国外计算机科学教材系列

Pearson

DEITEL®

Java

大学教程（第九版）（英文版）

Java How to Program

Ninth Edition

[美] Paul Deitel
Harvey Deitel 著

中国工信出版集团

電子工業出版社
PUBLISHING HOUSE OF ELECTRONICS INDUSTRY
http://www.phei.com.cn

国外计算机科学教材系列

Java 大学教程

（第九版）

（英文版）

Java How to Program

Ninth Edition

［美］ Paul Deitel Harvey Deitel 著

阜阳师范学院图书馆
藏书

電子工業出版社
Publishing House of Electronics Industry
北京 · BEIJING

内 容 简 介

本书是关于 Java 语言编程的优秀教材之一，秉承 Deitel 系列丛书的一贯特点：内容丰富、覆盖面广，提供详细代码与实例研究，总结出大量的面向对象编程技巧和经验。本书详细说明了在 Java 中面向对象编程的基本理论及实用知识，由初学者为起点，由点到面、由浅入深、循序渐进地介绍了事件处理、对象、接口、内置类、继承、多态性、数据结构和集合、查找与排序、流文件、applet、图形用户界面及多线程等，并且详细介绍了网络应用的开发与实践。第九版在前一版的基础上增加了更多的实际案例，更新了很多内容，有助于读者学习和借鉴。本书包括更广泛的教学特性，其中列举了数百个可实际使用的程序实例，并给出实际的运行结果，可以使学生在学习时更为直观。

本书结构清晰、逻辑性强，适合作为相关专业 Java 程序设计课程的双语教材，是所有对 Java 编程感兴趣的读者的有益参考书，也可供各类软件开发人员参考。

Original edition, entitled Java How to Program, Ninth Edition, ISBN 9780132575669, by Paul Deitel and Harvey Deitel, published by Pearson Education, Inc., publishing as Prentice Hall, Copyright©2012 Pearson Education, Inc.
All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or by any information storage retrieval system, without permission from Pearson Education, Inc.
China edition published by PEARSON EDUCATION ASIA LTD., and PUBLISHING HOUSE OF ELECTRONICS INDUSTRY copyright©2017.
This edition is manufactured in the People's Republic of China, and is authorized for sale and distribution only in the mainland of China exclusively(except Taiwan, Hong Kong SAR and Macau SAR).

本书英文影印版专有出版权由 Pearson Education（培生教育出版集团）授予电子工业出版社。未经出版者预先书面许可，不得以任何方式复制或抄袭本书的任何部分。
本书在中国大陆地区出版，仅限在中国大陆发行。
本书贴有 Pearson Education（培生教育出版集团）激光防伪标签，无标签者不得销售。

版权贸易合同登记号　图字：01-2015-8411

图书在版编目(CIP)数据

Java 大学教程 = Java How to Program：英文 /（美）保罗·戴特尔(Paul Deitel)，（美）哈维·戴特尔(Harvey Deitel)著. —9 版. —北京：电子工业出版社，2017.6
国外计算机科学教材系列
ISBN 978-7-121-31760-6

I. ①J…　II. ①保…　②哈…　III. ①JAVA 语言—程序设计—高等学校—教材—英文　IV. ①TP312.8

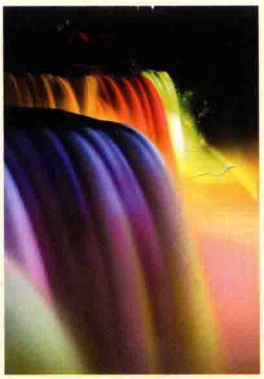
中国版本图书馆 CIP 数据核字(2017)第 124098 号

策划编辑：冯小贝
责任编辑：冯小贝
印　　刷：三河市鑫金马印装有限公司
装　　订：三河市鑫金马印装有限公司
出版发行：电子工业出版社
　　北京市海淀区万寿路 173 信箱　邮编　100036
开　　本：787 × 1092　1/16　　印张：72　　字数：2756 千字
版　　次：2002 年 6 月第 1 版(原著第 4 版)
　　2017 年 6 月第 4 版(原著第 9 版)
印　　次：2017 年 6 月第 1 次印刷
定　　价：168.00 元

凡所购买电子工业出版社图书有缺损问题，请向购买书店调换。若书店售缺，请与本社发行部联系，联系及邮购电话：(010)88254888，88258888。
质量投诉请发邮件至 zlts@phei.com.cn，盗版侵权举报请发邮件至 dbqq@phei.com.cn。
本书咨询联系方式：fengxiaobei@phei.com.cn。

Deitel® How to Program Series Cover Theme

The cover theme for the Deitel® How to Program Series emphasizes social consciousness issues such as going green, clean energy, recycling, sustainability and more. Within the text, in addition to conventional programming exercises, we've included our Making a Difference exercise set to raise awareness of issues such as global warming, population growth, affordable healthcare, accessibility, privacy of electronic records and more. In this book, you'll use Java to program applications that relate to these issues. We hope that what you learn in *Java How to Program,* 9/e will help you to make a difference.



