VIA501 2021-Fall Homework Assignment # 1

Remarks:

Write the code yourself. ***Cheating is strictly forbidden***.

For each problem write your code in the function format and give the names of the functions as problem numbers, for example for the solution of problem1:

                def problem1(input):

                  return something

Put the codes for all problems into one file (jupter notebook file) and name that file using your student username in the following format: badays_via501e_homework1.ipynb. The notebook file should definitely contain the outputs of the functions, if applicable. Sample solution file (sample_solution.ipynb) is given to you to show how to organize your solutions.

Also write your name and student number inside the jupyter notebook as well.

Give as much as documentation for your script using comments.

Note1: For the following problems, **do not** use libraries like Numpy or PANDAS. You are allowed to use only built-in python modules (os, sys, time, collections etc.)

Note2: If your homework solution file has problems in structure you can lose up to **_20_** points!!

For example, if you didn't write solutions in a function format or if you did not arrange input arguments properly you may lose points.

Problem 1 (15 Points).

A year is a leap year if it is divisible by 4, except that years divisible by 100 are not leap years unless they are also divisible by 400.
Write a function that takes a year as an input and determines how many leap years there have been between 1600 and that year.

```
problem1(2020)
```

the number of leap years from 1600 until 2020 is 102

Problem 2 (15 Points).

Write a program that generates a list of 20 random numbers between 1 and 100. When generating random number use random seed as 18.
    (a) Print the list.
    (b) Print the sorted list (sort list in the descending order)
    (c) Print the average of the elements in the list.
    (d) Print how many even numbers are in the list.
    (e) Print the largest and smallest values in the list.
    (f) Print the second largest and second smallest entries in the list

Since we use the same random seed number, your output should be exactly like this:

```
problem2()
```

```
the numbers in the list:
 [24, 16, 85, 58, 43, 31, 26, 63, 81, 64, 24, 62, 38, 59, 34, 26, 33, 89, 16, 42]
the sorted list:
 [89, 85, 81, 64, 63, 62, 59, 58, 43, 42, 38, 34, 33, 31, 26, 26, 24, 24, 16, 16]
the average of the list: 45.7
the number of even-numbers is : 12
the largest element of the list: 89
the smallest element of the list: 16
the second smallest element of the list: 24
the second largest element of the list: 85
```

Problem 3 (15 Points).

The Fibonacci numbers are the sequence below, where the first two numbers are 1, and each number thereafter is the sum of the two preceding numbers. Write a program that asks the user how many Fibonacci numbers to print and then prints that many.

1,1,2,3,5,8,13,21,34,55,89...

```
problem3(10)
```
```
[1, 1, 2, 3, 5, 8, 13, 21, 34, 55]
```

Problem 4 (15 Points).

You are given a csv (gdp_per_capita.csv) file for GDP per capita taken from World Bank. The file holds data from 1960 to 2017. Write a function that takes this file as an input and do the following tasks for *Turkey*:

1. a) Calculate the yearly percentage increase compared to previous year and the find the year that has highest increase in terms of percentage.
2. b) Find the years that GDP per capita decreased compared to the previous year.

```
problem4("homework1-data/gdp_per_capita.csv")
```

```
the highest increase happened in the year 1998
years that GDP per capita decreased compared to previous year:
 [1961, 1970, 1971, 1980, 1982, 1983, 1984, 1991, 1994, 1999, 2001, 2009, 2014, 2015, 2016,
 2017]
```

Problem 5 (15 Points).

The following two lists contain student names and scores.

names = ["David", "Michael", "John", "James", "Greg", "Mark", "William", "Richard", "Thomas", "Steven", "Mary", "Susan", "Maria", "Karen", "Lisa", "Linda", "Donna", "Patricia", "Debra", "Eric"]

scores = [99, 87, 78, 86, 68, 94, 76, 97, 56, 98, 76, 87, 79, 90, 73, 93, 82, 69, 97, 98]

By using the two lists above, print the names of students ranked in top-3 highest scores.

Your function should take these two lists as the inputs.

```
names = ["David", "Michael", "John", "James", "Greg", "Mark", "William", "Richard", "Thomas"
         "Mary", "Susan", "Maria", "Karen", "Lisa", "Linda", "Donna", "Patricia", "Debra",
scores = [99, 87, 78, 86, 68, 94, 76, 97, 56, 98, 76, 87, 79, 90, 73, 93, 82, 69, 97, 98]
```

```
problem5(names,scores)
```

```
rank 1 ['David'] score: 99
rank 2 ['Steven', 'Eric'] score: 98
rank 3 ['Richard', 'Debra'] score: 97
```

Problem 6 (15 Points).

In a magic square, every row, column, and the two diagonals add up to the same value. Create random 4x4 matrices (two dimensional lists) until you find a magic square. Print the magic square and how many times you created a random matrix. The number inside these random 4x4 matrices should range between 1 and 4. Please note that running this calculation might take a while.

```
problem6()
```

the number of random matrices created: 251441
the magic square found is [[2, 3, 4, 3], [2, 4, 2, 4], [4, 3, 3, 2], [4, 2, 3, 3]]

Problem 7 (10 Points).

In this problem, write a function that returns the number of hours you spent on this homework and difficulty level of the homework. Difficulty level should be between 1 and 5 referring very easy, easy, medium, difficult, very difficult respectively. The function should write the output into a file named "homework1_survey.txt".

When I call Problem6() function, I should get a text file similar to the text file given below.
Note the number of hours spent or difficulty level should not be input arguments.
This problem is intended to serve as survey.

Jupyter homework1_survey.text✔ birkaç saniye önce

File	Edit	View	Language

```
1  Hours spent on this homework : 10
2  Difficulty level of this homework : 3
```