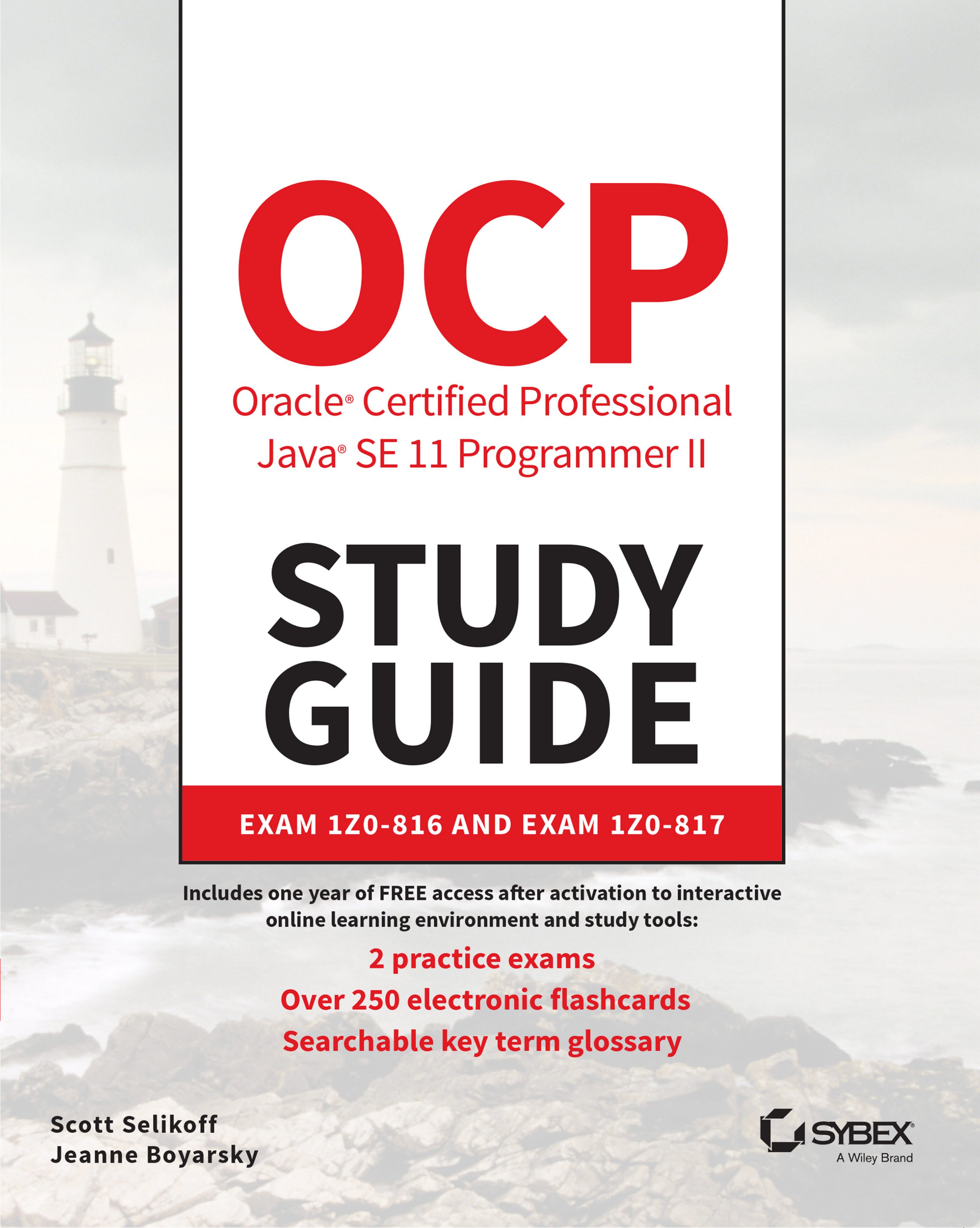

OCP

Oracle® Certified Professional Java® SE 11 Programmer II

STUDY GUIDE

EXAM 1Z0-816 AND EXAM 1Z0-817

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Scott Selikoff
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Study Guide