Night at the Niagara Falls—Ontario and New York

The Niagara Falls waterfalls straddle the border between Ontario, Canada and upstate New York in the United States. Horseshoe Falls is located on the Canadian side, and American Falls and Bridal Veil Falls are on the U.S. side.

The Niagara Falls are an awe-inspiring, world-class tourist attraction, and a significant source of hydroelectric power. On average, nearly four million cubic feet of water falls over the crest line each minute. The U.S. and Canada harness the natural energy from Niagara Falls to generate clean, inexpensive electricity. The first hydroelectric generating station on the Niagara River was built in 1881. Its electricity powered local mills and street lights. The Niagara Redevelopment Act, passed by the U.S. Congress in 1957, gave the New York Power Authority the right to develop the U.S. Niagara River hydroelectric power plants. The Niagara Falls hydroelectric project began operating in 1961. Up to 375,000 gallons of water per second is diverted from the river through conduits to the power plants. The water spins turbines that power generators that convert the mechanical energy into electrical energy. Today, the project generates 2.4 million kilowatts, which can power 24 million 100-watt light bulbs simultaneously. For further information visit:

```
en.wikipedia.org/wiki/Niagra_falls
www.nypa.gov/facilities/niagara.htm
www.niagarafrontier.com/power.html
```

About Deitel & Associates, Inc.

Deitel & Associates, Inc., is an internationally recognized authoring and corporate training organization. The company offers instructor-led courses delivered at client sites worldwide on programming languages and other software topics such as Java , C#®, Visual Basic®, Visual C++®, C++, C, Objective-C®, XML®, Python®, JavaScript, object technology, Internet and web programming, and Android and iPhone app development. The company's clients include many of the world's largest companies, as well as government agencies, branches of the military and academic institutions. To learn more about Deitel Pearson Higher Education publications and Dive Into® Series corporate training, e-mail `deitel@deitel.com` or visit `www.deitel.com/training/`. Follow Deitel on Facebook® at `www.deitel.com/deitelfan/` and on Twitter® `@deitel`.

Continued from Back Cover

> *The [early] introduction of the class concept is clearly presented. A comprehensive overview of control structures and the pitfalls that befall new programmers. I applaud the authors for their topical research and illustrative examples. The [arrays] exercises are sophisticated and interesting. The clearest explanation of pass-by-value and pass-by-reference that I've encountered. A logical progression of inheritance and the rationale for properly implementing encapsulation in a system involving an inheritance hierarchy. The polymorphism and exception handling discussions are the best I've seen. An excellent strings chapter. I like the [recursion] discussions of the 'Lo Fractal' and backtracking (which is useful in computer vision applications). A good segue into a data structures course.*"—**Ric Heishman, George Mason University**

> *Practical top-down, solution approach to teaching programming basics, covering pseudocode, algorithm development and activity diagrams. Of immense value to practitioners and students of the object-oriented approach. Demystifies inheritance and polymorphism, and illustrates their use in getting elegant, simple and maintainable code. The [optional OO design] case study presents the object-oriented approach in a simple manner, from requirements to Java code.*"
> **—Vinod Varma, Astro Infotech Private Limited**

> *Easy-to-follow examples provide great teaching opportunities! I like the [optional] graphics track early in the book—the exercises will be fun for the students. OO design techniques are incorporated throughout. The concept of inheritance is built through the examples and very understandable. Great examples of polymorphism and interfaces. Great comparison of recursion and iteration. The [Searching and Sorting] chapter is just right. A simplified explanation of Big O—the best I've read! I appreciate the coverage of GUI threading issues. Great approach to Java web technologies.*"
> **—Sue McFarland Metzger, Villanova University**

> *The Making a Difference exercises are inspired—they have a real contemporary feeling, both in their topics and in the way they encourage the student to gather data from the Internet and bring it back to the question at hand.*"
> **—Vince O'Brien, Pearson Education (our publisher)**

> *Most major concepts are illustrated by complete, annotated programs. Abundant exercises hone your understanding of the material. JDBC is explained well.*"—**Shyamal Mitra, University of Texas at Austin**

