Rogers Cadenhead

SIXTH EDITION

Covers Java 7 and Android

Sams Teach Yourself

Java™

in 24 Hours

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Sixth Edition

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Sams Teach Yourself Java™ in 24 Hours, Sixth Edition

ISBN-13: 978-0-672-33575-4
ISBN-10: 0-672-33575-1

Library of Congress Cataloging-in-Publication Data:

Cadenhead, Rogers.

Sams teach yourself Java in 24 hours / Rogers Cadenhead.

p. cm.

ISBN-13: 978-0-672-33575-4 (pbk.)

ISBN-10: 0-672-33575-1 (pbk.)

1. Java (Computer program language) I. Title.

QA76.73.J38C335 2012

005.13'3—dc23

2011038994

Printed in the United States of America

Second Printing: February 2012

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About the Author

Rogers Cadenhead is a writer, computer programmer, and web developer who has written more than 20 books on Internet-related topics, including *Sams Teach Yourself Java in 21 Days*. He maintains the Drudge Retort and other websites that receive more than 20 million visits a year. This book's official website is at www.java24hours.com.

Dedication

With this edition of the book, I'd like to break from tradition and cheat my family and friends out of praise, because frankly it's going to their heads. I dedicate this book to James Gosling, Mike Sheridan, Kim Polese, Bill Joy, and the others who launched the first version of this amazing programming language back in 1995. A language I was once surprised to see running on a web page is now running apps on millions of Android phones around the world—a testimonial to the visionary work you did at the late Sun Microsystems. Long may the purple reign!

Acknowledgments

To the folks at Sams—especially Mark Taber, Songlin Qiu, Tonya Simpson, Charlotte Kughen, and Boris Minkin. No author can produce a book like this on his own. Their excellent work will give me plenty to take credit for later.

To my wife, Mary, and my sons, Max, Eli, and Sam. Although our family has not fulfilled my dream of becoming death-defying high-wire trapeze acrobats, I'm the world's proudest husband and father in a household of acrophobics.

Reader Acknowledgments

I'd also like to thank readers who have sent helpful comments about corrections, typos, and suggested improvements to the book. The list includes Brian Converse, Philip B. Copp III, Wallace Edwards, M.B. Ellis, Kevin Foad, Adam Grigsby, Mark Hardy, Kelly Hoke, Donovan Kelorii, Russel Loski, Jason Saredy, Mike Savage, Peter Schrier, Gene Wines, Jim Yates, and others who shall remain nameless because they helped me improve the book before I started this list.

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Introduction

As the author of computer books, I spend a lot of time lurking in the computer section of bookstores, observing the behavior of readers while I'm pretending to read the latest issue of *In Touch Weekly* magazine.

Because of my research, I've learned that if you have picked up this book and turned to the introduction, I have only 12 more seconds before you put it down and head to the coffee bar for a double-tall-decaf-skim-with-two-shots-of-vanilla-hold-the-whip latte.

So I'll keep this brief: Computer programming with Java is easier than it looks. I'm not supposed to tell you that because thousands of programmers have used their Java skills to get high-paying jobs in software development, web application programming, and mobile app creation. The last thing any programmer wants is for the boss to know that anyone who has persistence and a little free time can learn this language, the most popular programming language in use today. By working your way through each of the one-hour tutorials in *Sams Teach Yourself Java in 24 Hours*, you'll be able to learn Java programming quickly.

Anyone can learn how to write computer programs—even if they can't program a DVR. Java is one of the best programming languages to learn because it's a useful, powerful, modern technology that's embraced by thousands of programmers around the world.

This book is aimed at nonprogrammers, new programmers who hated learning the subject, and experienced programmers who want to quickly get up to speed with Java. It uses Java 7, the version of the language just released.

Java is an enormously popular programming language because of the things it makes possible. You can create programs that feature a graphical user interface, design software that makes the most of the Internet, read XML data, create a game that runs on an Android cell phone, and more.

This book teaches Java programming from the ground up. It introduces the concepts in English instead of jargon with step-by-step examples of working programs you will create. Spend 24 hours with this book and you'll be writing your own Java programs, confident in your ability to use the language and learn more about it. You also will have skills that are becoming increasingly important—such as network computing, graphical user interface design, and object-oriented programming.

