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Complex networks are one of the most challenging research focuses of disciplines, including physics, mathematics, biology, medicine, engineering, and computer science, among others. The interest in complex networks is increasingly growing, due to their ability to model several daily life systems, such as technology networks, the Internet, and communication, chemical, neural, social, political and financial networks. The Special Issue “Computation in Complex Networks" of Entropy offers a multidisciplinary view on how some complex systems behave, providing a collection of original and high-quality papers within the research fields of: • Community detection • Complex network modelling • Complex network analysis • Node classification • Information spreading and control • Network robustness • Social networks • Network medicine This book constitutes the proceedings of the 11th International Conference on Information Security Practice and Experience, ISPEC 2015, held in Beijing China, in May 2015. The 38 papers presented in this volume were carefully reviewed and selected from 117 submissions. The regular papers are organized in topical sections named: system security, stream cipher, analysis, key exchange protocol, elliptic curve cryptography, authentication, attribute-based encryption, mobile security, theory, implementation, privacy and indistinguishability. "Intended as an upper-level undergraduate or introductory graduate text in computer science theory," this book lucidly covers the key concepts and theorems of the theory of computation. The presentation is remarkably clear; for example, the "proof idea," which offers the reader an intuitive feel for how the proof was constructed, accompanies many of the theorems and a proof. Introduction to the Theory of Computation covers the usual topics for this type of text plus it features a solid section on complexity theory--including an entire chapter on space complexity. The final chapter introduces more advanced topics, such as the discussion of complexity classes associated with probabilistic algorithms. Reverse mathematics studies the complexity of proving mathematical theorems and solving mathematical problems. Typical questions include: Can we prove this result without first proving that one? Can a computer solve this problem? A highly active part of mathematical logic and computability theory, the subject offers beautiful results as well as significant foundational insights. This text provides a modern treatment of reverse mathematics that combines computability theoretic reductions and proofs in formal arithmetic to measure the complexity of theorems and problems from all areas of mathematics. It includes detailed introductions to techniques

from computable mathematics, Weihrauch style analysis, and other parts of computability that have become integral to research in the field. Topics and features: Provides a complete introduction to reverse mathematics, including necessary background from computability theory, second order arithmetic, forcing, induction, and model construction Offers a comprehensive treatment of the reverse mathematics of combinatorics, including Ramsey's theorem, Hindman's theorem, and many other results Provides central results and methods from the past two decades, appearing in book form for the first time and including preservation techniques and applications of probabilistic arguments Includes a large number of exercises of varying levels of difficulty, supplementing each chapter The text will be accessible to students with a standard first year course in mathematical logic. It will also be a useful reference for researchers in reverse mathematics, computability theory, proof theory, and related areas. Damir D. Dzhafarov is an Associate Professor of Mathematics at the University of Connecticut, CT, USA. Carl Mummert is a Professor of Computer and Information Technology at Marshall University, WV, USA. This volume introduces materials that are the core knowledge in the theory of computation. The book is self-contained, with a preliminary chapter describing key mathematical concepts and notations and subsequent chapters moving from the qualitative aspects of classical computability theory to the quantitative aspects of complexity theory. Dedicated chapters on undecidability, NP-completeness, and relative computability round off the work, which focuses on the limitations of computability and the distinctions between feasible and intractable.Topics and features:*Concise, focused materials cover the most fundamental concepts and results in the field of modern complexity theory, including the theory of NP-completeness, NP-hardness, the polynomial hierarchy, and complete problems for other complexity classes*Contains information that otherwise exists only in research literature and presents it in a unified, simplified manner; for example, about complements of complexity classes, search problems, and intermediate problems in NP*Provides key mathematical background information, including sections on logic and number theory and algebra*Supported by numerous exercises and supplementary problems for reinforcement and self-study purposes With its accessibility and well-devised organization, this text/reference is an excellent resource and guide for those looking to develop a solid grounding in the theory of computing. Beginning graduates, advanced undergraduates, and professionals involved in theoretical computer science, complexity theory, and computability will find the book an essential and practical learning tool. Computability and complexity theory should be of central concern to practitioners as well as theorists. Unfortunately, however, the field is known for its impenetrability. Neil Jones's goal as an educator and author is to build a bridge between computability and complexity theory and other areas of computer science, especially programming. In a shift away from the Turing machine- and G&#xfffd;del number-oriented classical approaches, Jones uses concepts familiar from programming languages to make computability and complexity more accessible to computer