

Fourth Edition

Be Prepared
for the

AP

Computer
Science
Exam in Java

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Library of Congress Control Number: 2009904716

ISBN 978-0-9824775-0-2

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1 2 3 4 5 6 7 8 9 10 14 13 12 11 10 09

Printed in the United States of America

Preface

The AP exam in computer science tests your understanding of basic concepts in computer science as well as your fluency in Java programming. The exam covers roughly the material of a one-semester introductory college course in computer science (CS-1).

In the past, the College Board offered two computer science exams, called “A” and “AB.” Recently the College Board has made a decision to drop the more advanced AB exam and, starting in 2010, will offer only one exam (still called “A”).

Exam questions are developed by The College Board’s AP CS Test Development Committee, and exams are put together by Educational Testing Service (ETS). The College Board offers exams in more than 30 subjects. In 2008, 1,559,665 students took 2,694,569 exams in the US and Canada. The most up-to-date information on the AP exams offered and participation statistics can be found on The College Board’s *AP Central* web site, <http://apcentral.collegeboard.com>.

In the spring of 2004, the computer science exams used Java for the first time. At the same time, the AP CS program’s emphasis shifted from implementation of algorithms and coding proficiency to object-oriented software design and development. The 2009 exam, however, shows some renewed interest in algorithms.

Developing exams is a very big effort for The College Board; training teachers in a new programming language is another big undertaking. So it is safe to say that Java is here to stay for a few more years, as long as it remains a popular programming language in colleges and in the industry.

Answers to exam questions written in a programming language other than Java will not receive credit.

A working knowledge of Java is necessary but not sufficient for a good grade on the exam. First and foremost, you must understand the basic concepts of computer science, object-oriented programming (OOP), and some common algorithms. As for Java: you don’t have to know the whole language, just the subset described in The College Board’s *Advanced Placement Course Description for Computer Science* (www.collegeboard.com/student/testing/ap/sub_compscia.html). You must also be familiar with The College Board’s material developed specifically for the AP CS exam: the GridWorld case study.

This is a lot of material to cover, and it is certainly not the goal of this book to teach you everything you need to know from scratch. For that, you need a complete textbook with exercises and programming projects. Most students who take the exam are enrolled in an AP computer science course at their school. A determined student can prepare for the exam on his or her own; it may take anywhere between two and twelve months, and a good textbook will be even more important.

The goals of this book are:

- to describe the exam format and requirements
- to describe the AP Java subset
- to provide an effective review of what you should know with emphasis on the more difficult topics and on common omissions and mistakes
- to help you identify and fill the gaps in your knowledge
- to offer sample exam questions with answers, hints, and solutions for you to practice with and analyze your mistakes

The AP exam in computer science is a paper-and-pencil affair. While you need a computer with a Java compiler to learn how to program and how to implement common algorithms in Java, this book does not require the use of a computer. In fact, it is a good idea not to use one when you work on practice questions, so that you can get used to the exam's format and environment. One-hundred-percent correct Java syntax is not the emphasis here. Small mistakes (a missed semicolon or a brace) that a compiler would normally help you catch will probably not affect your exam score. You'll need a computer only to access collegeboard.com, *AP Central*, and our web site for the latest updates and past exam free-response solutions.

Chapter 1 of this book explains the format, required materials, and the Java subset for the exam and provides information about exam grading and exam-taking hints. Chapter 2 and Chapter 3 cover the elements of Java required for the exam. Chapter 4 deals with OOP topics. Chapter 5 deals with common algorithms for searching and sorting. Chapter 6 reviews the GridWorld case study. The review chapters contain sample multiple-choice questions with detailed explanations of all the right and wrong answers. Chapter 7 is actually on the web at this book's companion web site, www.skylit.com/beprepared/. It offers annotated solutions to free-response questions from past exams. At the end of the book are four complete practice exams followed by answers and solutions.

Good luck!



Our colleague and friend Dave Wittry passed away in a tragic accident while training for a triathlon, on February 5, 2008. He was 41. Dave contributed practice exam questions for the 2nd and 3rd editions of this book. Dave taught at Troy High School, a magnet school for science, math, and technology in Fullerton, California, and contributed to Troy's immense success in Computer Science. In 2005 Dave moved to Taiwan and taught AP Computer Science and mathematics at the Taipei American School. He was a reader for the AP Computer Science Exams for several years. Dave was always ready to help friends, students, and colleagues, and he developed valuable resources for computer science teachers. We miss Dave!



We are grateful to David Levine of St. Bonaventure University who recommended many important improvements, helped us catch technical and stylistic mistakes, and pointed out questions that needed clarification in the first edition of *Be Prepared*, which came out in 1999.

Roger Frank and Judy Hromcik contributed practice questions to the second and third editions; some of the questions in this book are based on their ideas. Roger also went very thoroughly over the draft of the earlier editions and recommended many corrections and improvements.

We thank teachers and students who alerted us to several mistakes in the earlier editions of this book.

Our special thanks to Margaret Litvin for making this book more readable with her thorough and thoughtful editing.

Finally, we thank the Boy Scouts of America for allowing us to allude to their motto in the book's title.

About the Authors

Maria Litvin has taught computer science and mathematics at Phillips Academy in Andover, Massachusetts, since 1987. She is an AP Computer Science exam reader and Question Leader and, as a consultant for The College Board, provides AP training for high school computer science teachers. Maria is a recipient of the 1999 Siemens Award for Advanced Placement for Mathematics, Science, and Technology for New England and of the 2003 RadioShack National Teacher Award. Prior to joining Phillips Academy, Maria taught computer science at Boston University. Maria is the author of the earlier, C++ version of *Be Prepared* and co-author of *C++ for You++: An Introduction to Programming and Computer Science*, which became one of the leading high school textbooks for AP Computer Science courses. More recently, Maria and Gary Litvin co-wrote *Java Methods A & AB: Object-Oriented Programming and Data Structures* (Skylight Publishing, 2006) that were used for AP CS courses in hundreds of schools. Their latest book is *Mathematics for the Digital Age and Programming in Python* (Skylight Publishing, 2008).

Gary Litvin is a co-author of *C++ for You++*, the *Java Methods* series, and *Mathematics for the Digital Age and Programming in Python*. Gary has worked in many areas of software development including artificial intelligence, pattern recognition, computer graphics, and neural networks. As founder of Skylight Software, Inc., he developed SKYLIGHTS/GX, one of the first visual programming tools for C and C++ programmers. Gary led in the development of several state-of-the-art software products including interactive touch screen development tools, OCR and handwritten character recognition systems, and credit card fraud detection software.