These terms might not mean much to you now. In fact, they're probably the kind of thing that makes programming seem intimidating and difficult. However, if you can use a computer to balance your checkbook, or create a photo album on Facebook, you can write computer programs by reading *Sams Teach Yourself Java in 24 Hours*.

At this point, if you would rather have coffee than Java, please reshelve this book with the front cover facing outward on an endcap near a lot of the store's foot traffic.

HOUR 3
Vacationing in Java

Before you venture further into Java programming, it's worthwhile to learn more about the language and see what programmers are doing with it today. Though Java has outgrown its origins as a language focused on web browser programs, you can still find some interesting examples of how Java is used on the Web.

During this hour, we take a look at sites that feature Java programs and talk about the history and development of the language.

To go on this vacation, you need a web browser that has been set up to run Java programs.

Load your browser of choice, put on your best batik shirt, and get ready to take a vacation. You won't be leaving your house, and you won't experience the simpler pleasures of tourism, such as reckless cab drivers, exotic food, exotic locals, exotic locals with food, and so on. Look on the bright side though: no traveler's check hassles, no passports, and no Montezuma's revenge.

WHAT YOU'LL LEARN IN THIS HOUR:

- The History of Java
- Benefits of using the language
- Examples of Java at work
- An explanation of object-oriented programming

First Stop: Oracle

The Java vacation begins at www.java.com, a site created by Oracle, the company that owns the Java language.

A Java program that runs as part of a web page is called an *applet*. Applets are placed on pages like other elements of a page. A markup language called HTML defines where the program should be displayed, how big it is, and what the program does when it runs. Java also enhances the Web in two other ways: Desktop programs written in Java can be launched from a web browser, and Java servlets are run by web servers to deliver web applications.

Oracle's Java division leads the development of the Java language and related software. The Java in Action section of Java.com showcases how Java is being used on websites, Android phones, and other platforms. Millions of devices run programs written with Java. Figure 3.1 shows RuneScape, a massively multiplayer online game powered by Java. You can play the game for free by using any web browser to visit www.runescape.com.

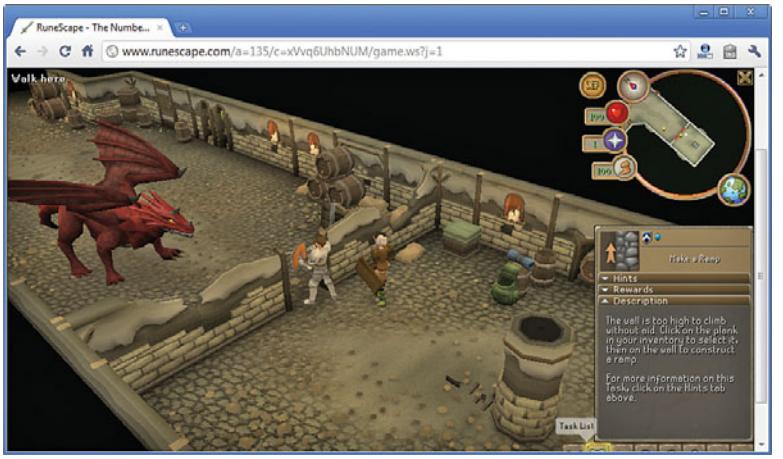

FIGURE 3.1
The Java-powered online game RuneScape.

Java.com provides a place to learn about how Java is being used. Oracle also offers a more technically oriented website for Java programmers at http://www.oracle.com/technetwork/java. This site is the place to find the latest released versions of NetBeans and the Java Development Kit along with other programming resources.

A Brief History of Java

Bill Joy, one of the executives at Sun Microsystems when the company created Java, called the language "the end result of 15 years of work to produce a better, more reliable way to write computer programs." Java's creation was a little more complicated than that.

Java was developed in 1990 by James Gosling as a language that would serve as the brains for smart appliances (interactive TVs, omniscient ovens, SkyNet military satellites that enslave mankind, and so on). Gosling was unhappy with the results he was getting by writing programs with a programming language called C++. In a burst of inspiration, he holed up in his office and wrote a new language to better suit his needs.

