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*Édouard Lucas  
and Primality Testing*



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# Edouard Lucas And Primality Testing

**Christian J.-C. Ballot, Hugh C. Williams**



## **Edouard Lucas And Primality Testing:**

*Edouard Lucas and Primality Testing* Hugh C. Williams, 1998-03-31 Describes the development and extension of fundamental idea of Edouard Lucas a French mathematician and mathematical recreationist that is still used today in the verification of the largest primes

**Édouard Lucas and Primality Testing** Hugh C. Williams, 2021 *Primality Testing and Integer Factorization in Public-Key Cryptography* Song Y. Yan, 2009-04-03 Intended for advanced level students in computer science and mathematics this key text now in a brand new edition provides a survey of recent progress in primality testing and integer factorization with implications for factoring based public key cryptography For this updated and revised edition notable new features include a comparison of the Rabin Miller probabilistic test in RP the Atkin Morain elliptic curve test in ZPP and the AKS deterministic test

**Factorization and Primality Testing** David M. Bressoud, 2012-12-06 About binomial theorems I'm teeming with a lot of news With many cheerful facts about the square on the hypotenuse William S Gilbert *The Pirates of Penzance* Act I The question of divisibility is arguably the oldest problem in mathematics Ancient peoples observed the cycles of nature the day the lunar month and the year and assumed that each divided evenly into the next Civilizations as separate as the Egyptians of ten thousand years ago and the Central American Mayans adopted a month of thirty days and a year of twelve months Even when the inaccuracy of a 360 day year became apparent they preferred to retain it and add five intercalary days The number 360 retains its psychological appeal today because it is divisible by many small integers The technical term for such a number reflects this appeal It is called a smooth number At the other extreme are those integers with no smaller divisors other than 1 integers which might be called the indivisibles The mystic qualities of numbers such as 7 and 13 derive in no small part from the fact that they are indivisibles The ancient Greeks realized that every integer could be written uniquely as a product of indivisibles larger than 1 what we appropriately call prime numbers To know the decomposition of an integer into a product of primes is to have a complete description of all of its divisors

*Fibonacci and Lucas Numbers with Applications* Thomas Koshy, 2011-10-24 The first comprehensive survey of mathematics most fascinating number sequences Fibonacci and Lucas numbers have intrigued amateur and professional mathematicians for centuries This volume represents the first attempt to compile a definitive history and authoritative analysis of these famous integer sequences complete with a wealth of exciting applications enlightening examples and fun exercises that offer numerous opportunities for exploration and experimentation The author has assembled a myriad of fascinating properties of both Fibonacci and Lucas numbers as developed by a wide range of sources and catalogued their applications in a multitude of widely varied disciplines such as art stock market investing engineering and neurophysiology Most of the engaging and delightful material here is easily accessible to college and even high school students though advanced material is included to challenge more sophisticated Fibonacci enthusiasts A historical survey of the development of Fibonacci and Lucas numbers biographical sketches of intriguing personalities involved in developing the

subject and illustrative examples round out this thorough and amusing survey. Most chapters conclude with numeric and theoretical exercises that do not rely on long and tedious proofs of theorems. Highlights include a balanced blend of theory and real world applications. Excellent reference material for student reports and projects. User friendly informal and entertaining writing style. Historical interjections and short biographies that add a richer perspective to the topic. Reference sections providing important symbols, problems, solutions and fundamental properties from the theory of numbers and matrices. Fibonacci and Lucas Numbers with Applications provides mathematicians with a wealth of reference material in one convenient volume and presents an in depth and entertaining resource for enthusiasts at every level and from any background.

**High Primes and Misdemeanours: Lectures in Honour of the 60th Birthday of Hugh Cowie Williams** A. J. Van Der Poorten, Andreas Stein, 2004 This volume consists of a selection of papers based on presentations made at the international conference on number theory held in honor of Hugh Williams sixtieth birthday. The papers address topics in the areas of computational and explicit number theory and its applications. The material is suitable for graduate students and researchers interested in number theory.

