

Preface



Writing This Book

Java has been around for over 25 years. During this time, the Java ecosystem has evolved to become the platform of choice for developing software systems, and the Java certification has evolved with it. The goal of this book is twofold: to provide a comprehensive guide, not only for learning Java, and also to nail the Java certification exams.

This book provides extensive coverage for the following Java certifications:

- *Oracle Certified Professional (OCP), Java SE 17 Developer*, and its required exam, *Java SE 17 Developer (1Z0-829)* (for details, see Appendix B)
- *Oracle Certified Professional (OCP), Java SE 11 Developer*, and its required exam, *Java SE 11 Developer (1Z0-819)* (for details, see Appendix C)

The exam syllabus is defined by a set of *exam objectives*. The exam objectives have evolved to become more high-level, with a smattering of specific topics, leaving plenty of room for interpretation as to which topics are covered by an exam objective. The scope of the exam objectives is thus very difficult to define, and entails exhaustive coverage of the Java language features and its many APIs to be on the safe side. This factor is the major cause of the considerable size of this book.

Our approach to writing this book has not changed from the one we employed for our previous books, mainly because it has proved successful. The emphasis remains on analyzing code scenarios, rather than esoteric syntax of individual language constructs. The exam continues to require actual experience with the language, not just mere recitation of facts. We still claim that proficiency in the language is the key to success.

Since the exam emphasizes the core features of Java, this book provides in-depth coverage of topics related to those features. This book is also no different from our previous books in one other important aspect: It is a one-stop guide, providing a mixture of theory and practice that enables readers to prepare for the exam. It can

be used to learn Java and to prepare for the exam. After the exam is passed, it can also be used as a handy reference for the Java language.

All elements found in our previous books (e.g., examples, figures, tables, review questions, mock exam questions) can be found in this one as well. We continue to use UML (Unified Modeling Language) extensively to illustrate concepts and language constructs, and all numbered examples continue to be complete Java programs ready for experimentation.

With that, dear reader, we wish you all the best should you decide to go down the path of Java certification. May your loops terminate and your exceptions get caught!

About This Book

This book provides extensive coverage of the core features of the Java programming language and its core application programming interface (API). The book is primarily intended for professionals who want to prepare for the *Java SE 17* or *Java SE 11 Developer Exams*, but it is readily accessible to any programmer who wants to master the language. For both purposes, it provides in-depth coverage of essential features of the language and its core API.

The demand for well-trained and highly skilled Java programmers remains unabated. Oracle offers many Java certifications that professionals can take to validate their skills (see <https://education.oracle.com>). The certification provides members of the IT industry with a standard to use when hiring such professionals, and it allows professionals to turn their Java skills into credentials that are important for career advancement.

The book provides extensive coverage of all the objectives defined by Oracle for both the *Java SE 17* and *Java SE 11 Developer Exams*. The exam objectives are selective, however, and do not include many of the essential features of Java. This book covers many additional topics that every Java programmer should master to be truly proficient. In this regard, the book is a comprehensive primer for learning the Java programming language. After mastering the language by working through this book, the reader can confidently sit for the exams.

This book is *not* a complete reference for Java, as it does not attempt to list every member of every class from the Java SE Platform API documentation. The purpose is not to document the Java SE Platform API. The emphasis is more on the Java programming language features—their syntax and correct usage through code examples—and less on teaching programming techniques.

The book assumes little background in programming. We believe the exam is accessible to any programmer who works through the book. A Java programmer can easily skip over material that is well understood and concentrate on parts that

need reinforcing, whereas a programmer new to Java will find the concepts explained from basic principles.

Each topic is explained and discussed thoroughly with examples, and is backed by review questions to reinforce the concepts. The book is not biased toward any particular platform, but provides platform-specific details where necessary.

Using This Book

The reader can choose a linear or a nonlinear route through the book, depending on their programming background. Non-Java programmers wishing to migrate to Java can read Chapter 1, which provides a short introduction to object-oriented programming concepts, and the procedure for compiling and running Java applications. For those preparing for any of the Developer exams, the book has a separate appendix (Appendix A) providing all the pertinent information on preparing for and taking the exams.

Cross-references are provided where necessary to indicate the relationships among the various constructs of the language. To understand a language construct, all pertinent details are provided where the construct is covered, but in addition, cross-references are provided to indicate its relationship to other constructs. Sometimes it is necessary to postpone discussion of certain aspects of a topic if they depend on concepts that have not yet been covered in the book. A typical example is the consequences of object-oriented programming concepts (e.g., inheritance) on the member declarations that can occur in a class. This approach can result in forward references in the initial chapters of the book.

