
Philip Heller
Simon Roberts

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To Keara:

Two years ago, before we met,
When you were only seven,
I thought the blue that fills your eyes
Was only found in heaven.

What wonders will you gaze upon
When my own eyes are fading,
In forty years, when you’re as old
As I was just this morning?
—Love, Philip

For my children, Emily and Bethan
—Simon
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Introduction

Tiger is a very big deal. Actually, we should say that release 5.0 of Java 2 is a very big deal. “Tiger” was the project’s code name during development. Now that it’s been released to the world, they’ve given it a number and taken away its name.

We have only good things to say about the release. It makes our lives better, because it invites us to write cleaner Java code. It also requires us to make some mental adjustments. It will do the same to you, if you haven’t already adjusted. You’re going to have to get used to structures like

```java
enum Size { SMALL, MEDIUM, LARGE; }
```

and

```java
for (String s : myVectorOfStrings)
```

and even

```java
Map<String, Float> myMap = new HashMap<String, Float>();
```

Since the new Java release is a very big deal, you would expect the Sun Certified Java Programmer (SCJP) and Sun Certified Java Developer (SCJD) exams to be similarly big deals. And they are. The Programmer Exam has been extensively revised, with new objectives and questions covering new subject matter.

At the time of this writing, Sun was keeping quiet about the Developer Exam, which is mostly a programming assignment, but you can be sure that you will be expected to know about Java’s new features and to use them appropriately. (By the way, your authors are the people who created the current edition of the Developer Exam. Our non-disclosure agreements limit what we’re allowed to tell you, but we can guarantee that everything we say about that exam is truthful and helpful. Other authors will claim to be able to tell you about the exam, but they don’t have full access to it, and they will have to rely on guesswork.)

And since the new exams are very big deals, this edition of this book is a very big deal. When JavaSoft revises Java, you can count on Sun to revise the exams. And when Sun revises the exams, you can count on us to revise this book.

The first part of the book contains nine chapters that discuss the content of every objective of the Programmer Exam. The second part of the book contains five chapters that prepare you to write the programming assignment and take the essay exam for the SCJD certification.

There are several ways to prepare for the Java certification exams, including attending seminars and study groups, visiting websites and newsgroups, programming at home and at work, and of course, reading study guides such as this. We’re glad you chose our book as one of your preparation tools, and we encourage you to exploit as many other resources as you can to ensure your success.
We believe you'll find this book particularly helpful because it was written by Java instructors and practitioners who have also taken part in the writing of the Java certification exams.

**Why Become Java 2 Certified?**

There are a number of reasons for becoming Java 2 certified:

- It provides proof of professional achievement.
- It increases your marketability.
- It provides greater opportunity for advancement in your field.
- It is increasingly found as a requirement for some types of advanced training.
- It raises customer confidence in you and your company’s services.

Let’s explore each reason in detail.

**Provides Proof of Professional Achievement**

Specialized certifications are the best way to stand out from the crowd. In this age of technology certifications, you will find hundreds of thousands of administrators who have successfully completed the Microsoft and Cisco certification tracks. To set yourself apart from the crowd, you need a little bit more. The Java Programmer Certification is the most basic Java certification and the Developer Certification is the most prestigious. If you pass either of these exams, you will get the recognition you deserve.

**Increases Your Marketability**

Almost anyone can bluff their way through an interview. Once you have been certified in Java, you will have the credentials to prove your competency. And certifications are not something that can be taken from you when you change jobs. Once certified, you can take that certification with you to any position you accept.

**Provides Opportunity for Advancement**

Those individuals who prove themselves as competent and dedicated are the ones who will most likely be promoted. Becoming certified is a great way to prove your skill level, and it shows your employers that you are committed to improving your skill set. Look around you at those who are certified. They are probably the ones who receive good pay raises and promotions when they come up.

**Fulfills Training Requirements**

Many companies have set training requirements for their staff so that they stay up-to-date on the latest technologies. Having a certification program for Sun’s Java family of products provides administrators another certification path to follow when they have exhausted some of the other industry-standard certifications.


