Tutorial series N°4

Exercise 1:

Write an algorithm that takes in a multiple of 3 and determines how many times it is divisible by 3.

Example:

The number 81 is divisible by 3 four times because 81 = 3 * 3 * 3 * 3.

Exercise 2:

A person has bought a new car at a price ***P***. Knowing that the car's value decreases at a fixed rate each year, the person wants to resell the car before it loses half of its initial value.

Write an algorithm that asks the user to enter the price of the car and the rate of price decrease, and calculates and displays the number of expected years of use.

Exercise 3:

We want to write an algorithm for a voting machine. For simplicity, we assume that there are only two candidates. So, we introduce the users' votes in the form of a number: 1 for the first candidate and 2 for the second. The voting is finished when a value other than 1 and 2 is entered.

At the end, the computer should display the vote percentages and the winner.

Exercise 4 :

Write an algorithm that asks the user for a positive non-zero integer and determines whether it is a prime number or not.

Remember that a prime number is a number whose only divisors are 1 and itself.

Example:

2, 3, 5, 7, 11, 13, 17, 19... are prime numbers.

Exercise 5:

Write an algorithm that calculates the factorial (**n!**) of an integer *n* read from the keyboard.

Reminder: n! = 1 × 2 × ... × n.

Exercise 6:

Write an algorithm that allows to read a positive non-zero integer *x* and calculate the following sum up to the n^{th} term (*n* is entered by the user):

$$S = \sum_{i=1}^{n} \left(x + \sum_{j=1}^{i-1} j \right)$$

For example, if *x* = 3 and *n* = 4, the sum *S* is:

S = 3 + (3+1) + (3 +1+2) + (3+1+2+3) = 3+4+6+9 =22

Exercise 7:

It was demonstrated that the value of ***e*** can be approximated by the following infinite sum:

$$e \approx \sum_{i=1}^{\infty} \frac{1}{i!}$$

In this exercise, we decide to stop the sum at a given positive non-zero integer *n* (with $n > 0$).

Write an algorithm that allows to read a positive non-zero integer *n* and calculate an approximation of ***e*** up to rank *n*.

Example:

If $n = 4$,

$$e \approx \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} = \frac{1}{1} + \frac{1}{1\times 2} + \frac{1}{1\times 2\times 3} + \frac{1}{1\times 2\times 3\times 4} = 1 + \frac{1}{2} + \frac{1}{6} + \frac{1}{24} = 1{,}708333$$

Additional exercises

Exercise 8:

Write an algorithm to display the divisors of a positive non-zero integer entered by the user.

Exercise 9:

Write an algorithm that allowing to enter a positive non-zero real number and calculate and display its integer part.

Exercise 10:

Write an algorithm that calculates the i^{th} digit of a number *n*. The integers *i* and *n* are entered via the keyboard. We assume that the units digit is number 0, the tens digit is number 1, and so on.

Exercise 11:

Write an algorithm that calculates and displays the maximum digit of an integer *N* read from the keyboard.

Exercise 12:

Write an algorithm that reads two positive non-zero integers, *A* and *B*, and finds their Least Common Multiple (LCM).

Exercise 13:

We can approximate the value of π using the following expression:

$$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \ldots.$$

Write an algorithm that calculates and displays an approximate value of π using the above expression.

The calculation stops when the difference between two consecutive values of this expression becomes strictly less than $\mathbf{10^{-3}}$.

Exercice 12:

Ecrire un algorithme qui permet de saisir au clavier une série de *n* nombres réels (*n* étant donné par l'utilisateur) et qui détermine le nombre maximal dans la série.

La première méthode possible pour calculer le PPMC est en s'aidant du PGCD:

ppcm(a, b) × pgcd(a, b) $= a \times b$

Le calcul du PPMC est possible par additions

Exemple:

PPMC(15, 25)

a=15 b=25

a=30 b=25

a=30 b=50

a=45 b=50

a=60 b=50

a=60 b=75

a=75 b=75

```
int main(){
   int a,b,c,d;
   a=50;
   b=30;
   c=a ;
   d=b ;
   while(a != b)
     if(a > b)
        b = b+d;
     else a = a+c  ;
   printf("Le PPMC est %d",a);
   return 0;
}
```