of the main themes of the topic, but seeing a bigger perspective around it than I'd ever previously been taught - plus a lot of new aspects have developed over those years (e.g., I still thought of P/NP as being about deterministic versus non-deterministic, rather than today's more common vantage: recognizing versus finding a solution to a problem instance).The footnote on page 111 is my favorite footnote ever.Given my background, I wouldn't mind (for the Second Edition?) a 2- or 3-page appendix with a Wikipedia type of entry about the technical details, so I could remind myself and ruminate more deeply without interrupting my transcendental state by running back to an actual computer screen, but that is hardly a criticism of the book, given its purpose.My work is in machine learning (aka, predictive analytics), and the author touches upon how P/NP relates to my field; tantalizing food for thought. Machine learning is not just optimization, though; beyond optimizing over a training data set, you need to ensure it then continues to perform well over data not used to optimize it. Hmm, how does this play out if P=NP?Eric Siegel, Ph.D.Founder, Predictive Analytics WorldAuthor,Ã Â Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die

Lance Fortnow's new book is an inspiring, accessible, and imaginative overview of P versus NP that everyone can read and appreciate, which until now has been conspicuously missing from the literature. Within the "folklore" of complexity theory, people have long uttered intuitive phrases to motivate P versus NP in passing, such as "P versus NP is asking whether creativity can be

automated by computers." Fortnow takes these intuitions and expands them, like no one else has before: really imagining a world where P = NP, exploring the magic of computing in that world, and arguing why that world is unlikely to exist. He also discusses a historical account of the problem's origins in both the East and West, how people cope with P versus NP in practice, some past attempts at resolving P versus NP, the applications to cryptography, and the relevance of quantum computing. All this in less than 200 pages!There is an intellectual cost to the immediate accessibility of this book: for example, P and NP are never really formally defined. If you would like to *work* on P versus NP, or (less ambitiously) are looking for a technical overview of the problem, there are many available books to recommend such as Scott Aaronson's newÃ Â Quantum Computing since DemocritusÃ Â or Sipser's classic textbookÃ Â Introduction to the Theory of Computation. However, if you're just looking for a high-level explanation of why P versus NP is so important, Fortnow's book is a great place to start.

The book contains no algorithms. It covers the history of complexity theory and speculates about a science fictionesque future in which cancer would be cured if only we could solve one NP-complete problem, but the author doubts it will happen. It reads like the script of a Discovery Channel program.

I really enjoyed this book. It was a light enough read to finish in one sitting on a weeknight within a few hours, but also showed its importance by being able to connect the dots between the P = NP problem to issues in health care, economics, security, scheduling and a number of other problems. And instead of talking in a "professor-like" tone, the author creates illustrative examples in Chapters 2 and 3 that are easy to grasp. These examples form the basis for much of the problems addressed in the book.This is a book that needed to be written and needs to be on everyone's bookshelf, particularly for those asking questions like "what is mathematics" or "what is mathematics used for". This book answers those questions, and towards the end gives examples (in plain English) of the different branches of mathematics and theoretical computer science, without making it read like a text book.

Good read, for a programmer that is

Excellent accessible book for a very reasonable price. Although I'd say I'm quite familiar with the subject---I've been teaching algorithms and complexity for the last 35 years---I still read the book in

one session, and I think I even got some nice examples for my class for it. At the price it is sold it is a great giveaway, really, it’s a nice gift to get people interested in the subject.

The content of this book is promising but it needs to be sent back to the editor for style and grammar review. If you can read past these issues it is pretty decent.

The Golden Ticket: P, NP, and the Search for the Impossible The Ticket: Full Disclosure: The Completely True Story of the Marconi-winning Little Ticket, A.k.a., the Station That Got Your Mom to Say ’Stay Hard’ Just the Ticket: Ticket Stub Organizer The Missing Golden Ticket and Other Splendiferous Secrets Inside Charlie’s Chocolate Factory: The Complete Story of Willy Wonka, the Golden Ticket, and Roald Dahl’s Most Famous Creation. Warriors Word Scramble: Word Scramble Games - Word Search, Word Puzzles And Word Scrambles (Word Games, Brain Games, Word Search, Word Search Games, Word ... Scramble, Word Scrabble, Unscramble Word) Magic Search Words-Health: Strategies and Search Tactics to Discover the Best of the Internet (Magic Search Words) Word Search: 100 Word Search Puzzles: Volume 3: A Unique Book With 100 Stimulating Word Search Brain Teasers, Each Puzzle Accompanied By A Beautiful ... Relaxation Stress Relief & Art Color Therapy) Word Search For Adult 100 Puzzles Book Volume1: Word Search Book Word Find Puzzles Large Print Game (Word Search Book For Adult 1) Word Search: 100 Word Search Puzzles: Volume 1: A Unique Book With 100 Stimulating Word Search Brain Teasers, Each Puzzle Accompanied By A Beautiful ... Relaxation Stress Relief & Art Color Therapy) Word Search Book Vol.1: 1,000 Verbs for Daily use (Word Search Games Puzzles) (50 Carefully Designed Word Search with Solution to Twist Your Brain Book 1) Word Search: 100 Word Search Puzzles: Volume 2: A Unique Book With 100 Stimulating Word Search Brain Teasers, Each Puzzle Accompanied By A Beautiful ... Relaxation Stress Relief & Art Color Therapy) Golden Legacy: The Story of Golden Books (Deluxe Golden Book) High Paying Clients for Life: A Simple Step By Step System Proven To Sell High Ticket Products And Services (Selling Services: How to sell anything to ... and How to Get Clients for Life Book 1) National Political Convention Ticket, Ribbon Badges and Other Memorabilia Catalog and Price Guide The Arena: Inside the Tailgating, Ticket-Scalping, Mascot-Racing, Dubiously Funded, and Possibly Haunted Monuments of American Sport Ticket Masters: The Rise of the Concert Industry and How the Public Got Scalped No Return Ticket -- Leg Two: Sailing in the Treacherous Roaring Forties, Redemption and Love in the Great Barrier Reef, Pirates On Deck (Volume 2) One Way Ticket To Kansas Caring About Someone With Borderline Personality Disorder And Finding A Healthy You Ticket to Ride: Inside the Beatles’ 1964 and 1965