Project 2
Python Programming

Problem 1: File Processing

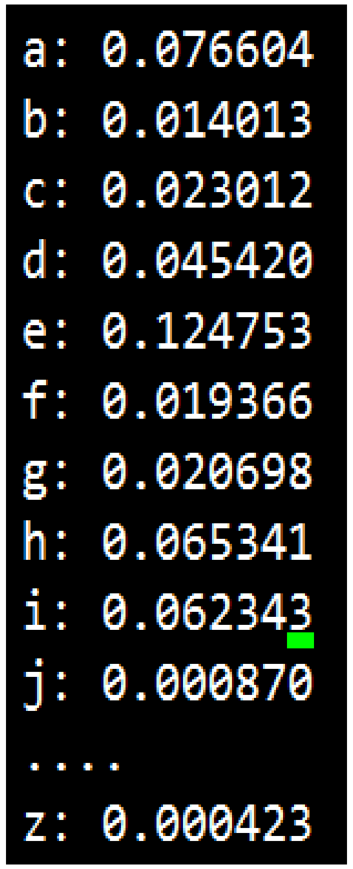
- Download the file **data.log** from:
https://samyzaf.com/braude/PYTHON/projects/data.log
- This file contains time/temperature data as sampled by a thermostat in a sensor unit in one day.
- Write Python code for answering the following questions:
  - What are the minimal and maximal temperatures ?
  - In what times the minimal temperature was obtained?
  - In what times the maximal temperature was obtained?
  - What is the average temperature?

Problem 2: DataBase processing

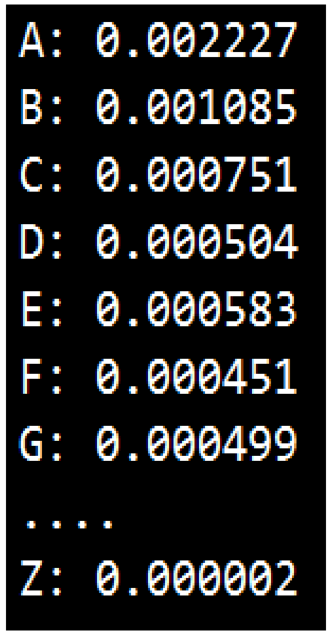
- Download the file db.csv from: https://samyzaf.com/braude/PYTHON/projects/db.csv
- Write a function db_query(file) for finding all the persons that meet the following criteria:
  - They are from Florida or California
  - Have blood type B+ or O+
  - Own a Mazda car
  - Were born before 1982
- How many such people did you find?

Problem 3: File Decryption

- Download the following two text files (famous English books):
  https://samyzaf.com/braude/PYTHON/projects/jude.txt
  https://samyzaf.com/braude/PYTHON/projects/oliver_twist.txt
- Write a Python function letter_frequency(file) for counting English letters frequency in a text file. Your program output should look like:



```
a: 0.076604
b: 0.014013
c: 0.023012
d: 0.045420
e: 0.124753
f: 0.019366
g: 0.020698
h: 0.065341
i: 0.062343
j: 0.000870
....
z: 0.000423
```



```
A: 0.002227
B: 0.001085
C: 0.000751
D: 0.000504
E: 0.000583
F: 0.000451
G: 0.000499
....
Z: 0.000002
```

- The frequency of a letter is defined as the ratio between the number of its occurrences and the total number of letters in the text (make sure to ignore characters that arenot English letters!).
- Print the frequency tables for the two books.
- Do you notice any similarities between the two tables?
- Hints: Import the **string module** and look at **string.letters** field of the string module. Use a **dictionary** to hold a mapping between a letter and its number of occurrences.

Problem 4: File Deciphering

- Explain what exactly happens in the following code?

```
def random_cipher():
    Letters = list(string.letters)
    random.shuffle(Letters)
    cipher = dict()
    for letter in string.letters:
       cipher[letter] = Letters.pop()
    return cipher
```

- Use a cipher object for encrypting a simple text file. Here is a start of your Python function:

```
def file_encrypt(file, outfile, cipher):
    letters = string.letters
    f1 = open(file, 'r')
    f2 = open(outfile, 'w')
    ...
```

- The **`file_encrypt`** function takes a source file, a target file, and a cipher dictionary. It translates each letter in the source file to its corresponding cipher[letter].
- Continued next slide

Problem 4: File Deciphering (Optional)

- This is an optional problem, you may skip it
- Download the encrypted file: https://samyzaf.com/braude/PYTHON/projects/decrypt_me.txt
- This file was generated by applying the function `file_encrypt` on a very famous English book by a secret cipher object
- Can you use the ideas in problem 3 in order to decrypt this book and its secret cipher? This is not a simple problem and not required to do by code only, you can use your eyes and guess too.
- Hints: Start with a utility: `find_closest(x, list_of_floats)` which finds the closest value in `list_of_floats` to `x`.