Gosling named his new language Oak after a tree he could see from his office window. The language was part of his company's strategy to make a fortune when interactive TV became a multimillion-dollar industry. That still hasn't happened today (though Netflix, TiVo, and others are making a game attempt), but something completely different took place for Gosling's new language. Just as Oak was about to be scrapped, the Web became popular.

In a fortuitous circumstance, many qualities that made Gosling's language good on its appliance project made it suitable for adaptation to the Web. His team devised a way for programs to be run safely from web pages and a catchy new name was chosen to accompany the language's new purpose: Java.

Although Java can be used for many other things, the Web provided the showcase it needed. When the language rose to prominence, you had to be in solitary confinement or a long-term orbital mission to avoid hearing about it.

There have been eight major releases of the Java language:

- **Fall 1995:** Java 1.0—The original release
- **Spring 1997:** Java 1.1—An upgrade that improved support for graphical user interfaces
- **Summer 1998:** Java 2 version 1.2—A huge expansion, making the language a general-purpose programming language
- **Fall 2000:** Java 2 version 1.3—A release for enhanced multimedia
- **Spring 2002:** Java 2 version 1.4—An upgrade of Internet support, XML capabilities, and text processing
- **Spring 2004:** Java 2 version 5—A release offering greater reliability and automatic data conversion
- **Winter 2006:** Java 6—A upgrade with a built-in database and web services support
- **Summer 2011:** Java 7—The current release, which adds new core language improvements, memory management improvements, and the Nimbus graphical user interface

NOTE

You might have heard that Java is an acronym that stands for Just Another Vague Acronym. You also might have heard that it was named for the Gosling's love of coffee. The story behind Java's naming contains no secret messages or declarations of liquid love. Java was chosen as the name for the same reason that comedian Jerry Seinfeld likes to say the word salsa: It sounds cool.

Going to School with Java

The Web includes numerous resources for educators and schoolchildren. Because Java programs can offer a more interactive experience than standard web pages, some programmers have used the language to write learning programs for the Internet.

For one such example, visit http://www.cs.ubc.ca/~van/sssjava to access a ski jump simulator created by Michiel van de Panne, a computer science professor at the University of British Columbia. The program uses Java to demonstrate physics-based animation as a skier tries several different slopes and jumps. The motion of the skier is controlled by moving a mouse one of eight directions, each of which affects the success of a jump. Figure 3.2 shows one run of the program right before my virtual skier met a gruesome end.

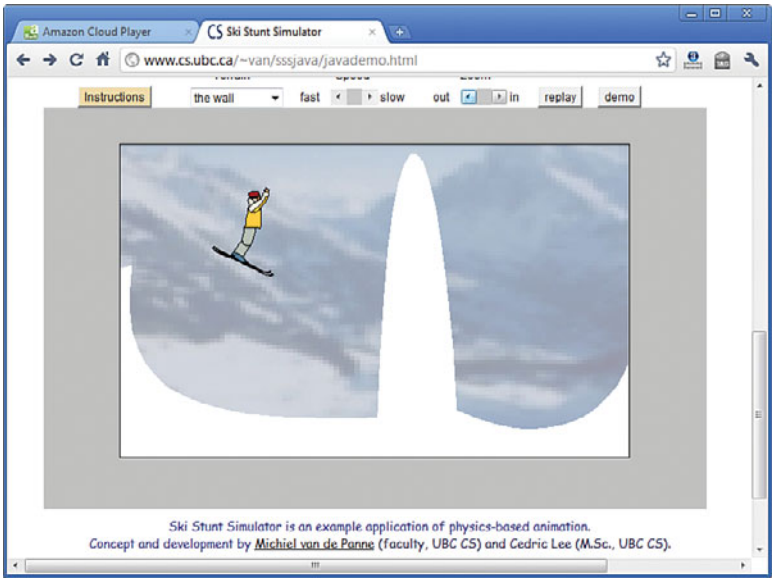

FIGURE 3.2
A ski-jump simulator can be experienced interactively on the Web using a Java program.

TIP

Oracle includes the Java Plug-in with the JDK and other products, so it might already be installed on your computer. To check if Java is installed, visit the www.java.com website. The "Do I Have Java?" link can detect the presence of Java.