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For my daughter, Sophia, you're the best combination of super silly and super serious. You always know exactly what you want. May you never lose that trait as you grow into a strong woman.
—Scott

Happy 20th anniversary to NYC FIRST and StuyPulse FRC Team 694.
—Jeanne

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We'd both like to thank Marcus Biel for providing a European's take on our localization content. Last but not least, both Scott and Jeanne would like to give a big thank-you to the readers of all our books. Hearing from all of you who enjoyed the book and passed the exam is a great feeling. We'd also like to thank those who pointed out errors and made suggestions for improvements in the 1Z0-815 Java 11 book. As of April 2020, the top two were Nikolai Vinoku and Edmond Yong. Also, an honorable mention to Jakub Chrobak.

About the Authors

Scott Selikoff is a professional software consultant, author, and owner of Selikoff Solutions, LLC, which provides software development solutions to businesses in the tri-state New York City area. Skilled in a plethora of software languages and platforms, Scott specializes in full-stack database-driven systems, cloud-based applications, microservice architectures, and service-oriented architectures.

A native of Toms River, New Jersey, Scott achieved his Bachelor of Arts degree from Cornell University in Mathematics and Computer Science in 2002, after three years of study. In 2003, he received his Master of Engineering degree in Computer Science, also from Cornell University.

As someone with a deep love of education, Scott has always enjoyed teaching others new concepts. He's given lectures at Cornell University and Rutgers University, as well as conferences including Oracle Code One and The Server Side Java Symposium. Scott lives in New Jersey with his loving wife, Patti; three amazing daughters, twins Olivia and Sophia and little Elysia; and two very playful dogs, Webby and Georgette. You can find out more about Scott at `www.linkedin.com/in/selikoff` or follow him on Twitter `@ScottSelikoff`.

Jeanne Boyarsky was selected as a Java Champion in 2019. She has worked as a Java developer for more than 18 years at a bank in New York City where she develops, mentors, and conducts training. Besides being a senior moderator at `CodeRanch.com` in her free time, she works on the forum code base. Jeanne also mentors the programming division of a FIRST robotics team where she works with students just getting started with Java. She also speaks at several conferences each year.

Jeanne got her Bachelor of Arts degree in 2002 and her Master in Computer Information Technology degree in 2005. She enjoyed getting her Master's degree in an online program while working full-time. This was before online education was cool! Jeanne is also a Distinguished Toastmaster and a Scrum Master. You can find out more about Jeanne at `www.jeanneboyarsky.com` or follow her on Twitter at `@JeanneBoyarsky`.

Scott and Jeanne are both moderators on the `CodeRanch.com` forums and can be reached there for question and comments. They also co-author a technical blog called Down Home Country Coding at `www.selikoff.net`.

In addition to this book, Scott and Jeanne are also authors of the following best-selling Java 8 certification books: *OCA Oracle Certified Associate Java SE 8 Programmer I Study Guide* (Sybex, 2015) and *OCP Oracle Certified Professional Java SE 8 Programmer II Study Guide* (Sybex, 2016). These two books have been combined into the single release: *OCA/OCP Java SE 8 Programmer Certification Kit: Exam 1Z0-808 and Exam 1Z0-809* (Sybex 2016). They have also written a book of practice test questions for the Java 8 certification exams: *OCA/OCP Java SE 8 Programmer Practice Tests* (Sybex, 2017). Their most recent book is *OCP Oracle Certified Professional Java SE 11 Programmer I Study Guide: Exam 1Z0-815* (Sybex, 2019).

Contents at a Glance

Contents

Introduction

Congratulations! If you are reading this, you've likely passed the 1Z0-815 Programmer I exam, and you are now ready to start your journey through the 1Z0-816 (Java SE Programmer II) exam. Or perhaps you came here from an older version of the certification and are now taking the IZ0-817 (Upgrade OCP Java 6, 7 & 8 to Java SE 11 Developer) exam. In either case, this book will guide you on your path to becoming a Java 11 Oracle Certified Professional.

