

# CONTENTS

PREFACE **vii**

SPECIAL FEATURES **xxvi**

## **CHAPTER 1** INTRODUCTION **1**

- 1.1 Computer Programs **2**
- 1.2 The Anatomy of a Computer **3**
- 1.3 The Java Programming Language **5**
- 1.4 Becoming Familiar with Your Programming Environment **8**
- 1.5 Analyzing Your First Program **12**
- 1.6 Errors **15**
- 1.7 Problem Solving: Algorithm Design **16**

## **CHAPTER 2** FUNDAMENTAL DATA TYPES **29**

- 2.1 Variables **30**
- 2.2 Arithmetic **41**
- 2.3 Input and Output **48**
- 2.4 Problem Solving: First Do It By Hand **57**
- 2.5 Strings **59**

## **CHAPTER 3** DECISIONS **81**

- 3.1 The if Statement **82**
- 3.2 Comparing Numbers and Strings **88**
- 3.3 Multiple Alternatives **96**
- 3.4 Nested Branches **100**
- 3.5 Problem Solving: Flowcharts **105**
- 3.6 Problem Solving: Test Cases **108**
- 3.7 Boolean Variables and Operators **111**
- 3.8 Application: Input Validation **116**

## **CHAPTER 4** LOOPS **139**

- 4.1 The while Loop **140**
- 4.2 Problem Solving: Hand-Tracing **147**
- 4.3 The for Loop **150**
- 4.4 The do Loop **156**

## Contents

4.5	Application: Processing Sentinel Values	158
4.6	Problem Solving: Storyboards	162
4.7	Common Loop Algorithms	165
4.8	Nested Loops	172
4.9	Application: Random Numbers and Simulations	176

## **CHAPTER 5**      **METHODS**      **201**

5.1	Methods as Black Boxes	202
5.2	Implementing Methods	204
5.3	Parameter Passing	207
5.4	Return Values	210
5.5	Methods Without Return Values	214
5.6	Problem Solving: Reusable Methods	215
5.7	Problem Solving: Stepwise Refinement	218
5.8	Variable Scope	225
5.9	Recursive Methods (Optional)	228

## **CHAPTER 6**      **ARRAYS AND ARRAY LISTS**      **249**

6.1	Arrays	250
6.2	The Enhanced for Loop	257
6.3	Common Array Algorithms	258
6.4	Using Arrays with Methods	268
6.5	Problem Solving: Adapting Algorithms	272
6.6	Problem Solving: Discovering Algorithms by Manipulating Physical Objects	279
6.7	Two-Dimensional Arrays	282
6.8	Array Lists	289

## **CHAPTER 7**      **INPUT/OUTPUT AND EXCEPTION HANDLING**      **317**

7.1	Reading and Writing Text Files	318
7.2	Text Input and Output	323
7.3	Command Line Arguments	330
7.4	Exception Handling	337
7.5	Application: Handling Input Errors	347

## **CHAPTER 8**      **OBJECTS AND CLASSES**      **361**

8.1	Object-Oriented Programming	362
8.2	Implementing a Simple Class	364

8.3	Specifying the Public Interface of a Class	<b>367</b>
8.4	Designing the Data Representation	<b>371</b>
8.5	Implementing Instance Methods	<b>372</b>
8.6	Constructors	<b>375</b>
8.7	Testing a Class	<b>380</b>
8.8	Problem Solving: Tracing Objects	<b>386</b>
8.9	Problem Solving: Patterns for Object Data	<b>388</b>
8.10	Object References	<b>395</b>
8.11	Static Variables and Methods	<b>400</b>

## **CHAPTER 9** INHERITANCE AND INTERFACES **415**

9.1	Inheritance Hierarchies	<b>416</b>
9.2	Implementing Subclasses	<b>420</b>
9.3	Overriding Methods	<b>424</b>
9.4	Polymorphism	<b>430</b>
9.5	Object: The Cosmic Superclass	<b>441</b>
9.6	Interface Types	<b>448</b>

## **CHAPTER 10** GRAPHICAL USER INTERFACES **465**

10.1	Frame Windows	<b>466</b>
10.2	Events and Event Handling	<b>470</b>
10.3	Processing Text Input	<b>481</b>
10.4	Creating Drawings	<b>487</b>

## **CHAPTER 11** ADVANCED USER INTERFACES (WEB ONLY) **+**

11.1	Layout Management
11.2	Choices
11.3	Menus
11.4	Exploring the Swing Documentation
11.5	Using Timer Events for Animations
11.6	Mouse Events

## **CHAPTER 12** OBJECT-ORIENTED DESIGN (WEB ONLY) **+**

12.1	Classes and Their Responsibilities
12.2	Relationships Between Classes
12.3	Application: Printing an Invoice
12.4	Packages

## **CHAPTER 13** RECURSION (WEB ONLY) **+**

- 13.1 Triangle Numbers Revisited
- 13.2 Problem Solving: Thinking Recursively
- 13.3 Recursive Helper Methods
- 13.4 The Efficiency of Recursion
- 13.5 Permutations
- 13.6 Mutual Recursion
- 13.7 Backtracking

## **CHAPTER 14** SORTING AND SEARCHING (WEB ONLY) **+**

- 14.1 Selection Sort
- 14.2 Profiling the Selection Sort Algorithm
- 14.3 Analyzing the Performance of the Selection Sort Algorithm
- 14.4 Merge Sort
- 14.5 Analyzing the Merge Sort Algorithm
- 14.6 Searching
- 14.7 Problem Solving: Estimating the Running Time of an Algorithm
- 14.8 Sorting and Searching in the Java Library

## **CHAPTER 15** THE JAVA COLLECTIONS FRAMEWORK (WEB ONLY) **+**

- 15.1 An Overview of the Collections Framework
- 15.2 Linked Lists
- 15.3 Sets
- 15.4 Maps
- 15.5 Stacks, Queues, and Priority Queues
- 15.6 Stack and Queue Applications

## **APPENDICES**

- APPENDIX A THE BASIC LATIN AND LATIN-1 SUBSETS OF UNICODE **507**
- APPENDIX B JAVA OPERATOR SUMMARY **511**
- APPENDIX C JAVA RESERVED WORD SUMMARY **513**
- APPENDIX D THE JAVA LIBRARY **515**
- APPENDIX E JAVA SYNTAX SUMMARY **+**
- APPENDIX F HTML SUMMARY **+**
- APPENDIX G TOOL SUMMARY **+**
- APPENDIX H JAVADOC SUMMARY **+**

APPENDIX I	NUMBER SYSTEMS	⊕
APPENDIX J	BIT AND SHIFT OPERATIONS	⊕
APPENDIX K	UML SUMMARY	⊕
APPENDIX L	JAVA LANGUAGE CODING GUIDELINES	⊕

GLOSSARY     **547**

INDEX     **559**

CREDITS     **585**

## ALPHABETICAL LIST OF SYNTAX BOXES

Arrays	251
Array Lists	290
Assignment	34
Cast	44
Catching Exceptions	341
Comparisons	89
Constant Declaration	35
Constructor with Superclass Initializer	430
Constructors	376
for Statement	152
if Statement	84
Input Statement	49
Instance Methods	373
Instance Variable Declaration	365
Interface Types	449
Java Program	13
Static Method Declaration	205
Subclass Declaration	422
The Enhanced for Loop	258
The finally Clause	344
The instanceof Operator	445
The throws Clause	343
Throwing an Exception	338
Two-Dimensional Array Declaration	283
while Statement	141
Variable Declaration	31