

Master the Fundamentals of Python

by
Teddy Petrou

© 2022 Teddy Petrou All Rights Reserved

Contents

1	Operators	9
1.1	Arithmetic operators	9
1.2	Operation Arguments	10
1.3	Operator Precedence	11
1.4	Comparison Operators	12
1.5	Unary Plus/Minus Operators	14
1.6	Boolean Operators	15
1.7	Assigning values to variable names	17
1.8	Comments	19
1.9	Augmented assignment statements	20
1.10	Other operators	20
1.11	Exercises for Module 1 - Operators	20
2	What is Python?	23
2.1	Multiple Implementations	24
2.2	Language Specification	24
2.3	Specification vs Implementation	25
2.4	The original Python implementation	25
2.5	Python Syntax	25
2.6	Tokens	26
2.7	Other syntax rules	27
2.8	An Interactive language	29
2.9	Running Python Interactively	29
2.10	Executing entire programs	30
2.11	Why use Python?	30
2.12	Exercises for Module 2 - What is Python?	31
3	Objects and Types	33
3.1	Every ‘value’ in Python is an ‘object’	33
3.2	Types in Python	33
3.3	Integer type	34
3.4	Boolean type	35
3.5	Float type	35
3.6	Complex type	36
3.7	None type	36
3.8	Variables in the <code>type</code> function	36
3.9	Object identity	37
3.10	Dynamic Typing	38
3.11	Built-in types	38
3.12	Attributes and methods	38
3.13	Dot Notation	39

3.14	What isn't an object	40
3.15	Exercises for Module 3 - Objects and Types	40
4	Strings	43
4.1	Built-in Types	43
4.2	String definition	44
4.3	Operators with strings	47
4.4	String methods	49
4.5	Method Chaining	54
4.6	Find the length of a string	55
4.7	String Interpolation	56
4.8	String formatting	57
4.9	Selecting substrings	64
4.10	Changing the characters of a string	68
4.11	More String Functionality	69
4.12	Test for a substring	69
4.13	Exercises for Module 4 - Strings	70
5	Lists	75
5.1	List creation	75
5.2	Selecting list items	76
5.3	Mutating Lists	78
5.4	The <code>is</code> operator	79
5.5	Variable names are references to objects	79
5.6	Discovering list methods	82
5.7	Using operators with lists	86
5.8	Reassigning slices of lists	87
5.9	Lists of lists	89
5.10	Creating a string from a list	90
5.11	Exercises for Module 5 - Lists	90
6	Ranges and Constructors	95
6.1	Ranges	95
6.2	Viewing the sequence defined by <code>range</code>	96
6.3	Constructors	97
6.4	The <code>bool</code> constructor	97
6.5	The <code>int</code> constructor	99
6.6	The <code>float</code> constructor	99
6.7	The <code>complex</code> constructor	100
6.8	The <code>str</code> constructor	100
6.9	More range functionality	100
6.10	Exercises for Module 6 - Ranges and Constructors	101
7	Module 7 - Conditional Statements	103
7.1	Conditional Statements	103
7.2	Python <code>if</code> statements	104
7.3	Ternary conditional operator	107
7.4	Implied truth values	109
7.5	Exercises for Module 7 - Conditional Statements	110
8	Module 8 - Writing Entire Programs	113
8.1	Computer programs	113
8.2	Running a Python Program	114

