

Java语言导学

Java
SE 8 版

雷蒙德·盖拉多 (Raymond Gallardo)

斯科特·霍梅尔 (Scott Hommel)

[美] 索娅·坎南 (Sowmya Kannan)

著

琼尼·戈登 (Joni Gordon)

沙伦·比奥卡·扎卡沃 (Sharon Biocca Zakhour)

(英文版·第6版)



经 典 原 版 书 库

Java语言导学

(英文版·第6版)

The Java Tutorial

A Short Course on the Basics (Sixth Edition)



雷蒙德·盖拉多 (Raymond Gallardo)
斯科特·霍梅尔 (Scott Hommel)
[美] 索娅·坎南 (Sowmya Kannan) 著
琼尼·戈登 (Joni Gordon)
沙伦·比奥卡·扎卡沃 (Sharon Biocca Zakhour)



机械工业出版社
China Machine Press

图书在版编目 (CIP) 数据

Java 语言导学 (英文版·第 6 版) / (美) 盖拉多 (Gallardo, R.) 等著. —北京: 机械工业出版社, 2016.4

(经典原版书库)

书名原文: The Java Tutorial: A Short Course on the Basics, Sixth Edition

ISBN 978-7-111-53433-4

I. J… II. 盖… III. JAVA 语言—程序设计—英文 IV. TP312

中国版本图书馆 CIP 数据核字 (2016) 第 067811 号

本书版权登记号: 图字: 01-2016-0768

Authorized Adaptation from the English Language edition, entitled *The Java Tutorial: A Short Course on the Basics, Sixth Edition* (ISBN 978-0-13-403408-9) by Raymond Gallardo, Scott Hommel, Sowmya Kannan, Joni Gordon, and Sharon Biocca Zakhour, Copyright © 2015 by 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.

English language adaptation edition published by Pearson Education Asia Ltd., and China Machine Press Copyright © 2016.

English language adaptation edition is manufactured in the People's Republic of China and is authorized for sale only in People's Republic of China excluding Taiwan, Hong Kong SAR and Macau SAR.

本书英文影印版由 Pearson Education Asia Ltd. 授权机械工业出版社独家出版。未经出版者书面许可, 不得以任何方式复制或抄袭本书内容。

仅限于中华人民共和国境内 (不包括中国香港、澳门特别行政区和中国台湾地区) 销售发行。

本书封面贴有 Pearson Education (培生教育出版集团) 激光防伪标签, 无标签者不得销售。

出版发行: 机械工业出版社 (北京市西城区百万庄大街 22 号 邮政编码: 100037)

责任编辑: 迟振春

责任校对: 殷虹

印刷: 北京诚信伟业印刷有限公司

版次: 2016 年 4 月第 1 版第 1 次印刷

开本: 186mm × 240mm 1/16

印张: 52.25

书号: ISBN 978-7-111-53433-4

定价: 129.00 元

凡购本书, 如有缺页、倒页、脱页, 由本社发行部调换

客服热线: (010) 88378991 88361066

投稿热线: (010) 88379604

购书热线: (010) 68326294 88379649 68995259

读者信箱: hzsj@hzbook.com

版权所有·侵权必究

封底无防伪标均为盗版

本书法律顾问: 北京大成律师事务所 韩光 / 邹晓东

出版者的话

文艺复兴以来，源远流长的科学精神和逐步形成的学术规范，使西方国家在自然科学的各个领域取得了垄断性的优势；也正是这样的优势，使美国在信息技术发展的六十多年间名家辈出、独领风骚。在商业化的进程中，美国的产业界与教育界越来越紧密地结合，计算机学科中的许多泰山北斗同时身处科研和教学的最前线，由此而产生的经典科学著作，不仅擘划了研究的范畴，还揭示了学术的源变，既遵循学术规范，又自有学者个性，其价值并不会因年月的流逝而减退。

近年，在全球信息化大潮的推动下，我国的计算机产业发展迅猛，对专业人才的需求日益迫切。这对计算机教育界和出版界都既是机遇，也是挑战；而专业教材的建设在教育战略上显得举足轻重。在我国信息技术发展时间较短的现状下，美国等发达国家在其计算机科学发展的几十年间积淀和发展的经典教材仍有许多值得借鉴之处。因此，引进一批国外优秀计算机教材将对我国计算机教育事业的发展起到积极的推动作用，也是与世界接轨、建设真正的世界一流大学的必由之路。

