**Every Boilermaker Engineering Code – Entry Level Programming**

**Week 7 – Programming Exercises**

1. (**20 points** **Random number File Writer and Reader**)
2. Write a Python program that writes a series of random numbers to a file. Each random number should be in the range of 1 through 500. The application should let the user specify how many random numbers the file will have.
3. Write another program that reads the random numbers from the file you create from a), displays the numbers, then display the following data:
   * The total of the numbers
   * The number of random numbers read from the file

**Test your program and submit the two .py files and the generated txt file to the Blackboard. Here is a sample of the test. You should follow the format and the numbers should be random generated numbers from your own code. (Only the red part should be typed in the interactive mode)**

1. **For the code of writing random numbers**

|  |  |
| --- | --- |
| **Sample input** | **Content is the txt file** |
| **Enter the number of random numbers to be written to the file: 15** | **131**  **294**  **345**  **320**  **448**  **163**  **265**  **369**  **119**  **355**  **301**  **391**  **112**  **249**  **59** |

1. **For the code of reading random numbers**

|  |  |
| --- | --- |
| **Sample input** | **Expected output** |
|  | **Total: 3,921**  **15 numbers were read from the file.** |

1. (**15 points** **Average Steps Taken**) A Personal Fitness Tracker is a wearable device that tracks your physical activity, calories burned, heart rate, sleeping patterns, and so on. One common physical activity that most of these devices track is the number of steps you take each day.

You’ll find a file named **‘steps.txt’** in the attachment. This file contains the number of steps a person has taken each day for a year. There are 365 lines in the file, and each line contains the number of steps taken during a day. (The first line is the number of steps taken on January 1st, the second line is the number of steps taken on January 2nd, and so forth.) Write a Python program that read the file, then displays the average number of steps taken for each month. (The data is from a year that was not a leap year, so February has 28 days.) **(Set the decimal precision to 1)**

**Use the following numbers to test (Only type in the red parts in interactive mode):**

|  |  |
| --- | --- |
| **Sample input** | **Expected output** |
|  | **The average steps taken in January was 5,246.1**  **The average steps taken in February was 4,851.9**  **The average steps taken in March was 5,777.6**  **The average steps taken in April was 5,802.1**  **The average steps taken in May was 4,711.5**  **The average steps taken in June was 4,792.3**  **The average steps taken in July was 5,638.2**  **The average steps taken in August was 5,759.6**  **The average steps taken in September was 6,114.6**  **The average steps taken in October was 5,411.0**  **The average steps taken in November was 4,268.8**  **The average steps taken in December was 5,138.1** |

1. **(15 points, Average Number of Words)** There’s a text file in the attachment called **‘average\_number\_of\_words.txt’**. The text is in the file is stored as one sentence per line. Write a Python program that reads the files contents and calculates the average number of words per sentence.

**Use the following numbers to test (Only type in the red parts in interactive mode):**

|  |  |
| --- | --- |
| **Sample input** | **Expected output** |
|  | **Average number of words per line: 26.0** |

1. **(15 points, Pig Latin)** Write a program that accepts a sentence as input and converts each word to ‘Pig Latin.’ In one version, to convert a word to Pig Latin, you remove the first letter and place that letter at the end of the word. Then you append the string “AY” to the word. Here is an example:

English: I SLEPT MOST OF THE NIGHT

Pig Latin: IAY LEPTSAY OSTMAY FOAY HETAY IGHTAY

(Hint: You should convert all letters to capital letters.)

**Use the following numbers to test (Only type in the red parts in interactive mode):**

|  |  |
| --- | --- |
| **Sample input** | **Expected output** |
| **Enter a string: Coding is fun** | **ODINGCAY SIAY UNFAY** |
| **Enter a string: Practice makes perfect** | **RACTICEPAY AKESMAY ERFECTPAY** |

1. **(15 points, Population Data)** The attached file **‘USPopulation.txt’** contains the midyear population of the United States, in thousands, during the years 1950 through 1990. The first line in the file contains the population for 1950, the second line contains the population for 1951, and so forth.

Write a program that reads the file’s contents into a list. The program should display the following data: **(Set the decimal precision of the average annual change to 2)**

* The average annual change in population during the time period
* The year with the greatest increase in population during the time period
* The year with the smallest increase in population during the time period.

**Use the following numbers to test (Only type in the red parts in interactive mode):**

|  |  |
| --- | --- |
| **Sample input** | **Expected output** |
|  | **The average annual change in population during the time period is 2,443.88**  **The year with the greatest increase in population was 1955**  **The year with the smallest increase in population was 1967** |

1. **(Bonus question: 15 points)** Many companies use telephone number like 555-GET-FOOD so the number is easier for their customers to remember. On a standard telephone, the alphabetic letters are mapped to numbers in the following fashion:

A, B, and C = 2

D, E, and F = 3

G, H, and I = 4

J, K, and L = 5

M, N, and O = 6

P, Q, R, and S = 7

T, U, and V = 8

W, X, Y, and Z = 9

Write a program that asks the user to enter a 10-character telephone number in the format XXX-XXX-XXXX. The application should display the telephone number with any alphabetic characters that appeared in the original translated to their numeric equivalent. For example, if the user enters 555-GET-FOOD, the application should display 555-438-3663.

**Use the following numbers to test (Only type in the red parts in interactive mode):**

|  |  |
| --- | --- |
| **Sample input** | **Expected output** |
| **Enter the telephone number in the format XXX-XXX-XXXX: 555-GET-FOOD** | **The phone number is 555-438-3663** |
| **Enter the telephone number in the format XXX-XXX-XXXX: 765-COE-EBEC** | **The phone number is 765-263-3232** |