The Programmer II exam builds upon the Programmer I exam. You are expected to know all of Programmer I material when taking the second exam. Some objectives on the 1Z0-816 exam are the same as those on the 1Z0-815 exam, such as the `final` modifier. Most are implied. For example, the 1Z0-816 exam objectives don't mention `if` statements, loops, and constructors. Clearly, you still need to know these. We will also point out differences in Java 11 to help those of you new to Java 11.

If you didn't score well on the 1Z0-815 exam or if it has been a while since you took it, we recommend reviewing the book you used to study for it. You really need to know the fundamentals well. If you've misplaced your study materials, feel free to check out our 1Z0-815 book, *OCP Oracle Certified Professional Java SE 11 Programmer I Study Guide: Exam 1Z0-815* (Sybex, 2019).

In the introduction, we will cover important information about the exam before moving on to information about this book. Finally, this introduction ends with an assessment test so you can see how much studying lays ahead of you.

Understanding the Exam

At the end of the day, the exam is a list of questions. The more you know about the structure of the exam, the better you are likely to do. For example, knowing how many questions the exam contains allows you to manage your progress and time remaining better. In this section, we discuss the details of the exam, along with some history of previous certification exams.

Broader Objectives

In previous certification exams, the list of exam objectives tended to include specific topics, classes, and APIs that you needed to know for the exam. For example, take a look at an objective for the 1Z0-809 (OCP 8) exam:

- Use BufferedReader, BufferedWriter, File, FileReader, FileWriter, FileInputStream, FileOutputStream, ObjectOutputStream, ObjectInputStream, and PrintWriter in the java.io package.

Now compare it with the equivalent objective for the 1Z0-816 (OCP 11) exam:

- Use I/O Streams to read and write files

Notice the difference? The older version is more detailed and describes specific classes you will need to understand. The newer version is a lot vaguer. It also gives the exam writers a lot more freedom to insert a new feature, for example, without having to update the list of objectives.

So how do you know what to study? By reading this study guide of course! We've spent years studying the certification exams, in all of their forms, and have carefully cultivated topics, material, and practice questions that we are confident can lead to successfully passing the exam.

Choosing Which Exam to Take

Java is now 25 years old, celebrating being "born" in 1995. As with anything 25 years old, there is a good amount of history and variation between different versions of Java. Over the years, the certification exams have changed to cover different topics. The names of the exams have even changed. This book covers the Java 11 exam.

Those with more recent certifications might remember that Oracle released two exams each for Java 7 and Java 8. The first exam tended to be easier, and completing it granted you the title of Oracle Certified Associate (OCA). The second exam was a lot more difficult, with much longer questions, and completing it granted you the title of Oracle Certified Professional (OCP).

Oracle did not release an exam for Java 9 or Java 10, probably because neither of these is a Long Term Support (LTS) release. With Java 11, Oracle decided to discontinue both the OCA certification and its associated exam. You still have to take two exams to earn an OCP title. The difference is that now you do not obtain a certification title from completing the first exam.

Figure I.1 shows these past and current Java certifications. This image is helpful if you run into material online that references older exams. It is also helpful if you have an older certification and are trying to determine where it fits in.

FIGURE I.1 Past and current Java certifications

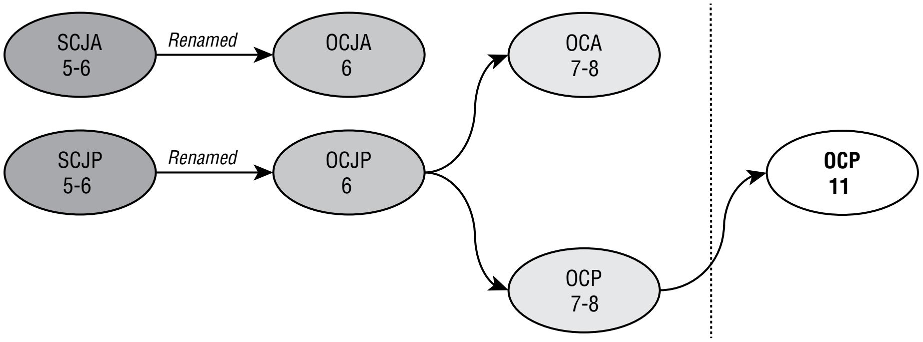
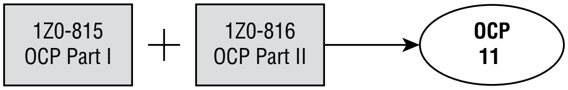