机械工业出版社华章公司较早意识到“出版要为教育服务”。自1998年开始，我们就将工作重点放在了遴选、移译国外优秀教材上。经过多年的不懈努力，我们与Pearson, McGraw-Hill, Elsevier, MIT, John Wiley & Sons, Cengage等世界著名出版公司建立了良好的合作关系，从他们现有的数百种教材中甄选出Andrew S. Tanenbaum, Bjarne Stroustrup, Brian W. Kernighan, Dennis Ritchie, Jim Gray, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Abraham Silberschatz, William Stallings, Donald E. Knuth, John L. Hennessy, Larry L. Peterson等大师名家的一批经典作品，以“计算机科学丛书”为总称出版，供读者学习、研究及珍藏。大理石纹理的封面，也正体现了这套丛书的品位和格调。

“计算机科学丛书”的出版工作得到了国内外学者的鼎力相助，国内的专家不仅提供了中肯的选题指导，还不辞劳苦地担任了翻译和审校的工作；而原书的作者也相当关注其作品在中国的传播，有的还专门为其书的中译本作序。迄今，“计算机科学丛书”已经出版了近百个品种，这些书籍在读者中树立了良好的口碑，并被许多高校采用为正式教材和参考书籍。其影印版“经典原版书库”作为姊妹篇也被越来越多实施双语教学的学校所采用。

权威的作者、经典的教材、一流的译者、严格的审校、精细的编辑，这些因素使我们的图书有了质量的保证。随着计算机科学与技术专业学科建设的不断完善和教材改革的逐渐深化，教育界对国外计算机教材的需求和应用都将步入一个新的阶段，我们的目标是尽善尽美，而反馈的意见正是我们达到这一终极目标的重要帮助。华章公司欢迎老师和读者对我们的工作提出建议或给予指正，我们的联系方式如下：

华章网站：www.hzbook.com

电子邮件：hzjsj@hzbook.com

联系电话：(010) 88379604

联系地址：北京市西城区百万庄南街1号

邮政编码：100037



华章科技图书出版中心

前 言

自从 2010 年年初 Oracle 公司收购 Sun 公司以来，Java 语言迎来了激动人心的时代。正如 Java Community Process 计划的活动所印证的，Java 语言处于持续发展之中。本书是《The Java Tutorial》第 6 版，基于 Java SE (Java Platform Standard Edition) 版本 8 并引用该版本的应用编程接口 (API)。

相比本书第 5 版 (针对的是 Java 版本 7)，第 6 版引入了一些新的特性：

- Lambda 表达式可用于将功能作为方法参数处理，或者将代码作为数据处理。Lambda 表达式使得我们可以更简洁地表达单个方法的接口 (简称功能性接口) 实例。具体内容见第 4 章。
- 类型注解可用于关联可插拔的类型系统以改进类型检查，重复注解使得相同的注解可以用于一个声明或类型使用。具体内容见第 5 章。
- 默认方法是已经在接口中实现的方法。使用默认方法，可将新功能添加到接口库中，并确保与老版本接口的代码是二进制兼容的。具体内容见第 6 章。
- 聚合操作可用于在元素流上执行功能型操作，特别是集合上的批量操作，如序列变换、并行映射归约变换。具体内容见第 12 章。
- 在限制恶意小程序的攻击和 RIA (富互联网应用) 方面也做了一些改进。具体内容参见第 16 章、第 19 章和第 20 章。
- 日期 / 时间 API 可用于表达日期和时间，并处理日期和时间的值。这些 API 支持国际标准化组织 (ISO) 的日历系统，以及其他通用的国际历法。具体内容见第 21 章。

如果你准备参加 Java SE 8 认证考试，本书可提供一定的帮助。附录列出三个级别的考试，详细介绍每个级别考试覆盖的项目，并指出本书相关信息的章节。注意，这只是参加认证考试要准备的众多内容的一部分。在线教程提供了最新的认证考试大纲，以及该教程各章节的交叉引用。

