Tutorial series N°2

In all exercises in this series, you are not required to ensure the validity of the entered data.

Exercise 1:

a) Provide the type of the following constants:

-10 ; 12.3 ; ″SLIM″ ; 2000 ; -12.33; ’’B’’ ; False ; ″7+2″ ; ’’False’’ ; ″21,4587″ ;

b) Indicate whether the following identifiers are syntactically correct; if not, explain why:

I ; Y_120 ; END ; RIAD; BAC+2 ; RATE% ; 12XY ; F$; ″ALGER″ ; ALPHA10-5 ; Charles VI; CITY

c) Express the following expressions in algorithmic form:

$$\Delta = \boldsymbol{B^2 - 4AC}\ ; \quad \boldsymbol{e = \frac{h^2 - B^2 - 3D}{2A}}\ ; \qquad \boldsymbol{\alpha = \frac{(a+b)^2}{ab} - \frac{2(k+c^3)}{a+b}}$$

Exercise 2:

a) Correct the following algorithm: :

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Algorithm Exercise 1
Const val=2,14597898 ; t←Exercise 1
Var 1n ; 2n ; 3n = integer ;
Begin ;
  Read(t;”1n”)
  1n= ”2”
  2n←val div 1n
  3n←val mod t
  val←0;
End ;
```

b) What will be the values of the variables used after the execution of each of the following algorithms?

Algorithm calculation;	Algorithm calculation;	Algorithm calculation;	Algorithm calculation;
Var A, B, C : Integer ; Begin A ← 5 ; B ← 3 ; C ← A + B ; A ← A - 3 ; C ← B – A ; End.	Var A, B, C : Real ; Begin A ← 3 ; Read(B) ; C ← A + B ; A ← C ; End.	Var A, B,C : Boolean ; Begin A ← True ; B ← False ; C ← A and not B ; A ← not A End.	Var A, B, C : String ; Begin A ← “423” ; B ← “12” ; C ← A + B + “cm” ; A← “@]..” ; End.

Exercise 3:

Write an algorithm that allows entering the marks for the "Algorithms and Data Structures" course of a first-year Mathematics student, and calculates and displays his average, knowing that the latter is calculated using the following formula:

$$Avg = \frac{TW + PW}{2} \times 0.4 + Exam \times 0.6$$

Exercise 4:

Consider a regular pyramid with a square base.

Write an algorithm that input the height of the pyramid and the length of the side of its square base, and calculates and displays its surface area.

Recall that the area of a triangle is equal to half of the product of the length of the base of the triangle by its height.

Exercise 5:

Let A, B, and C be three logical variables. Write an algorithm that reads the values of these 3 variables from the keyboard and calculates and displays the value of the following expression:

$$R=(A+B).(\overline{A}+C).(B+\overline{C})$$

Exercise 6:

The torr (Torr) is a unit of pressure measurement. It is defined as the pressure exerted at 0°C by a column of 1 millimeter of mercury. It was later indexed to atmospheric pressure: 1 standard atmosphere corresponds to 760 torrs and is equal to 101325 Pascals.

Write an algorithm that reads a pressure in torrs and converts it to pascals.

Exercise 7:

A magician asks a spectator to think of a number and write it on a slate. He invites the spectator to hide this slate for the duration of the act. He then asks him to add 3 and multiply this sum by the number he initially thought of. He insists: do not forget this result. Then calculates the square of the initial number. Finally, he asks the spectator to subtract this result from the previous one. The magician requests the spectator to say the final result out loud.

Establish the pseudo-code algorithm corresponding to this statement.

Additional exercises

Exercise 8:

It is well known that to swap the values of two variables, a third intermediate variable is required.

However, for integer numerical data, there is a way to do it without using an additional variable. Write the algorithm that allows swapping two integers without the use of an additional variable."

Exercise 9 :

Write an algorithm that asks the user for an integer smaller than 8 and displays the corresponding binary number.

Exercise 10 :

Write an algorithm that asks the user for a duration value expressed in seconds and displays its equivalent in hours, minutes, and seconds.

Example: 3800 seconds → 1 hour 3 minutes 20 seconds.