**Raises Customer Confidence**

As companies continue to write their production software using Java, they will undoubtedly require qualified staff to embrace this ever-changing technology. Many companies outsource the work to consulting firms with experience working with Java. Those firms that have certified staff have a definite advantage over other firms that do not.

**Who Should Buy This Book?**

If you want to acquire a solid foundation in Java and your goal is to prepare for the exam by learning how to program and develop in Java, this book is 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.

If you want to become certified as a Java programmer and developer, this book is definitely for you. However, if you just want to attempt to pass the exam without really understanding Java, this study guide is not for you. It is written for people who want to acquire hands-on skills and in-depth knowledge of programming Java.

**How to Become a Sun Certified Java Programmer for the Java 2 Platform 5.0**

You can take the Sun Certified Java Programmer Exam whenever you like by making an appointment with Sun Educational Services. Sun contracts with third-party test centers throughout the world, so you probably won’t have to travel far. The cost of taking the exam is $150.

The U.S. telephone number for Sun Educational Services is (800) 422-8020; their URL is http://suned.sun.com. From there it will be easy to find the links you need. We hesitate to give more detailed instructions, because the site layout may change.

You can make an appointment for any time during regular business hours. When you make the appointment, ask how much time you will have. This is subject to change; on average, you’ll be given two minutes per question. You will not be allowed to bring food or personal belongings into the test area. One piece of scratch paper is permitted; you will not be allowed to keep it after you have finished the exam. Most sites have security cameras.

You will be escorted to a cubicle containing a PC. The exam program will present you with randomly selected questions. Navigation buttons take you to the next or previous question for review and checking. When you have finished the test, the program will immediately present you with your score and a pass/fail indication. You will also be given feedback that indicates how well you performed in each of the dozen or so categories of the objectives. You will not be told which particular questions you got right or wrong.
Formalities of the Programmer’s Exam

There are no trick questions on the exam, but every question requires careful thought. The wording of the questions is highly precise; the exam has been reviewed not just by Java experts, but also by language experts whose task was to eliminate any possible ambiguity. All you have to worry about is knowing Java; your score will not depend on your ability to second-guess the examiners.

It is not a good idea to try to second-guess the question layout. For example, do not be biased toward answer C simply because C has not come up recently. The questions are taken from a pool and presented to you in a random order, so it is entirely possible to get a run of a particular option; it is also possible to get the answers neatly spread out.

Most of the questions are multiple-choice. Some are drag-and-drop: you might be called on to arrange four lines of code into the correct order or to drop each of five technical words near the phrase that best describes it. Be aware that where multiple answers are possible, you are being asked to make a decision about each answer, almost as though the question were five individual true/false questions. This requires more effort and understanding from you, because you have to get all the pieces correct. Think carefully, and always base your answer on your knowledge of Java.

The test is taken using a windowed interface that can be driven almost entirely with the mouse. Many of the screens require scrolling. Always check the scroll bar so you can be sure you have read a question in its entirety. It would be a shame to get a question wrong because you didn’t realize you needed to scroll down a few lines.

Some of the questions are easier than others, and undoubtedly you will be able to answer some more quickly than others. However, you really do need to answer all the questions if you possibly can. Unlike some exams, this one doesn’t penalize you for wrong answers. If you leave a question blank, you don’t have a chance. If a blind guess is your best shot, at least you have a chance. But best of all, study this book. It will prepare you so that you won’t need to guess about anything—you’ll know it all!

How to Become a Sun Certified Java Developer for the Java 2 Platform 5.0

The Sun Certified Java Developer Exam costs $250. You aren’t allowed to register for this exam unless you are a certified Java programmer. As with the Programmer’s Exam, you can register by phone or on the Web; you can use the phone number or URL given above for the Programmer’s Exam.

The Developer Exam requires you to write a Java application based on a specification. You do this on your own time, not at a testing site. After you complete your assignment and submit your work, you go to a testing site to take a follow-up exam. Chapter 10, “About the Developer’s Exam,” gives you all the details about this process.
Conventions Used in This Book

This book uses a number of conventions to present information in as readable a manner as possible. Tips, Notes, and Warnings, shown here, appear from time to time in the text in order to call attention to specific highlights.

