Programming for Data Analytics
Project A specification (SDH3)

Submission Instructions:

1. Upload your solution file (.py file) to Blackboard before 13:00 on **Friday Nov 5th 2018**.
2. Go to the Project A folder in Blackboard to upload your file.
3. Once you have submitted your file you should verify that you have correctly uploaded it. It is your responsibility to make sure you upload the correct file.
4. Please make sure you **fully comment your code** that will reflect your **OWN** work.
5. Please put **your student name and number** as comments **at the top of your file**.
6. Please note that everything highlighted in yellow in the sample output below is input provided by the user.
7. Please note that the numerical values used in the sample output below are not the actual values. They are included for illustration only.

This project specification contains five pages (including this one), totaling 100 points and it is worth 30% of the Programming for Data Analytics Module.

Project Description (Numerical Analysis):

The objective of this project is to develop a basic data analysis application that enables us to examine information on the rainfall in various parts of Ireland for each month over the past half century. The information is provided in the following datasets from the CSO (You will find these as a .zip file in your project folder).

The datasets are:
- CorkRainfall.txt
- DublinRainfall.txt
- LimerickRainfall.txt
- GalwayRainfall.txt
- BelfastRainfall.txt

Each line of these datasets contains the following precipitation information:
- Year
- Month
- Total Rainfall (Millimetres)
- Most Rainfall in a Day (Millimetres)
- Rain days (0.2mm or More) (Number)

You should use functions and NumPy, where possible, when developing the code for this project.

Part A : Main Menu

Main Menu (5 marks)

When the user runs the program initially they will be presented with the following menu of operations, which they can perform on the datasets.

Menu
1. Basic Statistics for Total Rainfall (Millimetres)
2. Basic Statistics for Most Rainfall in a Day (Millimetres)
3. Basic Statistics for Number of Rain days (0.2mm or More)
4. Wettest Location
5. Percentage of Rain Days
6. Exit
Please select one of the above options:

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Part B : Menu Options

1. Calculate Basic Statistics for Total Rainfall (Millimetres) (15 marks)

If the user selects the option 1 from the main menu (Calculate Basic Statistics for Total Rainfall (Millimetres)) the application will display a list of locations Cork – Limerick as shown below. The user will then select a location by entering a number (for example below the user selects Cork as the location by entering 1). The program should then print out the max total rainfall and average total rainfall for the chosen location (in the example below it depicts the max and average total rainfall for Cork).

Menu
1. Basic Statistics for Total Rainfall (Millimetres)
2. Basic Statistics for Most Rainfall in a Day (Millimetres)
3. Basic Statistics for Number of Rain days (0.2mm or More)
4. Wettest Location
5. Percentage of Rain Days
6. Exit
Please select one of the above options: 1

    1. Cork
    2. Belfast
    3. Dublin
    4. Galway
    5. Limerick
Please select a location: 1

Cork: Max Total Rainfall = 12.2
Cork: Average Total Rainfall = 5.6

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2. Calculate Basic Statistics for Most Rainfall in a Day (Millimetres) (15 marks)

If the user selects the option 2 from the main menu (Calculate Basic Statistics for Most Rainfall in a Day (Millimetres)) the application will display a list of locations Cork – Limerick as shown below. The user will then select a location by entering a number (for example below the user selects Belfast as the location by entering 2). The program should then print out the max 'Most Rainfall in a Day' value and the and the average 'Most Rainfall in a Day' value for the chosen location (in the example below it depicts the max and average ''Most Rainfall in a Day' value for Belfast).

```
Menu
 1. Basic Statistics for Total Rainfall (Millimetres)
 2. Basic Statistics for Most Rainfall in a Day (Millimetres)
 3. Basic Statistics for Number of Rain days (0.2mm or More)
 4. Wettest Location
 5. Percentage of Rain Days
 6. Exit
Please select one of the above options: 2

    1.  Cork
    2.  Belfast
    3.  Dublin
    4.  Galway
    5.  Limerick
Please select a location: 2

Belfast: Max Most Rainfall in a Day = 18.44
Belfast: Average Most Rainfall in a Day = 15.645
```

3. Calculate Basic Statistics for Number of Rain days (20 marks)

If the user selects the option 3 from the main menu (Calculate Basic Statistics for Number of Rain days (0.2mm or More)) the application will display a list of locations Cork – Limerick as shown below. The user will then select a location by entering a number (for example below the user selects Dublin as the location by entering 3). The program should then print out the max 'Number of Rain days' value and the average 'Number of Rain days' value for the chosen location (in the example below it depicts the max and average ''Number of Rain days' value for Dublin).

```
Menu
1. Basic Statistics for Total Rainfall (Millimetres)
2. Basic Statistics for Most Rainfall in a Day (Millimetres)
3. Basic Statistics for Number of Rain days (0.2mm or More)
4. Wettest Location
5. Percentage of Rain Days
6. Exit
Please select one of the above options: 3

        1.  Cork
        2.  Belfast
        3.  Dublin
        4.  Galway
        5.  Limerick
Please select a location: 3


Belfast: Max Number of Rain days= 23
Belfast: Average Number of Rain days = 12.4

```

4. <u>Wettest Location (20 marks)</u>

In this example, we are interested in determining the wettest location in Ireland. We will base this calculation on the cumulative 'total rainfall' figure for a specific location since records began (each dataset record begins in 1962). Therefore, you should calculate the cumulative total rainfall figure for each individual dataset. The dataset that produces the highest result will be classified as the wettest location in Ireland. Your output should provide the user with a list of each location and its associated cumulative total rainfall figure. The following is a sample output of this program (Figures provided in sample output are fictional).

```
Menu
1. Basic Statistics for Total Rainfall (Millimetres)
2. Basic Statistics for Most Rainfall in a Day (Millimetres)
3. Basic Statistics for Number of Rain days (0.2mm or More)
4. Wettest Location
5. Percentage of Rain Days
6. Exit
Please select one of the above options: 4
        1.  Cork 12459mm
        2.  Belfast 13503mm
        3.  Dublin 11343mm
        4.  Galway 12345mm
        5.  Limerick 18495mm
The wettest location in Ireland is Limerick with a rainfall figure of 18495mm
```

5. Percentage of Rain Days (20 marks)

This question focuses on the Number of Rain days column for each location. The user is asked to enter a maximum threshold value for the number of rain days. Your code should then output the percentage of the time (percentage of rows in the dataset) where the number of rain days is less than or equal to the threshold value.

In the example below the user selects 5 from the main menu in order to proceed with this query (Percentage of Rain Days). The user is then asked to enter a maximum threshold value for the number of rain days. In the example, below the user enters the value 6. Therefore, for each location, we will output the percentage of rows in the dataset where the Number of Rain Days is less than or equal to 6.

```
 Menu
 1. Basic Statistics for Total Rainfall (Millimetres)
 2. Basic Statistics for Most Rainfall in a Day (Millimetres)
 3. Basic Statistics for Number of Rain days (0.2mm or More)
 4. Wettest Location
 5. Percentage of Rain Days
 6. Exit
 Please select one of the above options: 5

 Please enter maximum threshold value for number of rain days: 6

 The following are the percentage of rain days less than or equal to 6:
      1.  Cork 12.5%
      2.  Belfast 13.5%
      3.  Dublin 10.2%
      4.  Galway 12.5%
      5.  Limerick 14.6%
```

6. Exit (5 marks)

If the user selects this option the program will exit, otherwise it will print out the main menu again.