**APPLIED CRYPTOGRAPHY** SINGH, KHUMAN, THEM MANGLEM, 2025-02-01 Cryptography is often perceived as a highly mathematical subject making it challenging for many learners to grasp. Recognizing this, the book has been written with a focus on accessibility requiring minimal prerequisites in number theory or algebra. The book aims to explain cryptographic principles and how to apply and develop cryptographic algorithms and systems. The book comprehensively covers symmetric and asymmetric ciphers, hashes, digital signatures, random number generators, authentication schemes, secret sharing schemes, key distribution, elliptic curves and their practical applications. To simplify the subject, the book begins with an introduction to the essential concepts of number theory tailored for students with little to no prior exposure. The content is presented with an algorithmic approach and includes numerous illustrative examples making it ideal for beginners as well as those seeking a refresher. Overall, the book serves as a practical and approachable guide to mastering the subject.

**KEY FEATURE** Includes recent applications of elliptic curves with extensive algorithms and corresponding examples and exercises with detailed solutions. Primality testing algorithms such as Miller Rabin, Solovay Strassen and Lucas Lehmer for Mersenne integers are described for selecting strong primes. Factoring algorithms such as Pollard  $\rho$ , Pollard Rho, Dixon's Quadratic sieve. Elliptic curve factoring algorithms are discussed. Paillier cryptosystem and Paillier publicly verifiable secret sharing scheme are described. Signcryption scheme that provides both confidentiality and authentication is explained for traditional and elliptic curve based approaches.

**TARGET AUDIENCE** B Tech Computer Science and Engineering, B Tech Electronics and Communication Engineering.

**Cryptography and Computational Number Theory** Kwok Y. Lam, Igor Shparlinski, Huaxiong Wang, Chaoping Xing, 2013-03-07 This volume contains the refereed proceedings of the Workshop on Cryptography and Computational Number Theory CCNT 99 which has been held in Singapore during the week of November 22-26, 1999. The workshop was organized by the Centre for Systems

Security of the National University of Singapore We gratefully acknowledge the financial support from the Singapore National Science and Technology Board under the grant number RP960668 M The idea for this workshop grew out of the recognition of the recent rapid development in various areas of cryptography and computational number theory The event followed the concept of the research programs at such well known research institutions as the Newton Institute UK Oberwolfach and Dagstuhl Germany and Luminy France Accordingly there were only invited lectures at the workshop with plenty of time for informal discussions It was hoped and successfully achieved that the meeting would encourage and stimulate further research in information and computer security as well as in the design and implementation of number theoretic cryptosystems and other related areas Another goal of the meeting was to stimulate collaboration and more active interaction between mathematicians computer scientists practical cryptographers and engineers in academia industry and government

**The Lucas Sequences** Christian J.-C. Ballot, Hugh C. Williams, 2023-10-19 Although the Lucas sequences were known to earlier investigators such as Lagrange Legendre and Genocchi it is because of the enormous number and variety of results involving them revealed by Édouard Lucas between 1876 and 1880 that they are now named after him Since Lucas' early work much more has been discovered concerning these remarkable mathematical objects and the objective of this book is to provide a much more thorough discussion of them than is available in existing monographs In order to do this a large variety of results currently scattered throughout the literature are brought together Various sections are devoted to the intrinsic arithmetic properties of these sequences primality testing the Lucasnomials some associated density problems and Lucas' problem of finding a suitable generalization of them Furthermore their application not only to primality testing but also to integer factoring efficient solution of quadratic and cubic congruences cryptography and Diophantine equations are briefly discussed Also many historical remarks are sprinkled throughout the book and a biography of Lucas is included as an appendix Much of the book is not intended to be overly detailed Rather the objective is to provide a good elementary and clear explanation of the subject matter without too much ancillary material Most chapters with the exception of the second and the fourth will address a particular theme provide enough information for the reader to get a feel for the subject and supply references to more comprehensive results Most of this work should be accessible to anyone with a basic knowledge of elementary number theory and abstract algebra The book's intended audience is number theorists both professional and amateur students and enthusiasts

