Series of Exercises N° : 02

Conditional instructions

Exercise N° : 01

Write an algorithm that reads an integer and determines whether it is even or odd.

Exercise N° : 02

Write an algorithm that asks the user to enter an integer number, then displays whether that number is positive, negative, or zero.

Exercise N° : 03

Write an algorithm that reads the values of three integer variables A, B, and C, then deduces the minimum and maximum among these variables.

Exercise N° : 04

Write an algorithm that reads the values of two variables A and B, then returns the sign of the product of these two variables without calculating the product.

Exercise N° : 05

Write an algorithm that reads the values of the three integer variables A, B and C, then performs the necessary permutations to ensure that the inequality $A \leq B \leq C$ will always be true.

Exercise N° : 06

Write an algorithm that converts the value of a positive sum of money given by the user into a minimum number of the usual coins (200 DA, 100 DA, 50 DA, 20 DA, 10 DA, 5 DA and 1 DA).

Exercise N° : 07

The student library offers a special discount for photocopying. So that, it charges 5 DA for the first ten copies, 4 DA for the next twenty, and 2.5 DA for each additional copy.
Write an algorithm that asks the user for the number of copies made and then displays the corresponding invoice.

Exercise N° : 08

Write an algorithm that determines the season from the number of a month.
For example:
If month = 6, then the season is Summer. If month = 3, then the season is Spring.

Exercise N° : 09

Write an algorithm that calculates the average and determines a student's grade based on their mathematics, computer science, and machine structure scores (notes) as follows:

$M \geq 16$: Excellent. $14 \leq M < 16$: Very good. $12 \leq M < 14$: Good.
$10 \leq M < 12$: Passable. $M < 10$: Fail.

Exercise N° : 10

Write an algorithm that solves an equation of the type: $\mathbf{A}x^2 + \mathbf{B}x + \mathbf{C} = 0$.

Exercise N° : 11

Write an algorithm that calculates the duration of a flight in hours and minutes, given the departure and arrival times.
1. Assume that the departure and arrival of the flight occur on the same day.
2. Assume that the flight duration is less than 24 hours but could occur the following day.

Series of Exercises N° : 03

Repetitive instructions

Exercise N° : 01

What do the following loops do?

1.
```
s ← 0
for i ← 0 to 10 do
   write (' Give a number : ')
   read (x)   s ← s + x
endfor
```

2.
```
repeat
   write ('Give a number : ')
   read (x)
until ((x > 0) and (x ≤ 10))
```

3.
```
s ← 0        Fin ← false        k ← 0
while (Fin = false) do
   write ('Give X : ')
   read (x)
   s ← s + 1/x        k ← k + 1
   if (k = 10) alors
        Fin ← true
   endif
endwhile
```

4.
```
s ← 0
for i ← 1 à 10 do
     j ← i    f ← 1
     while (j > 0 ) do
          f ← f * i      j ← j – 1
     endwhile
   s ← s + f
endfor
write (' S= ', S)
```

Exercise N° : 02

Write an algorithm that reads two positive integer numbers A and B such that $B \neq 0$, then calculates the result of the integer division A / B without performing the division operation.

Exercise N° : 03

Write an algorithm that checks whether a positive integer $X \geq 2$ given by the user is a prime number or not.

Exercise N° : 04

Write the algorithm that calculates the sum S such that:

1) $S = 1+2+4+8+ \ldots 2^n$.
2) $S = 1 + 1/1! + 1/2! + \ldots + 1/n!$
3) $S = 1 * 3 * 5 * 7 * \ldots * 99$
4) $S = 2 - 5 + 8 - 11 + \ldots + (-1)^{n+1} (3*n - 1)$

Exercise N° : 05

A number is said to be perfect if it is equal to the sum of its divisors, excluding itself. For example: 6 = 1 + 2 + 3.

- Write an algorithm that checks whether a given positive number is perfect or not.
- Extend this algorithm to find the perfect numbers between two given positive integers M and N.

Exercise N° : 06

Write the algorithm that allows you to find the GCD of two integers A and B using Euclid's method (A>=B).

Let R be the remainder of the division of A by B.:

- If R = 0 then GCD(A, B) = B, otherwise, GCD(A,B) = GCD(B,R).
- The operation will be repeated until R becomes zero.

Exercise N° : 07

Two numbers are said to be equivalent if the sums of their digits are equal. Write an algorithm that checks the equivalence of two positive numbers given by the user.

Exercise N° : 08

An integer number is called a palindrome if it reads the same backward as forward.
Example: N = 10201 is a palindrome.
Write an algorithm that reads a positive number and checks if it is a palindrome.