COMP1007 Assignment 3

Submission Deadline: 23:59 PM, 25 March 2019

Requirements:

- **Please submit a single Python source file that contains all your solutions.**
- **Use comments to label the question ID (i.e., Question 1, Question 2, etc.)**
- **For each Python function, you need to provide some testing statements to test your function.**

[10 marks per question]

1. Write a Python function to count the number of characters in a string, and return a dictionary. E.g., if the input to the function is "google.com", the returned dictionary should be: {'g': 2, 'o': 3, 'l': 1, 'e': 1, '.': 1, 'c': 1, 'm': 1}.

2. Write a Python function to check if a string contains all letters of the alphabet (case insensitive). For example, if the input string is "The quick brown fox jumps over the lazy cat", the function should return True; if the input string is "abcdefghijklmnopqrstuvwxy", the function should return False.

3. Write a Python function that takes a string as input and returns a new string by removing duplicate characters of the input string. E.g., if the input string is "Hello“, the output string should be "Helo"; if the input string is "Google", the output string should be "Gole".

4. Write a Python function that takes two parameters, a string ***str*** and a positive integer ***n***. The function returns a new string which lowercases the first ***n*** characters of the input string ***str***. For example, if ***str*** is "United States" and ***n*** is 5, the returned string should be "united States"; if ***str*** is "United States" and ***n*** is 8, the returned string should be "united states".

5. Write a Python function that counts the vowels of a given string. Vowels include 'a', 'e', 'i', 'o', 'u' and their uppercases. E.g., if the string is "Internet", the function should return 3.

6. Write a NumPy program to create an array of all the even integers from 100 to 200. Output the length of your array which should be 51.

7. Write a NumPy program to create an array of 100 ones followed by 100 fives, and then followed by 100 tens. Please use numpy.ones(), numpy.full(), and numpy.concatenate().

[**Self-learning**]: Please learn the usage of numpy.concatenate() from https://docs.scipy.org/doc/numpy/reference/generated/numpy.concatenate.html

8. Write a NumPy function to add a vector to each row of a given matrix. Assume the vector has the same dimension as the row of the given matrix. For example, if the vector is [2, 3, 4] and the given matrix is $\begin{bmatrix} 8 & 9 & 10 \\ 5 & 6 & 7 \end{bmatrix}$, then the matrix should be changed to $\begin{bmatrix} 10 & 12 & 14 \\ 7 & 9 & 11 \end{bmatrix}$.

9. Given a NumPy array that stores a vector of Centigrade values. Write a NumPy function to convert the values of Centigrade degrees into Fahrenheit degrees.

[Remark: find the conversion formula by yourself through Internet.]

10. Write a NumPy program that generates **ten** 100x100 arrays whose data follows standard normal distribution. Then output the **min**, **max**, **mean**, and **standard deviation** of the data **for each array**. Next, sum up the ten 100x100 arrays into a single 100x100 array. Output the min, max, mean, and standard deviation of this new array.

[Remark: this question helps you understand **the sum of normally distributed random variables**. For students who are interested in statistics, please check https://en.wikipedia.org/wiki/Sum_of_normally_distributed_random_variables]