Bits and Chips

Computer Science in Questions and Puzzles for Aspiring Coders

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Preface

At the intersection of mathematics and computer science lies a mysterious domain where kids and adults can notice patterns, solve problems, and sharpen their logic skills. Some call it "computational thinking." Others call it puzzle fun. After you've played around with the 244 questions in this book, you can decide what to call it.

This book was inspired by the questions we co-wrote for the Continental Mathematics League computer science contests. We have written two contests every year since 2014: one for elementary school kids (Grades 3-5) and one for middle school students (Grades 6-8). We have also added a few new questions for this book.

Our questions do not assume any prior knowledge of computer science or coding — only an open mind and an interest in solving problems and puzzles related to computer science. We have organized the questions by topic into 14 chapters. Each chapter begins with a brief prologue, which introduces the topic and its historical background. At the end of the book you will find answers and solutions for all the questions.

We do not expect every reader to answer all 244 questions, of course — you can pick and choose. You may like more Bongard problems (Chapter 2) or turtle graphics code (Chapter 6), number systems (Chapter 7) or strategy games (Chapter 11), or graphs (Chapter 13). As we said, no knowledge of coding is expected — the questions are suitable for "pre-coders" of all ages.

Even if you are an experienced computer programmer in Scratch, Python, Java, or another programming language, you will find many questions in this book to be informative and challenging enough. We believe a literate coder should be familiar with basic computer science and mathematical concepts.

The book includes questions of different levels of difficulty. "Intermediate" questions are marked by a "blue" square: ▪. Harder questions are marked by a "black diamond": ♦. Go ahead and try to answer all levels of questions — do not quit on a question too early. We hope you will enjoy solving them. Good luck!
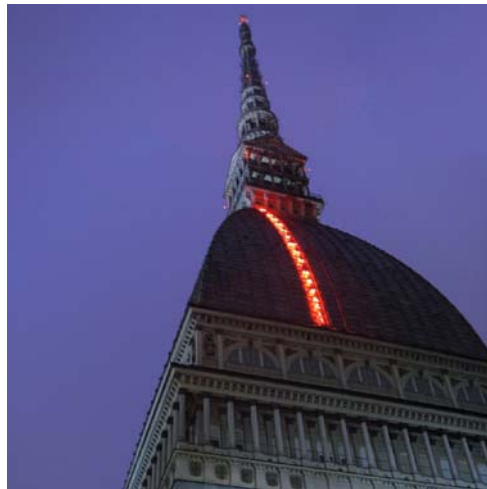
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We have added several questions in this edition.

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On the cover: *Il volo dei numeri* (the Flight of Numbers) by Mario Merz, a fragment. This installation on the roof of Mole Antonelliana in Turin is illuminated every night since 2000.

Courtesy luoghidelcontemporaneo.beniculturali.it/il-volo-dei-numeri.