8.3	Source-Code Editors	115
8.4	Downloading and Installing Visual Studio Code	115
8.5	Setting up VS Code	115
8.6	Opening up Python files in VS Code	116
8.7	Creating a New Python File	116
8.8	Creating a trivia game	116
8.9	Building a Choose Your Own Adventure Game	118
8.10	Game details	118
8.11	Implementing the game	119
9	Looping	121
9.1	For-loops	121
9.2	Example for-loops	123
9.3	While-loops	125
9.4	Example while-loops	126
9.5	More on Loops	127
9.6	Nested Loops	129
9.7	Mini-Project: Craps	130
9.8	Exercises for Module 9 - Looping	132
10	List Comprehensions	135
10.1	Conditional list comprehensions	137
10.2	Ternary conditional operator	138
10.3	Complex list comprehensions	139
10.4	Implied truth values	141
10.5	Exercises for Module 10 - List Comprehensions	142
11	Built-in Functions	145
11.1	Function calling	145
11.2	Built-in functions	145
11.3	Other built-in functions	150
11.4	Exercises for Module 11 - Built-in Functions	155
12	User-defined functions	157
12.1	Positional and keyword arguments	160
12.2	Keyword-only arguments	161
12.3	Positional-only arguments	162
12.4	Documenting functions with docstrings	164
12.5	Functions are objects	165
12.6	Function attributes and methods	167
12.7	Some built-in 'functions' are not functions	168
12.8	Anonymous functions	168
12.9	The built-in <code>map</code> and <code>filter</code>	170
12.10	Rules of Thumb for Functions	172
12.11	Code Refactoring	172
12.12	Exercises for Module 12 - User-Defined Functions	172
13	Tic-Tac-Toe	177
13.1	The functions	177
13.2	Test your functions	177
13.3	Play a game	180
13.4	Solution	180

14 Tuples, Sets, and Dictionaries	183
14.1 Tuples	183
14.2 Selecting items from a tuple	186
14.3 Using operators with tuples	186
14.4 Tuple Methods	187
14.5 Why use tuples when lists are more flexible?	187
14.6 Sets	188
14.7 Using the <code>set</code> constructor	189
14.8 Set membership checking	190
14.9 Mathematical set operations	191
14.10 Set methods	193
14.11 The birthday paradox	193
14.12 Dictionaries	195
14.13 Selecting values in a dictionary	197
14.14 Dictionary membership checking	198
14.15 Dictionary methods	198
14.16 Mutating dictionaries	200
14.17 Iterating through dictionaries	201
14.18 Tuple, set, and dictionary comprehensions	202
14.19 Unpacking iterables	203
14.20 The <code>zip</code> function	207
14.21 Exercises for Module 14 - Tuples, Sets, and Dictionaries	208
15 Python Modules	211
15.1 Importing a module	211
15.2 Different ways to use the <code>import</code> statement	213
15.3 Highlights from the standard library	215
15.4 The <code>re</code> module - regular expressions	215
15.5 The <code>datetime</code> module	216
15.6 The <code>calendar</code> module	218
15.7 The <code>time</code> module	219
15.8 The <code>collections</code> module	219
15.9 The <code>copy</code> module	223
15.10 The <code>bisect</code> module	224
15.11 The <code>math</code> module	225
15.12 The <code>fractions</code> module	226
15.13 The <code>statistics</code> module	226
15.14 The <code>sys</code> module	227
15.15 Third-Party Libraries	227
15.16 Exercises for Module 15 - Python Modules	227
16 User-Defined Python Modules	229
16.1 Modular Programming	229
16.2 Creating your own Python Modules	229
16.3 How does Python find modules?	230
16.4 “Private” variable names	232
16.5 Importing modules within modules	233
16.6 The <code>my_array.py</code> module	233
16.7 Unit testing	234
16.8 Importing edited modules into a Jupyter Notebook	235
17 Errors and Exceptions	237

17.1 Syntax Errors	237
17.2 Errors vs Exceptions	238
17.3 NameError	239
17.4 “Raised” exceptions	239
17.5 KeyError	239
17.6 IndexError	240
17.7 TypeError	240
17.8 ValueError	240
17.9 AttributeError	241
17.10 Other exceptions	241
17.11 Purposefully raising exceptions	241
17.12 Raising errors on bad input	242
17.13 Handling exceptions	243
17.14 Catching multiple different errors	245
17.15 The <code>else</code> and <code>finally</code> blocks	245
17.16 More on Exceptions	246
17.17 Exercises	246