scientists and more applicable to practical programming problems. According to Jones, the fields of computability and complexity theory, as well as programming languages and semantics, have a great deal to offer each other. Computability and complexity theory have a breadth, depth, and generality not often seen in programming languages. The programming language community, meanwhile, has a firm grasp of algorithm design, presentation, and implementation. In addition, programming languages sometimes provide computational models that are more realistic in certain crucial aspects than traditional models. New results in the book include a proof that constant time factors do matter for its programming-oriented model of computation. (In contrast, Turing machines have a counterintuitive "constant speedup" property: that almost any program can be made to run faster, by any amount. Its proof involves techniques irrelevant to practice.) Further results include simple characterizations in programming terms of the central complexity classes PTIME and LOGSPACE, and a new approach to complete problems for NLOGSPACE, PTIME, NPTIME, and PSPACE, uniformly based on Boolean programs. Foundations of Computing series Presents current developments in the

field of evolutionary scheduling and demonstrates the applicability of evolutionary computational techniques to solving scheduling problems This book provides insight into the use of evolutionary computations (EC) in real-world scheduling, showing readers how to choose a specific evolutionary computation and how to validate the results using metrics and statistics. It offers a spectrum of real-world optimization problems, including applications of EC in industry and service organizations such as healthcare scheduling, aircraft industry, school timetabling, manufacturing systems, and transportation scheduling in the supply chain. It also features problems with different degrees of complexity, practical requirements, user constraints, and MOEC solution approaches. Evolutionary Computation in Scheduling starts with a chapter on scientometric analysis to analyze scientific literature in evolutionary computation in scheduling. It then examines the role and impacts of ant colony optimization (ACO) in job shop scheduling problems, before presenting the application of the ACO algorithm in healthcare scheduling. Other chapters explore task scheduling in heterogeneous computing systems and truck scheduling using swarm intelligence, application of sub-population scheduling algorithm in multi-population evolutionary dynamic optimization, task scheduling in cloud environments, scheduling of robotic disassembly in remanufacturing using the bees algorithm, and more. This book: Provides a representative sampling of real-world problems currently being tackled by practitioners Examines a variety of single-, multi-, and many-objective problems that have been solved using evolutionary computations, including evolutionary algorithms and swarm intelligence Consists of four main parts: Introduction to Scheduling Problems, Computational Issues in Scheduling Problems, Evolutionary Computation, and Evolutionary Computations for Scheduling Problems Evolutionary Computation in Scheduling is ideal for engineers in industries, research scholars, advanced undergraduates and graduate students, and faculty teaching and conducting research in Operations Research and Industrial Engineering. This introductory text covers the key areas of computer science, including recursive function theory, formal languages, and automata. Additions to the second edition include: extended exercise sets, which vary in difficulty; expanded section on recursion theory; new chapters on program verification and logic programming; updated references and examples throughout. These are my lecture notes from CS381/481: Automata and Computability Theory, a one-semester senior-level course I have taught at Cornell Uni versity for many years. I took this course myself in thc fall of 1974 as a first-year Ph.D. student at Cornell from Juris Hartmanis and have been in love with the subject ever sin,:e. The course is required for computer science majors at Cornell. It exists in two forms: CS481, an honors version; and CS381, a somewhat gentler paced version. The syllabus is roughly the same, but CS481 go es deeper into thc subject, covers more material, and is taught at a more abstract level. Students are encouraged to start off in one or the other, then switch within the first few weeks if they find the other version more suitaLle to their level of mathematical skill. The purpose of t.hc course is twofold: to introduce computer science students to the rieh heritage of models and abstractions that have arisen over the years; and to dew!c'p the capacity to form abstractions of their own and reason in terms of them. The rapid growth and expansion of the chemical process industry during the past century have been accompanied by a simultaneous rise in human health problems as well as material and property losses because of fires, explosions, hazardous and toxic spills, equipment failures, other accidents, and business interruptions. Concern over the potential consequences of emissions of harmful chemicals (along with catastrophic accidents) has sparked interest at both the industrial and regulatory levels in obtaining a better understanding of the potential for environmental health risks in chemical and related industries. This practical book presents and examines the environmental and health risk assessment calculations as they apply to various chemical process industries. Chemical Process Industries: Environmental and Health Risk Calculations can be used as a college text designed to provide new engineers and scientists some comprehension of the industries into which they may enter. It also serves as a useful reference for practitioners and will help them better understand the health risk

