

## 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*)
- **Lab 3:** solve one problem from the given list (*homework from Lab2*)



### Requirements

- Implement a solution for the first two problems during the lab
- Implement a solution for one problem 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 product of the  $n$  natural numbers given as a list.  
Example:  $n = 3$ ,  $list = [3,4,5]$  product is 60.
- 2) Determine if a given number  $n$  is prime or not.  
Example:  $n = 3$  is prime, but  $n = 6$  is not prime

*Select one problem to start it 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 ( $1971 \rightarrow 18 \rightarrow 9$ ).
- 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<sup>th</sup> 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* then 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 elementsExample: 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* then 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  $2^p$  is smaller or equal to  $n$ .  
Example: For  $n=133$ , the result is  $p=7$  ( $2^7=128$ ,  $2^8=256$ ).