The table of contents; listings of tables, examples, and figures; and a comprehensive index facilitate locating topics discussed in the book.

In particular, we draw attention to the following features of the book:



Chapter Topics

Each chapter starts with a short summary of the topics covered in the chapter, pointing out the major concepts that are introduced.

Developer Exam Objectives

- [0.1] Exam objectives that are covered in each chapter are stated clearly at the beginning of every chapter.
- [0.2] The number in front of the objective identifies the exam objective, as defined by Oracle. The objectives are organized into major sections, detailing the curriculum for the exam.
- [0.3] The objectives for the *Java SE 17* and *Java SE 11 Developer Exams* are reproduced verbatim in Appendix B and Appendix C, respectively. These appendices also map each exam objective to relevant chapters and sections in the book.

Supplementary Topics

- Supplementary topics are Java topics that are *not* on the exam per se, but which the candidate is expected to know.
- Any supplementary topic is listed as a bullet at the beginning of the chapter.



Review Questions

Review questions are provided after every major topic to test and reinforce the material. The review questions predominantly reflect the kind of multiple-choice questions that can be asked on the actual exam. On the exam, the exact number of answers to choose for each question is explicitly stated. The review questions in this book follow that practice.

Many questions on the actual exam contain code snippets with line numbers to indicate that complete implementation is not provided, and that the necessary missing code to compile and run the code snippets can be assumed. The review questions in this book provide complete code implementations where possible, so that the code can be readily compiled and run.

Annotated answers to the review questions are provided in Appendix D.

Example 0.1

Example Source Code

We encourage readers to experiment with the code examples to reinforce the material in the book. The source code for the examples can be downloaded from the companion book website (see p. xlv), and readily imported into Eclipse IDE 2022-06.

Java code in the book is presented in a monospaced font. Lines of code in the examples or in code snippets are referenced in the text by a number, which is specified by using a single-line comment in the code. For example, in the following code snippet, the call to the method `doSomethingInteresting()` at (1) does something interesting:

```
// ...
doSomethingInteresting();           // (1)
// ...
```

Names of classes and interfaces start with an uppercase letter. Names of packages, variables, and methods start with a lowercase letter. Constants are in all uppercase letters. Interface names begin with the prefix `I`, when it makes sense to distinguish them from class names. Coding conventions are followed, except when we have had to deviate from these conventions in the interest of space or clarity.

Mock Exam

The mock exam for Java SE 17 in Appendix E should be attempted when the reader feels confident about the topics on the exam. It is highly recommended to read Appendix A before attempting the mock exam, as Appendix A contains pertinent information about the questions to expect on the actual exam. Each multiple-choice question in the mock exam explicitly states how many answers are applicable for a given question, as is the case on the actual exam. Annotated answers to the questions in the mock exam are provided in Appendix F.

Java SE Platform API Documentation

A vertical gray bar is used to highlight methods and fields found in the classes of the Java SE Platform API.

Any explanation following the API information is also similarly highlighted.

To obtain the maximum benefit from using this book in preparing for the *Java SE 17* and *Java SE 11 Developer Exams*, we strongly recommend installing the latest version (Release 17 or newer) of the JDK and its accompanying API documentation. The book focuses solely on Java SE 17 and Java SE 11, and does not acknowledge other versions.

Book Website

This book is backed by a website:

<https://www.mughal.no/jse17ocp/>

Auxiliary material on the website includes the following:

- Source code for all the examples in the book
- Annotated answers to the reviews questions in the book
- Annotated answers to the mock exam in the book
- Table of contents, sample chapters, and index from the book
- Content specific for the *Java SE 17* and *Java SE 11 Developer Exams*
- Errata for the book
- Links to miscellaneous Java resources (e.g., certification, discussion groups, and tools)

Information about the Java Standard Edition (SE) and its documentation can be found at the following website:

www.oracle.com/technetwork/java/javase/overview/index.html

The current authoritative technical reference for the Java programming language, *The Java® Language Specification: Java SE 17 Edition*, can be found at this website:

<http://docs.oracle.com/javase/specs/index.html>

Request for Feedback

Considerable effort has been made to ensure the accuracy of the content of this book. All code examples (including code fragments) have been compiled and tested on various platforms. In the final analysis, any errors remaining are the sole responsibility of the principal author.

