IO EXERCISES

1. Write a recursive function as input à string and print it in reverse (it must not be inverted, but just print).

2. Write a program to solve the Hanoi towers problem: move all disks from 1 to 2 using 3 as temporary. Only one piece can be moved at a time. A large piece cannot fit on top of a smaller one.

3. Write with a text editor a file containing numbers, one per line. Write a program that asks the user for the name of this file, open it and calculate and print on the screen how many are the read values, the maximum value, the minimum value, the sum and the average of all the values in the file.

4. Write a program that takes two positive integers as input and displays the matrix of couples whose first component is a number varying between 0 and the first number passed in parameter, and the second component is a number taken between 0 and the second number passed in parameter. Example: For 3 and 3 we have:
   (0, 0)(0, 1)(0, 2)(0, 3)
   (1, 0)(1, 1)(1, 2)(1, 3)
   (2, 0)(2, 1)(2, 2)(2, 3)
   (3, 0)(3, 1)(3, 2)(3, 3)

5. Write a recursive function to search for a value within an unordered list (linear search). The program must return the indexes of the positions where it was found.

   5 [3, 5, 2 , 5, 7, 10, 5, 12, 20, 5] returner [1, 3, 6, 9]

6. **Dichotomous search in an ordered list**
   Write a function to search for an element in an ordered list. The function will return the position index of the element in the list. Dichotomous search consists of dividing the list into two parts.
   ex. 8 [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
   divide the list in two. We obtain
   [1, 2, 3, 4, 5] and [6, 7, 8, 9, 10]

7. Write a program that reads a file containing pairs of integers (x and y), one per line, and writes a second file containing the x - y differences, one per line. Assume that the input file has no errors and that the user is prompted for file names.

8. Write a program that asks for the name of a file containing any text and it counts how many words begin with each letter of the alphabet.
   Example of output:


Words starting with A: 45
Words starting with B: 12
Words starting with C: 27
...
Words starting with Z: 3

9. A text file contains, in each line separated by spaces, 2 or 3 real values:
   1. In the first case it is the base and the height of a triangle
   2. In the second case it is the minor base, the major base and the height of a trapezoid.
   Write a program that asks the user for the name of this file, analyzes it and indicates the line of the file and the geometric figure having the greater area and the value of this area. If you find figures of equal areas, consider the first of these.

10. Write a program that reads a text from a file and breaks those longer than N characters into multiple lines (N asked to the user). The line is also broken in the middle of a word or before a space. The output must be saved in another file. For example, if the following line is read (it is only one, here it is written in two lines because it is too long):
    I have to go to the post office very quickly
    the output (with N equal to 22) must be:
    I have to go to the po
    st office very quickly

11. Like the previous one, but the lines can only be broken where there is a space (which should not be displayed at the beginning), if there is no space in the N characters, break the word at the N-th character as in the previous exercise.
    Example of output with N equal to 22:
    I have to go to the post office very quickly
    the output (with N equal to 22) must be:
    I have to go to the
    post office very
    quickly

12. **Merge of two rows**
    Two text files contain integers, arranged variously on several lines. Each of the two files is already sorted in sense INCREASING and it is not known a priori how many elements it contains (they can also have a different number of values).
    Write a program that reads these two files and produces a third containing the values of the two files all sorted in an INCREASING way. Do not use vectors or sorting algorithms. The names of the three files are asked to the user.