Homework 14

Exercise 1. Consider the folder: "Book" (download from http://www.mediafire.com/file/785a6bxo51azv22/Book.rar/file):
Create a Story class to solve the following exercises.
Template:

```
class Story:
    def __init__(self,story):
        pass
    def count_line(self):
        pass
    def count_work(self):
        pass
    ...
```

a) In the file: "Hamlet.txt" **(…**\Book\English\shakespeare\Hamlet.txt)
1) How many words are there?
2) How many lines are there?
3) Count the number of "Hamlet" in the file "Hamlet.txt". Is it the most frequent?

b) In the file "La capitaine.txt" (…\Book\French\chevalier\La capitaine.txt)

1) How many words are there from line 100 to line 300?

2) Find the line with the most words.

3) Find the line with the least number of words.

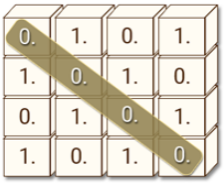
4) Find the line with the maximum length.

(hint: sometime we need with open(filename, endcoding ="utf8")…)

c) Save all result in a) and b) to the file "result_ex1.json".

Exercise 2. Write a NumPy program to

1) Create an array of 10 zeros,10 ones, 10 fives.
2) Create an array of all the even integers from 30 to 70.
3) Create a 3x3 identity matrix.
4) Generate a random number between 0 and 1.
5) Generate an array of 15 random numbers from a standard normal distribution.
6) Create a vector with values from 0 to 20 and change the sign of the numbers in the range from 9 to 15.
7) Create a 3x4 matrix filled with values from 10 to 21.
8) Create a 5x5 zero matrix with elements on the main diagonal equal to 1, 2, 3, 4, 5.
9) Create a 4x4 matrix in which 0 and 1 are staggered, with zeros on the main diagonal.



10) Create random vector of size 10 and replace the maximum value by 0

Exercise 3. Create the class Matrix with the following template

```
import numpy as np
class Matrix:
    def __init__(self,matrix):
        self._matrix = matrix
```

a) Let A be a matrix. Create a method that sums a_{ij} of the matrix $A = (a_{ij})$, where i+j is even.

b) Create a method to check if a matrix is symmetric.

c) Create a method to get a square matrix size $k \times k$ from the original matrix $A = (a_{ij})_{m \times n}$, where $k = min\{m, n\}$. Ex:

- input: $\begin{pmatrix} 1 & 2 & 2 \\ 3 & 4 & 5 \end{pmatrix}$; output: $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$
- input: $\begin{pmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{pmatrix}$; output: $\begin{pmatrix} 1 & 4 \\ 2 & 5 \end{pmatrix}$.

d) Create the method Gaussian Elimination to carry a matrix to the reduced row echelon form.