Numerous educational programs are available for many different operating systems, but one thing that makes this program stand out is its availability. The simulator is run directly from a web page. No special installation is needed, and, unlike most desktop software, it isn't limited to a particular operating system. You can run Java programs on any computer that has a Java Virtual Machine (JVM).

The JVM loaded by a browser is the same one used to run the `Saluton` program during Hour 2, "Writing Your First Program." A browser's JVM only can run Java programs that are set up to run on web pages and cannot handle programs set up to run elsewhere, such as in a file folder.

The first browsers to support Java included a built-in JVM. Today, browsers support Java by relying on the Java Plug-in, a JVM that works as a browser enhancement.

A Java program, such as the ski-jump simulator, does not have to be written for a specific operating system. Because operating systems like Windows also are called platforms, this advantage is called *platform independence*. Java was created to work on multiple systems. Originally, Java's developers believed it needed to be multiplatform because it would be used on a variety of appliances and other electronic devices.

Users can run the programs you write with Java on a variety of systems without requiring any extra work from you. Under the right circumstances, Java can remove the need to create specific versions of a program for different operating systems and devices.

Lunch in JavaWorld

After working up an appetite on the slopes, take a lunch break with *JavaWorld*, an online magazine for Java programmers. Visit www.javaworld.com.

JavaWorld offers how-to articles, news stories, and research centers on hot areas of Java development. One of the advantages of the publication's web format is that it can display functional Java programs in conjunction with articles. Figure 3.3 shows a Java poetry magnet board that accompanies a tutorial explaining how it is written.

FIGURE 3.3
A *JavaWorld* how-to article on how to create a poetry magnet board includes a working example of the program.

NOTE

JavaWorld occasionally moves things around, but at the time of this writing, you can go directly to the poetry magnet board tutorial at www.cadenhead.org/poetry. If that page is unavailable, use the site's search engine to look for the word "poetry."

JavaWorld publishes articles and commentary about the language and its development. One issue that has been hotly debated since Java's introduction is whether the language is secure.

Security is important because of the way Java programs work when they are placed on a web page. The Java programs you have tried during this hour were downloaded to your computer. When the program was finished downloading, it ran on your computer.

Unless you know a whole lot of people, most web pages you visit are published by strangers. In terms of security, running their programs isn't a lot different than letting the general public come over and borrow your computer. If the Java language did not have safeguards to prevent abuse, its programs could introduce viruses onto your system, delete files, play the collected works of Justin Bieber, and do other unspeakable things. Java includes several different kinds of security to make sure that its programs are safe when run from web pages.

The main security is provided by restrictions on Java programs running over the Web:

- No program can open, read, write, or delete files on the user's system.
- No program can run other programs on the user's system.
- All windows created by the program are identified clearly as Java windows.
- Programs cannot make connections to websites other than the one from which they came.
- All programs are verified to make sure that nothing was modified after they were compiled.

Although there are no guarantees, the language has been proven to have enough safeguards to be usable over the Web.

The Java language also offers a more flexible security policy for programs that run in a browser. You can designate some companies and programmers as trusted developers, which enables their Java programs to run in your browser without the restrictions that normally would be in place.

This system of trust is established through the use of signed applets that have *digital signatures*, files that clearly identify the author of a Java program. These signatures are created in collaboration with independent verification groups such as VeriSign.

If you ever have authorized a program to run in a browser such as Internet Explorer or Google Chrome, you have worked with a similar system of trust and identity verification.

Applets can still be useful today, but over the years other technology, such as Flash, Silverlight, and HTML5, have been employed for web page–based programs. Java is more commonly encountered on mobile apps, server programs, and desktop software.

Watching the Skies at NASA

The first afternoon stop on the Java tour is a trip to NASA, a U.S. government agency that makes extensive use of Java. One of the most popular examples is SkyWatch, an applet that helps stargazers keep an eye out for orbiting satellites. Load it in your browser by visiting www.cadenhead.org/nasa; you are forwarded automatically to NASA's SkyWatch site.

SkyWatch superimposes the current location and path of eight different satellites—which you can add or drop from view—over a globe of the world. The applet running in Figure 3.4 shows the SEASAT-1 satellite making a patch from the Bootes constellation to the Hercules constellation.