**High Primes and Misdemeanours** Hugh C. Williams, A. J. Van Der Poorten, Andreas Stein, This volume consists of a selection of papers based on presentations made at the international conference on number theory held in honor of Hugh Williams' sixtieth birthday The papers address topics in the areas of computational and explicit number theory and its applications The material is suitable for graduate students and researchers interested in number theory

**Number Theory for the Millennium III** M.A. Bennett, Bruce Berndt, N. Boston, A.J. Hildebrand, H.G. Diamond, W. Philipp, 2023-03-17 Building on the tradition of an outstanding series of conferences at the University of Illinois at Urbana

Champaign the organizers attracted an international group of scholars to open the new Millennium with a conference that reviewed the current state of number theory research and pointed to future directions in the field The conference was the largest general number theory conference in recent history featuring a total of 159 talks with the plenary lectures given by George Andrews Jean Bourgain Kevin Ford Ron Graham Andrew Granville Roger Heath Brown Christopher Hooley Winnie Li Kumar Murty Mel Nathanson Ken Ono Carl Pomerance Bjorn Poonen Wolfgang Schmidt Chris Skinner K Soundararajan Robert Tijdeman Robert Vaughan and Hugh Williams The Proceedings Volumes of the conference review some of the major number theory achievements of this century and to chart some of the directions in which the subject will be heading during the new century These volumes will serve as a useful reference to researchers in the area and an introduction to topics of current interest in number theory for a general audience in mathematics

**LATIN 2016: Theoretical Informatics** Evangelos Kranakis, Gonzalo Navarro, Edgar Chávez, 2016-03-21 This book constitutes the refereed proceedings of the 12th Latin American Symposium on Theoretical Informatics LATIN 2016 held in Ensenada Mexico in April 2016 The 52 papers presented together with 5 abstracts were carefully reviewed and selected from 131 submissions The papers address a variety of topics in theoretical computer science with a certain focus on algorithms approximation online randomized algorithmic game theory etc analytic combinatorics and analysis of algorithms automata theory and formal languages coding theory and data compression combinatorial algorithms combinatorial optimization combinatorics and graph theory complexity theory computational algebra computational biology computational geometry computational number theory cryptology databases and information retrieval data structures formal methods and security Internet and the web parallel and distributed computing pattern matching programming language theory and random structures

**The Joy of Factoring** Samuel S. Wagstaff (Jr.), 2013-10-24 This book is about the theory and practice of integer factorization presented in a historic perspective It describes about twenty algorithms for factoring and a dozen other number theory algorithms that support the factoring algorithms Most algorithms are described both in words and in pseudocode to satisfy both number theorists and computer scientists Each of the ten chapters begins with a concise summary of its contents This book is written for readers who want to learn more about the best methods of factoring integers many reasons for factoring and some history of this fascinating subject It can be read by anyone who has taken a first course in number theory Publisher website

**The Enchantment of Numbers** Eric L. F. Roettger, Hugh C. Williams, 2025-07-01 Inspired by the classic *Recreations in the Theory of Numbers* The Queen of Mathematics Entertains by Albert H Beiler this book brings the excitement of recreational number theory into the 21st century through the lens of computational techniques While Beiler's work originally published in 1964 captivated readers with its breadth and charm some sections have become dated Here we re examine most of the key topics Beiler covered while introducing fresh updates and insights rooted in computational number theory The authors aim to present efficient computer algorithms to tackle various problems that arise in the theory of numbers providing a deeper and

more modern perspective on these timeless puzzles Though we cannot rival Beiler's exuberant prose we hope our enduring fascination with these topics cultivated over decades of study and teaching will shine through and resonate with readers The book is structured into 21 chapters each focusing on different facets of number theory with which the authors have extensive expertise From ancient problems to contemporary computational challenges this volume will reignite the joy and wonder found in numbers while incorporating the power of modern computation Whether you're a seasoned mathematician or a curious learner this book promises a journey through the rich and playful landscape of number theory making both historical and new discoveries accessible to all