> *The best introductory textbook that I've encountered. I wish I had this book when I was learning how to program! Good introduction to UML and the software engineering process.*"—**Lance Andersen, Oracle**

> *You'll be well on your way to becoming a great Java programmer with this book. The Polymorphism and Generic Collections chapters are excellent for a new student.*"—**Peter Pilgrim, Java Champion, Consultant**

> *A good objects-early introduction to Java. Exceptionally well-written chapter on recursion. Graphics exercises are great. Excellent descriptions of the search and sort algorithms and a gentle introduction to Big-O notation. The examples give the code for the algorithms, and output that creates a picture of how the algorithms work.*"
> **—Diana Franklin, University of California, Santa Barbara**

> *Suitable for new programmers, intermediate-level programmers who want to hone their skills, and expert programmers who need a well-organized reference. Glad to see the mention of Nimbus. Swing components, event handling and layouts are well explained.*"—**Manjeet Rege, Rochester Institute of Technology**

> *Beautiful collections of exercises—a nice illustration of how to use Java libraries to generate impressive and stimulating graphics.*"—**Amr Sabry, Indiana University**

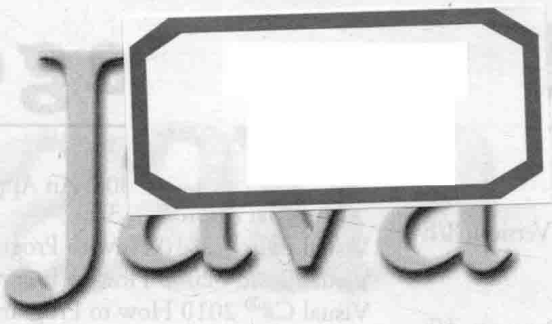
> *Excellent coverage of exception handling. A complete introduction to Java networking. Great coverage of multithreading.*"
> **—José Antonio González Seco, Parliament of Andalusia**

> *Good explanation of static vs. non-static methods and variables. Best introduction to Java 2D I've seen! The collections framework is well explained.*"—**Manfred Riem, Java Champion, Consultant, Robert Half**

> *The [optional] OOD ATM case study puts many concepts from previous chapters together in a plan for a large program, showing the object-oriented design process. The discussion on inheritance and polymorphism is especially good as [the authors] integrate these into the design.*"—**Susan Rodger, Duke University**

> *The transition from design to implementation is explained powerfully—the reader can easily understand the design issues and how to implement them in Java.*"—**S. Sivakumar, Astro Infotech Private Limited**

此为试读，需要完整PDF请访问：www.ertongbook.com



HOW TO PROGRAM

NINTH EDITION

Deitel Series Page

How To Program Series

Java™ How to Program, 9/E
Java™ How to Program, Late Objects Version, 8/E
C++ How to Program, 8/E
C How to Program, 6/E
Internet & World Wide Web How to Program, 4/E
Visual Basic® 2010 How to Program
Visual C#® 2010 How to Program, 3/E
Visual C++® 2008 How to Program, 2/E
Small Java How to Program, 6/E
Small C++ How to Program, 5/E

Simply Series

Simply C++: An App-Driven Tutorial Approach
Simply Java Programming: An App-Driven Tutorial Approach
Simply C#: An App-Driven Tutorial Approach
Simply Visual Basic® 2008, 3/E: An App-Driven Tutorial Approach

CourseSmart Web Books

www.deitel.com/books/CourseSmart/

C++ How to Program, 5/E, 6/E, 7/E & 8/E
Java How to Program, 6/E, 7/E, 8/E & 9/E
Simply C++: An App-Driven Tutorial Approach
(continued next column)

(continued)

Simply Visual Basic 2008: An App-Driven Tutorial Approach, 3/E
Visual Basic® 2010 How to Program
Visual Basic ®2008 How to Program
Visual C#® 2010 How to Program, 4/E
Visual C#® 2008 How to Program, 3/E

Deitel Developer Series

AJAX, Rich Internet Applications and Web Development for Programmers
Android for Programmers: An App-Driven Approach
C++ for Programmers
C# 2010 for Programmers, 3/E
iPhone for Programmers: An App-Driven Approach
Java for Programmers
JavaScript for Programmers

LiveLessons Video Learning Products

www.deitel.com/books/LiveLessons/

Java Fundamentals
C# Fundamentals
C++ Fundamentals
iPhone® App Development Fundamentals
JavaScript Fundamentals
Visual Basic Fundamentals

