

# Table of Contents

|                   |      |
|-------------------|------|
| <b>Dedication</b> | iii  |
| <b>Preface</b>    | xiii |

## **Chapter 1: Introduction to Java**

|   |      |
|---|------|
| Introduction                                      | 1-2  |
| History and Evolution of Java                     | 1-2  |
| Features of Java                                  | 1-2  |
| Platform Independency                             | 1-2  |
| Simplicity  | 1-2  |
| Double Stage System                               | 1-3  |
| Object Oriented                                   | 1-3  |
| Security  | 1-3  |
| Multithreading                                    | 1-3  |
| Easy to Operate                                   | 1-3  |
| Java and Object Oriented Programming              | 1-4  |
| Data Abstraction                                  | 1-4  |
| Encapsulation                                     | 1-4  |
| Polymorphism                                      | 1-5  |
| Inheritance                                       | 1-6  |
| Interface   | 1-8  |
| Similarities and Differences between Java and C++ | 1-8  |
| Java Compiler and Interpreter                     | 1-9  |
| Java Virtual Machine                              | 1-9  |
| Installing Java Development Kit                   | 1-10 |
| Hardware and Software Requirements                | 1-10 |
| Tools of JDK                                      | 1-10 |
| Java Statements                                   | 1-11 |
| Identifiers                                       | 1-11 |
| The Import Keyword                                | 1-12 |
| The Class Keyword                                 | 1-12 |
| System.out.println() Statement                    | 1-12 |
| public static void main(String args[ ])           | 1-12 |
| Comments in Java                                  | 1-13 |
| Access Specifiers                                 | 1-13 |
| Writing a Java Program                            | 1-14 |
| Compiling and Running a Java Program              | 1-16 |
| Setting the Path of Programs Folder               | 1-19 |
| Setting the Path on a Temporary Basis             | 1-19 |
| Setting the Path Directory on a Permanent Basis   | 1-20 |
| Java API and Packages                             | 1-22 |
| Java.lang   | 1-22 |

|                      |      |
|----------------------|------|
| Java.IO              | 1-22 |
| Java.util            | 1-22 |
| Java.net             | 1-22 |
| Java.awt             | 1-22 |
| Creating Package     | 1-23 |
| Self-Evaluation Test | 1-24 |
| Review Questions     | 1-25 |

## Chapter 2: Fundamental Elements in Java

|  |      |
|--|------|
| Introduction                             | 2-2  |
| Data Types                               | 2-2  |
| Integers                                 | 2-3  |
| Floating-point Types                     | 2-4  |
| Characters                               | 2-5  |
| Boolean                                  | 2-5  |
| Variables                                | 2-6  |
| Variable Name                            | 2-6  |
| Declaring a Variable                     | 2-6  |
| Initializing a Variable                  | 2-7  |
| Types of Variables                       | 2-10 |
| Scope and Lifetime of Variables          | 2-11 |
| Type Conversion                          | 2-13 |
| Automatic or Compatible Type Conversion  | 2-13 |
| Explicit or Incompatible Type Conversion | 2-15 |
| Operators                                | 2-16 |
| Arithmetic Operators                     | 2-17 |
| The Bitwise Operators                    | 2-25 |
| The Relational Operators                 | 2-30 |
| The Logical Operators                    | 2-31 |
| Other Important Operators                | 2-33 |
| The Assignment (=) Operator              | 2-33 |
| The ? : Operator                         | 2-33 |
| Operator Precedence                      | 2-34 |
| Self-Evaluation Test                     | 2-36 |
| Review Questions                         | 2-36 |
| Exercise 1                               | 2-38 |
| Exercise 2                               | 2-38 |

## Chapter 3: Control Statements and Arrays

|                    |     |
|--------------------|-----|
| Introduction       | 3-2 |
| Flowcharts         | 3-2 |
| Oval               | 3-2 |
| Rectangle          | 3-2 |
| Diamond            | 3-2 |
| Arrow              | 3-3 |
| Parallelogram      | 3-3 |
| Control Statements | 3-3 |

|                         |      |
|-------------------------|------|
| Selection Statements    | 3-3  |
| Iteration Statements    | 3-25 |
| Jump Statements         | 3-37 |
| Arrays                  | 3-43 |
| One-Dimensional Arrays  | 3-43 |
| Multidimensional Arrays | 3-47 |
| Self-Evaluation Test    | 3-52 |
| Review Questions        | 3-53 |
| Exercise 1              | 3-55 |
| Exercise 2              | 3-55 |
| Exercise 3              | 3-55 |