所有内容都由 Oracle Java 工程团队的成员审核过，以确保书中信息都是正确和最新的。本书也基于 Oracle 网站的在线教程，其网址如下：

<http://docs.oracle.com/javase/tutorial>

本书内容通常被视作核心教程，是初学者和中级程序员的必学知识。一旦掌握了这些内容，就可以学习网站上的其余 Java 平台文档。如果你有兴趣开发复杂的 RIA，可以学习 JDK (Java SE Development Kit) 中的图形用户接口 (GUI) 工具包 JavaFX，具体内容参见第 22 章。

和以前的版本一样，本书的目的是构建一个易于阅读的实用程序员指南，以协助读者学习如何使用 Java 提供的丰富的环境构建应用程序、applet 和构件。让我们继续学习编程吧！

读者对象

本书同时面向新手和有经验的程序员。

- 新手通读本书（包括第 1 章中编译和运行第一个程序的每一步指令）将有最大的收获。
 - 有经验的过程式语言（如 C 语言）程序员可以从面向对象的概念和 Java 程序语言的特性开始学习。
 - 有经验的程序员可以直接学习高级主题，如泛型、并发和部署等。
- 本书内容适于不同层次的程序员学习。

如何使用本书

本书可直接从头读到尾或忽略某些主题跳到另一个主题。这些信息的组织有一定的逻辑次序，并尽可能避免向前引用。

本书例子都在 JDK 8 版本中编译。读者需要下载该版本或更新的版本来编译和运行实例。

本书对引用的一些材料提供了在线帮助（如可下载的实例、问题和习题的答案、JDK 8 手册和 API 规范），以脚注形式提供的链接类似下面所示：

`8/docs/api/java/lang/Class.html`

和

`tutorial/java/generics/examples/BoxDemo.java`

Oracle 网站上的 Java 文档主页为：

`http://docs.oracle.com/javase/`

访问上述以脚注形式提供的链接文件时，只需在 Java 文档主页 URL 后添加链接文件，如下所示：

`http://docs.oracle.com/javase/8/docs/api/java/lang/Class.html`

`http://docs.oracle.com/javase/tutorial/java/generics/examples/BoxDemo.java`

Java 教程也提供了两种格式的电子书：

- 移动电子书文件，适用于 Kindle。
- ePub 电子书文件，适用于 iPad、Nook 和其他支持 ePub 格式的设备。

每本电子书包含唯一的路径，对应本书的相关章节。读者可通过 Java 教程主页上的链接“**In Book Form**”下载电子书：

`http://docs.oracle.com/javase/tutorial/index.html`

欢迎读者给我们反馈，请通过下述教程反馈页面联系我们：

`http://docs.oracle.com/javase/feedback.html`

致谢

如果没有 Oracle Java 工程团队不知疲倦地检查本书的技术内容，本书将不能面世。本书第 6 版的推出，要特别感谢 Alan Bateman、Alex Buckley、Stephen Colebourne、Joe Darcy、Jeff

Dinkins、Mike Duigou、Brian Goetz、Andy Herrick、Stuart Marks、Thomas Ng、Roger Riggs、Leif Samuelsson 和 Daniel Smith。

Jordan Douglas 和 Dawn Tyler 快速高效地创建了本书中专业的插图。

编辑 Janet Blowney、Deborah Owens 和 Susan Shepard 仔细完整地对手稿进行了编辑加工。

感谢团队成员 Devika Gollapudi、Ram Goyal 和 Alexey Zhebel 的支持。

最后要感谢管理人员 Sowmya Kannan、Sophia Mikulinsky、Alan Sommerer 和 Barbara Ramsey 的支持。

Contents

Chapter 1	Getting Started	1
	The Java Technology Phenomenon	1
	The Java Programming Language	2
	The Java Platform	2
	What Can Java Technology Do?	4
	How Will Java Technology Change My Life?	4
	The “Hello World!” Application	5
	“Hello World!” for the NetBeans IDE	6
	“Hello World!” for Microsoft Windows	15
	“Hello World!” for Solaris and Linux	20
	A Closer Look at the “Hello World!” Application	23
	Source Code Comments	24
	The HelloWorldApp Class Definition	25
	The main Method	25
	Common Problems (and Their Solutions)	27
	Compiler Problems	27
	Runtime Problems	29
	Questions and Exercises: Getting Started	31
	Questions	31
	Exercises	32
	Answers	32
Chapter 2	Object-Oriented Programming Concepts	33
	What Is an Object?	34
	What Is a Class?	36
	What Is Inheritance?	38
	What Is an Interface?	39
	What Is a Package?	40
	Questions and Exercises: Object-Oriented Programming Concepts	41
	Questions	41
	Exercises	41
	Answers	41
Chapter 3	Language Basics	43
	Variables	44
	Naming	45
	Primitive Data Types	46
	Arrays	51