To receive updates on Deitel publications, Resource Centers, training courses, partner offers and more, please register for the free *Deitel Buzz Online* e-mail newsletter at:

www.deitel.com/newsletter/subscribe.html

follow us on Twitter®

@deitel

and become a Deitel & Associates fan on Facebook®

www.deitel.com/deitelfan/

To communicate with the authors, send e-mail to:

deitel@deitel.com

For information on government and corporate *Dive-Into Series* on-site seminars offered by Deitel & Associates, Inc. worldwide, visit:

www.deitel.com/training/

or write to

deitel@deitel.com

For continuing updates on Prentice Hall/Deitel publications visit:

www.deitel.com
www.pearsoninternationaleditions.com/deitel/

Check out our Resource Centers for valuable web resources that will help you master Java, other important programming languages, software and, Internet- and web-related topics:

www.deitel.com/ResourceCenters.html

Java

HOW TO PROGRAM

NINTH EDITION

Paul Deitel
Deitel & Associates, Inc.

Harvey Deitel
Deitel & Associates, Inc.

International Edition Contributions by

Soumen Mukherjee
RCC Institute of Information Technology

Arup Kumar Bhattacharjee
RCC Institute of Information Technology

Prentice Hall

Boston Columbus Indianapolis New York San Francisco Upper Saddle River
Amsterdam Cape Town Dubai London Madrid Milan Munich Paris Montreal Toronto
Delhi Mexico City Sao Paulo Sydney Hong Kong Seoul Singapore Taipei Tokyo

Vice President and Editorial Director: ***Marcia J. Horton***
Editor-in-Chief: ***Michael Hirsch***
Associate Editor: ***Carole Snyder***
Vice President, Marketing: ***Patrice Jones***
Marketing Manager: ***Yezan Alayan***
Senior Marketing Coordinator: ***Kathryn Ferranti***
Vice President, Production: ***Vince O'Brien***
Managing Editor: ***Jeff Holcomb***
Associate Managing Editor: ***Robert Engelhardt***
Publisher, International Edition: ***Angshuman Chakraborty***
Acquisitions Editor, International Edition: ***Arunabha Deb***
Publishing Assistant, International Edition: ***Shokhi Shah***
Operations Specialist: ***Lisa McDowell***
Art Director: ***Linda Knowle***
Cover Design: ***Jodi Notowitz***
Media Editor: ***Daniel Sandin***
Media Project Manager: ***Wanda Rockwell***

Pearson Education Limited
Edinburgh Gate
Harlow
Essex CM20 2JE
England

and Associated Companies throughout the world

Visit us on the World Wide Web at:
www.pearsoninternationaleditions.com

© Pearson Education Limited 2012

The rights of Paul Deitel and Harvey Deitel to be identified as authors of this work have been asserted by them in accordance with the Copyright, Designs and Patents Act 1988.

Authorized adaptation from the United States edition, entitled Java, How To Program, 9th edition, *ISBN 978-0-13-257566-9 by Paul Deitel and Harvey Deitel published by Pearson Education © 2012.*

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without either the prior written permission of the publisher or a licence permitting restricted copying in the United Kingdom issued by the Copyright Licensing Agency Ltd, Saffron House, 6–10 Kirby Street, London EC1N 8TS.

All trademarks used herein are the property of their respective owners. The use of any trademark in this text does not vest in the author or publisher any trademark ownership rights in such trademarks, nor does the use of such trademarks imply any affiliation with or endorsement of this book by such owners.

Microsoft® and Windows® are registered trademarks of the Microsoft Corporation in the U.S.A. and other countries. Screen shots and icons reprinted with permission from the Microsoft Corporation. This book is not sponsored or endorsed by or affiliated with the Microsoft Corporation.

ISBN-10: 0-273-75976-0
ISBN-13: 978-0-273-75976-8

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

10 9 8 7 6 5 4 3 2 1
14 13 12 11 10

Typeset in AGaramond Regular by Gex Publishing Services
Printed and bound by Courier/Kendallville in The United States of America

The publisher's policy is to use paper manufactured from sustainable forests.

In memory of Sargent Shriver,
The first director of the Peace Corps and
founder of numerous social organizations:

For a lifetime of making a difference.

Paul and Harvey Deitel

Trademarks

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Microsoft, Internet Explorer and the Windows logo are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

UNIX is a registered trademark of The Open Group.

Apache is a trademark of The Apache Software Foundation.

CSS, XHTML and XML are registered trademarks of the World Wide Web Consortium.

Firefox is a registered trademark of the Mozilla Foundation.

Google is a trademark of Google, Inc.

Web 2.0 is a service mark of CMP Media.

Throughout this book, trademarks are used. Rather than put a trademark symbol in every occurrence of a trademarked name, we state that we are using the names in an editorial fashion only and to the benefit of the trademark owner, with no intention of infringement of the trademark.