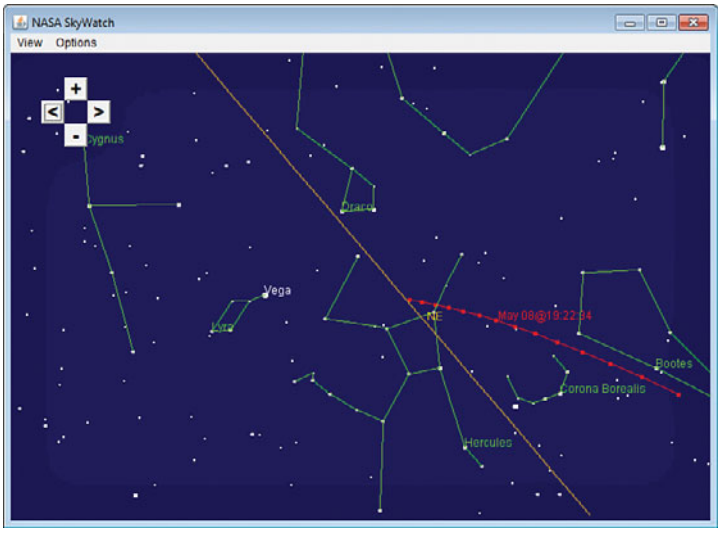

FIGURE 3.4
NASA's SkyWatch applet monitors the location and path of orbiting satellites, a boon to metal bird-watchers.

The applet redraws the position of each tracked satellite as it runs. This kind of real-time update is possible because the Java language is multithreaded. *Multithreading* is a way for the computer to do more than one thing at the same time. One part of a program takes care of one task, another part takes care of a different task, and the two parts can pay no attention to each other. Each part of a program in this example is called a *thread*.

In a program such as SkyWatch, each satellite could run in its own thread. If you use an operating system such as Windows 7, you're using a type of this behavior when you run more than one program at the same time. If you're at work playing Desktop Tower Defense in one window while running a company sales report in another window and making a long-distance call to a friend, congratulate yourself—you're multithreading!

Getting Down to Business

At this point in your travels, you might have the impression that Java is primarily of use to space buffs, atrocious poets, and terrible skiers. The next stop on our trip shows an example of Java getting down to business.

Direct your web browser to the JTicker website at www.jticker.com.

The publisher of JTicker, a company called Stock Applets, develops Java programs that display business news headlines and stock quotes for use on other websites. Figure 3.5 shows a demo of its scrolling stock ticker.

Unlike other stock analysis programs that require the installation of software on the computers of each employee who needs access, the use of Java enables customers of Stock Applets to make the programs available to anyone with a web browser. All employees have to do is access the company's website.

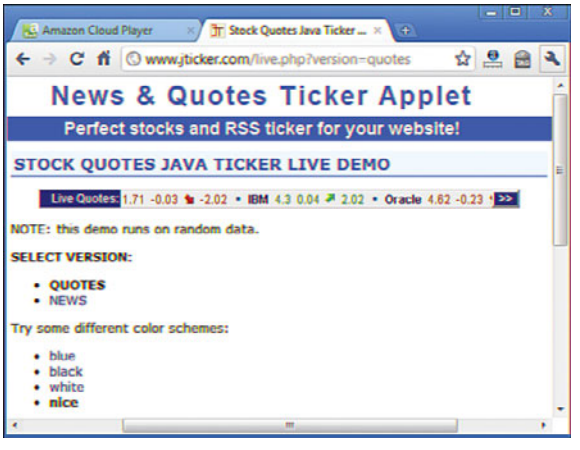

FIGURE 3.5
Java programs from Stock Applets report stock market prices.

You can think of a program like this stock ticker applet in several different ways. One is to think of a program as an object—something that exists in

the world, takes up space, and has certain things it can do. *Object-oriented programming* (OOP), which Java uses (read more in Hour 10, "Creating Your First Object"), is a way of creating computer programs as a group of objects. Each object handles a specific job and knows how to speak to other objects. For example, a stock ticker program could be set up as the following group of objects:

- A quote object, which represents an individual stock quote
- A portfolio object, which holds a set of quotes for specific stocks
- A ticker object, which displays a portfolio
- An Internet object, a user object, and many others

Under that model, the stock ticker software is a collection of all the objects necessary to get work done.