Summary of Variables	57
Questions and Exercises: Variables	57
Operators	58
Assignment, Arithmetic, and Unary Operators	59
Equality, Relational, and Conditional Operators	62
Bitwise and Bit Shift Operators	65
Summary of Operators	66
Questions and Exercises: Operators	67
Expressions, Statements, and Blocks	68
Expressions	68
Statements	70
Blocks	71
Questions and Exercises: Expressions, Statements, and Blocks	71
Control Flow Statements	72
The if-then and if-then-else Statements	72
The switch Statement	74
The while and do-while Statements	79
The for Statement	80
Branching Statements	82
Summary of Control Flow Statements	85
Questions and Exercises: Control Flow Statements	86
Chapter 4 Classes and Objects	87
Classes	88
Declaring Classes	89
Declaring Member Variables	90
Defining Methods	92
Providing Constructors for Your Classes	94
Passing Information to a Method or a Constructor	95
Objects	99
Creating Objects	100
Using Objects	104
More on Classes	107
Returning a Value from a Method	107
Using the this Keyword	109
Controlling Access to Members of a Class	110
Understanding Class Members	112
Initializing Fields	116
Summary of Creating and Using Classes and Objects	118
Questions and Exercises: Classes	119
Questions and Exercises: Objects	120
Nested Classes	121

	Why Use Nested Classes?	122
	Static Nested Classes	122
	Inner Classes	123
	Shadowing	123
	Serialization	124
	Inner Class Example	125
	Local and Anonymous Classes	127
	Modifiers	127
	Local Classes	127
	Anonymous Classes	131
	Lambda Expressions	136
	When to Use Nested Classes, Local Classes, Anonymous Classes, and Lambda Expressions	155
	Questions and Exercises: Nested Classes	156
	Enum Types	157
	Questions and Exercises: Enum Types	161
Chapter 5	Annotations	163
	Annotations Basics	164
	The Format of an Annotation	164
	Where Annotations Can Be Used	165
	Declaring an Annotation Type	165
	Predefined Annotation Types	167
	Annotation Types Used by the Java Language	167
	Annotations That Apply to Other Annotations	169
	Type Annotations and Pluggable Type Systems	170
	Repeating Annotations	171
	Step 1: Declare a Repeatable Annotation Type	172
	Step 2: Declare the Containing Annotation Type	172
	Retrieving Annotations	173
	Design Considerations	173
	Questions and Exercises: Annotations	173
	Questions	173
	Exercise	174
	Answers	174
Chapter 6	Interfaces and Inheritance	175
	Interfaces	175
	Interfaces in Java	176
	Interfaces as APIs	177
	Defining an Interface	177
	Implementing an Interface	178
	Using an Interface as a Type	180
	Evolving Interfaces	181

	Default Methods	182
	Summary of Interfaces	192
	Questions and Exercises: Interfaces	193
	Inheritance	193
	The Java Platform Class Hierarchy	194
	An Example of Inheritance	195
	What You Can Do in a Subclass	196
	Private Members in a Superclass	196
	Casting Objects	197
	Multiple Inheritance of State, Implementation, and Type	198
	Overriding and Hiding Methods	199
	Polymorphism	203
	Hiding Fields	206
	Using the Keyword super	206
	Object as a Superclass	208
	Writing Final Classes and Methods	212
	Abstract Methods and Classes	212
	Summary of Inheritance	216
	Questions and Exercises: Inheritance	216
Chapter 7	Generics	219
	Why Use Generics?	220
	Generic Types	220
	A Simple Box Class	220
	A Generic Version of the Box Class	221
	Type Parameter Naming Conventions	221
	Invoking and Instantiating a Generic Type	222
	The Diamond	223
	Multiple Type Parameters	223
	Parameterized Types	224
	Raw Types	224
	Generic Methods	226
	Bounded Type Parameters	227
	Multiple Bounds	228
	Generic Methods and Bounded Type Parameters	229
	Generics, Inheritance, and Subtypes	229
	Generic Classes and Subtyping	230
	Type Inference	232
	Type Inference and Generic Methods	232
	Type Inference and Instantiation of Generic Classes	233
	Type Inference and Generic Constructors	
	of Generic and Nongeneric Classes	234
	Target Types	235