此为试读，需要完整PDF请访问：www.ertongbook.com

Preface

Live in fragments no longer, only connect.

—Edgar Morgan Foster

Welcome to Java and *Java How to Program, Ninth Edition*! This book presents leadingedge computing technologies for students, instructors and software developers.

The new Chapter 1 engages students with intriguing facts and figures to get them excited about studying computers and programming. The chapter includes a table of some of the research made possible by computers; current technology trends and hardware discussion; the data hierarchy; a table of mobile and Internet app platforms; a new section on social networking; an introduction to Android; a table of popular web services; a table of business and technology publications and websites that will help you stay up to date with the latest technology news and trends; and updated exercises.

The book is appropriate for introductory course sequences based on the ACM/IEEE curriculum recommendations and for AP Computer Science exam preparation.

We focus on software engineering best practices. At the heart of the book is the Deitel signature "live-code approach"—concepts are presented in the context of complete working programs, rather than in code snippets. Each complete code example is accompanied by live sample executions. All the source code is available at www.deitel.com/books/ jhtp9/.[①]

As you read the book, if you have questions, send an e-mail to deitel@deitel.com; we'll respond promptly. For updates on this book, visit www.deitel.com/books/jhtp9/, follow us on Facebook (www.deitel.com/deitelfan) and Twitter (@deitel), and subscribe to the *Deitel Buzz Online* newsletter (www.deitel.com/newsletter/ subscribe.html).

New and Updated Features

Here are the updates we've made for *Java How to Program, 9/e*:

Java Standard Edition (SE) 7

- ***Easy to use as a Java SE 6 or Java SE 7 book.*** There are a few Java Standard Edition (SE) 7 features that affect CS 1 and CS 2 courses. We cover those features in optional modular sections that are easy to include or omit. Here's some of the new functionality: Strings in switch statements, the try-with-resources statement for managing AutoClosable objects, multi-catch for defining a single exception handler to replace multiple exception handlers that perform the same task, the NIO filesystem APIs and inferring the types of generic objects from the variable they're assigned to by using the <> notation. We also overview the new concurrency API features.
- ***Java SE 7 filesystem APIs.*** We provide an *alternate* online version of Chapter 17, Files, Streams and Object Serialization, that's reimplemented with the new filesystem APIs from Java SE 7.
- ***Java SE 7's AutoClosable versions of Connection, Statement and ResultSet.*** With the source code for Chapter 28, Accessing Databases with JDBC, we provide a version of the chapter's first example that's implemented using Java SE 7's AutoClosable versions of Connection, Statement and ResultSet. AutoClosable objects reduce the likelihood of resource leaks when you use them with Java SE 7's try-with-resources statement, which automatically closes the AutoClosable objects allocated in the parentheses following the try keyword.

Pedagogic Features

- ***Enhanced Making a Difference exercises set.*** We encourage you to use computers and the Internet to

① 也可登录华信教育资源网(www.hxedu.com.cn)下载本书相关代码。

research and solve significant social problems. These exercises are meant to increase awareness and discussion of important issues the world is facing. We hope you'll approach them with your own values, politics and beliefs. Check out our new Making a Difference Resource Center at www.deitel.com/MakingADifference for additional ideas you may want to investigate further.

- ***Page numbers for key terms in chapter summaries.*** For key terms that appear in the chapter summaries, we include the page number of the key term's defining occurrence.

Object Technology

- ***Object-oriented programming and design.*** We introduce the basic concepts and terminology of object technology in Chapter 1. Students develop their first customized classes and objects in Chapter 3. Presenting objects and classes early gets students "thinking about objects" immediately and mastering these concepts more thoroughly. [For courses that require a late-objects approach, consider *Java How to Program, Late Objects Version, 8/e,* which begins with six chapters on programming fundamentals (including two on control statements) and continues with seven chapters that gradually introduce object-oriented programming concepts.]
- ***Exception handling.*** We integrate basic exception handling earlier in the book and instructors can easily pull more material forward from Chapter 11, Exception Handling: A Deeper Look.
- ***Class Arrays and ArrayList.*** Chapter 7 covers class Arrays—which contains methods for performing common array manipulations—and class ArrayList— which implements a dynamically resizable array-like data structure. This follows our philosophy of getting lots of practice *using existing classes while learning how to define your own classes.*
- ***OO case studies.*** The early classes and objects presentation features Time, Employee and GradeBook class case studies that weave their way through multiple sections and chapters, gradually introducing deeper OO concepts.
- ***Optional Case Study: Using the UML to Develop an Object-Oriented Design and Java Implementation of an ATM.*** The UML(Unified Modeling Language) is the industry-standard graphical language for modeling object-oriented systems. Chapters 12–13 include an *optional* case study on object-oriented design using the UML. We design and implement the software for a simple automated teller machine (ATM). We analyze a typical requirements document that specifies the system to be built. We determine the classes needed to implement that system, the attributes the classes need to have, the behaviors the classes need to exhibit and specify how the classes must interact with one another to meet the system requirements. From the design we produce a *complete* Java implementation. Students often report having a "light-bulb moment"—the case study helps them "tie it all together" and really understand object orientation.
- ***Reordered data structures presentation.*** We begin with generic class ArrayList in Chapter 7. Because *students will understand basic generics concepts early in the book,* our later data structures discussions provide a deeper treatment of generic collections—showing how to use the built-in collections of the Java API. We then show how to implement generic methods and classes. Finally, we show how to build custom generic data structures.