- **This is a Tip.** Tips contain specific programming information.

- **This is a Note.** Notes contain important side discussions.

- **This is a Warning.** Warnings call attention to bugs, design omissions, and other trouble spots.

This book takes advantage of several font styles. **Bold font** in text indicates something that the user types. A **monospaced font** is used for code, output, URLs, and file and directory names. A **monospaced italic font** is used for code variables mentioned in text.

These style conventions are intended to facilitate your learning experience with this book—in other words, to increase your chances of passing the exam.

If you type, compile, and run the sample code in this book, you may observe slightly different results than what you see in the book. This is particularly true with code that has a GUI. Each platform has its own windowing system that displays buttons, check boxes, and so on differently.

How to Use This Book and the CD

We’ve included several testing features in both the book and on the CD bound at the back of the book. These tools will help you retain vital exam content as well as prepare to sit for the actual exam. Using our custom test engine, you can identify weak areas up front and then develop a solid studying strategy using each of these robust testing features. Our thorough readme will walk you through the quick and easy installation process.

**Before you begin** At the beginning of the book (right after this introduction, in fact) is an assessment test that you can use to check your readiness for the actual exam. Take this test before you start reading the book. It will help you determine the areas you may need to brush up on. The answers to each assessment test question appear on a separate page after the last question of the test. Each answer also includes an explanation and a note telling you in which chapter this material appears.

**Chapter review questions** To test your knowledge as you progress through the book, in Part 1 of this book there are review questions at the end of each chapter. As you finish each chapter, answer the review questions and then check to see if your answers are right—the correct answers
appear on the page following the last review question. You can go back and reread the section that deals with each question you got wrong to ensure that you get the answer correctly the next time you are tested on the material.

**Test engine** In addition to the assessment test and the chapter review tests, you’ll find four sample exams, three that are only on the CD and one that is both printed and electronic. Take these practice exams just as if you were taking the actual exam (that is, without any reference material). When you have finished the first exam, move onto the next one to solidify your test-taking skills. If you get more than 90 percent of the answers correct, you’re ready to go ahead and take the certification exam.

**Real-World Scenarios and Chapter Review Labs** The chapters in Part 1 of this book have Real World Scenarios, which are small programming exercises that give you a chance to put your new knowledge to use or to explore Java’s features in more depth. In the Programmer Exam part of this book you’ll find Chapter Review Labs, which let you practice the techniques you’ve just learned. You’ll find solutions to these scenarios and labs on the CD-ROM that accompanies this book, in the solutions directory. If you prefer to look on the Web, check out the book’s website at [www.sybex.com](http://www.sybex.com).

**Full Text of the book in PDF** If you have to travel but still need to study for the Java 2 programming exam and you have a laptop with a CD drive, you can carry this entire book with you just by taking along the CD. The CD contains this book in PDF (Adobe Acrobat) format so it can be easily read on any computer.

**About the Authors**

Philip Heller is a technical author, novelist, public speaker, and consultant. He has been instrumental in the creation and maintenance of the Java Programmer and Developer exams. His popular seminars on certification have been delivered internationally. He is also the author of *Ground-Up Java* (available from Sybex), which uses interactive animated illustrations to present fundamental concepts of Java programming to new programmers.

Simon Roberts worked for Sun Microsystems for nine years as an instructor, an authority on the Java language, and the key player in the development of the entire Java certification program. He is now a consultant and instructor, specializing in Java and security. He is also a flight instructor.
Assessment Test

1. Which of the following are valid declarations? Assume `java.util.*` is imported.
   A. `Vector<Map> v;`
   B. `Set<String> s;`
   C. `Map<String> m;`
   D. `Map<String, String> m;`

2. You can determine all the keys in a Map in which of the following ways?
   A. By getting a Set object from the Map and iterating through it.
   B. By iterating through the Iterator of the Map.
   C. By enumerating through the Enumeration of the Map.
   D. By getting a List from the Map and enumerating through the List.
   E. You cannot determine the keys in a Map.