## Chapter 4: Classes and Objects

|  |      |
|--|------|
| Introduction                                   | 4-2  |
| Classes  | 4-2  |
| Defining a class                               | 4-2  |
| Objects  | 4-3  |
| Declaring an Object                            | 4-3  |
| Assigning Initial Values to Instance Variables | 4-4  |
| Accessing Instance Variables                   | 4-4  |
| Assigning Object Reference Variables           | 4-8  |
| Methods  | 4-11 |
| Defining a Method                              | 4-11 |
| Calling a Method                               | 4-12 |
| Methods that Return a Value                    | 4-14 |
| Passing Parameters to Methods                  | 4-16 |
| Passing Objects to Methods                     | 4-19 |
| Returning Objects from Methods                 | 4-21 |
| Passing Arrays to Methods                      | 4-23 |
| Overloading Methods                            | 4-25 |
| Constructors                                   | 4-27 |
| Passing Parameters to Constructors             | 4-31 |
| Overloading Constructors                       | 4-33 |
| Command-Line Arguments                         | 4-36 |
| Recursion                                      | 4-37 |
| Garbage Collection                             | 4-40 |
| The finalize( ) Method                         | 4-40 |
| The this Keyword                               | 4-40 |
| Static Data Members and Methods                | 4-42 |
| Self-Evaluation Test                           | 4-44 |
| Review Questions                               | 4-44 |
| Exercise 1                                     | 4-48 |
| Exercise 2                                     | 4-48 |

## Chapter 5: Inheritance

|   |      |
|---|------|
| Introduction                                      | 5-2  |
| Inheritance Fundamentals                          | 5-2  |
| Access Specifiers and Inheritance                 | 5-6  |
| Private   | 5-6  |
| Public  | 5-7  |
| Protected   | 5-7  |
| No Modifier(Default)                              | 5-8  |
| The super Keyword                                 | 5-12 |
| Calling Superclass Constructors                   | 5-12 |
| Using the super Keyword for Accessing the Members | 5-15 |
| Multilevel Inheritance                            | 5-18 |
| Overriding Methods                                | 5-20 |
| Dynamic Method Dispatch                           | 5-24 |
| Abstract Classes                                  | 5-26 |
| The final Keyword                                 | 5-28 |
| To Declare a Variable as a Constant               | 5-28 |
| To Prevent Overriding                             | 5-29 |
| To Prevent Inheritance                            | 5-29 |
| Self-Evaluation Test                              | 5-30 |
| Review Questions                                  | 5-31 |
| Exercise 1  | 5-34 |

## Chapter 6: Inner Classes, Packages, and Interfaces

|                                  |      |
|----------------------------------|------|
| Introduction                     | 6-2  |
| The Object Class                 | 6-2  |
| Nested and Inner Classes         | 6-3  |
| Packages                         | 6-6  |
| Defining a Package               | 6-6  |
| Accessing a Package              | 6-7  |
| Accessing Protection in Packages | 6-9  |
| Importing Packages               | 6-10 |
| Interfaces                       | 6-13 |
| Defining an Interface            | 6-13 |
| Implementing an Interface        | 6-14 |
| Interface Variables              | 6-17 |
| Extending an Interface           | 6-18 |
| Nested or Member Interfaces      | 6-22 |
| Self-Evaluation Test             | 6-27 |
| Review Questions                 | 6-27 |
| Exercise 1                       | 6-29 |
| Exercise 2                       | 6-29 |

## Chapter 7: Exception Handling

|   |      |
|---|------|
| Introduction                                | 7-2  |
| Exception Handling Mechanism                | 7-2  |
| Exception Classes                           | 7-2  |
| Types of Exceptions                         | 7-3  |
| Blocks used in Exception-Handling Mechanism | 7-3  |
| Try Block                                   | 7-3  |
| The catch Block                             | 7-4  |
| Multiple catch Blocks                       | 7-7  |
| Nested try Statements                       | 7-12 |
| The throw Statement                         | 7-14 |
| The throws Keyword                          | 7-16 |
| The finally Clause                          | 7-18 |
| Defining Your Own Exception Subclasses      | 7-22 |
| Self-Evaluation Test                        | 7-25 |
| Review Questions                            | 7-25 |
| Exercise 1                                  | 7-28 |
| Exercise 2                                  | 7-28 |

## Chapter 8: Multithreading

|  |      |
|--|------|
| Introduction                               | 8-2  |
| Multithreading                             | 8-2  |
| Thread Model                               | 8-2  |
| Thread Priorities                          | 8-3  |
| Synchronization                            | 8-3  |
| The main Thread                            | 8-3  |
| Creating a New Thread                      | 8-5  |
| Implementing the Runnable Interface        | 8-5  |
| Extending the Thread Class                 | 8-10 |
| Creating Multiple Threads                  | 8-13 |
| The isAlive() and join() Methods           | 8-15 |
| Setting Thread Priorities                  | 8-18 |
| Synchronization                            | 8-23 |
| Deadlock                                   | 8-29 |
| Suspending, Resuming, and Stopping Threads | 8-29 |
| Self-Evaluation Test                       | 8-34 |
| Review Questions                           | 8-34 |
| Exercise 1                                 | 8-35 |
| Exercise 2                                 | 8-35 |