Database and Web Development

- ***JDBC 4.*** Chapter 28, Accessing Databases with JDBC, covers JDBC 4 and uses the Java DB/Apache Derby and MySQL database management systems. The chapter features an OO case study on developing a database-driven address book that demonstrates prepared statements and JDBC 4's automatic driver discovery.
- ***Java Server Faces (JSF) 2.0.*** Chapters 29–30 have been updated to introduce JavaServer Faces (JSF) 2.0 technology, which greatly simplifies building JSF web applications. Chapter 29 includes examples on building web application GUIs, validating forms and session tracking. Chapter 30 discusses

data-driven and Ajaxenabled JSF applications. The chapter features a database-driven multitier web address book that allows users to add and search for contacts. This Ajax-enabled application gives the reader a nice sense of Web 2.0 software development.

- ***Web services***. Chapter 31, Web Services, demonstrates creating and consuming SOAP-*and* REST-based web services. Case studies include developing blackjack and airline reservation web services.
- ***Java Web Start and the Java Network Launch Protocol (JNLP)***. We introduce Java Web Start and JNLP, which enable applets *and* applications to be launched via a web browser. Users can install locally for later execution. Programs can also request the user's permission to access local system resources such as files—enabling you to develop more robust applets and applications that execute safely using Java's sandbox security model, which applies to downloaded code.

Multithreading

- ***Multithreading***. We completely reworked Chapter 26, Multithreading [special thanks to the guidance of Brian Goetz and Joseph Bowbeer—two of the co-authors of *Java Concurrency in Practice,* Addison-Wesley, 2006].
- ***SwingWorker class***. We use class `SwingWorker` to *create multithreaded user interfaces.*

GUI and Graphics

- ***Scalable GUI and graphics presentation***. Instructors teaching introductory courses have a broad choice of the amount of GUI and graphics to cover—from none, to an optional 10-brief-sections introductory sequence woven in with the early chapters, to a deep treatment in Chapters 14, 15 and 25, and Appendix I.
- ***GroupLayout layout manager***. We discuss the `GroupLayout` layout manager in the context of the GUI design tool in the NetBeans IDE.
- ***JTable sorting and filtering capabilities***. Chapter 28 uses these capabilities to resort the data in a `JTable` and filter it by regular expressions.