OOP is a powerful way to create programs, and it makes the programs you write more useful. Consider the stock software. If the programmer wants to use the quote capabilities of that program in some other software, the quote object can be used with the new program. No changes need to be made.

Stopping by Java Boutique for Directions

This world tour of Java programs is being led by a professional who is well-versed in the hazards and highlights of web-based travel. You'll be venturing out on your own trips soon, so it's worthwhile to stop at one of the best guides for the tourist who wants to see Java: Java Boutique at http://javaboutique.internet.com.

Java Boutique features a directory of Java programs and programming resources related to the language. One of the best uses of the site for programmers is to see what programs are available that offer source code. In case you're unfamiliar with the term, *source code* is another name for the text files that are used to create computer programs. The `Saluton.java` file you developed during Hour 2 is an example of source code.

The Source Code link on the Java Boutique's home page lists the programs in the site's directory that include their source code.

One of the programs whose source code is available is Aleksey Udovydchenko's Absolute, a space videogame in which you control a ship and blast your way through an asteroid field (see Figure 3.6). The game features scrolling animation, graphics, keyboard control, and sound. To learn more and play the game, visit http://javaboutique.internet.com/Absolute.

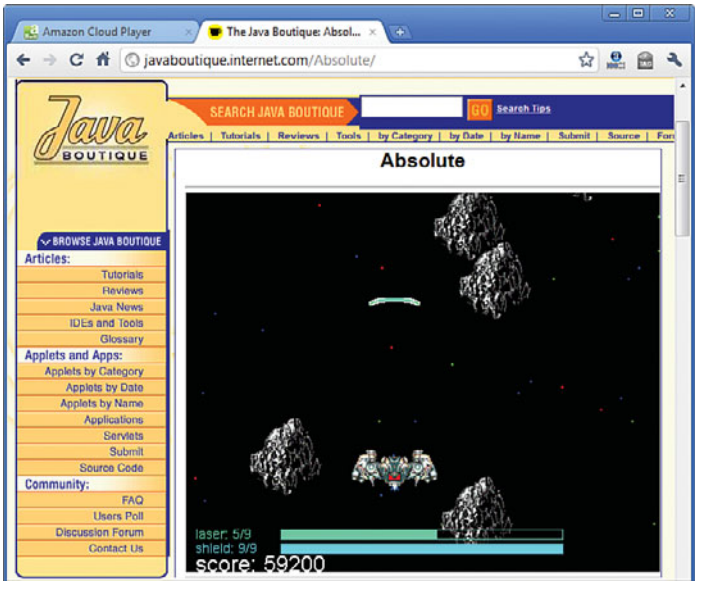

FIGURE 3.6
Source code for Java programs such as Aleksey Udovydchenko's space shoot-'em-up Absolute can be found using Java Boutique.

NOTE

Gamelan's Java Applet Ratings Service (JARS), a directory of browser-based Java programs and other resources available at www.jars.com, often includes programs that are accompanied by the source code used to create them. The language has been adopted by thousands of programmers around the world, partially because of the simplicity of the language.

The entire Absolute program was written in just more than 700 lines of code. That's an extremely small number, considering everything the program does. Java includes an extensive library of classes you can use in your own programs. Udovydchenko employs a class called Image to display graphics such as asteroids and an AudioClip class to play sounds such as laser fire and explosions.

One goal of Java's design was to make it easier to learn than C++, the language Gosling was having fits with on his smart-appliance project. Much of Java is based on C++, so programmers who have learned to use that language find it easier to learn Java. However, some of the elements of C++ that are the hardest to learn and use correctly are not present in Java.

For people learning programming for the first time, Java is easier to learn than C++. Some languages are created to make it easier for experienced programmers to harness the capabilities of the computer in their programs.

These languages include shortcuts and other features that programming veterans easily understand.

Java does not use some of these features, preferring to make the language as simple as an object-oriented programming language can be. Java was created to be easy to learn, easy to debug, and easy to use Java includes numerous enhancements that make it a worthy competitor to other languages.

Running Java on Your Phone

The last stop on your whirlwind tour of Java is the nearest Google Android cell phone. Every single program that runs on Android has been programmed with Java. These mobile programs, which extend the functionality of the phones, are called apps. One of the most popular apps is a game called Angry Birds, shown in Figure 3.7.

