Beginning Java 17 Fundamentals

Object-Oriented Programming in Java 17

—

Third Edition

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Kishori Sharan
Adam L. Davis

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ISBN-13 (pbk): 978-1-4842-7306-7
ISBN-13 (electronic): 978-1-4842-7307-4
https://doi.org/10.1007/978-1-4842-7307-4

Managing Director, Apress Media LLC: Welmoed Spahr
Acquisitions Editor: Steve Anglin
Development Editor: Matthew Moodie
Coordinating Editor: Mark Powers

Cover designed by eStudioCalamar

Cover image by Christina Rumpf on Unsplash (www.unsplash.com)

Distributed to the book trade worldwide by Apress Media, LLC, 1 New York Plaza, New York, NY 10004, U.S.A. Phone 1-800-SPRINGER, fax (201) 348-4505, e-mail orders-ny@springer-sbm.com, or visit www.springeronline.com. Apress Media, LLC is a California LLC and the sole member (owner) is Springer Science + Business Media Finance Inc (SSBM Finance Inc). SSBM Finance Inc is a **Delaware** corporation.

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Printed on acid-free paper

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Chád (shod) Darby is an author, instructor, and speaker in the Java development world. As a recognized authority on Java applications and architectures, he has presented technical sessions at software development conferences worldwide (United States, United Kingdom, India, Italy, Russia, Netherlands, Singapore, Japan, and Australia). In his 25 years as a professional software architect, he's had the opportunity to work for Blue Cross/Blue Shield, Merck, Boeing, Red Hat, and a handful of startup companies.

Chád is a contributing author to several Java books, including *Professional Java E-Commerce* (Wrox Press), *Beginning Java Networking* (Wrox Press), and *XML and Web Services Unleashed* (Sams Publishing). Chád has Java certifications from Oracle and IBM. He holds a BS in computer science from Carnegie Mellon University.

Acknowledgments

I would like to thank my family members and friends for their encouragement and support: my mom, Pratima Devi; my elder brothers, Janki Sharan and Dr. Sita Sharan; my nephews, Gaurav and Saurav; my sister, Ratna; my friends Karthikeya Venkatesan, Rahul Nagpal, Ravi Datla, Mahbub Choudhury, and Richard Castillo; and many more friends not mentioned here.

My wife, Ellen, was always patient when I spent long hours at my computer desk working on this book. I want to thank her for all of her support in writing this book.

My special thanks to my friend Preethi Vasudev for offering her valuable time for providing solutions to the exercises in this book. She likes programming challenges—particularly Google Code Jam. I bet she enjoyed solving the exercises in each chapter of this book.

My sincere thanks are due to the wonderful team at Apress for their support during the publication of this book. Thanks to Mark Powers, Editorial Operations Manager, for providing excellent support. Last but not least, my sincere thanks to Steve Anglin, Lead Editor at Apress, for taking the initiative for the publication of this book.

—Kishori Sharan

Introduction

How This Book Came About

My first encounter with the Java programming language was during a one-week Java training session in 1997. I did not get a chance to use Java in a project until 1999. I read two Java books and took a Java 2 programmer certification examination. I did very well on the test, scoring 95%. The three questions that I missed on the test made me realize that the books that I had read did not adequately cover details of all the topics necessary about Java. I made up my mind to write a book on the Java programming language. So I formulated a plan to cover most of the topics that a Java developer needs to use the Java programming language effectively in a project, as well as to get a certification. I initially planned to cover all essential topics in Java in 700–800 pages.

As I progressed, I realized that a book covering most of the Java topics in detail could not be written in 700–800 pages. One chapter alone that covered data types, operators, and statements spanned 90 pages. I was then faced with the question, "Should I shorten the content of the book or include all the details that I think a Java developer needs?" I opted for including all the details in the book, rather than shortening its content to keep the number of pages low. It has never been my intent to make lots of money from this book. I was never in a hurry to finish this book because that rush could have compromised the quality and the coverage of its content. In short, I wrote this book to help the Java community understand and use the Java programming language effectively, without having to read many books on the same subject. I wrote this book with the plan that it would be a comprehensive one-stop reference for everyone who wants to learn and grasp the intricacies of the Java programming language.