Other Features

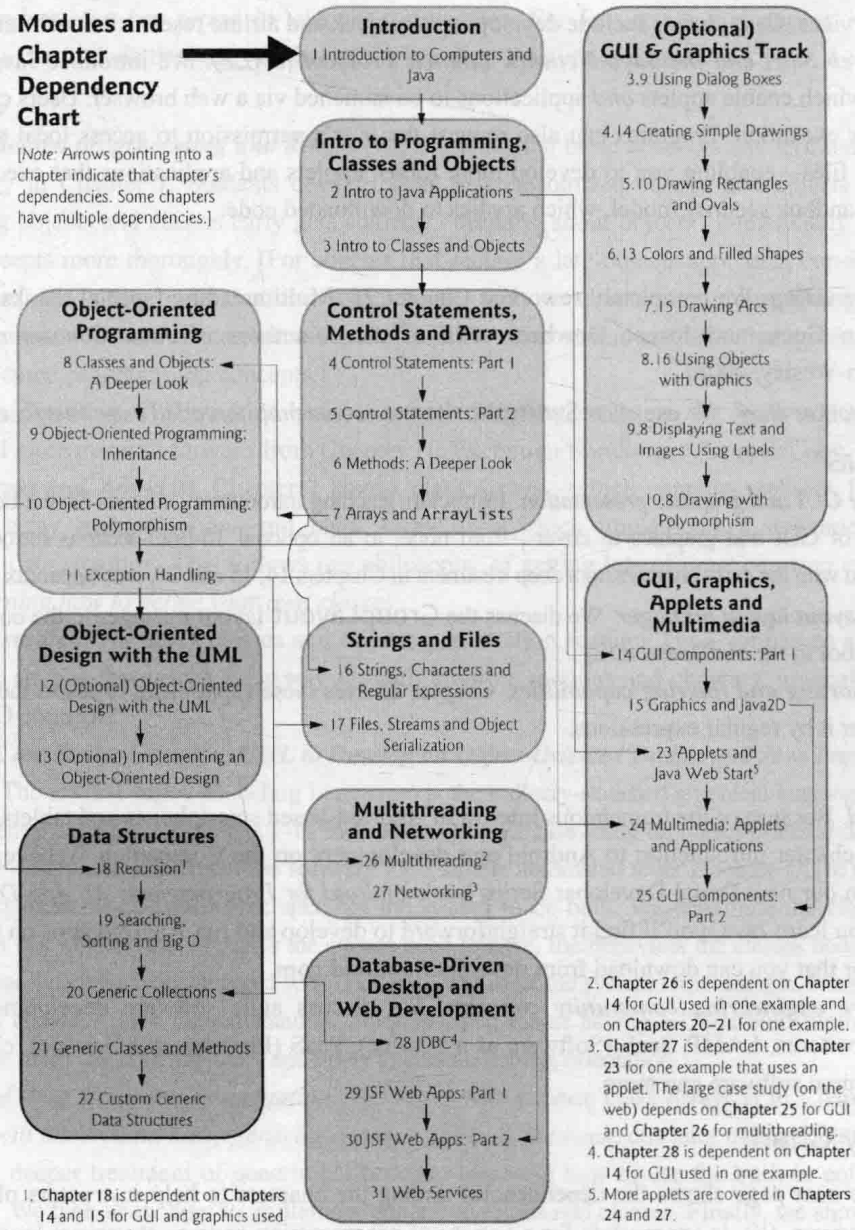
- ***Android***. Because of the tremendous interest in Android-based smartphones and tablets, we've included a three-chapter introduction to Android app development on the Companion Website. These chapters are from our new Deitel Developer Series book *Android for Programmers: An App-Driven Approach.* After you learn Java, you'll find it straightforward to develop and run Android apps on the free Android emulator that you can download from `developer.android.com`.
- ***Software engineering community concepts***. We discuss agile software development, refactoring, design patterns, LAMP, SaaS (Software as a Service), PaaS (Platform as a Service), cloud computing, open-source software and more.

Dependency Chart

The chart on the next page shows the dependencies among the chapters to help instructors plan their syllabi. *Java How to Program, 9/e*, is appropriate for a variety of programming courses at various levels, most notably CS 1 and CS 2 courses and introductory course sequences in related disciplines. The book has a clearly delineated, modular organization. Chapters 1–11 and 14–17 form an accessible elementary programming sequence with a solid introduction to object-oriented programming. *Optional* Chapters 12–13 form an accessible introduction to object-oriented design with the UML. The GUI and Graphics Track and Chapters 14, 15, 23, 24 and 25 form a substantial GUI, graphics and multimedia sequence. Chapters 18–22 form a nice data-structures sequence. Chapters 26–27 form a solid introduction to multithreading and Internet networking. Chapters 28–31 form a rich database-intensive web application development sequence.

Teaching Approach

Java How to Program, 9/e, contains hundreds of complete working examples. We stress program clarity and concentrate on building well-engineered software.



Code Highlighting. We place yellow rectangles around key code segments.

Using Fonts for Emphasis. We place the key terms and the index's page reference for each defining occurrence in **bold maroon** text for easier reference. We emphasize on-screen components in the bold Helvetica font (e.g., the File menu) and emphasize Java program text in the Lucida font (for example, `int x = 5;`).

Web Access. All of the source-code examples can be downloaded from:

```
www.deitel.com/books/jhtp9
```

Objectives. The opening quotes are followed by a list of chapter objectives.

Illustrations/Figures. Abundant tables, line drawings, UML diagrams, programs and program outputs are included.

Programming Tips. We include programming tips to help you focus on important aspects of program development. These tips and practices represent the best we've gleaned from a combined seven decades of programming and teaching experience.

Good Programming Practice

The Good Programming Practices *call attention to techniques that will help you produce programs that are clearer, more understandable and more maintainable.*

Common Programming Error

Pointing out these Common Programming Errors *reduces the likelihood that you'll make them.*

Error-Prevention Tip

These tips contain suggestions for exposing bugs and removing them from your programs; many describe aspects of Java that prevent bugs from getting into programs in the first place.

