

Detailed table of contents

CHAPTER 1: BACKGROUND, I 1.1 Introduction, 2 1.2 Computer organization, 3 1.2.1 Computing units of measure, 5 1.2.2 Buying a personal computer, 6 1.3 Internet computing, 10 1.3.1 Networks, 11 Software and lava, 14 1.4 1.4.1 Programming languages, 14 1.4.2 Running a Java program, 15 1.5 Engineering software, 18 1.5 L Software engineering principles, 20 1.6 Object-oriented design, 23 1.7 Problem solving, 26 1.7.1 Ask questions as needed, 29 1.7.2 Find out as much as you can, 30 1.7.3 Break complex problems into subproblems, 31 1.7.4 Reuse and expect future reuse, 32 1.7.5 Further reading, 33 Review, 34 1.8 1.9 Self-test, 35 1.10 Exercises, 35 1.11 Self-test answers, 38 CHAPTER 2: JAVA BASICS, 39 2.1 A first program, 40 2.1.1 Commenting and whitespace, 41 Classes, keywords, and identifiers, 43 2.1.2 2.1.3 Methods, 44 2.1.4 Selecting methods print() and println(), 46 2.1.5 Escape sequences, 49 Simple computations, 52 2.2 2.2.1 Constants, 54 2.2.2 Variables, 56 2.2.3 Operations, 57

2.3

Primitive types, 61

int type, 61

char type, 63

2.3.1

2.3.2

		2.3.3 double type, 65	
	2.4	Expressions, 67	
		2.4.1 Unary and binary operators, 68	
		2.4.2 Precedence, 69	
		2.4.3 Widening and narrowing operand conversion, 71	
		2.4.4 Overflow, underflow, and exceptions, 73	
	2.5	Interactive programs, 73	
	2.6	Primitive variable assignment, 78	
		2.6.1 Swapping, 81	
		2.6.2 Assignment precedence and associativity, 82	
		2.6.3 Increment and decrement, 83	
	2.7	Case study — averaging five numbers, 86	
	2.8	Review, 89	
	2.9	Self-test, 91	
		Exercises, 93	
		Programming project — you, 98	
	2.12		
	2.12		
	2.13	Sell-test allsweis, 103	
CHAPTER 3:	Using objects, 105		
	3.1·	Classes, 106	
	3.2	Objects and variables, 107	
		3.2.1 Initialization, 108	
		3.2.2 Null and uninitialized references, 110	
•	3.3	Assignment, III	
	3.4	Final variables, 113	
	3.5	String operations and methods, 115	
	3.6	Case study — date translation, 123	
	3.7	Review, 129	
	3.8	Self-test, 130	
	3.9	Exercises, 130	
	3.10	Programming project — harvester, 134	
	3.11	Self-test answers, 136	
CHAPTER 4:	BEING CLASSY, 139		
CHAPTER 4:	4.I		
	4.2	Preparation, 140	
	4.2	A very simple class, 142 4.2.1 Instance variables and attributes, 144	
		4.2.2 A default constructor, 146	
		4.2.3 An instance method, 147	
		• •	
	4.3		
	4.4	Methods with parameters and return values, 154	
	4.4 4.5	Summary, 166	
	4.5 4.6	Review, 167	
	4.6 4.7	Self-test, 169	
	4./ 4.8	Exercises, 169 Programming project — rationality, 172	
	4.0	rrogramming project rationality, 1/2	

4.9 Self-test answers, 175

CHAPTER 5: DECISIONS, 179

- 5.1 Boolean algebra and truth tables, 180
 - 5.1.1 Logical expressions, 181
- 5.2 Boolean type, 182
 - 5.2.1 Boolean equality and ordering operators, 183
 - 5.2.2 Operator precedence revisited, 186
- 5.3 If statement, 187
 - 5.3.1 Avoiding gotchas, 191
- 5.4 If-else statement, 192
- 5.5 Nested constructs, 195
- 5.6 If-else-if construct, 198
- 5.7 Testing objects for equality, 202
- 5.8 Switch statement, 206
- 5.9 Case study checksum validation, 213
- 5.10 Case study --- triangles, 217
- 5.11 Review, 226
- 5.12 Self-test, 228
- 5.13 Exercises, 230
- 5.14 Programming project medical assistant, 235
- 5.15 Self-test answers, 239

