Lesson Plan

# Lesson 9: Final Exercise

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| **Lesson Overview** | | | |
| **Lesson Length** | 6 hours (360 minutes) | | |
| **Overview** | This exercise requires students to apply their knowledge of the Python scripting language and tests their ability to analyze real-world data utilizing Python. Students have 360 minutes to complete the Fundamentals of Problem Solving Using Python I Final Exercise. | | |
| **Objectives**   * **Domain:** Cognitive * **Level:** Applying | Using conditionals, loops, Python dictionaries, local data, the CSV Library, and the Glob Library, students will be able to:   * TLO 1: Examine the implications of using computation to solve a problem   + ELO 1.1: Discuss best practices for using computation to solve a problem   + ELO 1.2: Suggest types of problems that can be solved through computation   + ELO 1.3: Show how computation can solve a problem * TLO 2: Recognize key computer science concepts   + ELO 2.1: Identify data types used in Python scripting   + ELO 2.2: Identify data structures used in Python scripting   + ELO 2.3: Define variables and strings   + ELO 2.4: Recognize how queries operate * TLO 3: Demonstrate the ability to build basic scripts using Python scripting language   + ELO 3.1: Use various data types and structures in Python Scripting   + ELO 3.2: Collect data using Python scripting   + ELO 3.3: Extract data using Python scripting   + ELO 3.4: Develop advanced data structures using Python scripting | | |
| **Instructional Methods** | Informal lecture, practical exercises | | |
| **Assessment Strategies** | Informal: N/A  Formal: Final exercise | | |
| **Materials and Equipment Needed** | Required:   * SBU * Jupyter Notebook * Python * FinalExerciseTrackingSheet.pptx * Bb CoP   Optional:   * N/A | | |
| **Background Resources** | Resources:   * NGA SME * Technical facilitators   Subject matter/content questions may be referred to:   * Jeremy DeBrow, Course Manager   Jeremy.R.Debrow@nga.mil  National Geospatial-Intelligence College (NGC) HDNPE Branch  Unclassified: 571-557-7583 | | |
| **Comments** | Ensure that the Final Exercise has been activated in the Community of Practice (check the Adaptive Release status) | | |
| **Lesson Sequence** | | | |
| **Lesson Topic** | **Instructional Method** | | **Time**  **(mins)** |
| Introduction | Informal lecture | | 05 |
| Assessment: Final Exercise (Admin) | Informal lecture | | 05 |
| Assessment: Final Exercise (Introduction) | Informal lecture | | 05 |
| Assessment: Final Exercise Part 1 | Practical exercise | | 120 |
| Assessment: Final Exercise Part 2 | Practical exercise | | 120 |
| Assessment: Final Exercise Part 3 | Practical exercise | | 100 |
| Conclusion | Informal lecture | | 05 |
| **Lesson Outline** | | | |
| **Introduction** | | | |
| Introduction | * **Attention** (to be personalized by instructor) * **Motivation** (to be personalized by the instructor) * **Overview** (to be personalized by the instructor)   + Learning objectives   + Lesson topics/main points * **Rules of Engagement** (to be personalized by the instructor) | | |
| **Body** | | | |
| ***Lesson Topic*** | ***Main Points/Notes*** | ***Personalization*** | |
| Assessment: Final Exercise (Admin) | **Informal lecture (05 minutes)**  **9.0. Introduction**  **9.0.1. Objectives**  *(Facilitator Note: The final exercise is designed to capture a students understanding of the following objectives.)*  Using conditionals, loops, Python dictionaries, local data, the CSV Library, and the Glob Library, students will be able to:   * Examine the implications of using computation to solve a problem   + Discuss best practices for using computation to solve a problem   + Suggest types of problems that can be solved through computation   + Show how computation can solve a problem * Recognize key computer science concepts   + Identify data types used in Python scripting   + Identify data structures used in Python scripting   + Define variables and strings   + Recognize how queries operate * Demonstrate the ability to build basic scripts using Python scripting language.   + Use various data types and structures in Python scripting.   + Collect data using Python scripting.   + Extract data using Python scripting.   + Develop advanced data structures using Python scripting.   **9.0.2. Overview:**  This final exercise is a formal evaluation of the Python scripting language at a fundamental level. This exercise requires students to apply their knowledge of the Python scripting language and tests their ability to analyze a real-world dataset utilizing Python.  *(Facilitator Note: Provide students with an overview of the entire final exercise. Explain each of the sections and ensure students understand what is expected from them in each section. Describe to students the review process that takes place after each task has been completed and the process of submitting the final exercise via Blackboard.)*  This final exercise is divided into three parts   * Part 1 is focused on describing the dataset * Part 2 is focused on conducting exploratory analysis of the dataset * Part 3 is focused on restructuring the data for use outside of Python   **9.0.3. Notes:**  This Final Exercise is an open-book assessment.   * You are free to use the following:   + All of the notes taken during class   + All of the provided student materials (including all solutions)   + All of the available search engines/online tools   + Facilitators’/classmates’ assistance   **9.0.4. Collaboration Policy**:  *(Facilitator Note: Explain to students that sharing .ipynb files with classmates is not considered a form of collaboration. All students are expected to explain their answers to a technical facilitator during each review.*  During the final exercise, students are encouraged to collaborate. If you choose to collaborate with fellow students, any code cells that were developed as part of a collaborative effort must be annotated by commenting in (##) the names of all collaborators. When asked by a technical facilitator, students should be able to explain how each answer was generated. |  | |
| Assessment: Final Exercise Introduction | **Informal lecture (05 minutes)**  **9.0.5. Final Exercise**  Using the “best practices” you have learned during the past week, how would you address the following problem?  You just got hired as an analyst for LA Parking Enforcement. You have a dataset that contains information about Los Angeles Parking Enforcement's ticketing history and you want to better understand patterns around the tickets distributed in the area.  In your current role, you are expected to generate a report that addresses one of the following, in regard to Parking Violations:   * Fines collected due to parking violations * Frequency of tickets recieved by state * What time of day are most tickets written   You will also need to create a text file that contains the findings so you can share your results with your management team. |  | |
| Assessment: Final Exercise (Part 1) | **Practical exercise (120 minutes)**  **9.1. Part 1: Describe the Parking Violations Dataset**  *(Facilitator Note: See the instructor notebook for potential solutions)*  First, you will need to explore the data to see what sort of data you have. Take some time to explore and characterize the dataset. The data for this final exercise can be found in the following folder. “data/parking\_records/”  Open a few of the files at random to determine what type of data you are working with. Begin the final exercise once you have a good understanding of the dataset.   * 9.1.1. Identify the types of data that are in the dataset (i.e., Booleans, strings, integers).   + Comments are sufficient to answer this question. No actual code is required. * 9.1.2. Look at the contents of the data folder and identify any issues or inconsistencies.   + What are the file formats? Can you identify any limitations, inconsistencies, or distortions of the data?   + Comments are sufficient to answer this question. No actual code is required. * 9.1.3. Use Python to Identify all the Files   + Using the glob library, create a list of the filenames in the folder * 9.1.4. Read in the data.   + Use the list of filenames created in 9.1.3 to read in all the files. Use the DictReader from the CSV library so that your final data structure is a list of dictionaries.   *(Facilitator Note: If students need help with this prompt give them the following hint: Read data files into a dictionary, where the key is an employee's ID number and the value is the employee's training dictionary.)*   * 9.1.5. Identify the number of records in your list.   + How many records are in your list?   *(Facilitator Note: Review the students' work as they reach each of the STOP points. After they have successfully completed Part 1 of the final exercise, initial the exercise tracking sheet (FinalExerciseTrackingSheet.pptx) located at their desk. Direct students to begin Part 2.)* |  | |