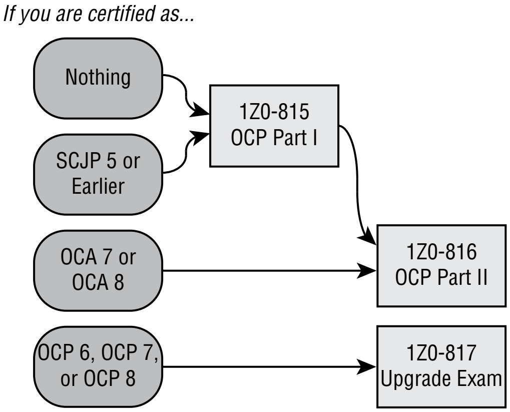
Figure I.2 shows the exams you need to take in order to earn the latest Java certification if you don't have any existing Java certifications. If you haven't taken the 1Z0-815 exam yet, see our *OCP Oracle Certified Professional Java SE 11 Programmer I Study Guide: Exam 1Z0-815* (Sybex, 2019).

FIGURE I.2 Latest Java certification exams



If you already hold a Java certification, you need to decide which exam you can take to earn the Java 11 OCP title. Besides the 1Z0-816 Programmer II exam, there is also a 1Z0-817 Upgrade exam. Oracle has defined a number of upgrade paths to achieve the OCP title, shown in Figure I.3.

FIGURE I.3 Exam prerequisites



In a nutshell, you can take the 1Z0-816 exam if you passed the 1Z0-815 exam or hold the OCA 7 or 8 title. Oracle's goal here is to help people get to Java 11 OCP certification if they are halfway through the journey to OCP certification.

If you hold a recent OCP 6, 7, or 8 certification title (or even the older Sun Certified Programmer 6 title), then you can take the 1Z0-817 exam to obtain the Java 11 OCP title with just one exam. Those with a Java certification older than this will have to start over and take the 1Z0-815 exam, followed by the 1Z0-816 exam.

What if you hold both OCA and OCP Java 7 or 8 certifications? Well, in that case you have a decision to make. Passing either the 1Z0-816 or 1Z0-817 exam will grant you the Java 11 OCP title. We recommend reviewing the objectives between the two exams and deciding which one you feel more comfortable with.

There are also two edge cases. Those who passed the OCA 6 exam must still take the 1Z0-815 exam. The OCA 6 exam covered far less material than the OCA 7 or 8.

Additionally, those who passed the OCP 7 or 8 exam but never received the OCP title because they didn't pass the OCA exam, need to take the 1Z0-815 exam. After that, you have a choice of the 1Z0-816 exam or the 1Z0-817 exam.

TIP

If you're not sure which exam you should take, you can post questions on CodeRanch.com, and the community will be happy to help. You might even get a response from Scott or Jeanne!

Taking the Upgrade Exam

The chapters of this book are structured for those taking the 1Z0-816 Programmer II exam. As we said earlier, though, you can easily rely on this book to prepare for the 1Z0-817 exam. If, after reading the previous section, you decide to take the 1Z0-817 exam, then you should be aware that the objectives between the two exams are not the same.

To help support those taking the 1Z0-817 exam, we include Appendix A, "The Upgrade Exam," as part of this book. This appendix includes material you would have learned when taking the 1Z0-815 Programmer I exam that you will need to know for the 1Z0-817 exam. Because of this, you should actually read this appendix first. For example, you need to first know how to create a module before you can create a module service in Chapter 6, "Modular Applications."

While we think every chapter is worth reading, here are some chapters you can skip if you are taking the 1Z0-817 exam:

- Chapter 2, "Annotations"
- Chapter 8, "I/O"
- Chapter 10, "JDBC"
- Chapter 11, "Security"

For other chapters, the 1Z0-817 exam may involve understanding the entire chapter or select portions of the chapter. We've included a mapping of all of the upgrade exam objectives and their associated chapters in the "Reviewing Exam Objectives" section of this introduction.