CHAPTER 6: ITERATION, 241

- 6.1 While statement, 242
- 6.2 For statement, 252
 - 6.2.1 Index variable scope, 256
 - 6.2.2 Computing the number of combinations, 256
- 6.3 Do-while statement, 258
- 6.4 Nested loops, 262
- 6.5 Simple file processing, 265
- 6.6 Case study data set analysis, 272
- 6.7 Review, 280
- 6.8 Self-test, 281
- 6.9 Exercises, 282
- 6.10 Programming project --- four hobo problem, 285
- 6.11 Self-test answers, 287

GRAPHICS INTERLUDE 1: GUI-BASED PROGRAMMING, 289

- G1.1 GUI and event-driven programming, 290
- G1.2 Windchill calculator, 293
 - G1.2.1 Class constants and instance variables, 298
 - G1.2.2 GUI construction, 301
 - G1.2.3 Event handling and actionPerformed(), 304
 - G1.2.4 Method main(), 306
- G1.3 Review, 308
- G1.4 Self-test, 309

```
G1.5 Exercises, 310
                G1.6 Programming project — training zones, 311
                G1.7 Self-test answers, 313
CHAPTER 7:
               PROGRAMMING WITH METHODS AND CLASSES, 315
                7. L
                      Modifier static, 316
                7.2
                      Parameter passing, 322
                7.3
                      This, 331
                7.4
                      Inherited methods and overriding, 334
                7.5
                      Scope and name reuse, 340
                      7.5.1
                              Local scope rules, 340
                      7.5.2
                              Name reuse, 341
                7.6
                      Overloading, 344
                7.7
                      Illustrations, 351
                7.8
                      Generic classes, 358
                7.9
                      Review, 361
                7.10 Self-test, 363
                7.11 Exercises, 365
                7.12 Programming project — automobile financing, 373
                7.13
                      Self-test answers, 377
                ARRAYS AND COLLECTIONS, 381
CHAPTER 8:
                8. I
                      Basic list requirements, 382
                8.2
                      One-dimensional arrays, 382
                      8.2.1
                              Definitions, 383
                      8.2.2
                              Element access, 385
                      8.2.3
                              Explicit initialization, 388
                      8.2.4
                              Constant arrays, 389
                      8.2.5
                              Members, 390
                8.3
                      Iterator for loop, 393
                8.4
                      Simple array processing, 396
                      8.4.1
                              Extraction, 396
                      8.4.2
                              Searching for a key value, 398
                      8.4.3
                              Searching for the minimum value, 400
                8.5
                      Arrays and methods, 401
                      8.5.1
                              Sequential and binary search, 402
                      8.5.2
                              Zeroing, 405
                      8.5.3
                              Display, 408
                      8.5.4
                              Extraction and reversal, 411
                      8.5.5
                              Increasing representation capacity, 411
                8.6
                      Sorting, 413
                      8.6.1
                              Method selectionSort(), 414
                              Quality of selectionSort(), 416
                      8.6.2
                      Command-line parameters, 417
                8.7
                8.8
                      Multidimensional arrays, 419
                      8.8 1
                              Matrices, 422
                89
                      Collections framework, 424
```