aspects of various industrial operations. The chemical process industries employ mechanical, electrical, and civil engineers and a host of other scientists; these professions should also benefit from material in this book that applies to their fields of work. This book constitutes the proceedings of the 18th Conference on Computability in Europe, CiE 2022, in Swansea, UK, in July 2022. The 19 full papers together with 7 invited papers presented in this volume were carefully reviewed and selected from 41 submissions. The motto of CiE 2022 was “Revolutions and revelations in computability”. This alludes to the revolutionary developments we have seen in computability theory, starting with Turing's and Gödel's discoveries of the uncomputable and the unprovable and continuing to the present day with the advent of new computational paradigms such as quantum computing and bio-computing, which have dramatically changed our view of computability and revealed new insights into the multifarious nature of computation. This volume contains the texts of the four series of lectures presented by B.Cockburn, C.Johnson, C.W. Shu and E.Tadmor at a C.I.M.E. Summer School. It is aimed at providing a comprehensive and up-to-date presentation of numerical methods which are nowadays used to solve nonlinear partial differential equations of hyperbolic type, developing shock discontinuities. The most effective methodologies in the framework of finite elements, finite differences, finite volumes spectral methods and kinetic methods, are addressed, in particular high-order shock capturing techniques, discontinuous Galerkin methods, adaptive techniques based upon a-posteriori error analysis. This book constitutes the refereed proceedings of the 9th Conference on Computability in Europe, CiE 2013, held in Milan, Italy, in July 2013. The 48 revised papers presented together with 1 invited lecture and 2 tutorials were carefully reviewed and selected with an acceptance rate of under 31,7%. Both the conference series and the association promote the development of computability-related science, ranging over mathematics, computer science and applications in various natural and engineering sciences such as physics and biology, and also including the promotion of related non-scientific fields such as philosophy and history of computing. This book aims to provide a general overview of heuristic search, to present the basic steps of the most popular heuristics, and to stress their hidden difficulties as well as their opportunities. It provides a comprehensive understanding of Heuristic search, the applications of which are now widely used in a variety of industries including engineering, finance, sport, management and medicine. It intends to aid researchers and practitioners in solving complex combinatorial and global optimisation problems, and spark interest in this exciting decision science-based subject. It will provide the reader with challenging and lively methodologies through which they will be able to design and analyse their own techniques This volume constitutes the refereed proceedings of the 36th International Symposium on Mathematical Foundations of Computer Science, MFCS 2011, held in Warsaw, Poland, in August 2011. The 48 revised full papers presented together with 6 invited talks were carefully reviewed and selected from 129 submissions. Topics covered include algorithmic game theory, algorithmic learning theory, algorithms and data structures, automata, grammars and formal languages, bioinformatics, complexity, computational geometry, computer-assisted reasoning, concurrency theory, cryptography and security, databases and knowledge-based systems, formal specifications and program development, foundations of computing, logic in computer science, mobile computing, models of computation, networks, parallel and distributed computing, quantum computing, semantics and verification of programs, and theoretical issues in artificial intelligence. This book constitutes the refereed proceedings of the 11th Australasian Conference on Information Security and Privacy, ACISP 2006, held in Melbourne, Australia, July 2006. The book presents 35 revised full papers and 1 invited paper, organized in topical sections on stream ciphers, symmetric key ciphers, network security, cryptographic applications, secure implementation, signatures, theory, security applications, provable security, protocols, as well as hashing and message authentication. This textbook is uniquely written with dual purpose. It cover cores material in the foundations of computing for graduate students in computer science and also provides an introduction to some more advanced topics for

those intending further study in the area. This innovative text focuses primarily on computational complexity theory: the classification of computational problems in terms of their inherent complexity. The book contains an invaluable collection of lectures for first-year graduates on the theory of computation. Topics and features include more than 40 lectures for first year graduate students, and a dozen homework sets and exercises. Aimed at mathematicians and computer scientists who will only be exposed to one course in this area, Computability: A Mathematical Sketchbook provides a brief but rigorous introduction to the abstract theory of computation, sometimes also referred to as recursion theory. It develops major themes in computability theory, such as Rice's theorem and the recursion theorem, and provides a systematic account of Blum's complexity theory as well as an introduction to the theory of computable real numbers and functions. The book is intended as a university text, but it may also be used for self-study; appropriate exercises and solutions are included. This book constitutes the refereed proceedings of the 14th Conference on Computability in Europe, CiE 2018, held in Kiel, Germany, in July/ August 2017. The 26 revised full papers were carefully reviewed and selected from 55 submissions. In addition, this volume includes 15 invited papers. The conference CiE 2018 has six special sessions, namely: Approximation and optimization, Bioinformatics and bio-inspired computing, computing with imperfect information, continuous computation, history and philosophy of computing (celebrating the 80th birthday of Martin Davis), and SAT-solving. The theme of this book is formed by a pair of