Tutorial Serie 1

Objectives : *to master the basic instructions (assignment, reading, writing)*

Exercise 1

Let the following problems:
1. Calculation of the sum of two complex numbers.
2. Calculation of the product of two complex numbers.
3. Determination of the type of an angle θ expressed in degrees. Knowing that an angle can be :
   - Zero (or Null) ($\theta = 0°$),
   - Acute ($0° < \theta < 90°$),
   - Right ($\theta = 90°$),
   - Obtuse ($90° < \theta < 180°$),
   - Straight ($\theta = 180°$),
   - Reflex ($180° < \theta < 360°$),
   - Complete (or Full) ($\theta = 360°$).

4. Deliberation of a group of 20 students by displaying for each student: his name, his first name, his identification number, his average and the decision of the jury of deliberation «Admitted» or «Postponed ». Knowing that:
   - All students in the group follow 4 modules (M1, M2 M3 and M4).
   - The respective coefficients of modules are: 2, 1, 3 and 2.
   - The student is declared «Admitted» if his average is greater than or equal to 10 otherwise is declared «Postponed».

Question:

Identify for each of the above issues:
   - The input data,
   - The output results
   - The main stages (steps) of resolution.

Exercise 2

1. Knowing that a = 4, b = 5, c = -1 and d = 0, evaluate the following logical expressions:
   - $a < b$ **AND** $c \geq d$
   - **NOT** $(a < b)$ **OR** $c \neq b$
   - **NOT** (a$\neq$ b^2) **AND** a*c $< d$
2. Knowing that: A= TRUE, B=FALSE, C= TRUE; evaluate the following logical expressions:
   - A **OR** B **AND** A **OR** C
   - **NOT** (A) **AND** B **OR** A **AND NOT** (B)
   - A **AND** B **AND** B **AND** C **OR** C **AND** A
   - A **AND** B **OR** B **AND** C **ET** C **AND** A
   - A **OR** A **AND** B **AND** A **OR** B **AND** C

3. Knowing that A=3, B=4, X=3.0, Y= -1.0, C='K' and F=False.
   Indicate the evaluation order and the value of each of the following expressions:
   - -X*A+Y,
   - B-A/Y+2,
   - 4+A*4–B+A+2 4/Y–9+6*3,

- B–2/Y/3/2*5*X-4 2,
- F **AND NOT** (C<'A'),
- X≤Y **OR** A>B,

Exercise 3

These are the following algorithms:

```
Algorithm Algo_01;
Var A, B, C: integer ;
     D: Boolean;
Begin
   A ← 5;
   B ← 6 ;
   C ← A + B*2 + 3;
   D ← (C mod A) < (C div B) ;
   Write (A,B,C,D);
End.
```

```
Algorithm Algo_02;
Var A, B, C: integer ;
     D: Boolean;
Begin
   Read (A);
   Read (B);
   C ← A + B*2 + 3;
   D ← (C mod A) < (C div B) ;
   Write (A,B,C,D);
End.
```

```
Algorithm Algo_03;
Var x, y: real;
Begin
   x ← 10;
   y ← x * 2;
   Write (x, " *2= ", y);
End.
```

```
Algorithm Algo_04;
Var x, y: real;
Begin
   Read (s);
   y ← x * 2;
   Write (x, " *2= ", y);
End.
```

Questions:
1. Perform the trace of the algorithms **Algo_01** and **Algo_02.**
2. What results does the Algo_03 algorithm produce**.**
3. What results does the Algo_04 algorithm produce**.**
4. What is the relationship between the last two algorithms.

Exercise 4

These are the following expressions **"**Exp1, Exp2 and Exp3":

$$\text{Exp1} = \frac{5(a - cd)^2 - 3bc}{2be + ac}$$

$$\text{Exp2} = \frac{-a + 3 - \quad 5 * \dfrac{b}{c}}{\dfrac{2c}{d} - \dfrac{2c - 3}{b}}$$

$$\text{Exp3} = a + b - c - \frac{a + c * d - b + 5}{d + \dfrac{c}{2}}$$

Without mathematical simplifications, write instructions equivalent to the previous expressions.

Exercise 5

Write **an algorithm and its C program** that allows to calculate and display the square and the double of an integer introduced by the user.

Exercise 6

Writing **an algorithm** and its **C program** qui can read three (3) real numbers and calculate and display their sum, their product and their average.

Exercise 7 -optional-

Let the following algorithm :

```
Algorithm Algo_05 ;
Var   A, B : entier ;
Begin
    Read (A);
    Read (B);
    A ← B;
    B ← A;
    Write (A,B);
End.
```

Questions:

1. Perform the trace of the Algo_05 **algorithm by** entering 5 and 10 as values of A and B.

2. Can the algorithm instructions exchange the two values of B and A?

3. Reverse the order of the instructions (A ← B;) and (B ← A;) and perform the trace of the new algorithm.

4. If the value exchange problem of A and B is not resolved, propose an algorithm to solve this problem.

Exercise 8 -optional-

Let A, B and C be three points in the plane defined by their coordinates $A(x_A, y_A)$, $B(x_B, y_B)$ and $C(x_C, y_C)$. Write an algorithm that determines and displays the nature of the ABC triangle.

(An ABC triangle is either isosceles, equilateral or any.)