

Contents

<i>Preface</i>	xi
<i>Acknowledgments</i>	xiv

Part 1: Learning the fundamentals of Python and geoprocessing 1

Chapter 1: Introducing Python	3
1.1 Introduction	3
1.2 Exploring the features of Python	3
1.3 Comparing scripting vs. programming	4
1.4 Using scripting in ArcGIS	5
1.5 Python history and versions	5
1.6 About this book	6
1.7 Exploring how Python is used	8
1.8 Choosing a Python script editor	13
Points to remember	19
Chapter 2: Geoprocessing in ArcGIS	21
2.1 Introduction	21
2.2 What is geoprocessing?	21
2.3 A note on ArcObjects	23
2.4 Using toolboxes and tools	24
2.5 Learning types and categories of tools	25
2.6 Running tools using tool dialog boxes	26
2.7 Specifying environment settings	30
2.8 Using batch processing	32
2.9 Using models and ModelBuilder	34
2.10 Using scripting	38
2.11 Running scripts as tools	41
2.12 Converting a model to a script	44
2.13 Scheduling a Python script to run at prescribed times	45
Points to remember	47

Chapter 3: Using the Python window	49
3.1 Introduction	49
3.2 Opening the Python window	49
3.3 Writing and running code	50
3.4 Getting assistance	52
3.5 Exploring Python window options	54
3.6 Saving your work	55
3.7 Loading code into the Python window	56
Points to remember	57
Chapter 4: Learning Python language fundamentals	59
4.1 Introduction	59
4.2 Locating Python documentation and resources	59
4.3 Working with data types and structures	60
4.4 Working with numbers	60
4.5 Working with variables and naming	62
4.6 Writing statements and expressions	63
4.7 Using strings	64
4.8 Using lists	66
4.9 Working with Python objects	66
4.10 Using functions	68
4.11 Using methods	69
4.12 Working with strings	70
4.13 Working with lists	74
4.14 Working with paths	78
4.15 Working with modules	79
4.16 Controlling workflow using conditional statements	81
4.17 Controlling workflow using loop structures	83
4.18 Getting user input	85
4.19 Commenting scripts	86
4.20 Working with code in the PythonWin editor	88
4.21 Following coding guidelines	89
Points to remember	90

Chapter 5: Geoprocessing using Python	95
5.1 Introduction	95
5.2 Using the ArcPy site package	95
5.3 Importing ArcPy	96
5.4 Working with earlier versions of ArcGIS	97
5.5 Using tools	98
5.6 Working with toolboxes	104
5.7 Using functions	106
5.8 Using classes	107
5.9 Using environment settings	110
5.10 Working with tool messages	112
5.11 Working with licenses	115
5.12 Accessing ArcGIS Desktop Help	119
Points to remember	122
Chapter 6: Exploring spatial data	123
6.1 Introduction	123
6.2 Checking for the existence of data	123
6.3 Describing data	125
6.4 Listing data	127
6.5 Using lists in for loops	131
6.6 Working with lists	132
6.7 Working with tuples	133
6.8 Working with dictionaries	134
Points to remember	137
Chapter 7: Manipulating spatial data	139
7.1 Introduction	139
7.2 Using cursors to access data	139
7.3 Using SQL in Python	144
7.4 Working with table and field names	146
7.5 Parsing table and field names	148
7.6 Working with text files	149
Points to remember	158
Chapter 8: Working with geometries	159
8.1 Introduction	159
8.2 Working with geometry objects	159
8.3 Reading geometries	160
8.4 Working with multipart features	164
8.5 Working with polygons with holes	167
8.6 Writing geometries	169
8.7 Using cursors to set the spatial reference	172
8.8 Using geometry objects to work with geoprocessing tools	174
Points to remember	175

Chapter 9: Working with rasters	177
9.1 Introduction	177
9.2 Listing rasters	177
9.3 Describing raster properties	178
9.4 Working with raster objects	182
9.5 Working with the ArcPy Spatial Analyst module	183
9.6 Using map algebra operators	184
9.7 Using the ApplyEnvironment function	187
9.8 Using classes of the <code>arcpy.sa</code> module	188
9.9 Using raster functions to work with NumPy arrays	192
Points to remember	193
Part 3: Carrying out specialized tasks	195
Chapter 10: Map scripting	197
10.1 Introduction	197
10.2 Working with the ArcPy mapping module	197
10.3 Opening map documents	198
10.4 Accessing map document properties and methods	200
10.5 Working with data frames	201
10.6 Working with layers	203
10.7 Fixing broken data sources	208
10.8 Working with page layout elements	213
10.9 Exporting maps	216
10.10 Printing maps	218
10.11 Working with PDFs	219
10.12 Creating map books	220
10.13 Using sample mapping scripts	222
Points to remember	225
Chapter 11: Debugging and error handling	227
11.1 Introduction	227
11.2 Recognizing syntax errors	227
11.3 Recognizing exceptions	230
11.4 Using debugging	230
11.5 Using debugging tips and tricks	237
11.6 Error handling for exceptions	238
11.7 Raising exceptions	239
11.8 Handling exceptions	241
11.9 Handling geoprocessing exceptions	244
11.10 Using other error-handling methods	247
11.11 Watching for common errors	247
Points to remember	249

Chapter 12: Creating Python functions and classes	251
12.1 Introduction	251
12.2 Creating functions	251
12.3 Calling functions from other scripts	255
12.4 Organizing code into modules	258
12.5 Using classes	260
12.6 Working with packages	264
Points to remember	267
Part 4: Creating and using script tools	269
Chapter 13: Creating custom tools	271
13.1 Introduction	271
13.2 Why create your own tools?	271
13.3 Steps to creating a tool	273
13.4 Editing tool code	279
13.5 Exploring tool parameters	280
13.6 Setting tool parameters	285
13.7 Examining an example script tool	290
13.8 Customizing tool behavior	293
13.9 Working with messages	294
13.10 Handling messages for stand-alone scripts and tools	297
13.11 Customizing tool progress information	297
13.12 Running a script in process	301
Points to remember	302
Chapter 14: Sharing tools	303
14.1 Introduction	303
14.2 Choosing a method for distributing tools	303
14.3 Handling licensing issues	304
14.4 Using a standard folder structure for sharing tools	305
14.5 Working with paths	306
14.6 Finding data and workspaces	308
14.7 Creating a geoprocessing package	310
14.8 Embedding scripts and password-protecting tools	311
14.9 Documenting tools	312
14.10 Example tool: Market analysis	315
Points to remember	321
<i>Appendix A Data source credits</i>	323
<i>Appendix B Data license agreement</i>	327
<i>Appendix C Installing the data and software</i>	331
<i>Index</i>	337