concepts: the concept of formal language as carrier of the precise expression of meaning, facts and problems, and the concept of algorithm or calculus, i.e. a formally operating procedure for the solution of precisely described questions and problems. The book is a unified introduction to the modern theory of these concepts, to the way in which they developed first in mathematical logic and computability theory and later in automata theory, and to the theory of formal languages and complexity theory. Apart from considering the fundamental themes and classical aspects of these areas, the subject matter has been selected to give priority throughout to the new aspects of traditional questions, results and methods which have developed from the needs or knowledge of computer science and particularly of complexity theory. It is both a textbook for introductory courses in the above-mentioned disciplines as well as a monograph in which further results of new research are systematically presented and where an attempt is made to make explicit the connections and analogies between a variety of concepts and constructions. Complexity, computability and solution of linear programming systems are re-examined in the light of Khachian's new notion of (approximate) solution. Algorithms, basic theorems and alternate representations are reviewed. It is shown that the Klee-Minty example has never been exponential for (exact) adjacent extreme point algorithms and that the Balinski-Gomory (exact) algorithm is polynomial where (approximate) ellipsoidal 'centered-cut-off' algorithms (Levin, Shor, Khachian, Gacs-Lovasz) are exponential. Both the Klee-Minty and the new J. Clausen example are shown to be trivial (explicitly solvable) interval programming problems. A new notion of computable (approximate) solution is proposed together with an a priori regularization for linear programming systems. New polyhedral 'constraint contraction' algorithms are proposed for approximate solution and the relevance of interval programming for good starts or exact solution is brought forth. (Author). The internet of things (IoT) is quickly growing into a large industry with a huge economic impact expected in the near future. However, the users needs go beyond the existing web-like services, which do not provide satisfactory intelligence levels. Ambient intelligence services in IoT environments is an emerging research area that can change the way that technology and services are perceived by the users. Ambient Intelligence Services in IoT Environments: Emerging Research and Opportunities is a unique source that systemizes recent trends and advances for service development with such key technological enablers of modern ICT as ambient intelligence, IoT, web of things, and cyber-physical systems. The considered concepts and models are presented using a smart spaces approach with a particular focus on the Smart-M3 platform, which is now shaping into an

open source technology for creating ontology-based smart spaces and is shifting towards the development of web of things applications and socio-cyber-physical systems. Containing coverage on a broad range of topics such as fog computing, smart environments, and virtual reality, multitudes of researchers, students, academicians, and professionals will benefit from this timely reference. The goal of the Encyclopedia of Optimization is to introduce the reader to a complete set of topics that show the spectrum of research, the richness of ideas, and the breadth of applications that has come from this field. The second edition builds on the success of the former edition with more than 150 completely new entries, designed to ensure that the reference addresses recent areas where optimization theories and techniques have advanced. Particularly heavy attention resulted in health science and transportation, with entries such as "Algorithms for Genomics", "Optimization and Radiotherapy Treatment Design", and "Crew Scheduling". New and classical results in computational complexity, including interactive proofs, PCP, derandomization, and quantum computation. Ideal for graduate students. Although computation and the science of physical systems would appear to be unrelated, there are a number of ways in which computational and physical concepts can be brought together in ways that illuminate both. This volume examines fundamental questions which connect scholars from both disciplines: is the universe a computer? Can a universal computing machine simulate every physical process? What is the source of the computational power of quantum computers? Are computational approaches to solving physical problems and paradoxes always fruitful? Contributors from multiple perspectives reflecting the diversity of thought regarding these interconnections address many of the most important developments and debates within this exciting area of research. Both a reference to the state of the art and a valuable and accessible entry to interdisciplinary work, the volume will interest researchers and students working in physics, computer science, and philosophy of science and mathematics. This book assembles some of the most important problems and solutions in theoretical computer science-from computability, logic, circuit theory, and complexity. The book presents these important results with complete proofs in an understandable form. It also presents previously open problems that have found (perhaps unexpected) solutions, and challenges the reader to pursue further active research in computer science. Finite Element Solution of Boundary Value Problems: Theory and Computation provides an introduction to both the theoretical and computational aspects of the finite element method for solving boundary value problems for partial differential equations. This book is composed of seven chapters and begins with surveys of the two kinds of preconditioning techniques, one based on the symmetric successive overrelaxation iterative method for solving a system of equations and a form of incomplete factorization. The subsequent chapters deal with the concepts from functional analysis of boundary value problems. These topics