Building Java Programs Textbook mapping to Shoreline’s CS141: Java I

Key: Core Concept Recommended

| **Chapter** | **Topics** | **Week** | **Day** |
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| Chapter 1: Introduction to Java Programming | 1.1 Basic Computing Concepts   * Why Programming? * Hardware and Software * The Digital Realm * Why Java? * The Process of Programming * The Java Programming Environment   1.2 And Now--Java   * String Literals (Strings) * System.out.println * Escape Sequences * print versus println * Identifiers and Keywords * A Complex Example: DrawFigures1 * Comments and Readability   1.3 Program Errors   * Syntax Errors * Logic Errors (bugs)   1.4 Procedural Decomposition   * Static Methods * Flow of Control * Methods That Call Other Methods * An Example Runtime Error   1.5 Case Study: DrawFigures   * Structured Version * Final Version without Redundancy * Analysis of Flow of Execution | 1 | 01 |
| Chapter 2: Primitive Data and Definite Loops | 2.1 Basic Data Concepts   * Primitive Types * Expressions * Literals * Arithmetic Operators * Precedence * Mixing Types and Casting   2.2 Variables   * Assignment/Declaration Variations * String Concatenation * Increment/Decrement Operators * Variables and Mixing Types   2.3 The for Loop   * Tracing for Loops * for Loop Patterns * Nested for Loops   2.4 Managing Complexity   * Scope * Pseudocode * Class Constants   2.5 Case Study: A Complex Figure   * Problem Decomposition and Pseudocode * Initial Structured Version * Adding a Class Constant * Further Variations | 1 | 02 |
| Chapter 3: Introduction to Parameters and Objects | 3.1 Parameters   * The Mechanics of Parameters * Limitations of Parameters * Multiple Parameters * Parameters Versus Constants * Overloading of Methods   3.2 Methods that Return Values   * The Math Class * Defining Methods that Return Values   3.3 Using Objects   * String Objects * Interactive Programs and Scanner Objects * Sample Interactive Program   3.4 Case Study: Projectile Trajectory   * Unstructured Solution * Structured Solution | 2 | 03 |
| Supplement 3G: Graphics | 3G.1 Introduction to Graphics   * DrawingPanel * Drawing Lines and Shapes * Colors * Drawing with Loops * Text and Fonts * Images   3G.2 Procedural Decomposition with Graphics   * A Larger Example: DrawDiamonds   3G.3 Case Study: Pyramids   * Unstructured Partial Solution * Generalizing the Drawing of Pyramids * Complete Structured Solution | 2 | 04 |
| Chapter 4: Conditional Execution | 4.1 if/else Statements   * Relational Operators * Nested if/else Statements * Object Equality * Factoring if/else Statements * Multiple Conditions   4.2 Cumulative Algorithms   * Cumulative Sum * Min/Max Loops * Cumulative Sum with if * Roundoff Errors   4.3 Text Processing   * The char Type * char versus int * Cumulative Text Algorithms * System.out.printf   4.4 Methods with Conditional Execution   * Preconditions and Postconditions * Throwing Exceptions * Revisiting Return Values * Reasoning about Paths   4.5 Case Study: Body Mass Index   * One-person Unstructured Solution * Two-person Unstructured Solution * Two-person Structured Solution * Procedural Design Heuristics | 3 | 05, 06 |
| Chapter 5: Program Logic and Indefinite Loops | 5.1 The while Loop   * A Loop to Find the Smallest Divisor * Random Numbers * Simulations * The do/while Loop   5.2 Fencepost Algorithms   * Sentinel Loops * Fencepost with if   5.3 The boolean Type   * Logical Operators * Short-Circuited Evaluation * boolean Variables and Flags * Boolean Zen * Negating Boolean Expressions   5.4 User Errors   * Scanner Lookahead * Handling User Errors   5.5 Assertions and Program Logic   * Reasoning About Assertions * A Detailed Assertions Example   5.6 Case Study: NumberGuess   * Initial Version without Hinting * Randomized Version with Hinting * Final Robust Version | 4 | 07, 08 |
| Midterm | Chapters 1-5 | 5 | 09, 10 |
| Chapter 6: File Processing | 6.1 File Reading Basics   * Data, Data Everywhere * File Basics * Reading a File with a Scanner   6.2 Details of Token-Based Processing   * Structure of Files and Consuming Input * Scanner Parameters * Paths and Directories * A More Complex Input File   6.3 Line-Based Processing   * String Scanners and Line/Token Combinations   6.4 Advanced File Processing   * Output Files with PrintStream * Guaranteeing that Files Can Be Read   6.5 Case Study: ZIP Code Lookup | 6 | 11, 12 |
| Chapter 7: Arrays | 7.1 Array Basics   * Constructing and Traversing an Array * Accessing an Array * A Complete Array Program * Random Access * Arrays and Methods * The For-Each Loop * Initializing Arrays * The Arrays Class   7.2 Array Traversal Algorithms   * Printing an Array * Searching and Replacing * Testing for Equality * Reversing an Array * String Traversal Algorithms   7.3 Reference Semantics   * Multiple Objects   7.4 Advanced Array Techniques   * Shifting Values in an Array * Arrays of Objects * Command Line Arguments * Nested Loop Algorithms   7.5 Multidimensional Arrays   * Rectangular Two-Dimensional Arrays * Jagged Arrays   7.6 Arrays of Pixels  7.7 Case Study: Benford's Law   * Tallying values * Completing the Program | 7 | 13, 14 |
| Chapter 8: Classes | 8.1 Object-Oriented Programming   * Classes and Objects * Point Objects   8.2 Object State and Behavior   * Object State: Fields * Object Behavior: Methods * The Implicit Parameter * Mutators and Accessors * The toString Method   8.3 Object Initialization: Constructors   * The Keyword this * Multiple Constructors   8.4 Encapsulation   * Private Data Fields * Class Invariants * Changing Internal Implementations   8.5 Case Study: Designing a Stock Class   * Object-Oriented Design Heuristics * Stock Fields and Method Headers * Stock Method and Constructor Implementation | 8 | 15, 16 |
| Chapter 9: Inheritance and Interfaces | 9.1 Inheritance Basics   * Non-programming Hierarchies * Extending a Class * Overriding Methods   9.2 Interacting with the Superclass   * Calling Overridden Methods * Accessing Inherited Fields * Calling a Superclass's Constructor * DividendStock Behavior * The Object Class * The equals Method * The instanceof Keyword   9.3 Polymorphism   * Polymorphism Mechanics * Interpreting Inheritance Code * Interpreting Complex Calls   9.4 Inheritance and Design   * A Misuse of Inheritance * Is-a versus Has-a Relationships * Graphics2D   9.5 Interfaces   * An Interface for Shapes * Implementing an Interface * Benefits of Interfaces   9.6 Case Study: Financial Class Hierarchy   * Designing the Classes * Redundant Implementation * Abstract Classes | 9 | 17 |
| Chapter 10: ArrayLists | 10.1 ArrayLists   * Basic ArrayList Operations * ArrayList Searching Methods * A Complete ArrayList Program * Adding to and Removing from an ArrayList * Using the For-Each Loop with ArrayLists * Wrapper Classes   10.2 The Comparable Interface   * Natural Ordering and compareTo * Implementing the Comparable Interface   10.3 Case Study: Vocabulary Comparison   * Some Efficiency Considerations * Version 1: Compute Vocabulary * Version 2: Compute Overlap * Version 3: Complete Program | 9 | 18, 19 |
| Final Review | Chapters 1-10 | 10 | 20 |