1st year Computer Science Degree   TD ASD2
Exercises Serie N°1   2023/2024

Sub Programs

Exercice 1   Write a function that says if a month, given as an integer between 1 and 12, has 31 days or not. This function returns 1 if it is the case and 0 otherwise.

Exercice 2   Write a function calculating the product of two positive integers A and B using successive additions.

Exercice 3   Write a function that returns the entire part of a positive real number using successive minus operations.

Exercice 4   Write a function (then a procedure) to compute the GCD of two positive integers.

Exercice 5   Write a procedure that receive as input a positive integer and returns its mirror image.
Example : if the number is 3524, we should display 4253.

Exercice 6   Write a procedure to exchange the contents of two integer variables passed as parameters.

Exercice 7   Write a procedure that display the n first prime numbers using the following rule : a prime number is always of the form $6 \times k \pm 1$, where k is an integer ≥ 1.

Exercice 8   Write a procedure which takes an array of integers as parameter and displays the elements with odd index.

Exercice 9   Write a function that take as a parameter an array of integers and returns the max of all its elements.

Exercice 10   Write a function that take as a parameter an array of integers and returns the sum of its elements.

Exercice 11   Write a function that take as a parameter an array of integers and an integer m, and returns 1 if there exists an element equal to m in the array and 0 otherwise.

Exercice 12   Write a procedure that take as a parameter an array of size n, an integer $k > 0$, then realizes a circular shift of the array elements by k positions to the right.

Exercice 13   Write a procedure that initialize each element $tab[i]$ of an array tab passed as a parameter by the value 2^i.

Exercice 14   Using the function of the previous exercise, write a function that read from the keyboard a string of characters each one is either 0 or 1 and compute the number in decimal that this string represents in binary.

Exercice 15   Write a procedure that sort an array of n integers by the two methods studied in the course (Selection and Bulles).

Exercice 16   Let $t1$ and $t2$ two arrays of n real each. Write an algorithm that compute two arrays in a thrid one t.

Exercice 17   Consider two arrays of n reals each sorted in an increasing order $t1$ and $t2$. Write a sub program that merges elements of $t1$ and $t2$ in a third array t such that t is sorted.

Exercice 18   Let Text be an array of n characters of 'A'.. 'Z', '.' And ' '
Write an algorithm for a sub program which :
– calculates the number of words in Text.
– calculates the number of sentences in Text.
– calculates the number of palindrome words in Text. (a palindrome is a word that is read on the left and on the right, example "ELLE", "LAVAL").
– optimizes the number of blanks in Text.
– calculates the number of occurrences of a given word in Text.

Exercice 19   Let $M1$ and $M2$ be two matrices represented as two-dimensional arrays of real numbers.
Write a sub program which :
– calculates the sum of the two matrices.
– calculates the product of the two matrices.
Nb : Pay attention to the sizes of the matrices.

Exercice 20   A magic square is a square matrix of size $n \times n$ such that the sum of each row, each column and each diagonal has the same value. For example, the following square is magical :

$$
\begin{array}{ccc}
6 & 7 & 2 \\
1 & 5 & 9 \\
8 & 3 & 4 \\
\end{array}
$$

Write a sub program that allows you to check whether a given square is magical or not.