STSCI 4060 HW 1

(Assigned on 2/8/2019; Due: 11:59 PM, 2/15/2019)

General Instructions

- Do your own work. Cornell's code of academic integrity is strictly enforced!
- What and how to turn in: Submit a zip file named HW1_LastName_FirstName.zip to Blackboard. Your zip file should contain the following files:
  - Your Python program named HW1_Code_LastName_FirstName.py.
  - Your results named HW1_results_LastName_FirstName.txt.
- Coding requirement: Use a print statement, at the beginning of your Python program, first display the name of the homework and your full name, NetID, and then the question number. For each question, you first display what it does (which is a kind of documentation of your code), and then display the sub-questions (if any) in order, explaining what this sub-question does. Finally, display your result if any, i.e., the output of your code. You should leave a blank line between the sub-questions.
- Up to 10 points will be taken off if above coding and submission requirements are violated.

  For example, the beginning of your output should be something like

  STSCI 4060 HW1
  Name: FirstName LastName
  NetID: Your NetID

  ****** Question 1 ******

  This program is to manipulate a string using a format string, string methods, and a tuple.

  A. Define a string variable, story, to hold the content of the story including its layout.

1. In the IDLE editor window, you code the following story using a format string and a tuple. Here is the story:

   Once upon a time, deep in an ancient
   jungle, there lived a tiger. This tiger
   liked to eat fish, but the jungle had
   very little fish to offer. One day, an
   explorer found the tiger and discovered
   it liked fish. The explorer took the
   tiger back to NYC, where it could
   eat as much fish as it wanted. However,

the tiger became homesick, so the
explorer brought it back to the jungle,
leaving a large supply of fish.

-- The End of the Story --

A. Define a variable called “story” to hold the content of the story, keeping the same layout as above. Display the content of the story. **(5 points)**
B. Change the content of the story into a format string by replacing the words “tiger” and “fish” with a format symbol with the replace() string method. (Hint: use a statement like story = story.replace() so that the variable story holds the current content of the story). Display the story (i.e., the format string) to see if you have made the changes. **(10 points)**
C. Create a tuple called “t1” to hold the words of “tiger” and “fish” so that the tuple can be used to restore the story to its original condition by using a string format operator (%). Display the story again to show if you have restored the story. **(10 points)**
D. Now programmatically create a different version of the story by changing the animal and its food from “tiger’ and “fish” to “monkey” and “bananas.” You should go through similar steps from B to C. **(15 points)**

2. Using the final story created in Question1, write a program to use a format string and a dictionary to format and change the story.

   New knowledge: You can include a key of a dictionary in a format string in the form of “%(key)s” as a format symbol, as a result, every occurrence of “%(key)s” in the format string will be replaced by the value of the key. For example, if you have the following format string: myStr = ‘The person lives in %(city)s and has to take a %(vehicle)s every day.’, and a dictionary: myDict = {‘city’:’Ithaca’, ‘vehicle’:’bus’}. After you apply the string format operator: myStr % myDict, you get “The person lives in Ithaca and has to take a bus every day.”

   A. Using the replace() method, replace the word "monkey" with "%(animal)s", "bananas" with "%(food)s", and NYC with "%(city)s ." **(10 points)**
   B. Define a dictionary, myDict, to hold the following keys and values. The keys are animal, food, and city and the values are cat, mice and Beijing respectively. Display the dictionary by starting with “The dictionary is: ” to confirm that myDict has been successfully created. Then, use the string format operator and apply the dictionary to the format string. Display the updated story. **(10 points)**
   C. Using assignment statements ONLY, update the dictionary values with the values of "fox", "rabbits", and "London" respectively, and then display the updated dictionary and the story after you have applied the updated dictionary to the format string. **(10 points)**

3. Write a program to calculate the dot product of two vectors (review your Linear Algebra notes for the definition of dot product of the n-vectors if needed). Here

lists are used to represent n-vectors. Suppose you have two 4-vectors **u** and **v** below

$$\boldsymbol{u} = \begin{bmatrix} 10 \\ -2 \\ 3 \\ 44 \end{bmatrix}, \quad \boldsymbol{v} = \begin{bmatrix} 20 \\ 3 \\ -2 \\ 11 \end{bmatrix}$$

Treat these two vectors as 4X1 matrices, and define them using lists (refer to the lecture notes). Calculate the dot product **u•v**. Remember a single element of a matrix is extracted with a double index. In your output, you are required to display the two lists (starting with a phrase like "The list representation of vector u is ") and the result (starting with a phrase like "The dot product u•v is "). Note that in this homework you are not required to write a general-purpose Python program that is capable of processing all dot product calculations, that is, you only need to take care of the two vectors given in this question.

(20 points)