

Table of Contents

Preface	15
About the Authors.....	15
Acknowledgments	16
Who Should Buy This Book?.....	16
Where to Find Answers to Review Questions and Exercises.....	16
How to Report Errata	16
Conventions Used in This Book.....	17
Chapter 1 How a Computer Works	19
1.1 Introduction.....	19
1.2 What is Hardware?.....	19
1.3 What is Software?.....	20
1.4 How a Computer Executes (Runs) a Program	20
1.5 Compilers and Interpreters.....	21
1.6 What is Source Code?.....	22
1.7 Review Questions: True/False.....	22
1.8 Review Questions: Multiple Choice.....	23
1.9 Review Questions	24
Chapter 2 Python and Integrated Development Environments (IDEs)	25
2.1 What is Python?.....	25
2.2 How Python Works.....	25
2.3 How to Set Up Python.....	25
2.4 Integrated Development Environments	26
2.5 IDLE.....	26
2.6 How to Set Up IDLE.....	26
2.7 Eclipse	27
2.8 How to Set up Eclipse.....	27
2.9 Review Questions	31
Chapter 3 Basic Algorithmic Concepts	33
3.1 What is an Algorithm?	33
3.2 The Algorithm for Making a Cup of Tea.....	33
3.3 Okay about Algorithms. But what is a Computer Program Anyway?	34
3.4 The Three Parties!.....	34
3.5 The Three Main Stages Involved in Creating an Algorithm	34
3.6 What are “Reserved Words”?	35
3.7 Your First Python Program	35
3.8 What is the Difference between a Syntax Error, a Runtime Error, and a Logic Error?.....	36

3.9	What Does “Debugging” Mean?	36
3.10	Commenting Your Code	37
3.11	Review Questions: True/False	38
3.12	Review Questions: Multiple Choice	38
3.13	Review Questions	39
Chapter 4 Variables and Constants		41
4.1	What is a Variable?	41
4.2	How Many Types of Variables Exist?	43
4.3	Rules for Naming Variables in Python	43
4.4	What Does the Phrase “Declare a Variable” Mean?	44
4.5	Review Questions: True/False	44
4.6	Review Questions: Multiple Choice	45
4.7	Review Exercises	46
4.8	Review Questions	46
Chapter 5 Handling Input and Output		47
5.1	Which Statement Outputs Messages and Results to a User’s Screen?	47
5.2	How to Alter the Default Behavior of a <code>print</code> Statement	48
5.3	Which Statement Lets the User Enter Data? Which Statement Prompts the User to Enter Data?	51
5.4	Review Questions: True/False	53
5.5	Review Questions: Multiple Choice	53
5.6	Review Questions	53
Chapter 6 Operators		55
6.1	The Value Assignment Operator	55
6.2	Arithmetic Operators	56
6.3	What is the Precedence of Arithmetic Operators?	57
6.4	Compound Assignment Operators	58
	Exercise 6.4.1 – Which Python Statements are Syntactically Correct?	60
	Exercise 6.4.2 – Finding Variable Types	60
6.5	String Operators	61
	Exercise 6.5.1 – Concatenating Names	61
6.6	Review Questions: True/False	62
6.7	Review Questions: Multiple Choice	62
6.8	Review Exercises	64
6.9	Review Questions	65
Chapter 7 Using IDLE		67
7.1	Introduction	67
7.2	IDLE - Creating a New Python Module	67
7.3	IDLE - Writing and Executing a Python Program	69

7.4	IDLE - Finding Runtime and Syntax Errors.....	71
Chapter 8 Using Eclipse		73
8.1	Introduction.....	73
8.2	Eclipse - Creating a New Python Project.....	73
8.3	Eclipse - Writing and Executing a Python Program	78
8.4	Eclipse - Finding Runtime and Syntax Errors.....	80
Chapter 9 Writing your First Real Programs.....		83
9.1	Introduction.....	83
	Exercise 9.1.1 – Calculating the Area of a Rectangle	83
	Exercise 9.1.2 – Calculating the Area of a Circle.....	84
	Exercise 9.1.3 – Fahrenheit to Celsius.....	85
9.2	Review Exercises	85
9.3	Review Questions	86
Chapter 10 Manipulating Numbers		87
10.1	Introduction.....	87
10.2	Useful Functions and Methods.....	87
10.3	Review Questions: True/False.....	91
10.4	Review Exercises	91
Chapter 11 Manipulating Strings.....		93
11.1	Introduction.....	93
11.2	Retrieving Individual Characters from a String.....	93
11.3	Retrieving a Portion of a String	96
	Exercise 11.3.1 – Displaying a String Backward	97
11.4	Useful Functions and Methods.....	98
	Exercise 11.4.1 – Creating a Login ID.....	100
	Exercise 11.4.2 – Switching the Order of Names	100
	Exercise 11.4.3 – Creating a Random Word.....	101
11.5	Review Questions: True/False.....	102
11.6	Review Questions: Multiple Choice.....	103
11.7	Review Exercises	104
11.8	Review Questions	105
Chapter 12 Making Questions.....		107
12.1	Introduction.....	107
12.2	How to Write Simple Questions.....	107
	Exercise 12.2.1 – Filling in the Table	108
12.3	Logical Operators and Complex Questions.....	109
12.4	Python’s Membership Operators	111
12.5	What is the Order of Precedence of Logical Operators?.....	111