FIGURE 3.7
Angry Birds and all other Android apps were created with the Java language.

You can learn more about this game, if you're not already familiar with it, by visiting www.angrybirds.com. (But don't do it! The game will obliterate any hope you had of being productive for the rest of the day, week, or even month—depending on how much you hate fortified pigs.)

Android ends the trip around Java because it's becoming an incredibly popular place for the language to be used. After you learn Java, you can apply your skills developing your own apps using the Android Software Development Kit (SDK), a free programming toolkit that runs on Windows, MacOS, and Linux.

More than 250,000 apps have been created for Android phones and other devices that run the mobile operating system. You learn more about it in Hour 24, "Writing Android Apps."

Summary

Now that the hour-long vacation is over, it's time to put away your luggage and get ready for a return to actual Java programming.

During the next 21 hours, you will master the basic building blocks of the Java language, learn how to create your own objects to accomplish tasks in object-oriented programming, design graphical user interfaces, and much more.

Unless you've stopped reading this book to play Angry Birds.

Q&A

Q. Why are Java applets no longer popular?

A. When the Java language was introduced in the mid-'90s, most people were learning the language to write applets. Java was the only way to create interactive programs that ran in a web browser.

Over the years, alternatives emerged. Macromedia Flash, Microsoft Silverlight, and the new web publishing HTML5 standard all offer ways to put programs on web pages.

Applets were hampered by poor loading time and slow support for new versions of Java by browser developers. A Java plug-in was introduced that could run the current version of Java in browsers, but by that time Java had outgrown its origins and was a sophisticated general-purpose programming language.

Q. What's a Chris Steak House, and why does Ruth have one?

A. Ruth's Chris Steak House, the chain of more than 120 upscale steak restaurants across the United States and a handful of other countries, has an odd two-first-name name that reveals its humble origins and the stubborn streak of its founder.

The chain was founded in 1965 as a solitary New Orleans restaurant owned by Ruth Fertel, a single mother of two sons. Fertel saw a classified ad offering a restaurant for sale and took out a $22,000 home mortgage to buy it (equivalent to around $150,000 in present dollars).

She reached a deal to keep the name Chris Steak House with original owner Chris Matulich, but later had to relocate after a kitchen fire.

Fertel's contract did not permit her to use the Chris Steak House name anywhere but the original location, so she renamed it Ruth's Chris Steak House. Though she had no restaurant or culinary expertise, the business was so successful that she began offering it as a franchise within 12 years. She disregarded several suggestions over the years to change the name to broaden its appeal.

"I've always hated the name," she once told a reporter for *Fortune* magazine, "but we've always managed to work around it."

Fertel, who died in 2002, was born on Feb. 5, 1927—the same day that Matulich opened the steakhouse.

Workshop

If your mind hasn't taken a vacation by this point, test your knowledge of this hour with the following questions.

Quiz

1. How did object-oriented programming get its name?
   - **A.** Programs are considered to be a group of objects working together.
   - **B.** People often object because it's hard to master.
   - **C.** Its parents named it.
2. Which of the following isn't a part of Java's security?
   - **A.** Web programs cannot run programs on the user's computer.
   - **B.** The identity of a program's author is always verified.
   - **C.** Java windows are labeled as Java windows.
3. What is a program's capability to handle more than one task called?
   - **A.** Schizophrenia
   - **B.** Multiculturalism
   - **C.** Multithreading

Answers

1. **A.** It's also abbreviated as OOP.
2. **B.** Programmers can use digital signatures and an identity-verification company such as VeriSign in Java, but it isn't required.
3. **C.** This also is called multitasking, but the term *multithreading* is used in conjunction with Java because a separately running part of a program is called a thread.

Activities

Before unpacking your luggage, you can explore the topics of this hour more fully with the following activities:

- Use the Java Boutique site at http://javaboutique.internet.com to find out what card games have been developed using the language.
- Visit Oracle's website for Java users, www.java.com, and click the "Do I Have Java?" link. Follow the instructions to see whether Java's present on your computer. Download and install the most up-to-date version, if prompted to do so.

Solutions for the activities in this book are presented on the book's website at www.java24hours.com.

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