Any questions, comments, suggestions, and corrections are welcome. Let us know whether the book was helpful (or not) for your purpose. Any feedback is valuable. The principal author and the co-author can be reached at the following email addresses, respectively:

khalid@mughal.no
vasiliy.a.strelnikov@oracle.com

About the Authors

Khalid A. Mughal

Khalid A. Mughal is the principal author of this book, primarily responsible for writing the material covering the Java topics. He is also the principal author of three other books on previous versions of the Java certification exam: Java SE 8 OCA (1Z0-808), Java SE 6 (1Z0-851), and SCPJ2 1.4 (CX-310-035).

Khalid is an associate professor emeritus at the Department of Informatics at the University of Bergen, Norway, where he was responsible for designing and implementing various courses in informatics. Over the years, he has taught programming (primarily Java), software engineering (object-oriented system development), databases (data modeling and database management systems), compiler techniques, web application development, and software security courses. For 15 years, he was responsible for developing and running web-based programming courses in Java, which were offered to off-campus students. He has also given numerous courses and seminars at various levels in object-oriented programming and system development using Java and Java-related technologies, both at the University of Bergen and various other universities in Norway and East Africa, and also for the IT industry.

Vasily A. Strelnikov

Vasily Strelnikov is primarily responsible for developing new review questions for the chapters contained in this book.

Vasily is a senior principal OCI (Oracle Cloud Infrastructure) solution specialist, working at Oracle for more than 26 years. He is a co-author of the Java EE 7, Java SE 8, Java SE 11, and Java SE 17 Certification exams. He has designed multiple Java courses that are offered by Oracle: Java SE 17 Programming Complete, Java SE 11 Programming Complete, and Java SE 8 Certification Preparation Seminar. He has

also created the Developing Applications for the Java EE 7 Platform training at Oracle. Vasily has over 20 years of experience in Java. He specializes in Java middleware application development and web services.

Acknowledgments

First of all, we would like to acknowledge the contribution that Rolf W. Rasmussen at vizrt made in earlier Java certification books that we wrote together. Some of that contribution still permeates this edition as well.

At Pearson, senior executive editor Greg Doench was once again at the helm. He managed the long process of publishing this book. Senior content producer Julie Nahil was again the in-house contact at Pearson, professionally and efficiently managing production of the book. Audrey Doyle did a truly marvelous job copyediting the book. She scrutinized every sentence with a meticulous eye—and taught us a thing or two about the English language. The folks at codeMantra did the critical proof-reading, endorsing the book with a quality assurance stamp. Rob Mauhar at CIP Group performed the typesetting wizardry necessary to give the book its professional look. Our sincere thanks to Greg, Julie, Audrey, Rob, the folks at codeMantra, and all those behind the scenes at Pearson, who helped to make this publication see the light of day.

For the technical review of the book, we were lucky to have two Java gurus who agreed to take on the task.

- Mikalai Zaikin is a lead Java developer at IBA Lithuania, and is currently located in Vilnius. He has helped Oracle with development of Java certification exams and has also been a technical reviewer of several Java certification books. He also contributes to the Java Quiz column for Oracle's Java Magazine in collaboration with Simon Roberts.
- Ankit Garg is currently Vice President at Morgan-Stanley, Bengaluru, India, and a Sheriff (i.e., Moderator) for various Java Forums at coderanch.com. He is a Java developer with many years' experience in several Java-related technologies (e.g., Java SE, Java EE, and Spring). He is also a certified Java Programmer and Web Component Developer.

Without doubt, both Mikalai and Ankit have an eye for detail. It is no exaggeration to say that their feedback has been invaluable in improving the quality of this book at all levels. Our most sincere thanks to both Mikalai and Ankit for the many excellent comments and suggestions, and above all, for weeding out numerous pesky errors in the manuscript.

Kristian Berg and Morten Nygaard Åsnes were kind enough to review two chapters each and provide useful feedback, for which we are very grateful.

Great effort has been made to eliminate mistakes and errors in this book. We accept full responsibility for any remaining oversights. We hope that when our diligent readers find any, they will bring them to our attention.

Without family support this edition would still be a fantasy, and we are very grateful to our families for putting up with us when we were burning the midnight oil. Hopefully we can get our family life back now that this book is out the door.

—*Khalid A. Mughal*
December 2, 2022.
Bergen, Norway.