Tutorial Series No. 6

Exercise 01

Given an array of 20 real numbers, we wish for you to develop an algorithm to input the array ***T***, calculate its Olympic average, and display the result.
To do so, you will begin by defining a procedure called ***MinMaxSum(T, minT, maxT, sumT)*** that computes the smallest element ***minT***, the largest element ***maxT*** of array ***T***, and the sum of all its elements ***sumT***.
Then, you will calculate the Olympic average, which is defined as the arithmetic mean of all numbers in the array, excluding the smallest and the largest.
For example, for the array {2, 3, 13, 7, 8}, the arithmetic mean is 6.6, and the Olympic average is 6.

Exercise 02

A point in the plane is characterised by its x and y coordinates.

1. Propose the data structure that can be used to represent a point in the plane.
2. Write a procedure or function that takes the coordinates of two distinct points in the plane as parameters, then calculates and returns the coordinates of the midpoint.

Exercise 03

Consider the following algorithm (**Fig. 1**)

For the correct calls, give the values of parameters ***A***, *B* and ***C*** at the start and end of the execution of the procedure ***Test***, and of variables ***X***, ***Y*** and ***Z*** at the end.

1. Test (1, 2, 3)
2. Test (X, Y, Z)
3. Test (Z, Y, X)
4. Test (1+X*10, Y, Z)

```
Algorithm Parameters ;
Var X, Y, Z : integer ;
Procedure Test (A : integer, var B, C : integer) ;
Begin
A ← A + 1 ;
B ← 22 ;
C ← C + 3 ;
End;
Begin
X ← 3
Y ← 7
Z ← 11
Test …….{procedure call}
Write (X,Y, Z) ;
End.
```

Fig.1

Exercise 04

We would like to develop a set of procedures and functions to easily manipulate hours and minutes. Here are the subprograms to be implemented:

1. The function 'Minutes', which calculates the total number of minutes corresponding to a given number of hours and minutes.
2. The function or procedure 'HoursMinutes', which performs the inverse transformation of the 'Minutes' function.
3. The procedure 'AddTime' that adds two sets of time data (hours and minutes) using the two previous functions.

Exercise 5 (June 2022)

1. Write the function ***Mirror (N)*** which calculates and returns the mirror of a positive integer ***N***. For example: Mirror (7893) = 3987.
2. Write the procedure ***Integer_decimal (X, Int, Dec)*** which calculates the integer part (الجزء الصحيح) ***Int*** and the decimal part (الجزء العشري) ***Dec*** of a positive real number ***X***.
   For example: for X=347.12, the integer Int = 347, the decimal part Dec=0.12).
3. Write a procedure ***transform_expo (X, nb, pow)*** that transforms the fractional part of the positive real number ***X*** into the exponential form $nb \times 10^{-pow}$, with pow≥0. For example: for X=0.349, nb=349 and pow=3.
4. Let X be a positive real number.
   Using the previous subprograms, write a function named ***is_symmetric(X)*** to determine if ***X*** is a symmetric real number, meaning its integer part is the mirror of its decimal part.
   For example: X = 5641.1465 is a symmetric real number.
   X = 123.322 is not a symmetric real number.