
COMP1406

Introduction to Computer Science II

Course Notes



Notes maintained by Mark Lanthier (2017 version)

Table of Contents

1	Programming in JAVA	1
1.1	Object-Oriented Programming and JAVA	2
1.2	Writing Your First JAVA Program	6
1.3	Python vs. JAVA	8
1.4	Getting User Input	11
1.5	Formatting Text	15
2	Creation and Storage of JAVA Objects	21
2.1	Using Existing JAVA Objects	22
2.2	Creating Your Own Objects in JAVA	24
2.3	Memory Allocation and Object Storage	27
3	Defining Object Behavior	39
3.1	Object Constructors (Re-Visited)	40
3.2	Defining Methods	44
3.3	Null Pointer Exceptions	52
3.4	Overloading	54
3.5	Instance vs. Class (i.e., static) Methods	56
3.6	Encapsulation - Protecting An Object's Internals	60
3.7	Changing How Objects Look When Printed	69
3.8	A Bank Example	73
4	Class Hierarchies and Inheritance	84
4.1	Organizing Classes	85
4.2	Inheritance	90
4.3	Abstract Classes & Methods	108
4.4	JAVA Interfaces	115
4.5	Polymorphism	120
5	Graphical User Interfaces	134
5.1	User Interfaces and Java FX Applications	135
5.2	Components and Containers	140
5.3	Grouping Components Together	146
5.4	Event Handling	153
6	Proper Coding Style Using MVC	168
6.1	Separating Model, View and Controller Components	169
6.2	Preparing Your Model Classes for the GUI	170
6.3	Developing a Proper View	174
6.4	Developing a Proper Controller	179
7	User Interface Extensions	186
7.1	Automatic Resizing Using Layouts	187
7.2	Adding Menus	207
7.3	Standard Dialog Boxes	215
7.4	Making Your Own Dialog Boxes	233

8 Abstract Data Types	250
8.1 Common Abstract Data Types	251
8.2 The List ADT	253
8.3 The Queue ADT	274
8.4 The Deque ADT	281
8.5 The Stack ADT	283
8.6 The Set ADT	289
8.7 The Dictionary / Map ADT	297
8.8 Collections Class Tools	308
8.9 Implementing an ADT (Doubly-Linked Lists)	311
9 Recursion With Data Structures	320
9.1 Recursive Efficiency	321
9.2 Examples With Self-Referencing Data Structures	323
9.3 A Maze Searching Example	343
10 Exception Handling	351
10.1 Simple Debugging	352
10.2 Exceptions	354
10.3 Examples of Handling Exceptions	364
10.4 Creating and Throwing Your Own Exceptions	371
11 Saving and Loading Information	379
11.1 Introduction to Files and Streams	380
11.2 Reading and Writing Binary Data	382
11.3 Reading and Writing Text Data	388
11.4 Reading and Writing Whole Objects	391
11.5 Saving and Loading Example	395
11.6 The File Class	402
12 Network Programming	406
12.1 Networking Basics	407
12.2 Reading Files From the Internet (URLs)	411
12.3 Client/Server Communications	415
12.4 Datagram Sockets	422
13 Other Interesting JAVA Classes	427
13.1 The String Class	428
13.2 The StringBuilder & Character Classes	434
13.3 The Date and Calendar Classes	437
14 Graphics	444
14.1 Doing Simple Graphics	445
14.2 Displaying Images and Manipulating Pixels	451
14.3 Graph Editor Example	454
14.4 Adding Features to the Graph Editor	475