REPUBLIQUE ALGERIENNE DEMOCRATIQUE ET POPULAIRE
MINISTERE DE L'ENSEIGNEMENT SUPERIEUR ET DE LA RECHERCHE SCIENTIFIQUE

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قسم الإعلام الآلي

Level: 1st year of computer science
Course: ADS1

series TD/TP N°: 05

Academic year:2023/2024
Chapter 4 : Loops

Exercise 1: TD/TP
Write an algorithm with its C program that calculates the factorial of a number.
N.B. : 0!=1 et n! $= 1 \times 2 \times \ldots \times$ n

Exercise 2: TP
Write a program to display all the divisors of a number.

Exercise 3: TD
Write an algorithm to display all the common divisors of two numbers.

Exercise 4: TP
Write a program that displays the mirror image of an integer (displays it in reverse).

Exercise 5: TD/TP
Write an algorithm with its C program that determines if a number is prime or not.

- Using the for loop.
- Using the while loop.
- Generalize this algorithm to display all prime numbers less than or equal to N (≤N).

Exercise 6: TD/TP
Write an algorithm with its C program that calculates the GCD (Greatest Common Divisor).
Given that:

$$PGCD(a,b) = \begin{cases} PGCD(b,(a\ \%\ b)), & b \neq 0 \\ a, & b = 0 \end{cases}$$

Exercise 7: TD
Write an algorithm to calculate the nth term of the Fibonacci sequence defined by:

$$u(n) = \begin{cases} 0 & si\ n = 0 \\ 1 & si\ n = 1 \\ u(n-2) + u(n-1), & si\ n > 1 \end{cases}$$

Exercise 8: TP
If you knew that

$$\pi = 4\sum_{k=0}^{n} \frac{(-1)^k}{2k+1} = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11}$$

Write a program that calculates the approximate value of π.
N.B. : make sure that n is strictly positive.

Exercise 9: TD
If you knew that

$$\exp(x) := \sum_{k=0}^{n} \frac{x^k}{k!} = 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^4}{24} +$$

Write a program that calculates exp(x) (x is a real number and n is an integer).
N.B. : make sure that n is strictly positive.

Exercise 10: (at home)
Write the program to calculate $\boldsymbol{x^n}$. (x is a real number and n is an integer that can be positive, negative or zero).

Exercise 11: (at home)
Write a program that calculates the Least Common Multiple (LCM) of two numbers.

Exercise 12: (at home)
If you know that the square root of a number "a" is calculated by the following recursive relationship :

$$x_{n+1} = \frac{x_n + \frac{a}{x_n}}{2}$$

$$x_0 = 1$$

Write an algorithm with its C program that calculates the square root of a number « a » with approximation error $\varepsilon = 10^{-6}$. In other words $(x_n)^2 - a \leq \varepsilon$