12.6	What is the Order of Precedence of Arithmetic, Comparison, and Logical Operators?.....	112
	Exercise 12.6.1 – Filling in the Truth Table.....	112
12.7	Converting English Sentences to Boolean Expressions.....	114
12.8	Review Questions: True/False.....	116
12.9	Review Questions: Multiple Choice.....	117
12.10	Review Exercises.....	118
12.11	Review Questions.....	119
Chapter 13 Asking Questions - The <code>if</code> Structure		121
13.1	The <code>if</code> Structure.....	121
	Exercise 13.1.1 – Find Out What is Displayed.....	123
	Exercise 13.1.2 – Are you Allowed to Drive a Car?.....	123
	Exercise 13.1.3 – Finding Minimum and Maximum Values with <code>if</code> Structures.....	124
	Exercise 13.1.4 – Finding the Name of the Heaviest Person	125
13.2	Review Questions: True/False.....	126
13.3	Review Questions: Multiple Choice.....	127
13.4	Review Exercises.....	128
13.5	Review Questions.....	129
Chapter 14 Asking Questions - The <code>if-else</code> Structure		131
14.1	The <code>if-else</code> Structure.....	131
	Exercise 14.1.1 – Finding the Output Message	132
	Exercise 14.1.2 – Who is the Greatest?	132
	Exercise 14.1.3 – Converting Gallons to Liters, and Vice Versa.....	133
14.2	Review Questions: True/False.....	134
14.3	Review Questions: Multiple Choice.....	134
14.4	Review Exercises.....	136
Chapter 15 Asking Questions - The <code>if-elif</code> Structure		137
15.1	The <code>if-elif</code> Structure.....	137
	Exercise 15.1.1 – Find Out What is Displayed.....	138
	Exercise 15.1.2 – Counting the Digits	139
	Exercise 15.1.3 – The Days of the Week.....	140
	Exercise 15.1.4 – Where is the Tollkeeper?	141
15.2	Review Questions: True/False.....	142
15.3	Review Exercises.....	142
Chapter 16 Asking Questions - Nested Structures		147
16.1	Nested Decision Structures.....	147
	Exercise 16.1.1 – Find Out What is Displayed.....	148
	Exercise 16.1.2 – Positive, Negative, or Zero?.....	149
	Exercise 16.1.3 – The Most Scientific Calculator Ever!.....	149

16.2	Review Questions: True/False.....	150
16.3	Review Exercises	150
16.4	Review Questions	151
Chapter 17 Doing Loops		153
17.1	What is a Loop Structure?.....	153
17.2	From Sequence to Loop Structure	153
17.3	Review Questions: True/False.....	155
Chapter 18 Doing Loops - The <code>while</code> Structure.....		157
18.1	The <code>while</code> Structure.....	157
	Exercise 18.1.1 – Counting the Total Number of Iterations	158
	Exercise 18.1.2 – Finding the Sum of Four Numbers	158
	Exercise 18.1.3 – Finding the Sum of Positive Numbers.....	159
	Exercise 18.1.4 – Finding the Sum of N Numbers.....	160
	Exercise 18.1.5 – Finding the Sum of an Unknown Quantity of Numbers.....	161
	Exercise 18.1.6 – Finding the Product of Five Numbers	162
18.2	Review Questions: True/False.....	162
18.3	Review Questions: Multiple Choice.....	163
18.4	Review Exercises	165
Chapter 19 Doing Loops - The <code>for</code> Structure		167
19.1	The <code>for</code> Structure.....	167
	Exercise 19.1.1 – Find Out What is Displayed.....	169
	Exercise 19.1.2 – Find Out What is Displayed.....	169
	Exercise 19.1.3 – Finding the Sum of Four Numbers	169
	Exercise 19.1.4 – Finding the Average Value of N Numbers	170
19.2	Review Questions: True/False.....	171
19.3	Review Questions: Multiple Choice.....	171
19.4	Review Exercises	173
Chapter 20 Doing Loops - Nested Structures		175
20.1	Nested Loop Structures.....	175
	Exercise 20.1.1 – Counting the Total Number of Iterations.	176
	Exercise 20.1.2 – Find Out What is Displayed.....	177
20.2	Review Questions: True/False.....	177
20.3	Review Questions: Multiple Choice.....	178
20.4	Review Exercises	180
Chapter 21 Tips and Tricks with Loop Structures		183
21.1	Introduction.....	183
21.2	Choosing a Loop Structure.....	183