	Wildcards	236
	Upper-Bounded Wildcards	236
	Unbounded Wildcards	237
	Lower-Bounded Wildcards	238
	Wildcards and Subtyping	239
	Wildcard Capture and Helper Methods	240
	Guidelines for Wildcard Use	243
	Type Erasure	244
	Erasure of Generic Types	245
	Erasure of Generic Methods	246
	Effects of Type Erasure and Bridge Methods	247
	Nonreifiable Types and Varargs Methods	249
	Restrictions on Generics	252
	Cannot Instantiate Generic Types with Primitive Types	252
	Cannot Create Instances of Type Parameters	253
	Cannot Declare Static Fields Whose Types Are Type Parameters	254
	Cannot Use Casts or instanceof with Parameterized Types	254
	Cannot Create Arrays of Parameterized Types	255
	Cannot Create, Catch, or Throw	
	Objects of Parameterized Types	255
	Cannot Overload a Method Where the Formal Parameter	
	Types of Each Overload Erase to the Same Raw Type	256
	Questions and Exercises: Generics	256
	Answers	258
Chapter 8	Packages	259
	Creating and Using Packages	259
	Creating a Package	261
	Naming a Package	262
	Using Package Members	263
	Managing Source and Class Files	267
	Summary of Creating and Using Packages	269
	Questions and Exercises: Creating and Using Packages	269
	Questions	269
	Exercises	270
	Answers	270
Chapter 9	Numbers and Strings	271
	Numbers	271
	The Numbers Classes	272
	Formatting Numeric Print Output	274
	Beyond Basic Arithmetic	279
	Autoboxing and Unboxing	283
	Summary of Numbers	286

	Questions and Exercises: Numbers	286
	Characters	287
	Escape Sequences	288
	Strings	288
	Creating Strings	289
	String Length	290
	Concatenating Strings	291
	Creating Format Strings	292
	Converting between Numbers and Strings	292
	Manipulating Characters in a String	295
	Comparing Strings and Portions of Strings	300
	The StringBuilder Class	302
	Summary of Characters and Strings	306
	Questions and Exercises: Characters and Strings	307
Chapter 10	Exceptions	309
	What Is an Exception?	310
	The Catch or Specify Requirement	311
	The Three Kinds of Exceptions	311
	Bypassing Catch or Specify	312
	Catching and Handling Exceptions	313
	The try Block	314
	The catch Blocks	315
	The finally Block	316
	The try-with-resources Statement	317
	Putting It All Together	320
	Specifying the Exceptions Thrown by a Method	323
	How to Throw Exceptions	324
	The throw Statement	325
	Throwable Class and Its Subclasses	325
	Error Class	326
	Exception Class	326
	Chained Exceptions	326
	Creating Exception Classes	328
	Unchecked Exceptions: The Controversy	329
	Advantages of Exceptions	330
	Advantage 1: Separating Error-Handling	
	Code from “Regular” Code	331
	Advantage 2: Propagating Errors Up the Call Stack	332
	Advantage 3: Grouping and Differentiating Error Types	334
	Summary	335
	Questions and Exercises: Exceptions	336
	Questions	336

	Exercises	337
	Answers	337
Chapter 11	Basic I/O and NIO.2	339
	I/O Streams	339
	Byte Streams	340
	Character Streams	342
	Buffered Streams	345
	Scanning and Formatting	346
	I/O from the Command Line	352
	Data Streams	354
	Object Streams	357
	File I/O (Featuring NIO.2)	359
	What Is a Path? (And Other File System Facts)	359
	The Path Class	362
	File Operations	370
	Checking a File or Directory	374
	Deleting a File or Directory	375
	Copying a File or Directory	376
	Moving a File or Directory	377
	Managing Metadata (File and File Store Attributes)	378
	Reading, Writing, and Creating Files	386
	Random Access Files	393
	Creating and Reading Directories	395
	Links, Symbolic or Otherwise	399
	Walking the File Tree	401
	Finding Files	407
	Watching a Directory for Changes	410
	Other Useful Methods	416
	Legacy File I/O Code	418
	Summary	421
	Questions and Exercises: Basic I/O	422
	Questions	422
	Exercises	422
	Answers	422
Chapter 12	Collections	423
	Introduction to Collections	424
	What Is a Collections Framework?	424
	Benefits of the Java Collections Framework	425
	Interfaces	426
	The Collection Interface	428
	Traversing Collections	429
	Collection Interface Bulk Operations	432