	8.14	Self-test, 445	
	8.15	Exercises, 446	
	8.16	Programming project — matrices, 452	
	8.17	Self-test answers, 453	
CHAPTER 9:	INHERITANCE AND POLYMORPHISM, 459		
	9.1	Object-oriented design, 460	
		9.1.1 ThreeDimensionalPoint, 462	
		9.1.2 ColoredPoint, 469	
	9.2	Polymorphism, 474	
	9.3	Inheritance nuances, 476	
		9.3.1 Controlling access, 477	
		9.3.2 Data fields, 480	
		9.3.3 Typing, 483	
		9.3.4 Late binding, 484	
		9.3.5 Finality, 486	
	9.4	Abstract base classes, 487	
	9.5	Interfaces, 491	
	9.6	Case study preparing the aquarium, 496	
	9.7	Review, 507	
	9.8	Self-test, 509	
	9.9	Exercises, 511	
		Programming project — change maker, 515	
	9.11	Self-test answers, 518	
GRAPHICS IN	ITERL	UDE 2: GUI-BASED PROGRAMMING, 519	
	G2.1	Case study — personality typing, 520	
		G2.1.1 Background, 520	
	G2.2	Programming project — Smiley guessing game, 535	
CHAPTER 10	: Exc	EPTIONS, 551	
	10.1	Exception handling, 552	
	10.2	Finally and the command type, 56	
	10.3	Creating and throwing exceptions, 563	
	10.4	Review, 568	
	10.5	Self-test, 569	
		Exercises, 569	
•	10.7	Programming project — a second look, 570	
	10.8	Self-test answers, 570	
CHAPTER II	: REC	CURSIVE PROBLEM SOLVING, 573	
	11.1	Recursive methods, 574	

11.1.1 Fibonacci numbers and squares, 577 11.2 Case study - recursive binary search, 581

8.10 ArrayList<T>, 425 8.11 Collections algorithms, 430

Review 443

Case study - pie charts, 434

8.12

8.13

11.3 Method mergeSort(), 587
11.4 How fast can we sort?, 592
11.5 Recursion versus iteration, 593
11.6 Case study — string permutation, 595
11.7 Review, 601
11.8 Self-test, 601
11.9 Exercises, 602
11.10 Programming project — Sierpinski fractal, 605
11.11 Self-test answers, 608

CHAPTER 12: THREADS, 609

- 12.1 Scheduling, 610 12.1.1 Running after a delay, 612
 - 12.1.2 Running repeatedly, 615 12.1.3 Running at a chosen time, 619
- 12.2 Sleeping, 624
- 12.3 Case study animation, 626
- 12.4 Case study swimming fish, 632
- 12.5 Review, 639
- 12.6 Self-test, 640
- 12.7 Exercises 640
- 12.8 Programming project better fish, 642
- 12.9 Self-test answers, 644

CHAPTER 13: TESTING AND DEBUGGING, 645

- 13.1 Testing, 646
 - 13.1.1 Testing an example, 647
 - 13.1.2 Testing fundamentals, 656
 - 13.1.3 Reviews and inspections, 659
 - 13.1.4 Black-box and white-box testing, 662
 - 13.1.5 Integration and system testing, 666
- 13.2 Debugging, 667
 - 13.2.1 Scientific method, 667
 - 13.2.2 Debugging tips and techniques, 671
- 13.3 Review, 675
- 13.4 References, 675
- 13.5 Self-test, 676
- 13.6 Exercises, 676
- 13.7 Programming project getList(), 677
- 13.8 Self-test answers, 679

APPENDIX A: TABLES AND OPERATORS, 681

- A.I Unicode character set, 682
- A.2 Reserved words, 683
- A.3 Operators and precedence, 683

APPENDIX B: NUMBER REPRESENTATION, 687

B.I Binary number representation, 688

B.2 Two's-complement representation, 689

APPENDIX C: FORMATTED I/O, 691

C.I Introduction, 692

C.2 Format String Syntax, 692

APPENDIX D: APPLETS, 697

D.1 A simple applet, 698

D.2 Applet methods, 700

D.2.1 Method init(), 700

D.2.2 Method start(), 701

D.2.3 Method stop(), 701

D.2.4 Method destroy(), 701

D.2.5 Method paint(), 701

D.3 Applets and threads, 705

D.4 Applet security, 707

D.5 Summary, 708

APPENDIX E: STANDARD JAVA PACKAGES, 709 INDEX, 903