



LABORATORY 01

OBJECTIVES

- Be able to setup the work environment for python (download and install python 3.x from www.python.org)
- Execute simple instructions using the python interpreter
- Write and execute a simple python program using python IDLE editor (part of python installation)
- Simple problems just to exercise read, write, conditional, loop, function

REQUIREMENTS

- Select one problem statement from each set and solve it.
 - Each solution must have a console-based interface, expected inputs as well as output must be clearly stated to the user.
-

PROPOSED PROBLEM STATEMENTS

SET A

- [1] Generate the first prime number larger than a given natural number n .
- [2] Given the natural number n , determine the prime numbers p_1 and p_2 such that $n = p_1 + p_2$ (check the Goldbach hypothesis).
- [3] For a given natural number n find the minimal natural number m formed with the same digits. E.g. $n=3658$, $m=3568$.
- [4] For a given natural number n find the largest natural number written with the same digits. E.g. $n=3658$, $m=8653$.
- [5] Generate the largest prime number smaller than a given natural number n . If such a number does not exist, a message should be displayed.

SET B

- [6] Determine the age of a person, in number of days.
- [7] Determine a calendar data (as year, month, day) starting from two integer numbers representing the year and the day number inside that year.
- [8] Determine the twin prime numbers p_1 and p_2 immediately larger than the given non-null natural number n . Two prime numbers p and q are called twin if $q - p = 2$.
- [9] Find the smallest number m from the Fibonacci sequence, defined by $f[0]=f[1]=1$, $f[n]=f[n-1]+f[n-2]$, for $n>2$, larger than the given natural number n . So, find k and m such that $f[k]=m$, $m>n$ and $f[k-1] \leq n$.
- [10] Consider a given natural number n . Determine the product p of all the proper factors of n .
- [11] The palindrome of a number is the number obtained by reversing the order of digits. E.g. palindrome (237) = 732). For a given natural number n , determine its palindrome.

SET C

- [12] The numbers n_1 and n_2 have the property P if their writings in basis 10 have the same digits (e.g. 2113 and 323121). Determine whether two given natural numbers have the property P .
- [13] Determine the n -th element of the sequence 1,2,3,2,5,2,3,7,2,3,2,5,... obtained from the sequence of natural numbers by replacing composed numbers with their prime divisors, without memorizing the elements of the sequence.

- [14] Determine the n -th element of the sequence 1,2,3,2,2,5,2,2,3,3,3,7,2,2,3,3,3,... obtained from the sequence of natural numbers by replacing composed numbers with their prime divisors, each divisor d being written d times, without memorizing the elements of the sequence.
- [15] Generate the smallest perfect number larger than a given natural number n . If such a number does not exist, a message should be displayed. A number is perfect if it is equal to the sum of its divisors, except itself. E.g. 6 is a perfect number ($6=1+2+3$).
- [16] Generate the largest perfect number smallest than a given natural number n . If such a number does not exist, a message should be displayed. A number is perfect if it is equal to the sum of its divisors, except itself. E.g. 6 is a perfect number ($6=1+2+3$).