Collection Interface Array Operations	432
The Set Interface	433
The List Interface	438
The Queue Interface	446
The Deque Interface	448
The Map Interface	449
Object Ordering	458
The SortedSet Interface	464
The SortedMap Interface	467
Summary of Interfaces	469
Questions and Exercises: Interfaces	470
Aggregate Operations	471
Pipelines and Streams	472
Differences between Aggregate Operations and Iterators	474
Reduction	474
Parallelism	480
Side Effects	484
Questions and Exercises: Aggregate Operations	487
Implementations	489
Set Implementations	492
List Implementations	493
Map Implementations	495
Queue Implementations	496
Deque Implementations	498
Wrapper Implementations	499
Convenience Implementations	502
Summary of Implementations	504
Questions and Exercises: Implementations	504
Algorithms	505
Sorting	505
Shuffling	508
Routine Data Manipulation	508
Searching	508
Composition	509
Finding Extreme Values	509
Custom Collection Implementations	509
Reasons to Write an Implementation	510
How to Write a Custom Implementation	511
Interoperability	513
Compatibility	513
API Design	515

Chapter 13	Concurrency	519
	Processes and Threads	520
	Processes	520
	Threads	520
	Thread Objects	521
	Defining and Starting a Thread	521
	Pausing Execution with Sleep	522
	Interrupts	523
	Joins	525
	The SimpleThreads Example	525
	Synchronization	527
	Thread Interference	527
	Memory Consistency Errors	528
	Synchronized Methods	529
	Intrinsic Locks and Synchronization	531
	Atomic Access	533
	Liveness	533
	Deadlock	534
	Starvation and Livelock	535
	Guarded Blocks	535
	Immutable Objects	539
	A Synchronized Class Example	540
	A Strategy for Defining Immutable Objects	541
	High-Level Concurrency Objects	543
	Lock Objects	544
	Executors	546
	Concurrent Collections	552
	Atomic Variables	553
	Concurrent Random Numbers	554
	Questions and Exercises: Concurrency	555
	Question	555
	Exercises	555
	Answers	556
Chapter 14	Regular Expressions	557
	Introduction	558
	What Are Regular Expressions?	558
	How Are Regular Expressions Represented in This Package?	558
	Test Harness	559
	String Literals	560
	Metacharacters	561
	Character Classes	562
	Simple Classes	562
	Predefined Character Classes	566

Quantifiers	568
Zero-Length Matches	569
Capturing Groups and Character Classes with Quantifiers	572
Differences among Greedy, Reluctant, and Possessive Quantifiers	573
Capturing Groups	574
Numbering	574
Backreferences	575
Boundary Matchers	576
Methods of the Pattern Class	578
Creating a Pattern with Flags	578
Embedded Flag Expressions	580
Using the matches(String,CharSequence) Method	580
Using the split(String) Method	581
Other Utility Methods	582
Pattern Method Equivalents in java.lang.String	582
Methods of the Matcher Class	583
Index Methods	583
Study Methods	584
Replacement Methods	584
Using the start and end Methods	585
Using the matches and lookingAt Methods	586
Using replaceFirst(String) and replaceAll(String)	587
Using appendReplacement(StringBuffer,String) and appendTail(StringBuffer)	588
Matcher Method Equivalents in java.lang.String	589
Methods of the PatternSyntaxException Class	589
Unicode Support	591
Matching a Specific Code Point	591
Unicode Character Properties	591
Questions and Exercises: Regular Expressions	592
Questions	592
Exercise	593
Answers	593
Chapter 15 The Platform Environment	595
Configuration Utilities	595
Properties	596
Command-Line Arguments	600
Environment Variables	601
Other Configuration Utilities	602
System Utilities	603
Command-Line I/O Objects	603