| Assessment: Final Exercise (Part 2) | **Practical exercise (120 minutes)**  **9.2. Part 2: Analyze the Data**  *(Facilitator Note: See the instructor notebook for potential solutions)*   * 9.2.1 Select only ONE of the three questions listed below:   + You will be using the question you select to work through Part 2 and Part 3 of the Exercise.   + 1. Calculate Total Fines Collected By Parking Violations   Your managers are interested in the amount of money they have collected from all the parking violations in the area. For each of the violations in the dataset, locate the fine amount and add it to a grand total of fines collected. Note, some of the values for fine amount are empty; you will need to replace its value before trying to add the fines together.9.2.2. Identify the courses any employee has not taken   * + 2. Evaluate the Number of Violations by State   Parking Enforcement wants to know which states they write tickets for most often. Create a dictionary where the key is the state represented on the vehicles licence plate and the value is the number of times a vehicle from that state was given a ticket. Vehichles from which state recieved the most violations? How many violations did they recieve?   * + 3. Determine Violation Count by Time of Day   Parking Enforcement wants to better understand what time of day most of their tickets are issued ('Issue time'). In the dataset, Issue time is stored as a string between '0100.00' and '2400.00'.  Create variables to hold the number of parking violations that occured at each part of the day: Morning, Afternoon, and Night. Which time of day does Parking Enforcement issue the most tickets?   * 9.2.2. Apply Computational Thinking   *(Facilitator Note: Review the students' work as they reach each of the STOP points. After they have successfully completed Part 2 of the final exercise, initial the exercise tracking sheet [FinalExerciseTrackingSheet.pptx] located at their desk. Direct students to begin Part 3.)* |  | |
| Assessment: Final Exercise: (Part 3) | **Practical exercise (100 minutes)**  **9.3 Part 3: Write the Data Out**  *(Facilitator Note: See the instructor notebook for potential solutions)*   * 9.3.1. Write the data to a file   + Using the variable containing the results you found in Part 2, create a string explaining your findings. Write that string to a text file located in the 'data/parking\_records/' folder.   For example, the file may contain something like “Parking enforcement collected a total of $150 in fines”.  *(Facilitator Note: Review the students' work as they reach each of the STOP points. After they have successfully completed Part 3 of the final exercise, initial the exercise tracking sheet [FinalExerciseTrackingSheet.pptx] located at their desk. Direct students to submit the course and complete the end of course survey.)* |  | |
| **Conclusion** | | | |
| Conclusion | *Facilitator Note: The following administrative notes must be provided to each student after they complete their final exercise:*   * *Save your completed FinalExercise\_Student\_v1.0.ipynb file as: YourBlackboardUserID\_Cohort#\_Final.ipynb*   + *Example: 1234567\_24\_Final.ipynb* * *Save your YourBlackboardUserID\_Cohort#\_Final.ipynb as a .zip file*   + *Right-click the file*   + *Select Send to>Compressed (zipped) folder* * *Submit YourBlackboardUserID\_Cohort#\_Final.zip via Blackboard.*   + *Log in to Blackboard and go to the Data Literacy Community of Practice (CoP)*   + *Select CSCI2011 - Fundamentals of Problem Solving Using Python I (left side of the CoP)*   + *Select CSCI2011 Final Exercise*   + *Select Submit CSCI2011 Final Exercise*   + *Under the Assignment Submission section, attach your reviewed and completed YourBlackboardUserID\_Cohort#\_Final.zip file*   + *Select Submit*   + *Confirm with the facilitator that YourBlackboardUserID\_Cohort#\_Final.zip was received* * *Complete the end of course survey.*   + Log in to Blackboard and go to the Data Literacy Community of Practice (CoP)   + Select CSCI2011 - Fundamentals of Problem Solving Using Python I (left side of the CoP)   + Select CSCI2011 End of Course Survey   + Select the EOC Survey associated with your assigned session * **Remotivation** (to be personalized by instructor) * **Closure** (to be personalized by instructor) | | |