

Preface

This book offers a thorough introduction to the concepts and practices of object-oriented programming in Java. It also introduces the most common data structures and related algorithms and their implementations in the Java collections framework. As the title implies, the book covers the material in the A- and AB-level AP Computer Science course syllabus. This is equivalent to a two- or three-semester college course sequence in introductory programming and data structures for computer science majors. In addition to covering the AP curriculum in depth, we introduce several topics that are not required for the AP exams, including file input and output, graphics, graphical user interfaces, events handling in Java, and design patterns. This additional material gives students a better sense of real-world Java programming and makes case studies, labs, and exercises more fun.

This edition builds on our earlier books, *Java Methods: An Introduction to Object-Oriented Programming* (Skylight Publishing, 2001) and *Java Methods AB: Data Structures* (Skylight Publishing, 2003). In this edition we have organized all of the material into one volume. Besides incorporating new and useful features of Java 5.0, we have made many substantial changes that reflect the current thinking about object-oriented programming (OOP) among computer science educators and professionals. We have revised the sequence of topics for an earlier introduction of inheritance, class hierarchies, interfaces, and polymorphism; enhanced the discussion of object-oriented design; introduced new case studies and labs and updated and streamlined those we decided to keep from the previous edition; recast almost all examples from applets into applications; added a separate chapter on the Java collections framework; and made other improvements.

The book follows four main threads: OOP concepts and techniques, algorithms, Java syntax and style, and Java libraries. As in the software engineering profession itself, these threads are interwoven into an inseparable braid.

Our book strives to present the technical details while grounding them in clear explanations of the underlying concepts. OOP has an extensive conceptual layer and complex terminology. Fortunately, many OOP concepts are more straightforward

than the terminology makes them appear. The notions of *objects* (entities that combine data elements and functions), *classes* (definitions of types of objects), *methods* (functions that handle certain tasks), *instantiation* (creating an object of a particular class), *inheritance* (one class extending the features of another class), *encapsulation* (hiding the implementation details of a class), *polymorphism* (calling the correct methods automatically for specific objects disguised as objects of more generic types), and *event-driven* applications (where the operating system, the user, or events in the program trigger certain actions) are actually quite intuitive.

We also emphasize good programming style, an element not mandated by formal Java language specifications but essential for writing readable and professional programs.

Our labs and case studies aim to demonstrate the most appropriate uses of the programming techniques and data structures we cover. OOP is widely believed to facilitate team work, software maintenance, and software reuse. While it is not possible for an introductory textbook to present a large-scale real-world project as a case study, the case studies and labs in this book offer a taste of how these OOP benefits can play out in larger projects.

We assume that at least two or three class periods each week will be held in a computer lab with students working independently or in small groups. A set of files, which we call *Student Disk*, downloadable from the book's web site, contains files for all the case studies, labs, and exercises in the book; downloadable *Teacher Disk*, available to teachers, provides complete solutions to all the labs and exercises.

Still, with all the examples and case studies, we leave a lot of work to you, the student. This is not a *Java-in-n-days* book or an *n-hours-to-complete* book. It is a book for learning essential concepts and technical skills at a comfortable pace, for acquiring a repertoire of techniques and examples to work from, and for consulting as needed when you start writing your own Java programs professionally or for fun.

Working through this book will not make you a Java expert right away — but it will bring you to the level of an entry-level Java programmer with a better than average understanding of the fundamental concepts. Object-oriented programming was originally meant to make software development more accessible to beginners, and *Java Methods A & AB* is written in that spirit.



Since our first book came out in 1998, many of our colleagues, too many to name, have become good friends. We are grateful to them for their loyal support, encouragement, and the many things they have taught us over the years.

Our sincere thanks to our reviewers, Don Slater from Carnegie Mellon University and Roger Frank from Ponderosa High School in Parker, Colorado, whose vision and attention to detail helped us improve this book and avoid many mistakes.

We thank the students in Maria's 2005-2006 introductory and AP Computer Science classes for their patience while studying from a draft of this book, catching some typos and mistakes, and making many useful suggestions.

Our special thanks to Margaret Litvin for her thorough and thoughtful editing.



Without further delay, let us begin learning object-oriented programming in Java!

About the Authors

Maria Litvin has taught computer science and mathematics at Phillips Academy in Andover, Massachusetts, since 1987. She is an Advanced Placement 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 a 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, and of the earlier editions of *Java Methods* and *Java Methods AB*. Maria is also the author of *Be Prepared for the AP Computer Science Exam in Java*.

Gary Litvin is a co-author of *C++ for You++*, *Java Methods*, and *Java Methods AB* and a contributor to the 2006 edition of *Be Prepared for the AP Computer Science Exam in Java*. 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.