UCF Physics PHZ 3150: Introduction to Numerical Computing
Homework 6
Due September 29 2022

Goals: Become familiar with Python, strings, dictionaries and plotting.
Reading and study: Read Think Python Chapters 8 and 11.

Problems to Hand In: For this assignment, your log is part of your homework. In one of the entries, it should identify the start and end of HW6 and list the problem numbers in order. Keep notes about what you are doing for each exercise/problem, as well as the answers to the problems. If you made a HW6 entry in your log in a prior session and want to change it, just copy it to the current (last) session and edit there. We will grade the last entry only. All text related to one assignment should be in one entry, with the problems done in order.

Problem 1 (**5 points**). For this homework you should make a new folder called HW6/. Your main homework file is a Python file named hw6_<username>.ipynb. Save it under HW6/ . Remember to commit your file often and push it to GitHub (also, great backup!). We will check this as part of your grading!
Your name, assignment number, and the date should appear as comments at the top using markdown. Put the problems numbers in markdown comments, as well as any remarks or written answers you may make. If you need to comment something in the code (for clarity) do so with a normal comment. **Print the problem number (as in "Problem 1:") on a line by itself before each problem's output.** Use the print() function to print, don't just type the expression.

Problem 2 (**15 points**). Import numpy and matplotlib.pyplot. Create a numpy array x that goes from 1 up to and including 100 (last element *must* be 100.0) with a step of 0.5. Create array y that is the log10 of x and array z that is equal to the square root of x. Plot $y(x)$ and $z(x)$ in the same plot. Manually specify **different** colors, line styles, line thicknesses, markers (and their size) and tickmarks for your plot. Add titles to your plot axis. Make sure they are legible. Save it as a pdf file using the appropriate naming conventions.

Problem 3. (**15 points**) Create a numpy array q that has the values: 45, 24, 5 ,30 , 3, 67, 33, 60, 65, 13, 82, 75, 21, 77, 67, 8, 86, 62, 23, 70, 11, 70, 21, 15, 84, 51, 6, 79, 78, 66, 2, 93, 49, 74, 23, 85, 25, 38, 1, 89 . Print the array. Print the locations where q is larger than 50. Print, in one command, the elements of q that are larger than 50 and smaller than 70.

Make a list q_list out of q. Print the 12th up to and including the 14th elements of

the list `q_list`. Change element 28 of the list to be 42.0. Does it work? Why/ why not? Explain.

Make a tuple `q_tuple` out of `q`. Print the 20th element of `q_tuple`. Change element 21 of `q_tuple` to be 44.0. Does it work? Why/ why not? Explain.

Create a list of strings `word_list` that contains the words 'twinkle', 'twinkle', 'little', 'star'. Scan every word (one by one is fine, we haven't talked about `for` loops yet) of your list and find out which words contain a 'e', and which words contain an 'a'. Also, find the index of the letter 'e' and 'a' in the word (e.g., in Mary 'a' is on 1). Is word 'star' or 'bright' in your `word_list`? Write the code to test it.

Problem 4 (**15 points**). Create a function `word_to_number` that takes as input an English word that corresponds to a number from 0 to 20 ('zero', 'one' etc) and returns the corresponding number (0, 1, etc). In the function create a dictionary that maps every appropriate English word to the corresponding number (so 1 will be mapped to 'one'). The keys should be your words and the values the number. Remember to write an appropriate docstring for your function! In the main program call the function for: 'three', 'seven', 'twelve' , 'sixteen' and 'nineteen' and print an informative statements (e.g., " 'three' is 3 ").

Problem 5 (**10 points**). Prepare and submit your homework. Copy the finalized Jupyter notebook to the handin/hw6_* folder and don't forget to commit and push it to GitHub. Explain what you did to do that in your log. Make a screenshot that shows you committed the file and add it to your handin/hw6_* folder (remember to use an appropriate name for the screenshot!). Write what you did to make and submit the zip file into your log. When satisfied, close the log, copy it to your homework directory one last time, and make the zip file. Turn the file in on WebCourses.