are followed by discussions of the Ritz method, which minimizes the quadratic functional associated with a given boundary value problem over some finite-dimensional subspace of the original space of functions. Other chapters are devoted to direct methods, including Gaussian elimination and related methods, for solving a system of linear algebraic equations. The final chapter continues the analysis of preconditioned conjugate gradient methods, concentrating on applications to finite element problems. This chapter also looks into the techniques for reducing rounding errors in the iterative solution of finite element equations. This book will be of value to advanced undergraduates and graduates in the areas of numerical analysis, mathematics, and computer science, as well as for theoretically inclined workers in engineering and the physical sciences. Juraj Hromkovic takes the reader on an elegant route through the theoretical fundamentals of computer science. The author shows that theoretical computer science is a fascinating discipline, full of spectacular contributions and miracles. The book also presents the development of the computer scientist's way of thinking as well as fundamental concepts such as approximation and randomization in algorithmics, and the basic ideas of cryptography and interconnection network design. The interplay between computability and randomness has been an active area of research in recent years, reflected by ample funding in the USA, numerous workshops, and

publications on the subject. The complexity and the randomness aspect of a set of natural numbers are closely related. Traditionally, computability theory is concerned with the complexity aspect. However, computability theoretic tools can also be used to introduce mathematical counterparts for the intuitive notion of randomness of a set. Recent research shows that, conversely, concepts and methods originating from randomness enrich computability theory. The book covers topics such as lowness and highness properties, Kolmogorov complexity, betting strategies and higher computability. Both the basics and recent research results are desribed, providing a very readable introduction to the exciting interface of computability and randomness for graduates and researchers in computability theory, theoretical computer science, and measure theory. This collection of articles presents a snapshot of the status of computability theory at the end of the millennium and a list of fruitful directions for future research. The papers represent the works of experts in the field who were invited speakers at the AMS-IMS-SIAM 1999 Summer Conference on Computability Theory and Applications, which focused on open problems in computability theory and on some related areas in which the ideas, methods, and/or results of computability theory play a role. Some presentations are narrowly focused; others cover a wider area. Topics included from "pure" computability theory are the computably enumerable degrees (M. Lerman), the computably enumerable sets (P. Cholak, R. Soare), definability issues in the c.e. and Turing degrees (A. Nies, R. Shore) and other degree structures (M. Arslanov, S. Badaev and S. Goncharov, P. Odifreddi, A. Sorbi). The topics involving relations between computability and other areas of logic and mathematics are reverse mathematics and proof theory (D. Cenzer and C. Jockusch, C. Chong and Y. Yang, H. Friedman and S. Simpson), set theory (R. Dougherty and A. Kechris, M. Groszek, T. Slaman) and computable mathematics and model theory (K. Ambos-Spies and A. Kucera, R. Downey and J. Remmel, S. Goncharov and B. Khoussainov, J. Knight, M. Peretyat'kin, A. Shlapentokh). The book is a collection of high-quality research papers presented at 7th Euro-China Conference on Intelligent Data Analysis and Applications, hosted by Communication University of Zhejiang, China and technically co-sponsored by Shandong University of Science and Technology, China; Zhejiang Lab, China; and Fujian University of Technology, China. The book covers areas like intelligent data analysis, computational intelligences, signal processing, and all associated applications of artificial intelligence. This text covers the classic material on computability using Turing machines, more recent results concerning complexity classes, NP-completeness and PSPACE-completeness. It also includes numerous exercises. For upper level courses on Automata. Combining classic theory with unique applications, this crisp narrative is supported by abundant examples and clarifies key concepts by introducing important uses of techniques in real systems. Broad-ranging coverage allows instructors to easily customise course material to fit their unique requirements. Internet usage has become a facet of everyday life, especially as more technological advances have made it easier to connect to the web from virtually anywhere in the developed world. However, with this increased usage comes heightened threats to security within digital environments. The Handbook of Research on Modern Cryptographic Solutions for Computer and Cyber Security identifies emergent research and techniques being utilized in the field of cryptology and cyber threat prevention. Featuring theoretical perspectives, best practices, and future research directions, this handbook of research is a vital resource for professionals, researchers, faculty members, scientists, graduate students, scholars, and software developers interested in threat identification and prevention. This is volume I of the proceedings of the Second International Conference on Natural Computation, ICNC 2006. After a demanding review process 168 carefully revised full papers and 86 revised short papers were selected from 1915 submissions for presentation in two volumes. This first volume includes 130 papers related to artificial neural networks, natural neural systems and cognitive science, neural network applications, as well as evolutionary computation: theory and algorithms. The vast majority of real-world problems can be expressed as an optimisation task by formulating an objective function, also known as cost or fitness function.

