Solving simple problems with Python

Objectives

Working with Python Shell and IDLE to solve simple problems

- Execute simple instructions using the Python interpreter
- Implement simple programs using Python IDLE and execute them
- Solve simple problems using conditional statements and loops

Deadlines

- ***Lab 2****:* solve first two problems *(work during the same lab)*
  Upload your solution online before the end of the Lab2*.*

- ***Lab 3****:* solve at least three other problems from the given list *(homework from Lab2)*
  Upload your solution online before the start of Lab3*.*

Requirements

- Implement a solution for the first two problems during the lab
- Implement a solution for at least three other problems from the list until next lab
- The solution should offer a console type interface that allows the user to input the data and visualize the output

Problems to be solved ***during the lab (Lab2)****:*

1) Compute the sum of all even numbers less or equal to a given number ***n***.
   Example: ***n = 7***, sum is 0 + 2 + 4 + 6 = 12 and the result should be the message *"The sum of even numbers up to 7 is 12"*.

2) Determine if a given number ***n*** is prime or not.
   Example: ***n = 3*** is prime, but ***n = 6*** is not prime

Select the problems to start today and solve ***until next lab (Lab3):***

1) Compute the control digit of an integer by summing up its digits, then summing up the digits of the sum, so on, until a sum of only one digit is obtained.
   Example: The control digit of integer number 1971 is *9* (*1971 → 18 → 9*).

2) Determine a date (as day, month, year) starting from two integer numbers that represent the year and the number of the day in that year.
   Example: For *year = 2004* and *number of day = 68*, the date is *8.03.2004*

3) Print all powers less than k of a given integer number n.
   Example: For *n=5* and *k=100*, print the numbers *1, 5, 25*.

4) Determine the smallest number that can be formed with the digits of a number read from keyboard.
   Example: for the number *30027* the result is *20037*.

5) Determine the value of the element at index k in the array 1, 2, 2, 3, 3, 3, 4, 4, 4, 4,… without reading or effectively creating the array.
   Example: the 35^{th} element of the array is 8

6) Given the current date (day, month, year) and the birthdate of a person (day, month, year) compute the age of the person in number of years.
   Example: If the current date is *4.3.2002* and the person birthdate is *5.9.1980* than the person is *21* years old.

7) Generate in ascending order the first n numbers from the set **M** defined as:
   a. Number **1** belongs to **M**
   b. If **x** belongs to **M** then **2x+1** and **3x+1** also belong to **M**
   c. **M** does not contain any other elements

   Example: The first *10* numbers in *M* are *1, 3, 4, 7, 9, 10, 13, 15, 19, 21*.

8) Consider an integer number n. Print the nearest prime number to n.
   Example: For *n=22*, the result is *23*, whereas for n=*20*, the result is *19*.

9) Print all numbers with maximum 2 digits of form xy with the property that the last digit of $(xy)^2$ is y.
   Example: $5^2=25$ or $(10)^2=100$ or $(76)^2=5776$.

10) Read integers numbers until number 0 is read. Print the number of pairs n1 and n2 of numbers read consecutively with the property that the number of digits 5 from n1 is strictly higher than the number of digits 5 from n2.
    Example: If the numbers read are 182, 457,341, 497, 5597, 1335, 15, 38, 5, 0 than the result is 3 (as the pairs 457-341, 5597-1335, 15-38 satisfy the required property).

11) Generate all prime numbers having n digits with the property that all its prefixes are also prime.
    Example: For n=2 the first number is 23 (2, 23 are primes).

12) Determine if two natural numbers have the following property: the same digits are necessary to write them in base 10.

Example: *2113* and *31221* have this property, whereas *12521* and *11551* do not.

13) Read a natural number. Form another number from its digits found at odd positions (from left to right).
Example: For *1234*, the result is *13*.

14) Read a natural number **n**. Print the number of 1s from the binary representation of n.
Example: *547* has *4* digits equal to *1* in its binary representation.

15) Determine the age of a person in number of days. The current date and the birthdate are known.
Example: If the birthdate is *1.1.2009* and the current date is *28.9.2009* than the person has *271* days.

16) Read numbers having minimum 2 digits until number 0 is given. Print how many numbers have the unit figure smaller than the tens figure.
Example: If numbers read are *25, 653, 2965, 211, 154, 1256, 0* value *3* will be displayed.

17) A number n is special if there is a natural number m such that n=m+S(m) where S(m) is the sum of digits of m. Verify if a given number is special.
Example: *1235* is special (*1235=1225+10*)

18) Print the number of common digits of two numbers, as well as the digits.
Example: *21348* and *14513* have *3* common digits and they are *1,3,4*.

19) Print the numbers of n digits equal to k multiplied by their product. Numbers n and k (n between 1 and 9, k between 1 and 1000) are given.
Example: For *n=3* and *k=5* the only number that satisfies the requested properties is *175 (5*(1*7*5)).*

20) Given a natural number n, determine the greatest number p having the property that $\mathbf{2^p}$ is smaller or equal to n.
Example: For *n=133*, the result is *p=7* ($2^7=128$, $2^8=256$).