

Contents

1	An Introduction to Python and Computer Programming	1
1.1	Introduction	1
1.1.1	Python and Computer Programming	2
1.2	Preliminaries	2
1.2.1	The Computer	3
1.2.2	The File System	3
1.2.3	Text User Interfaces to Operating Systems	5
1.2.4	The Python Application Program	8
1.2.5	Python and Environment Variables	9
2	Using Python as a Calculator	13
2.1	Using Python as a Calculator	13
2.1.1	Floating Point Expressions	15
2.1.2	Identifiers, Variables and Assignment	18
2.2	The Underlying Mechanism	21
2.2.1	Information	22
2.2.2	Python Memory Management	25
2.3	More Mathematical Functions Using the <i>math</i> and <i>cmath</i> Modules	29
2.3.1	Complex Numbers and the <i>cmath</i> Module	31
2.3.2	Random Numbers and the <i>random</i> Module	34
3	The First Python Program	37
3.1	Text Input and Output Using Strings	37
3.1.1	Text IO	45
3.2	The First Python Program	49
3.2.1	The Structure of Python Programs	51

3.3	The Underlying Mechanism of Module Execution.	53
3.3.1	Module Objects	54
3.3.2	Library Modules.	55
3.3.3	The Mechanism of Module Importation.	56
3.3.4	Duplicated Imports	58
3.3.5	Importing Specific Identifiers	60
4	Branching and Looping	67
4.1	The Boolean Type	68
4.2	Branching Using the <i>if</i> Statement	72
4.2.1	Nested <i>if</i> Statements	78
4.3	Looping Using the <i>While</i> Statement	81
4.3.1	Branching Nested in a Loop.	86
4.3.2	Break and Continue	88
4.4	Debugging	89
5	Problem Solving Using Branches and Loops	97
5.1	Basic Problems.	97
5.1.1	Summation.	97
5.1.2	Iteratively Calculating Number Sequences	102
5.2	Numerical Analysis Problems.	105
5.2.1	Numerical Differentiation.	105
5.2.2	Numerical Integration	106
5.2.3	Monte-Carlo Methods	109
5.2.4	Differential Equations and Iterative Root Finding	113
5.3	Tuples and the <i>for</i> loop	116
5.3.1	Tuples.	116
5.3.2	The <i>for</i> Loop	120
5.3.3	Problem Solving by Traversal of a Tuple.	122
6	Functions	127
6.1	Function Definition Using <i>lambda</i> expressions	127
6.2	Function Definition Using the <i>def</i> Statement	132
6.2.1	The Dynamic Execution Process of Function Calls	135
6.2.2	Input Arguments.	136
6.2.3	Return Statements.	137
6.2.4	Modularity.	140
6.3	Identifier Scopes.	144
6.4	The Underlying Mechanism of Functions.	148
7	Lists and Mutability	157
7.1	Lists—A Mutable Sequential Type	157
7.1.1	List Mutation	160

7.2	Working with Lists	166
7.2.1	Copying Lists.	167
7.2.2	Lists as Items in Tuples and Lists	169
7.2.3	Lists and Loops	173
7.2.4	Lists and Function Arguments	177
7.2.5	Lists and Function Return Values	178
7.2.6	Initializing a List	180
7.2.7	Lists and Sequential Data Structures	181
8	Sequences, Mappings and Sets.	187
8.1	Methods of Sequential Types	187
8.2	Dicts—A Mutable Mapping Type	195
8.2.1	Dict Modification	199
8.2.2	Dicts and Loops	201
8.2.3	Dicts and Functions	203
8.3	Sets and Bitwise Operations	205
8.3.1	Set Modification	207
8.3.2	Bitsets and Bitwise Operators	209
9	Problem Solving Using Lists and Functions	217
9.1	Lists of Lists and Nested Loops	217
9.1.1	Treating Sublists as Atomic Units	217
9.1.2	Matrices as Lists of Lists	221
9.2	Functions and Problem Solving	224
9.2.1	Recursive Function Calls	225
9.2.2	Functional Programming	229
9.3	Files, Serialization and <i>urllib</i>	236
9.3.1	Files	236
9.3.2	Serialization Using the <i>pickle</i> Module	240
9.3.3	Reading Web Pages Using the <i>urllib</i> Module	241
10	Classes	245
10.1	Classes and Instances	246
10.1.1	Classes and Attributes	246
10.1.2	Methods and Constructors	248
10.1.3	Class Attributes and the Execution of a Class Statement	252
10.1.4	Special Methods	253
10.1.5	Class Examples	257
10.1.6	The Underlying Mechanism of Classes and Instances	260
10.2	Inheritance and Object Oriented Programming	263
10.2.1	Sub Classes	264
10.2.2	Overriding Methods	266

10.2.3	The Underlying Mechanism of Class Extention	267
10.2.4	Object Oriented Programming	269
10.3	Exception Handling.	269
10.3.1	Exception Handling.	271
10.3.2	Exception Objects.	274
11	Summary	279
11.1	The Structure of a Python Program	279
11.1.1	Expressions	279
11.1.2	Statements	283
11.2	The Data Model of Python.	285
11.2.1	Identity, Type and Value	285
11.2.2	Attributes and Methods	286
11.2.3	Documenting Objects	287
11.3	Modules and Libraries	289
11.3.1	Packages	290
11.3.2	Library Modules	291

An Introduction to Python and Computer Programming

Zhang, Y.

2015, X, 295 p. 58 illus., 5 illus. in color., Hardcover

ISBN: 978-981-287-608-9