Creating Python® Scripts for ArcGIS®

STUDENT EDITION

Copyright © 2022 Esri

All rights reserved.

Course version 7.0. Version release date February 2022.

Printed in the United States of America.

The information contained in this document is the exclusive property of Esri. This work is protected under United States copyright law and other international copyright treaties and conventions. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system, except as expressly permitted in writing by Esri. All requests should be sent to Attention: Director, Contracts and Legal, Esri, 380 New York Street, Redlands, CA 92373-8100, USA.

Export Notice: Use of these Materials is subject to U.S. export control laws and regulations including the U.S. Department of Commerce Export Administration Regulations (EAR). Diversion of these Materials contrary to U.S. law is prohibited.

The information contained in this document is subject to change without notice.

Commercial Training Course Agreement Terms: The Training Course and any software, documentation, course materials or data delivered with the Training Course is subject to the terms of the Master Agreement for Products and Services, which is available at https://www.esri.com/~/media/Files/Pdfs/legal/pdfs/ma-full/ma-full.pdf. The license rights in the Master Agreement strictly govern Licensee's use, reproduction, or disclosure of the software, documentation, course materials and data. Training Course students may use the course materials for their personal use and may not copy or redistribute for any purpose. Contractor/Manufacturer is Esri, 380 New York Street, Redlands, CA 92373-8100, USA.

Esri Trademarks: Esri trademarks and product names mentioned herein are subject to the terms of use found at the following website: https://www.esri.com/legal/copyright-trademarks.html.

Other companies and products or services mentioned herein may be trademarks, service marks or registered marks of their respective mark owners.

Table of Contents

Esri resources for your organization

Course introduction

Course introduction
Course goals
Installing the course data
Icons used in this workbook

1 Python automation for your organization

Lesson introduction
Benefits of Python automation
The Python script creation workflow
Integrating Python in ArcGIS Pro
Python development and run environments
Accessing Python
Adding Python packages to ArcGIS Pro
Lesson review
Answers to Lesson 1 questions

2 Using Python to access geoprocessing tools

Lesson introduction

Viewing parameters in a geoprocessing tool

Explore the syntax of a geoprocessing tool

Ways to use variables in a script

Using variables in a script

Exercise 2A: Create a simple script with variables

Sign in to ArcGIS Pro

Create a new ArcGIS Pro project

Add data for the affected area

Evaluate the syntax of the Copy Features tool

Evaluate the syntax of the Buffer tool

Combine the geoprocessing tools in a script

Verify the script in PyCharm

Python troubleshooting techniques

Troubleshooting errors in a script

Exercise 2B: Add troubleshooting techniques to a Python script

Add informative comments

Add print functions

Comment existing code

Create a variable

Use debugging tools in PyCharm

Lesson review

3 Using Describe properties in geoprocessing tools

Lesson introduction

Accessing properties with a Describe function

Identify available Describe function properties

Describe syntax and usage

Accessing Describe properties

Exercise 3: Use the Describe function in a geoprocessing script

Create a new map

Examine the properties of a feature class

Use the Describe function to examine properties

Create a new Python script in PyCharm

Create a Describe object

Use Describe properties to create a new feature class

Verify the new feature class

Using the da. Describe object in a geoprocessing script

Lesson review

Answers to Lesson 3 questions

4 Automating Python scripts with lists

Lesson introduction

List functions in Python

Examine the ListFiles function

Finishing the List function syntax

Exercise 4A: Prepare to automate with Python lists

Create a new map

Create a list of workspaces

Create a list of features

Create a list of fields

Using a for loop

Using a for loop to iterate over lists

Exercise 4B: Automate a geoprocessing workflow using loops

Create a new Python script in PyCharm

Copy feature classes from a workspace

Verify the new feature classes

Lesson review

Answers to Lesson 4 questions

5 Working with cursors

Lesson introduction

Types of cursors

Examine cursors

Determine which cursor to use

Exploring cursor syntax

Using cursors in a workflow

Apply the cursor workflow

Exercise 5: Read and update values in a feature class

Create a new Python script in PyCharm

Set up the Python script

Create an Update cursor

Create a Search cursor

Write values to a CSV file

Run the script in PyCharm

Create a new map

Verify the script results

Lesson review

Answers to Lesson 5 questions

6 Geoprocessing with geometry objects

Lesson introduction

Benefits of geometry objects

Workflows to create geometry objects

Discovering polyline geometry objects

Components of a geometry object

Discover geometry object methods

Exercise 6: Convert coordinates into affected area polygons

Open a Python script in PyCharm

Evaluate the Python script

Create the geometry object from a list

Run the script in PyCharm

Create a new map

Verify the script output feature classes

Lesson review

Answers to Lesson 6 questions

7 Using ArcGIS Notebooks

Lesson introduction

Capabilities of ArcGIS Notebooks

Benefits of ArcGIS Notebooks

Explore a sample notebook

Impact of data engineering on analysis results

Evaluate data changes in a notebook in ArcGIS Pro

Exercise 7: Create a notebook in ArcGIS Pro

Create a new map

Create a new notebook

Add Markdown to the notebook

Import Python site packages

Add Python code to query the data

Add Python code to create a chart
Add Python code to perform analysis
Lesson review
Answers to Lesson 7 questions

8 Creating a Python script tool

Lesson introduction
Improving script accessibility
Components of a Python script tool
Accepting user input
Parameter identification
Exercise 8: Create a Python script tool
Prepare the Python script for user input
Create a new map
Create a script tool in ArcGIS Pro
Run the Python script tool
Lesson review
Answers to Lesson 8 questions

9 Adding validation to script tools

Lesson introduction
Customizing script tool behavior
Using validation to create customizations
Validate script tool inputs using ToolValidator methods
Exercise 9: Add custom messaging to a script tool
Open the script tool validation properties
Add code to the validator script
Verify the validator code
Verify the updated tool messaging
Lesson review
Answers to Lesson 9 questions

10 Using Python script tools in ArcGIS

Lesson introduction
Methods to share a Python script tool
Determining the appropriate method
Workflow to share a Python script tool
Exercise 10: Share a geoprocessing package
Start ArcGIS Pro
Analyze the geoprocessing package
Modify the metadata
Share the geoprocessing package
Workflow review
Sharing a web tool within ArcGIS
Answers to Lesson 10 questions