Changes to the Exam

At the time of this book being published, all OCP 11 certification exams contain 80 questions and have a duration of 3 hours. The 1Z0-816 exam requires a passing score of 63 percent, while the 1Z0-817 exam requires a passing score of 61 percent.

Oracle has a tendency to fiddle with the length of the exam and the passing score once it comes out. Oracle also likes to "tweak" the exam topics over time. It wouldn't be a surprise for Oracle to make minor changes to the exam objectives, the number of questions, or the passing score after this book goes to print.

If there are any changes to the exam after this book is published, we will note them on the book page of our blog.

```
www.selikoff.net/ocp11-2
```

Exam Questions

The exams consist entirely of multiple-choice questions. There are between four and seven possible answers. If a question has more than one answer, the question specifically states exactly how many correct answers there are. This book does not do that. We say "Choose all that apply" to make the questions harder. This means the questions in this book are generally harder than those on the exam. The idea is to give you more practice so you can spot the correct answer more easily on the real exam.

If you read about older versions of the exam online, you might see references to drag-and-drop questions. These questions had you do a puzzle on how to complete a piece of code. Luckily, these are no longer on the exam.

Many of the questions on the exam are code snippets rather than full classes. Saving space by not including imports and/or class definitions leaves room for lots of other code. For example, it is common to come across classes on the exam with portions omitted, like so:

```
public class Zoo {
   String name;
   // Getters/Setters/Constructors omitted
}
```

In this case, you would assume methods like `getName()` and `setName()`, as well as related constructors, exist. For example, we would expect this code to compile:

```
var name = new Zoo("Java Zoo").getName();
```

Out-of-Scope Material

When you take the exam, you may see some questions that appear to be out of scope. *Don't panic!* Often, these questions do not require knowing anything about the topic to answer the question. For example, after reading this book, you should be able to spot that the following does not compile, even if you've never heard of `LocalDate` and `ChronoUnit`:

```
final LocalDate holiday = LocalDate.now();
holiday = LocalDate.now().plus(5, ChronoUnit.HOURS);
```

The classes and enums used in this question are not in scope for the exam, but the reason it does not compile is in scope. In particular, you should know that you cannot reassign a variable marked `final`.

See, not so scary is it? Expect to see at least a few structures on the exam that you are not familiar with. If they aren't part of your exam preparation material, then you don't need to understand them to answer the question.

Question Topic Tips

The following list of topics is meant to give you an idea of the types of questions and oddities that you might come across on the exam. Being aware of these categories of such questions will help you get a higher score on the exam.

Questions with Extra Information Provided Imagine the question includes a statement that `XMLParseException` is a checked exception. It's fine if you don't know what an `XMLParseException` is or what XML is for that matter. (If you are wondering, it is a format for data.) This question is a gift. You know the question is about checked and unchecked exceptions.

Questions with Embedded Questions To answer some questions on the exam, you may have to actually answer two or three subquestions. For example, the question may contain two blank lines, and the question may ask you to choose the two answers that fill in each blank. In some cases, the two answer choices are not related, which means you're really answering multiple questions, not just one! These questions are among the most difficult and time-consuming on the exam because they contain multiple, often independent, questions to answer. Unfortunately, the exam does not give partial credit, so take care when answering questions like these.

Questions with Unfamiliar APIs If you see a class or method that wasn't covered in this book, assume it works as you would expect. Some of these APIs you might come across, such as `LocalDate`, were on the Java 8 exam and are not part of the Java 11 exams. Assume that the part of the code using that API is correct and look very hard for other errors.

Questions with Made-Up or Incorrect Concepts In the context of a word problem, the exam may bring up a term or concept that does not make any sense such as saying an interface inherits from a class, which is not a correct statement. In other cases, they may use a keyword that does not exist in Java, like `struct`. For these, you just have to read them carefully and recognize when the exam is using invalid terminology.

