Laboratory work 1

Jupyter Notebook Basics

Goal: Learning the specifics of using Python language in Jupyter Notebook.

1. Theoretical information

See the lecture 1 - https://github.com/svniko/python_en/blob/master/Lecture_1_en.pdf

2. Assignments:

1. Install Anaconda.

2. Create environment for Python 3.

3. Change the Jupyter start-up folder.

4. Using the Markdown language and HTML tags for the country, according to you individual task (see Table 1), input information about the country's area, its population, government, celebrities, cultural and natural attractions, and so on. When formatting information, you should use:

- headings of different levels;
- bold, italics and underlines;
- different colors of symbols and background;
- borders;
- tables;
- nested lists;
- linked and embedded pictures;
- hyperlinks;
- the HTML tag <svg> to draw the country's flag.

5. Create a function to implement the algorithm, according to your individual task from Table. 1. For the created function implement 2-3 test cases in the cells of the Jupyter notebook. For all tasks, organize checking of the input values, for example, as follows:

```
In [159]: task4()
          4 5 sd 3 6 1
Out[159]: 'Error. There is a non-numeric value in the list'
```

Table 1. Individual tasks for the lab

Ind. task	Assignment 4	Assignment 5
1	Greece	Implementation of Goldbach's conjecture, which states that Every even integer greater than 2 can be expressed as the

		sum of two primes.
		Examples:
		`In [2] task_1()`
		`6`
		`Out [2] Number 6 can be expresses as 3+3`
		
		`In [3] task_1()`
		`28`
		`Out [3] Number 28 can be expresses as 5+23`

2	Burkina Faso	Implementation of the Euclidean algorithm to find the greatest common divisor (gcd).
		Examples:
		`In [2] task_2()`
		`16 36`
		`Out [2] gcd of 16 and 36 is 4`
		
		`In [2] task_2()`
		`12 54`
		`Out [2] gcd of 12 and 54 is 6`

3	Guyana	Enter a list of integers. Find a number, or tuple, that will be exactly in the middle of the list when it is sorted. The list should be entered as a string separated by spaces.
		Examples:
		`In [2] task_3()`
		`2 4 5 1 7`
		`Out [2] 4 is a middle of the sorted list`
		
		`In [3] task_3()`
		`7 3 1 7 4 2 8 2`
		`Out [3] (3, 4) is a middle of the sorted list`

4	Djibouti	Implement Bubble sorting. Count the number of swaps. The list should be entered as a string separated by spaces.
		Examples:
		`In [2] task_4()`
		`5 6 23 8 12 5`
		`Out [2] There was 6 swaps`
		
		`In [3] task_4()`
		`7 3 1 7 4 2 8 2`
		`Out [3] There was 14 swaps`

5	Ghana	Output *k*-th prime. The number *k* is entered when running the script. Examples:

		In [2] task_5() 5 Out [2] 5th prime is 11 In [3] task_5() 34 Out [3] 34th prime is 139
6	Jordan	Enter two integers *a* and *b*. Find all the primes in the interval [*a*, *b*]. Examples: In [2] task_6() 3 15 Out [2] [3, 5, 7, 11, 13] In [3] task_6() 6 24 Out [3] [7, 11, 13, 17, 19, 23]
7	Iceland	Implement an algorithm for converting integers from decimal to binary number system. Examples: In [2] task_7() 32 Out [2] '32 in binary number system is 100000' In [3] task_7() 156 Out [3] '156 in binary number system is 10011100'
8	Georgia	Implement a descending Gnome sort for the entered list of integers. Example: In [2] task_8() 5 3 78 3 23 7 34 Out [2] [78, 34, 23, 7, 5, 3, 3]
9	Czech Republic	Filter entered list to leave only non-primes in descending order. Examples: In [2] task_9() 3 12 15 7 11 35 18 Out [2] [35, 18, 15, 12] In [3] task_9() 0 34 2 1 15 22 4 23 6 Out [3] [34, 22, 15, 6, 4]

10	Norway	Implement an algorithm for determining if the entered number N is the sum of two squares of natural numbers. That is, define integers a and b such that $a^2+b^2=N$. If such numbers do not exist, output the corresponding message. Examples: In [2] task_10() 45 Out [2] '3^2+6^2=45' In [3] task_10() 21 Out [3] 'The number 21 cannot be expressed as squares of integers'

7. Post the created notebook on GitHub

3. The content of the report

1. Cover page of the report
2. Topic and goal of the lab
3. Progress of the work with the listings of input cells and responses in output cells.
4. Activity diagram for assignment 5
5. Screen shots with inputs and outputs.
6. Link to the created Jupyter notebook on GitHub, rendered by nbviewer.
7. Conclusions