ELEC 4511/5511

Lab 1

List, Dictionary, Files, NumPy

Problem 1 (List & Dictionary):

Please design a function "**nested_dictionary**" to convert lists (**ID**, **Name**, **Score**) into a "nested dictionary".

- The three lists are defined as shown below:

```
ID = ["#1", "#2", "#3", "#4", "#5"]
Score = [97, 88, 79, 92, 87]
Name = ["David Jake", "Leo Marsh", "Duncan John", "Tom Richards", "Jimmy Connors "]
```

- And the expected output is:

```
[{'#1': {'David Jake': 97}}, {'#2': {'Leo Marsh': 88}}, {'#3': {'Duncan John': 79}}, {'#4': {'Tom Richards': 92}}, {'#5': {'Jim
my Connors ': 87}}]
```

- The template of the "**nested_dictionary**" function is also given here:

```
def nested_dictionary(ID, Name, Score):
    …
    return …
```

Problem 2 (NumPy):

Please write a function that takes in an array of integers and returns the length of the **"longest peak-sequence"** in an 1D array. "**peak-sequence**" is defined as a continuous integer sequence in the array that strictly increases until it reaches the peak value (the maximum number) and then strictly decreases. (*Must first strictly increase and then strictly decrease*)

For example,

① "**1, 4, 10, 2**" forms a "**peak-sequence**", where **10** is the peak, and **1 → 4→ 10** shows a strict increase and **10→2** shows a strict decrease.

② "**4, 0, 10**" does not form a "**peak-sequence**" since **0→10** shows a strict increase while there is no decreasing sequence afterwards.

③ "**1, 2, 2, 0**" does not form a "**peak-sequence**". Even though **1→2** shows a strict increase, but **2→2** is neither an increase nor a decrease.

The function is defined as follows:

```
def longestPeak(array):
    … …
    return longestPeakLength
```

Where the input is a NumPy array and the output is an integer that indicates the length of the "**longest peak-sequence"**. You can use the following input examples to test your design.

1. array = [1, 2, 3, 3, 4, 0, 10, 6, 5, -1, -3, 2, 3] Output: 6 (the longest one is "**0, 10, 6, 5, -1, -3**")
2. array = [] Output: 0
3. array = [1, 2, 3, 2, 1, 1] Output: 5 (the longest one is "**1, 2, 3, 2, 1**")
4. array = [5, 4, 3, 2, 1, 2, 10, 12] Output: 0

Problem 3 (Files):

You are given a text file called "**words.txt**". Please write a function that takes the text file as input, then counts and returns the number of words in the file. (Please be aware that in the given text file some words are separated by a comma rather than a space.)

The function is defined as follows:

```
def count_words(filepath):
    ……
    return ……
```

Canvas submission: Please submit your report in ".**pdf**" file format and compress your codes into a "**.zip**" file.

What needs to be included in your report:

1. Screenshots of the results you get after running each program.
2. Copy and paste your code. And write comments for each function.
3. Please write a short analysis of each problem, mainly explaining how you think about the design of the function, what troubles you encountered during the design process, and how you finally solved them, etc.

What needs to be included in your "**.zip**" file:

Your Python code (.py file) for each problem.