21.3	The “Ultimate” Rule	184
21.4	Breaking Out of a Loop	186
21.5	Endless Loops and How to Avoid Them.....	187
21.6	The “From Inner to Outer” Method.....	188
21.7	Review Questions: True/False.....	189
21.8	Review Questions: Multiple Choice.....	190
21.9	Review Exercises	190
Chapter 22 More Exercises with Loop Structures		193
22.1	Exercises of a General Nature with Loop Structures	193
	Exercise 22.1.1 – Finding the Sum of $1 + 2 + 3 + \dots + 100$	193
	Exercise 22.1.2 – Finding the Product of $2 \times 4 \times 6 \times 8 \times 10$	194
	Exercise 22.1.3 – Finding the Average Value of Positive Numbers	195
	Exercise 22.1.4 – Counting the Numbers According to Which is Greater	196
	Exercise 22.1.5 – Counting the Numbers According to Their Digits	196
	Exercise 22.1.6 – How Many Numbers Fit in a Sum	197
	Exercise 22.1.7 – Iterating as Many Times as the User Wants	198
	Exercise 22.1.8 – Finding Minimum and Maximum Values with Loop Structures	199
	Exercise 22.1.9 – Fahrenheit to Kelvin, from 0 to 100.....	200
	Exercise 22.1.10 – Rice on a Chessboard	200
	Exercise 22.1.11 – Game - Find the Secret Number.....	201
22.2	Review Exercises	202
Chapter 23 Turtle Graphics		205
23.1	Introduction.....	205
23.2	The x-y Plane	205
23.3	Where is the Turtle?	207
23.4	Moving Forward and Backward	208
23.5	Turning Left and Right	210
	Exercise 23.5.1 – Drawing a Rectangle	212
	Exercise 23.5.2 – Drawing a Rectangle of Custom Size	213
23.6	Set the Orientation to a Specified Angle.....	214
23.7	Setting the Delay	215
23.8	Changing Pen’s Color and Size	217
23.9	Pulling Turtle’s Pen Up or Down.....	218
	Exercise 23.9.1 – Drawing a House.....	219
23.10	Moving a Turtle Directly to a Specified Position	221
23.11	Using Decision and Loop Structures with Turtles	223
	Exercise 23.11.1 – Drawing Squares of Different Sizes.....	227
	Exercise 23.11.2 – Drawing Houses of Different Sizes	228
	Exercise 23.11.3 – Drawing Polygons.....	231

Exercise 23.11.4 – Drawing a Star.....	232
Exercise 23.11.5 – Drawing Random Stars at Random Positions	233
Exercise 23.11.6 – Using Decision Structures to Draw Stars	235
23.12 Review Exercises	237
Chapter 24 Data Structures in Python	241
24.1 Introduction to Data Structures	241
24.2 What is a List?	242
Exercise 24.2.1 – Designing a Data Structure.....	242
Exercise 24.2.2 – Designing Data Structures	243
24.3 Creating Lists in Python.....	244
24.4 What is a Tuple?.....	246
24.5 Creating Tuples in Python.....	246
24.6 How to Get a Value from a List or Tuple	246
Exercise 24.6.1 – Find What is Displayed	248
Exercise 24.6.2 – Using a Non-Existing Index in Lists	248
24.7 How to Alter the Value of a List Element.....	249
Exercise 24.7.1 – Find the Error	249
24.8 How to Iterate Through a List or Tuple.....	250
Exercise 24.8.1 – Finding the Sum	251
24.9 How to Add Values (Entered by the User) to a List.....	252
Exercise 24.9.1 – Displaying Words in Reverse Order	253
Exercise 24.9.2 – Displaying Positive Numbers in Reverse Order.....	254
Exercise 24.9.3 – Finding the Sum	254
Exercise 24.9.4 – Finding the Average Value.....	255
Exercise 24.9.5 – Displaying Reals Only	256
Exercise 24.9.6 – Displaying Odd Indexes Only.....	257
24.10 What is a Dictionary?	258
24.11 Creating Dictionaries in Python.....	258
24.12 How to Get a Value from a Dictionary.....	259
Exercise 24.12.1 – Using a Non-Existing Key in Dictionaries	259
24.13 How to Alter the Value of a Dictionary Element.....	260
Exercise 24.13.1 – Assigning a Value to a Non-Existing Key.....	260
24.14 How to Iterate Through a Dictionary	260
24.15 Useful Statements, Functions and Methods.....	262
24.16 Review Questions: True/False.....	265
24.17 Review Questions: Multiple Choice.....	269
24.18 Review Exercises	272
24.19 Review Questions	275
Chapter 25 More Exercises with Data Structures	277

