

CONTENTS

PART I ♦ FUNDAMENTALS OF PROGRAMMING	1
Chapter 1 Introduction to Computers, Programs, and Java	3
1.1 Introduction	4
1.2 What Is a Computer?	4
1.3 Programs	7
1.4 Operating Systems	9
1.5 Number Systems (Optional)	10
1.6 Java, World Wide Web, and Beyond	13
1.7 Characteristics of Java (Optional)	16
1.8 The Java Language Specification, API, JDK, and IDE	19
1.9 A Simple Java Program	20
1.10 Creating, Compiling, and Executing a Java Program	21
1.11 Anatomy of the Java Program	23
1.12 Displaying Text in a Message Dialog Box	25
Chapter 2 Primitive Data Types and Operations	32
2.1 Introduction	33
2.2 Writing Simple Programs	33
2.3 Identifiers	35
2.4 Variables	36
2.5 Assignment Statements and Assignment Expressions	37
2.6 Constants	38
2.7 Numeric Data Types and Operations	39
2.8 Numeric Type Conversions	44
2.9 Character Data Type and Operations	45
2.10 boolean Data Type and Operations	47
2.11 Operator Precedence and Associativity	50
2.12 Operand Evaluation Order	51
2.13 The String Type	52
2.14 Getting Input from Input Dialogs	53
2.15 Case Studies	56

2.16	Getting Input from the Console (Optional)	63
2.17	Formatting Output (JDK 1.5 Feature)	64
2.18	Programming Style and Documentation	66
2.19	Programming Errors	68
2.20	Debugging	69
Chapter 3	Control Statements	80
3.1	Introduction	81
3.2	Selection Statements	81
3.3	Loop Statements	91
3.5	Which Loop to Use?	100
3.6	Using the Keywords <code>break</code> and <code>continue</code>	101
3.7	Case Studies	104
Chapter 4	Methods	125
4.1	Introduction	126
4.2	Creating a Method	126
4.3	Calling a Method	127
4.4	Passing Parameters by Values	130
4.5	Overloading Methods	133
4.6	The Scope of Local Variables	137
4.7	Method Abstraction	138
4.8	The <code>Math</code> Class	138
4.9	Case Study: Generating Random Characters	141
4.10	Stepwise Refinement (Optional)	143
4.11	Recursion (Optional)	149
4.12	Packages (Optional)	159
Chapter 5	Arrays	175
5.1	Introduction	176
5.2	Array Basics	176
5.3	Copying Arrays	183
5.4	Passing Arrays to Methods	184
5.5	Returning an Array from a Method	188
5.6	Sorting Arrays	191
5.7	Searching Arrays	193
5.8	Multidimensional Arrays	196

PART II ♦ OBJECT-ORIENTED PROGRAMMING	211
Chapter 6 Objects and Classes	213
6.1 Introduction	214
6.2 Defining Classes for Objects	214
6.3 Constructing Objects Using Constructors	215
6.4 Accessing Objects via Reference Variables	216
6.5 Using Classes from the Java Library	222
6.6 Visibility Modifiers, Accessors, and Mutators	223
6.7 Data Field Encapsulation	225
6.8 Immutable Objects and Classes	227
6.9 Passing Objects to Methods	228
6.10 Static Variables, Constants, and Methods	229
6.11 The Scope of Variables	233
6.12 The <code>this</code> Keyword	234
6.13 Array of Objects	235
6.14 Class Abstraction and Encapsulation	238
6.15 Case Study: The <code>Loan</code> Class	238
6.16 Case Study: The <code>StackOfIntegers</code> Class (Optional)	242
6.17 Inner Classes	245
Chapter 7 Strings	257
7.1 Introduction	258
7.2 The <code>String</code> Class	258
7.3 The <code>Character</code> Class	267
7.4 The <code>StringBuffer</code> Class	270
7.5 The <code>StringTokenizer</code> Class	274
7.6 The <code>Scanner</code> Class (JDK 1.5 Feature)	276
7.7 Implementing <code>MyInput</code> Using <code>Scanner</code>	276
7.8 Command-Line Arguments	278
Chapter 8 Inheritance and Polymorphism	287
8.1 Introduction	288
8.2 Superclasses and Subclasses	288
8.3 Using the Keyword <code>super</code>	289
8.4 Overriding Methods	291
8.5 The <code>Object</code> class	293
8.6 Polymorphism, Dynamic Binding, and Generic Programming	294