One of my high school teachers used to tell us that if one wanted to understand a building, one must first understand the bricks, steel, and mortar that make up the building. The same logic applies to most of the things that we want to understand in our lives. It certainly applies to an understanding of the Java programming language. If you want to master the Java programming language, you must start by understanding its basic building blocks. I have used this approach throughout this book, endeavoring to build each topic by describing the basics first. In the book, you will rarely find a topic described without first learning its background. Wherever possible, I have tried to correlate the programming practices with activities in our daily life. Most of the books about the Java programming language available on the market either do not include any pictures at all or have only a few. I believe in the adage "A picture is worth a thousand words." To a reader, a picture makes a topic easier to understand and remember. I have included plenty of illustrations in the book to aid readers in understanding and visualizing the contents. Developers who have little or no programming experience have difficulty in putting things together to make it a complete program. Keeping them in mind, we have included over 290 complete Java programs that are ready to be compiled and run in the book.

I spent countless hours doing research for writing this book. My main source of research was the *Java Language Specification*, whitepapers and articles on Java topics, and Java Specification Requests (JSRs). I also spent quite a bit of time reading the Java source code to learn more about some of the Java topics. Sometimes, it took a few months researching a topic before I could write the first sentence on the topic. Finally, it was always fun to play with Java programs, sometimes for hours, to add them to the book.

Introduction to the Third Edition

We are pleased to present this edition of the *Beginning Java 17 Fundamentals* book. It is the first book in the three-volume *Beginning Java* series. It was not possible to include all JDK features in this volume. We have included version-specific changes at appropriate places in three volumes. If you are interested in learning only JDK 9–specific topics, we suggest you read *Java 9 Revealed*. To learn more about Java 17, we suggest you read *More Java 17*. There are several changes in this edition, and they are as follows.

We have added a separate chapter (Chapter 2) on setting up your environment, such as downloading and installing JDK 17, verifying the JDK version, etc.

In this edition we have added some introductions to lambda expressions, method references, and Streams throughout the book where they are referenced. We've also included many of the more recently introduced features of Java such as local variable type inference, switch expressions, sealed classes, multiline text blocks, and Records.

Chapter 3 provides a comprehensive introduction to the module system. We provide a step-by-step process on how to write, compile, package, and run your first Java program using a command prompt and the NetBeans integrated development environment (NetBeans IDE). Chapter 10 contains an in-depth coverage of the module system.

JDK 17 ships with a very valuable tool called the JShell (short for Java Shell) tool. It lets you explore the Java programming language interactively by entering chunks of code, rather than writing a full-fledged program. We strongly encourage you to use this tool to play with snippets of Java code when you are writing a Java program. We introduced this tool in Chapter 2, and we have covered it extensively in Chapter 23. The reason we did not cover it in one of the first few chapters of the book is because, as a beginner, you need to know the basics of Java programming first.

The first edition contained a chapter entitled "Classes and Objects," which was over 120 pages long. This edition has divided this chapter into three chapters titled “Classes,” “Methods,” and “Constructors” (Chapters 7–9).

We have updated Appendix B to cover Javadoc features of JDK 17. In the previous edition, Appendix B included frames, but they have since been removed from Javadocs.

We received several emails from the readers about the fact that the first books in this series did not include questions and exercises, which are needed mainly for students and beginners. Students use this book in their Java classes as a Java textbook, and many beginners use it to learn Java. Based on this popular demand, over 60 hours was spent preparing questions and exercises at the end of each chapter of this book.

Apart from these changes, we have updated all chapters that were part of the previous edition. We have edited the contents to make them flow better, changed or added new examples, and updated the contents to include features specific to JDK 9–17.

It is our sincere hope that this edition of the book will help you learn Java better.

Structure of the Book

This book contains 23 chapters and two appendixes. The chapters contain fundamental topics of Java such as syntax, data types, operators, classes, objects, etc. The chapters are arranged in an order that aids learning the Java programming language faster. The first chapter, "Programming Concepts," explains basic concepts related to programming in general, without going into too many technical details; it introduces Java and its features.

The third chapter, "Writing Java Programs," introduces the first program using Java; this chapter is especially written for those learning Java for the first time. Subsequent chapters introduce Java topics in an increasing order of complexity. The new features of Java are included wherever they fit in the chapter.

After finishing this book, to take your Java knowledge to the next level, two companion books are available by the authors: *More Java 17* and *Modern Programming Made Easy*.