Performance Tip

These tips highlight opportunities for making your programs run faster or minimizing the amount of memory that they occupy.

Portability Tip

The Portability Tips *help you write code that will run on a variety of platforms.*

Software Engineering Observation

The Software Engineering Observations *highlight architectural and design issues that affect the construction of software systems, especially large-scale systems.*

Look-and-Feel Observation

The Look-and-Feel Observations *highlight graphical-user-interface conventions. These observations help you design attractive, user-friendly graphical user interfaces that conform to industry norms.*

Summary Bullets. We present a section-by-section bullet-list summary of the chapter.

Self-Review Exercises and Answers. Extensive self-review exercises *and* answers are included for self study. All of the exercises in the optional ATM case study are fully solved.

Exercises. The chapter exercises include:

- simple recall of important terminology and concepts
- What's wrong with this code?
- What does this code do?
- writing individual statements and small portions of methods and classes
- writing complete methods, classes and programs
- major projects
- in many chapters, Making a Difference exercises.

Index. We've included an extensive index.

Software Used in *Java How to Program, 9/e*

All the software you'll need for this book is available free for download from the web. See the Before You Begin section that follows this Preface for links to each download.

We wrote most of the examples in *Java How to Program, 9/e*, using the free Java Standard Edition Development Kit (JDK) 6. For the optional Java SE 7 modules, we used the OpenJDK's early access

version of JDK 7. In Chapters 29–31, we also used the Netbeans IDE, and in Chapter 28, we used MySQL and MySQL Connector/J. You can find additional resources and software downloads in our Java Resource Centers at:

www.deitel.com/ResourceCenters.html

Discounts on *Deitel Developer Series* Books

If you'd like to receive information on professional *Deitel Developer Series* titles, including *Android for Programmers: An App-Driven Approach*, please register your copy of *Java How to Program, 9/e* at informit.com/register. You'll receive information on how to purchase *Android for Programmers* at a discount.

Instructor Supplements[①]

The following supplements are available to qualified instructors only through www.pearsoninternationaleditions.com/deitel:

- ***PowerPoint® slides*** containing all the code and figures in the text, plus bulleted items that summarize key points.
- ***Test Item File*** of multiple-choice questions (approximately two per book section).
- ***Solutions Manual*** with solutions to the vast majority of the end-of-chapter exercises.

Please do not write to us requesting access to the Pearson Instructor's Resource Center which contains the book's instructor supplements, including the exercise solutions. Access is limited strictly to college instructors teaching from the book. Instructors may obtain access only through their Pearson representatives. Solutions are *not* provided for "project" exercises. Check out our Programming Projects Resource Center for lots of additional exercise and project possibilities (www.deitel.com/ProgrammingProjects/).

If you're not a registered faculty member, contact your Pearson representative.

Acknowledgments

We'd like to thank Abbey Deitel and Barbara Deitel for long hours devoted to this project. We're fortunate to have worked on this project with the dedicated team of publishing professionals at Pearson. We appreciate the guidance, savvy and energy of Michael Hirsch, Editor-in-Chief of Computer Science. Carole Snyder recruited the book's reviewers and managed the review process. Bob Engelhardt managed the book's production.

Reviewers

We wish to acknowledge the efforts of our eighth and ninth edition reviewers. They scrutinized the text and the programs and provided countless suggestions for improving the presentation: Lance Andersen (Oracle), Soundararajan Angusamy (Sun Microsystems), Joseph Bowbeer (Consultant), William E. Duncan (Louisiana State University), Diana Franklin (University of California, Santa Barbara), Edward F. Gehringer (North Carolina State University), Huiwei Guan (Northshore Community College), Ric Heishman (George Mason University), Dr. Heinz Kabutz (JavaSpecialists.eu), Patty Kraft (San Diego State University), Lawrence Premkumar (Sun Microsystems), Tim Margush (University of Akron), Sue McFarland Metzger (Villanova University), Shyamal Mitra (The University of Texas at Austin), Peter Pilgrim (Consultant), Manjeet Rege, Ph.D. (Rochester Institute of Technology), Manfred Riem (Java Champion, Consultant, Robert Half), Simon Ritter (Oracle), Susan Rodger (Duke University), Amr Sabry (Indiana University), José Antonio González Seco (Parliament of Andalusia), Sang Shin (Sun Microsystems), S. Sivakumar (Astra Infotech Private Limited),

① 教辅资源申请方式请参见书末的"教学支持说明"。

此为试读，需要完整PDF请访问：www.ertongbook.com