25.1	Simple Exercises with Data Structures.....	277
	Exercise 25.1.1 – Creating a List with the Greatest Values	277
	Exercise 25.1.2 – On Which Days Was There a Possibility of Snow?	277
	Exercise 25.1.3 – Was There Any Possibility of Snow?	278
25.2	How to Use More Than One Data Structures in a Program.....	280
	Exercise 25.2.1 – Finding the Average Value.....	280
	Exercise 25.2.2 – Using a List Along with a Dictionary	281
25.3	Finding Minimum and Maximum Values in Lists.....	282
	Exercise 25.3.1 – Which Depth is the Greatest?	282
	Exercise 25.3.2 – Which Lake is the Deepest?.....	283
	Exercise 25.3.3 – Which Lake, in Which Country, Having Which Average Area, is the Deepest?.....	284
	Exercise 25.3.4 – Which Students are the Shortest?	286
25.4	Searching Elements in Data Structures	287
	Exercise 25.4.1 – Searching in a List That May Contain the Same Value Multiple Times	287
	Exercise 25.4.2 – Display the Last Names of All Those People Who Have the Same First Name.....	288
	Exercise 25.4.3 – Searching in a Data Structure that Contains Unique Values.....	288
	Exercise 25.4.4 – Searching for a Given Social Security Number	289
25.5	Review Questions: True/False.....	290
25.6	Review Exercises	290
Chapter 26 Introduction to Subprograms		293
26.1	What is a Subprogram?	293
26.2	What is Procedural Programming?	293
26.3	What is Modular Programming?	294
26.4	Review Questions: True/False.....	295
26.5	Review Questions	296
Chapter 27 User-Defined Subprograms		297
27.1	Subprograms that Return Values.....	297
27.2	How to Call a Function that Returns Values	298
27.3	Subprograms that Return no Values	300
27.4	How to Call a Function that Returns no Values.....	301
27.5	Formal and Actual Arguments	302
27.6	How Does a Subprogram Execute?.....	303
27.7	Can Two Subprograms Use Variables of the Same Name?	304
27.8	Can a Subprogram Call Another Subprogram?.....	305
27.9	Default Argument Values and Keyword Arguments.....	306
27.10	The Scope of a Variable.....	307
27.11	Review Questions: True/False.....	309
27.12	Review Exercises	311
27.13	Review Questions	312

Chapter 28 More Exercises with Subprograms	313
28.1 Some More Exercises for Extra Practice	313
Exercise 28.1.1 – Back to Basics – Calculating the Sum of Two Numbers	313
Exercise 28.1.2 – Calculating the Sum of Two Numbers Using Fewer Lines of Code!	313
Exercise 28.1.3 – A Simple Currency Converter	314
Exercise 28.1.4 – A More Complete Currency Converter	315
Exercise 28.1.5 – Finding the Average Values of Positive Integers	316
Exercise 28.1.6 – Roll, Roll, Roll the... Dice!	317
28.2 Review Exercises	318
Chapter 29 Object-Oriented Programming	321
29.1 What is Object-Oriented Programming?.....	321
29.2 Classes and Objects in Python.....	322
29.3 The Constructor and the Keyword <code>self</code>	324
29.4 Passing Initial Values to the Constructor.....	326
29.5 Class Variables vs Instance Variables.....	327
29.6 Getter and Setter Methods vs Properties.....	330
Exercise 29.6.1 – The Roman Numerals	334
29.7 Can a Method Call Another Method of the Same Class?.....	336
Exercise 29.7.1 – Doing Math	337
29.8 Class Inheritance.....	338
29.9 Review Questions: True/False.....	341
29.10 Review Exercises	341
29.11 Review Questions	345
Some Final Words from the Authors	347
Index	349