

Contents

Prefacexi
Acknowledgmentsxv
Chapter 1 Introducing Python	1
1.1 Introduction	1
1.2 Exploring the features of Python	1
1.3 Scripting versus programming	2
1.4 Using scripting in ArcGIS Pro	3
1.5 Python history and versions	4
1.6 The structure of this book	5
1.7 Exploring how Python is used	7
Points to remember	12
Key terms	12
Review questions	13
Chapter 2 Working with Python editors	15
2.1 Introduction	15
2.2 Python installation	15
2.3 Using a Python editor or IDE	17
2.4 Using IDLE	19
2.5 Using PyCharm as your Python IDE	25
2.6 Notes on other IDEs	35
2.7 Using notebooks	35
2.8 Using the Python window	37
2.9 Important notes about Python scripts and sample code in this book	38
2.10 Writing and running code in the Python window	39
2.11 Getting assistance in the Python window	44

2.12	Exploring Python window options	49
2.13	Saving your work in the Python window	49
2.14	Loading code into the Python window	50
2.15	Using IDEs for ArcGIS Desktop 10.x	51
	Points to remember	53
	Key terms	54
	Review questions	54
Chapter 3	Geoprocessing in ArcGIS Pro	55
3.1	Introduction	55
3.2	What is geoprocessing?	55
3.3	Using toolboxes and tools	56
3.4	Types and categories of tools	60
3.5	Running tools using tool dialog boxes	61
3.6	Specifying environment settings	68
3.7	Using batch processing and dynamic naming	72
3.8	Using models and ModelBuilder	79
3.9	Using scripting	83
3.10	Running scripts as tools	86
3.11	Scheduling a Python script to run at prescribed times	88
	Points to remember	88
	Key terms	89
	Review questions	89
Chapter 4	Learning Python language fundamentals	91
4.1	Introduction	91
4.2	Locating Python documentation and resources	91
4.3	Working with data types and structures	92
4.4	Working with numbers	93
4.5	Working with variables and naming	95
4.6	Writing statements and expressions	99
4.7	Using strings	100
4.8	Using lists	103
4.9	Working with Python objects	104

- 4.10 Using functions 106
- 4.11 Using methods 109
- 4.12 Working with strings 109
- 4.13 Printing and string formatting 114
- 4.14 Using Boolean logic 117
- 4.15 Working with lists 120
- 4.16 Working with tuples 127
- 4.17 Working with dictionaries 128
- 4.18 Using sets 131
- 4.19 Working with paths 133
- 4.20 Working with modules 135
- 4.21 Controlling workflow using conditional statements 138
- 4.22 Compound statements and indentation 140
- 4.23 Controlling workflow using looping structures 141
- 4.24 Working with long lines of code 143
- 4.25 Getting user input 147
- 4.26 File management 149
- 4.27 Commenting scripts 151
- 4.28 Following coding guidelines 153
 - Points to remember 155
 - Key terms 156
 - Review questions 157

Chapter 5 Geoprocessing using Python 159

- 5.1 Introduction 159
- 5.2 Using the ArcPy package 159
- 5.3 Importing ArcPy 160
- 5.4 Setting up a workspace 161
- 5.5 Using geoprocessing tools 162
- 5.6 Working with Result objects 167
- 5.7 Working with toolboxes 169
- 5.8 Using functions 170
- 5.9 Using classes for tool parameters 172
- 5.10 Working with coordinate systems 174

5.11	Using environments	178
5.12	Working with tool messages	179
5.13	Working with licenses	185
5.14	Accessing ArcGIS Pro help	190
	Points to remember	193
	Key terms	193
	Review questions	194
Chapter 6	Exploring spatial data	195
6.1	Introduction	195
6.2	Checking for the existence of data	195
6.3	Describing data	197
6.4	Listing data	201
6.5	Workspaces and listing data	206
6.6	Using lists in <code>for</code> loops	214
6.7	Working with lists	217
	Points to remember	220
	Key terms	220
	Review questions	221
Chapter 7	Debugging and error handling	223
7.1	Introduction	223
7.2	Working with syntax errors	223
7.3	Recognizing exceptions	227
7.4	Using debugging	228
7.5	Using debugging tips and tricks	236
7.6	Error handling for exceptions	237
7.7	Raising exceptions	238
7.8	Handling exceptions	239
7.9	Handling geoprocessing exceptions	243
7.10	Using other error-handling methods	246
7.11	Watching for common errors	246
	Points to remember	247
	Key terms	248
	Review questions	248

Chapter 8 Manipulating spatial and tabular data 249

- 8.1** Introduction 249
- 8.2** Using cursors to access data 249
- 8.3** Using SQL expressions in Python 256
- 8.4** Working with table and field names 261
- 8.5** Parsing table and field names 263
- 8.6** Python expressions for field calculations 264
- 8.7** Working with text files 277
- 8.8** Working with CSV files 284
 - Points to remember 287
 - Key terms 288
 - Review questions 288

Chapter 9 Working with geometries 289

- 9.1** Introduction 289
- 9.2** Working with geometry objects and tokens 289
- 9.3** Understanding geometry objects 291
- 9.4** Reading geometries 295
- 9.5** Working with multipart features 299
- 9.6** Working with polygons with holes 301
- 9.7** Writing geometries 303
- 9.8** Using cursors to set the spatial reference 310
- 9.9** Using geometry objects to work with geoprocessing tools 312
 - Points to remember 313
 - Key terms 314
 - Review questions 314

Chapter 10 Working with rasters 315

- 10.1** Introduction 315
- 10.2** Understanding raster data 315
- 10.3** Using the Spatial Analyst and Image Analyst modules 317
- 10.4** Working with raster objects 318
- 10.5** Describing raster properties 321
- 10.6** Listing rasters 327

10.7	Raster analysis using geoprocessing tools	328
10.8	Using map algebra operators	332
10.9	Using classes of the <code>arcpy.sa</code> and <code>arcpy.ia</code> modules	338
10.10	Working with the Raster Cell Iterator	342
10.11	Using Spatial Analyst functions	346
10.12	Working with NumPy arrays	349
	Points to remember	352
	Key terms	352
	Review questions	353
Chapter 11	Map scripting	355
11.1	Introduction	355
11.2	Working with the ArcPy mapping module	355
11.3	Referencing projects	356
11.4	Accessing project properties and methods	358
11.5	Working with maps	361
11.6	Working with layers	364
11.7	Adding, removing, inserting, and moving layers	369
11.8	Working with layer symbology	374
11.9	Applying graduated color symbology	380
11.10	Applying symbology to raster layers	382
11.11	Working with layouts	384
11.12	Working with maps, map frames, and cameras	387
11.13	Exporting and printing layouts	389
11.14	CIM access using Python	392
11.15	Other functionality of <code>arcpy.mp</code>	392
	Points to remember	393
	Key terms	394
	Review questions	394