3. What keyword is used to prevent an object from being serialized?
   A. private
   B. volatile
   C. protected
   D. transient
   E. None of the above

4. An abstract class can contain methods with declared bodies.
   A. True
   B. False

5. Select the order of access modifiers from least restrictive to most restrictive.
   A. `public, private, protected, default`
   B. `default, protected, private, public`
   C. `public, default, protected, private`
   D. `default, public, protected, private`
   E. `public, protected, default, private`

6. Which access modifier allows you to access method calls in libraries not created in Java?
   A. public
   B. static
   C. native
   D. transient
   E. volatile
7. Which of the following statements are true? (Select all that apply.)
   A. A final object’s data cannot be changed.
   B. A final class can be subclassed.
   C. A final method cannot be overloaded.
   D. A final object cannot be reassigned a new address in memory.
   E. None of the above.

8. The keyword extends refers to what type of relationship?
   A. “is a”
   B. “has a”
   C. “was a”
   D. “will be a”
   E. None of the above

9. Which of the following keywords is used to invoke a method in the parent class?
   A. this
   B. super
   C. final
   D. static

10. Given the following code, what will be the outcome?
    public class Funcs extends java.lang.Math {
        public int add(int x, int y) {
            return x + y;
        }
        public int sub(int x, int y) {
            return x - y;
        }
        public static void main(String[] a) {
            Funcs f = new Funcs();
            System.out.println("" + f.add(1, 2));
        }
    }
    A. The code compiles but does not output anything.
    B. “3” is printed out to the console.
    C. The code does not compile.
    D. None of the above.
11. Given the following code, what is the expected outcome?

```java
public class Test {
    public static void main(String [] a) {
        int [] b = [1,2,3,4,5,6,7,8,9,0];
        System.out.println("a[2]=" + a[2]);
    }
}
```

A. The code compiles but does not output anything.
B. “a[2]=3” is printed out to the console.
C. “a[2]=2” is printed out to the console.
D. The code does not compile.
E. None of the above.

12. What is the value of x after the following operation is performed?

```java
x = 23 % 4;
```

A. 23
B. 4
C. 5.3
D. 3
E. 5

13. Given the following code, what keyword must be used at line 4 in order to stop execution of the for loop?

```java
1. boolean b = true;
2. for (; ;) {
3.     if (b) {
4.         <insert code>
5.     }
6.     // do something
7. }
```

A. stop
B. continue
C. break
D. None of the above
14. What method call is used to tell a thread that it has the opportunity to run?
   A. wait()
   B. notify()
   C. start()
   D. run()

15. Given the following code, which of the results that follow would you expect?
   1. package mail;
   2.
   3. interface Box {
   4.    protected void open();
   5.    void close();
   6.    public void empty();
   7. }

   A. The code will not compile because of line 4.
   B. The code will not compile because of line 5.
   C. The code will not compile because of line 6.
   D. The code will compile.

16. Assertions are used to enforce all but which of the following?
   A. Preconditions
   B. Postconditions
   C. Exceptions
   D. Class invariants

17. The developer can force garbage collection by calling System.gc().
   A. True
   B. False

18. Select the valid primitive data types. (Select all that apply.)
   A. boolean
   B. bit
   C. char
   D. float
   E. All of the above
19. How many bits does a float contain?
   A. 1  
   B. 8  
   C. 16  
   D. 32  
   E. 64

20. What is the value of x after the following line is executed?
    \[ x = 32 \times (31 - 10 \times 3); \]
    A. 32
    B. 31
    C. 3
    D. 704
    E. None of the above

21. A StringBuffer is slower than a StringBuilder, but a StringBuffer is threadsafe.
    A. True
    B. False

22. Select the list of primitives ordered in smallest to largest bit size representation.
    A. boolean, char, byte, double
    B. byte, int, float, char
    C. char, short, long, float
    D. char, int, float, long
    E. None of the above

23. Which class provides locale-sensitive text formatting for date and time information?
    A. java.util.TimeFormat
    B. java.util.DateFormat
    C. java.text.TimeFormat
    D. java.text.DateFormat

24. The following line of code is valid.
    \[ \text{int } x = 9; \text{ byte } b = x; \]
    A. True
    B. False