Java for Aliens

Preface

Java for Aliens is structured in such a way as to facilitate the learning of the Java language (Version 13), even for those who have never programmed, or for those who have programmed with functional languages. The structure, writing and contents have been chosen carefully, based on the experience I have accumulated as a trainer and mentor over a twenty-year career. In particular, for Sun Microsystems, for Oracle, and as a freelancer, I've had the opportunity to deliver about 250 courses, for thousands of learners, on Java technology, architecture, object-oriented analysis, design and UML. This book also covers complex topics that even the most experienced Java programmers might not master. These topics are marked with appropriate icons to warn the reader about the frequency of use, complexity and importance.

This two-volume book represents an evolution of the most popular book on Java in Italy, which since 2006, has been recommended as a reference book in all the most important Italian universities. The "Java Manual", (published by Hoepli), boasts the highest number of reviews on Amazon Italy compared to all other programming books, even those of the most established international authors. Furthermore, my free book on Java 5 (**http://www.claudiodesio.com**), has been downloaded over 450,000 times out of a total of about 2 million Italian programmers of all languages.

The book you have in your hands is therefore the result of years of work, based not only on practical and educational experience, but also on extensive feedback from readers.

What's New?

From Version 9 of Java onwards, a new six-monthly release cycle has been introduced. This book is being published at the same time as Version 13, and also covers all of the new features in Versions 9, 10, 11 and 12, often with a very high level of detail. Each topic introduced in these versions will be presented with a specific icon that is clearly identifiable. After the Java 8 revolution, Versions 9 to 13 have brought new constructs (`switch` expressions, text boxes, modules...), new ways to launch applications (JShell, Launch Single Source Files...), new Garbage Collectors (G1, Epsilon, ZGC, Shenandoah...), new syntax words (`var`, `opens`, `exports`...), new application types (Modules, Custom Runtime Images, Modular Jar...), new JDK tools (**jlink**, **jmod**...) and much more ... including loads of challenging insights for more skilled aliens!

Book Structure

Java for Aliens is divided into 7 parts within two volumes:

1. Part I, "Java Language Basics" (Chapters 1 to 5 of Volume 1), presents all the fundamental concepts of Java programming, such as the development environment, essential components, programming constructs (including novelties such as the `switch` expression), data types, etc. The study of the first five chapters should therefore allow the reader to write their first programs, and also to be confident in the development environment. Nothing will be taken for granted, and notions of basic computer science will also be introduced. Furthermore, the reader will receive support in the form of simplified examples, exercises and explanations. However, there will also be an in-depth analysis, especially on the latest new features. I have also created a simple, free and open source development tool called EJE, to support the initial learning phases.
2. Part II, "Object Orientation" (Chapters 6 to 10 of Volume 1), explains the fundamental concepts for correctly designing our programs. How do we organize a program from scratch? How many classes do we need to create? What should these classes be called? What methods will they have to define? How can we create a program capable of evolving without changing parts that have already been written? These and many other questions are answered by the theory of Object Orientation with its paradigms (abstraction, reuse, encapsulation, inheritance, polymorphism and then cohesion and coupling, and the principle of inversion of dependence, etc.). In this part, particular emphasis is placed on the support that the language offers to Object Orientation. Usually, the major difficulty that a Java programmer faces is being able to exploit the paradigms of object-oriented programming in practice. This text then strives to provide all the information needed by the reader in order to follow the path of Java programming in the most correct way possible, that is, the object-oriented way. Further, important features such as abstract classes, interfaces, packages, initializers, design by contract with assertions, handling exceptions, errors and warnings, etc. will be presented contextually.
3. Part III, "Java Language Advanced Features" (Chapters 11 and 12 of Volume 1), introduces some more complex topics such as enumerations, generic types, erasure, wildcards, bounded wildcards, bounded parameters, generic methods, intersection types, wildcard capture, helper methods, covariant parameters, nested types, and anonymous classes. These arguments are in preparation for those that will be presented in the chapters that follow. Furthermore, at this point and in other chapters, the discussion is extensively developed with a view to supporting possible Oracle certification (both OCA and OCP).