The most logical methods to optimise such a function when (1) an analytical expression is not available, (2) mathematical hypotheses do not hold, and (3) the dimensionality of the problem or stringent real-time requirements make it infeasible to find an exact solution mathematically are from the field of Evolutionary Computation (EC) and Swarm Intelligence (SI). The latter are broad and still growing subjects in Computer Science in the study of metaheuristic approaches, i.e., those approaches which do not make any assumptions about the problem function, inspired from natural phenomena such as, in the first place, the evolution process and the collaborative behaviours of groups of animals and communities, respectively. This book contains recent advances in the EC and SI fields, covering most themes currently receiving a great deal of attention such as benchmarking and tunning of optimisation algorithms, their algorithm design process, and their application to solve challenging real-world problems to face large-scale domains. Today's highly parameterized large-scale distributed computing systems may be composed of a large number of various components (computers, databases, etc) and must provide a wide range of services. The users of such systems, located at different (geographical or managerial) network cluster may have a limited access to the system's services and resources, and different, often conflicting, expectations and requirements. Moreover, the information and data processed in such dynamic environments may be incomplete, imprecise, fragmentary, and overloading. All of the above mentioned issues require some intelligent scalable methodologies for the management of the whole complex structure, which unfortunately may increase the energy consumption of such systems. An optimal energy utilization has reached to a point that many information technology (IT) managers and corporate executives are all up in arms to identify scalable solution that can reduce electricity consumption (so that the total cost of operation is minimized) of their respective large-scale computing systems and simultaneously improve upon or maintain the current throughput of the system. This book in its eight chapters, addresses the fundamental issues related to the energy usage and the optimal low-cost system design in high performance ``green computing'' systems. The recent evolutionary and general metaheuristic-based solutions for energy optimization in data processing, scheduling, resource allocation, and communication in modern computational grids, could and network computing are presented along with several important conventional technologies to cover the hot topics from the fundamental theory of the ''green computing'' concept and to describe the basic architectures of systems. This book points out the potential application areas and provides detailed examples of application case studies in low-energy computational systems. The development trends and open research issues are also outlined. All of those technologies have formed the foundation for the green computing that we know of today. Volumes CCIS 107 and LNCS 6382 constitute the proceedings of the 5th International Symposium, ISICA 2010, held in Wuhan, China, in October 2010. ISICA 2010 attracted 267 submissions and through rigorous reviews 53 papers were included in LNCS 6382. The papers are presented in sections on ANT colony and particle swarm optimization, differential evolution, distributed computing, genetic algorithms, multi-agent systems, multi-objective and dynamic optimization, robot intelligence, statistic learning and system design. The take-it-with-you collecting resource? At last, a guide you can really carry along to estate sales, garage sales, and flea markets, containing 1,000 color photographs and current pricing to make on-the-spot appraisals easy. New to this edition! Feature chapters on Christmas stamps and Error stamps 1,000 detailed color photos Listings for all 4,250+ U.S. regular-issue and Airmail stamps from 1847-2010 Accurate prices in Unused and Used condition State-of-the-market report and advice on beginning a collection, including where to find stamps, judging quality, grading, and handling and storage The focus of this book is the P versus NP Question and the theory of NP-completeness. It also provides adequate preliminaries regarding computational problems and computational models. The P versus NP Question asks whether or not finding solutions is harder than checking the correctness of solutions. An alternative formulation asks whether or not discovering proofs is harder than verifying their correctness. It is widely believed that the answer to

these equivalent formulations is positive, and this is captured by saying that P is different from NP. Although the P versus NP Question remains unresolved, the theory of NP-completeness offers evidence for the intractability of specific problems in NP by showing that they are universal for the entire class. Amazingly enough, NP-complete problems exist, and furthermore hundreds of natural computational problems arising in many different areas of mathematics and science are NP-complete.