## Chapter 9: String Handling

|                     |     |
|---------------------|-----|
| Introduction        | 9-2 |
| The String Class    | 9-2 |
| String( )           | 9-2 |
| String(char arr[ ]) | 9-2 |

|   |      |
|---|------|
| String(char arr[ ], int start, int length)      | 9-3  |
| String(String obj)                              | 9-3  |
| String(byte asciiarr[ ])                        | 9-3  |
| String(byte asciiarr[ ], int start, int length) | 9-4  |
| String Literals                                 | 9-4  |
| String Concatenation Using the + Operator       | 9-4  |
| Methods Used for String Comparison              | 9-4  |
| compareTo( )                                    | 9-7  |
| compareToIgnoreCase( )                          | 9-8  |
| The == Operator                                 | 9-8  |
| regionMatches( )                                | 9-9  |
| startsWith( )                                   | 9-10 |
| endsWith( )                                     | 9-11 |
| The toString( ) Method                          | 9-11 |
| Methods Used for Extracting Characters          | 9-13 |
| Methods Used to Modify a String                 | 9-15 |
| Changing the Case of a Character of a String    | 9-18 |
| Methods Used for Searching Strings              | 9-18 |
| The valueOf( ) Method                           | 9-21 |
| Finding the Length of a String                  | 9-23 |
| The StringBuffer Class                          | 9-23 |
| Constructors of the StringBuffer Class          | 9-24 |
| Methods of the StringBuffer Class               | 9-25 |
| Self-Evaluation Test                            | 9-35 |
| Review Questions                                | 9-35 |
| Exercise 1                                      | 9-36 |
| Exercise 2                                      | 9-36 |
| Exercise 3                                      | 9-36 |

## Chapter 10: Introduction to Applets and Event Handling

|   |       |
|---|-------|
| Introduction                                      | 10-2  |
| The Applet Class                                  | 10-2  |
| Applets   | 10-4  |
| Types of Applets                                  | 10-4  |
| The Life Cycle of an Applet                       | 10-5  |
| The paint( ) Method                               | 10-5  |
| Creating an Applet                                | 10-6  |
| Manipulating the Color of an Applet               | 10-9  |
| Passing Parameters to an Applet                   | 10-11 |
| The getCodeBase( ) and getDocumentBase( ) Methods | 10-13 |
| Event Handling                                    | 10-15 |
| Event Handling Mechanism                          | 10-15 |
| Event Classes                                     | 10-16 |
| The EventObject Class                             | 10-17 |
| The AWTEvent Class                                | 10-17 |
| The ActionEvent Class                             | 10-17 |
| The ItemEvent Class                               | 10-18 |

|                           |       |
|---------------------------|-------|
| The AdjustmentEvent Class | 10-19 |
| The TextEvent Class       | 10-20 |
| The ComponentEvent Class  | 10-21 |
| The InputEvent Class      | 10-21 |
| The KeyEvent Class        | 10-22 |
| The MouseEvent Class      | 10-23 |
| The FocusEvent Class      | 10-25 |
| The ContainerEvent Class  | 10-26 |
| The WindowEvent Class     | 10-27 |
| Event Sources             | 10-28 |
| Creating Event Listener   | 10-29 |
| Self-Evaluation Test      | 10-32 |
| Review Questions          | 10-32 |
| Exercise 1                | 10-33 |
| Exercise 2                | 10-33 |

## Chapter 11: Abstract Windowing Toolkit

|                              |       |
|------------------------------|-------|
| Introduction                 | 11-2  |
| AWT Windows                  | 11-2  |
| Frame Window                 | 11-2  |
| Working with Graphics        | 11-9  |
| Drawing Lines                | 11-9  |
| Drawing Rectangles           | 11-11 |
| Drawing Circles and Ellipses | 11-13 |
| Drawing Arcs                 | 11-15 |
| Drawing Polygons             | 11-17 |
| AWT Controls                 | 11-19 |
| Label Controls               | 11-19 |
| Button Controls              | 11-23 |
| TextField Controls           | 11-27 |
| Check Box Controls           | 11-31 |
| Choice Controls              | 11-36 |
| List Controls                | 11-41 |
| Scroll Bar Controls          | 11-50 |
| TextArea Controls            | 11-53 |
| Layout Managers              | 11-55 |
| FlowLayout                   | 11-55 |
| BorderLayout                 | 11-58 |
| GridLayout                   | 11-60 |
| Self-Evaluation Test         | 11-63 |
| Review Questions             | 11-63 |
| Exercise 1                   | 11-64 |
| Exercise 2                   | 11-64 |
| Exercise 3                   | 11-65 |

## Chapter 12: The Java I/O System

|  |       |
|--|-------|
| Introduction                           | 12-2  |
| Stream Classes                         | 12-2  |
| The Byte Stream Classes                | 12-2  |
| The InputStream Classes                | 12-2  |
| The OutputStream Classes               | 12-4  |
| The Character Stream Classes           | 12-6  |
| The Reader Stream Classes              | 12-7  |
| The Writer Stream Classes              | 12-7  |
| The File Class                         | 12-8  |
| Naming Conventions for Creating a File | 12-8  |
| Random Access Files                    | 12-14 |
| Self-Evaluation Test                   | 12-21 |
| Review Questions                       | 12-21 |
| Exercise 1                             | 12-22 |
| Exercise 2                             | 12-22 |
| Index                                  | 1     |