8.7	Casting Objects and the instanceof Operator	296
8.8	Hiding Data Fields and Static Methods (Optional)	299
8.9	The protected Data and Methods	301
8.10	The final Classes, Methods, and Variables	302
8.11	The finalize, clone, and getClass Methods (Optional)	302
8.12	Initialization Blocks (Optional)	305
Chapter 9	Abstract Classes and Interfaces	315
9.1	Introduction	316
9.2	Abstract Classes	316
9.3	The Calendar and GregorianCalendar classes	322
9.4	Interfaces	323
9.5	Processing Primitive Data Type Values as Objects	331
9.6	Automatic Conversion Between Primitive Types and Wrapper Class Types (JDK 1.5 Feature)	336
Chapter 10	Object-Oriented Modeling	343
10.1	Introduction	344
10.2	The Software Development Process	344
10.3	Discovering Relationships Among Classes	345
10.4	Case Study: A Class Design Example	348
10.5	Case Study: The Rational Class	353
10.6	Class Design Guidelines	358
10.7	Modeling Dynamic Behavior Using Sequence Diagrams and Statecharts (Optional)	360
10.8	Framework-Based Programming Using Java API	362
PART III ♦ GUI PROGRAMMING		367
Chapter 11	Getting Started with GUI Programming	369
11.1	Introduction	370
11.2	GUI Components	370
11.3	The Java GUI API	371
11.4	Frames	374
11.5	Layout Managers	377
11.6	The Color Class	384
11.7	The Font Class	385
11.8	Using Panels as Subcontainers	386
11.9	Drawing Graphics on Panels	388

11.10	Centering a Display Using the <code>FontMetrics</code> Class	398
11.11	Case Studies: The <code>MessagePanel</code> Class	400
11.12	Case Studies: The <code>StillClock</code> Class (Optional)	404
Chapter 12	Event-Driven Programming	419
12.1	Introduction	420
12.2	Event and Event Source	420
12.3	Listeners, Registrations, and Handling Events	421
12.4	Mouse Events	430
12.5	Keyboard Events	435
12.6	The <code>Timer</code> Class (Optional)	438
Chapter 13	Creating User Interfaces	446
13.1	Introduction	447
13.2	Common Features of Swing GUI Components	447
13.3	Buttons	449
13.4	Check Boxes	457
13.5	Radio Buttons	460
13.6	Labels	463
13.7	Text Fields	464
13.8	Text Areas	466
13.9	Combo Boxes	470
13.10	Lists	473
13.11	Scroll Bars	476
13.12	Sliders	479
13.13	Creating Multiple Windows	482
Chapter 14	Applets, Images, and Audio	497
14.1	Introduction	498
14.2	The <code>Applet</code> Class	498
14.3	The <code>JApplet</code> Class	500
14.4	The HTML File and the <code><applet></code> Tag	501
14.5	Passing Strings to Applets	506
14.6	Enabling Applets to Run as Applications	508
14.7	Case Study: TicTacToe (Optional)	512
14.8	Case Study: Bouncing Ball (Optional)	516
14.8	The <code>URL</code> Class (Optional)	519
14.9	Displaying Images (Optional)	520
14.10	Case Study: The <code>ImageViewer</code> Component	522
14.11	Case Study: The Image Animations (Optional)	526

14.12	Playing Audio	528
14.13	Packaging and Deploying Java Projects (Optional)	530
14.14	Pluggable Look-and-Feel (Optional)	533

PART IV ♦ EXCEPTION HANDLING AND IO 547

Chapter 15 Exceptions and Assertions 549

15.1	Introduction	550
15.2	Exceptions and Exception Types	550
15.3	Understanding Exception Handling	553
15.4	Rethrowing Exceptions	561
15.5	The finally Clause	561
15.6	When to Use Exceptions	562
15.7	Creating Custom Exception Classes (Optional)	562
15.8	Assertions	563

Chapter 16 Simple Input and Output 572

16.1	Introduction	573
16.2	The File Class	573
16.3	How is I/O Handled in Java?	575
16.4	Text I/O	578
16.5	Case Study: Text Viewer	585
16.6	Binary I/O	587
16.7	Case Study: Copy File	593
16.8	More on Text Files and Binary Files	595
16.9	Object I/O (Optional)	596
16.10	Random Access Files (Optional)	600
16.11	Case Study: Address Book (Optional)	603

APPENDIXES	1163
Appendix A Java Keywords	1165
Appendix B The ASCII Character Set	1166
Appendix C Operator Precedence Chart	1168
Appendix D Java Modifiers	1170
Appendix E UML Graphical Notations	1171
Classes and Objects	1171
The Modifiers <i>public</i> , <i>private</i> , <i>protected</i> , and <i>static</i>	1172
Class Relationships	1172
Abstract Classes and Interfaces	1173
Sequence Diagrams	1173
Statechart Diagrams	1173
Appendix F Special Floating-Point Values	1175
Appendix G Bit Operations	1176
Index	1177