**Public-Key Cryptography and Computational Number Theory** Kazimierz Alster, Jerzy Urbanowicz, Hugh C. Williams, 2011-06-24 The Proceedings contain twenty selected refereed contributions arising from the International Conference on Public Key Cryptography and Computational Number Theory held in Warsaw Poland on September 11-15 2000 The conference attended by eighty-five mathematicians from eleven countries was organized by the Stefan Banach International Mathematical Center This volume contains articles from leading experts in the world on cryptography and computational number theory providing an account of the state of research in a wide variety of topics related to the conference theme It is dedicated to the memory of the Polish mathematicians Marian Rejewski 1905-1980 Jerzy Rycki 1909-1942 and Henryk Zygański 1907-1978 who deciphered the military version of the famous Enigma in December 1932 January 1933 A noteworthy feature of the volume is a foreword written by Andrew Odlyzko on the progress in cryptography from Enigma time until now

Those Fascinating Numbers Jean-Marie De Koninck, 2009 Who would have thought that listing the positive integers along with their most remarkable properties could end up being such an engaging and stimulating adventure The author uses this approach to explore elementary and advanced topics in classical number theory A large variety of numbers are contemplated Fermat numbers Mersenne primes powerful numbers sublime numbers Wieferich primes insolite numbers Sastry numbers voracious numbers to name only a few The author also presents short proofs of miscellaneous results and constantly challenges the reader with a variety of old and new number theory conjectures This book becomes a platform for exploring new concepts such as the index of composition and the index of isolation of an integer In addition the book displays several tables of particular families of numbers including the list of all 88 narcissistic numbers and the list of the eight known numbers which are not prime powers but which can be written as the sum of the cubes of their prime factors and in each case with the algorithm used to create them

**Combinatorial Number Theory** Bruce Landman, Melvyn B. Nathanson, Jaroslav Nešetřil, Richard J. Nowakowski, Carl Pomerance, 2011-12-22 This carefully edited volume contains selected refereed papers based on lectures presented by many distinguished speakers at the Integers Conference 2005 an international conference in combinatorial number theory The conference was held in celebration of the 70th birthday of Ronald Graham a leader in several fields of mathematics

**Recurrence Sequences** Graham Everest, Alf van der Poorten, Igor Shparlinski, Thomas Ward, 2015-09-03 Recurrence sequences are of great intrinsic interest and have

been a central part of number theory for many years Moreover these sequences appear almost everywhere in mathematics and computer science This book surveys the modern theory of linear recurrence sequences and their generalizations Particular emphasis is placed on the dramatic impact that sophisticated methods from Diophantine analysis and transcendence theory have had on the subject Related work on bilinear recurrences and an emerging connection between recurrences and graph theory are covered Applications and links to other areas of mathematics are described including combinatorics dynamical systems and cryptography and computer science The book is suitable for researchers interested in number theory combinatorics and graph theory

**Integers** Bruce Landman, 2014-06-18 Integers is a refereed online journal devoted to research in the area of combinatorial number theory It publishes original research articles in combinatorics and number theory Topics covered by the journal include additive number theory multiplicative number theory sequences and sets extremal combinatorics Ramsey theory elementary number theory classical combinatorial problems hypergraphs and probabilistic number theory Integers also houses a combinatorial games section This work presents all papers of the 2013 volume in book form

**Mathematical Journeys** Peter D. Schurer, 2004-02-11 A colorful tour through the intriguing world of mathematics Take a grand tour of the best of modern math its most elegant solutions most clever discoveries most mind bending propositions and most impressive personalities Writing with a light touch while showing the real mathematics author Peter Schurer introduces you to the history of mathematics number theory combinatorics geometry graph theory and recreational mathematics Requiring only high school math and a healthy curiosity Mathematical Journeys helps you explore all those aspects of math that mathematicians themselves find most delightful You ll discover brilliant sometimes quirky and humorous tidbits like how to compute the digits of pi the Josephus problem mathematical amusements such as Nim and Wythoff s game pizza slicing and clever twists on rolling dice



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