Questions That Are Really Out of Scope When introducing new questions, Oracle includes them as unscored questions at first. This allows them to see how real exam takers do without impacting your score. You will still receive the number of questions as the exam lists. However, a few of them may not count. These unscored questions may contain out-of-scope material or even errors. They will not be marked as unscored, so you still have to do your best to answer them. Follow the previous advice to assume that anything you haven't seen before is correct. That will cover you if the question is being counted!

Reading This Book

It might help to have some idea about how this book has been written. This section contains details about some of the common structures and features you will find in this book, where to go for additional help, and how to obtain bonus material for this book.

Who Should Buy This Book

If you want to obtain the OCP 11 Java programmer certification, this book is definitely for you. If you want to acquire a solid foundation in Java and your goal is to prepare for the exam, then this book is also for you. You'll find clear explanations of the concepts you need to grasp and plenty of help to achieve the high level of professional competency you need in order to succeed in your chosen field.

Since both the 1Z0-816 and 1Z0-817 exams have prerequisites, we assume you have taken at least one Java certification exam prior to reading this book. To help ease the transition, though, we provide refresher material throughout this book. For example, before covering advanced exception handling topics, we review the core exception classes. Likewise, we review how to create functional interfaces and lambda expressions from scratch since this topic is the foundation for a lot of other topics.

How This Book Is Organized

This book consists of this introduction, 11 chapters, and two appendixes. You might have noticed that there are more than 11 exam objectives. We organized what you need to know to make it easy to learn and remember. Each chapter begins with a list of the objectives that are covered in that chapter.

The chapters and appendixes are organized as follows:

- **Chapter 1: Java Fundamentals** covers core Java topics including enums, the `final` modifier, inner classes, and interfaces. There are now many types of interface methods that you need to know for the exam. It also includes an introduction to creating functional interfaces and lambda expressions.
- **Chapter 2: Annotations** describes how to define and apply your own custom annotations, as well as how to use the common built-in ones.
- **Chapter 3: Generics and Collections** goes beyond the basics and demonstrates method references, generics with wildcards, and Collections. The Collections portion covers many common interfaces, classes, and methods that are useful for the exam and in everyday software development.

- **Chapter 4: Functional Programming** explains lambdas and stream pipelines in detail. It also covers the built-in functional interfaces and the `Optional` class. If you want to become skilled at creating streams, read this chapter more than once!
- **Chapter 5: Exceptions, Assertions, and Localization** shows advanced exception handling topics including creating custom exceptions, try-with-resources statements, and suppressed exceptions. It also covers how to use assertions to validate your program. It concludes with localization and formatting, which allows your program to gracefully support multiple countries or languages.
- **Chapter 6: Modular Applications** shows advanced modularization concepts including services and how to migrate an application to a modular infrastructure.
- **Chapter 7: Concurrency** introduces the concept of thread management and teaches you how to build multithreaded programs using the concurrency API and parallel streams.
- **Chapter 8: I/O** introduces you to managing files and directories using the `java.io` API. It covers a number of I/O stream classes, teaches you how to serialize data, and shows how to interact with a user.
- **Chapter 9: NIO.2** shows you how to manage files and directories using the newer NIO.2 API. It includes techniques for using streams to traverse and search the file system.
- **Chapter 10: JDBC** provides the basics of working with databases in Java including working with stored procedures.
- **Chapter 11: Security** describes how to securely build your program and protect against common malicious attacks.
- **Appendix A: The Upgrade Exam** covers topics from the 1Z0-815 Programmer I exam that are on the 1Z0-817 Upgrade exam but not on the 1Z0-816 Programmer II exam.
- **Appendix B: Answers to Review Questions** lists the answers to the review questions that are at the end of each chapter.

At the end of each chapter, you'll find a few elements you can use to prepare for the exam:

Summary This section reviews the most important topics that were covered in the chapter and serves as a good review.

Exam Essentials This section summarizes highlights that were covered in the chapter. You should be able to convey the information described.

Review Questions Each chapter concludes with at least 20 review questions. You should answer these questions and check your answers against the ones provided in Appendix B. If you can't answer at least 80 percent of these questions correctly, go back and review the chapter, or at least those sections that seem to be giving you difficulty.