4. Part IV, "Java API Fundamentals" (Chapters 13 to 15 of Volume 2), presents the fundamental standards libraries for language and utilities. These include the *Date & Time API*, the *Reflection API* and all the fundamental classes such as `Object`, `System`, `String`, `Runtime`, `Math`, etc. Further, it introduces APIs for managing string formatting, internationalizing our applications, creating configuration files, using regular expressions. It also explains how to manage *concurrent (multi-threaded) programming* and the related libraries that support it.
5. Part V, "Java Language Evolution" (Chapters 16 to 19 of Volume 2), presents the main features introduced in recent years that have revolutionized the language, such as *functional programming* with lambda expressions and method references, the *Fluent API* with streams, *meta-programming* with annotations, and the Java Platform Module System that has changed the way we design Java programs today - a key part for keeping up with the times.
6. Part VI, "Java Integration API" (Chapters 20 to 22 of Volume 2), introduces the Java support structures that allow us to interact with other technologies or systems. The Java Native Interface, the `java.io`, `java.nio` packages (and the sub-packages that define *NIO 2 API*), networking support with `java.net`, the JDBC interface to connect with databases, and libraries for interacting with programs and technologies based on XML, are featured in this part of the book.
7. Finally, Part VII, "Java Graphical User Interfaces" (Chapters 23 and 24 of Volume 2), presents the libraries that will allow us to create graphical user interfaces with Java. In particular, we will learn to use the AWT, Swing and JavaFX libraries, with a view to creating any kind of user interface for standalone programs.

This is therefore a book that should satisfy the expectations of both the aspiring programmer and the expert programmer.
Moreover, in order not to burden the body and the cost of the work too much, a lot of material (including over 500 exercises) has been moved to a special space available online at this address: **http://www.javaforaliens.com**.

Text Styles

The text is stylized to capture attention, highlighting words, sentences or entire paragraphs. In particular: with the *Italic* style, particular or important terms are highlighted; the **Bold** style highlights key words, important concepts of the Java language, names of technologies or other things the author considered important and sought to draw attention to; the **Interface** style is used, within the text, for links, commands and everything that can be typed in the interfaces of

an operating system; the `Code in the text` style is used to distinguish parts of the code in the explanations from the rest of the text. The code lines are inserted in highlighted blocks similar to the following:

```
public class MyFirstJava13Class {
    //This is Java 13 code!
}
```

while the command line inputs and execution outputs are formatted in blocks with a black background:

```
this is the output of my program
```

Finally, notes like this add information to the topic before or after it. They can be insights, suggestions, or even simple references to other parts of the work.

Semantic Icons

To help visually identify parts of the text with particular semantic characteristics, the following icons have been used.

New Feature in Java 9

New Feature in Java 10

New Feature in Java 11

New Feature in Java 12

New Feature in Java 13

Curiosity (Non-essential concept or story)

Trick

Common Error

Rarely Used

Best Practice

Very Important

Complex Concept

Only for Aliens

We recommend the novice reader not to dwell on the parts marked with the icon "Only for Aliens" and "Rarely Used", in case they are too complicated. These are not essential parts for language learning, and you can go back to reading them when you feel ready.

Who Should Read This Book?

Java for Aliens has been structured to meet the expectations of:

- Aspiring programmers who want to become pro: nothing is taken for granted, you can learn to program even from scratch, and enter the world of work from the front door.
- University students: the previous versions of this work have been adopted as a textbook for many university courses in all the major Italian universities.
- Expert Java programmers: who need to upgrade to Version 13 and keep up with the times.

Online Resources

A lot of resources have been moved online for this edition. This could easily have given rise to a third volume! In particular, in addition to fifteen appendices, the errata, all the source code of the examples, there are about 500 exercises (and their solutions), fundamental for learning the concepts presented in the paper book.
You can download all the exercises and the appendices and the other files in a special space available online accessible at **http://www.javaforaliens.com**.
You can also subscribe to the Telegram channel **https://t.me/java4aliens** in order to be notified about future updates of the online material.

Source Code

Working with the code examples in this book, you can decide to write the whole code by hand, or to use the source files that come with the book. All of the source code written in this book is available for download at **http://www.javaforaliens.com**.

Errata

Every effort has been made to avoid errors in the text and in the code.
However, nobody is perfect, and mistakes happen. If you find a spelling error or a part of the code that is not working, the author would be grateful for the feedback and it will be reported in a new version of the errata. Other readers will thus avoid hours of frustration and, at the same time, it will help to ensure the highest possible standards in terms of quality of information. You can do this by writing to the author at **claudio@javaforaliens.com**. As usual, the reference address remains: **http://www.javaforaliens.com**.

Author

Since 1999, I have worked as a freelance IT consultant. Today I am a specialist in training, technical writing, development, analysis, design, Java technologies, architecture and object-oriented methodologies. I am the author of several technical articles and the "Manuale di Java" series from Version 6 to 9, Italian bestsellers, all published by Hoepli. I have worked with several universities, ministerial authorities and IT companies including Sun Microsystems, as a trainer and mentor. Today, I mainly work as a training consultant for Oracle.

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I would also like to thank (though it's never enough) my parents, for all they have done for me and continue to do, and for their unconditional love.
Finally, I thank my family, who are my reason for living: Rosalia, Andrea and Simone. This book, as always, is dedicated to you. You are everything to me.

Claudio De Sio Cesari

To Rosalia, Andrea and Simone...

Claudio De Sio Cesari

Java for Aliens

learn Java from scratch and become a Pro

Volume 1

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Claudio De Sio Cesari

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Volume 2

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