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

Université de M'sila
Faculté des Mathématiques et de l'Informatique
Département d'informatique

جامعة المسيلة
كلية الرياضيات والإعلام الآلي
قسم الإعلام الآلي

Level: 1st year computer science
Material: ADS2

TD/TP Series N: 02

Academic year: 2023/2024
Chapter 1 : Recursion

Exercise 1: (TD)
Consider the following program:

- What is the value of "r" after running the program for a=3 and b=5
- What do you notice? And why?
- How do we fix this?
- Convert the sum procedure into a function.

```
1  #include <string.h>
2  sum(int d, int   f, int s) {
3    int i;
4    s=0;
5    for (i =  d; i <= f; i++)
6      s = s + i;
7  }
8  main() {
9    int a, b, r;
10   r=0;
11   printf("enter two numbers");
12   scanf("%d%d", &a, &b);
13   sum(a,  b, r);
14   printf("the result is %d", r);
15 }
```

Exercise 2: (TP)
Write a recursive subroutine "***conv10to2"*** to convert from decimal system 10 to binary system 2 (display)

Exercise 3: (TD/ TP)
Write a recursive subroutine called 'pos' that returns the location of the character 'x' in string 's' starting from position 'd' and returns -1 if it cannot be found.

Exercise 4: (TP)
If you know that the largest common divisor is defined as follows:

$$\gcd(x,y) = \begin{cases} x & \text{if } y = 0 \\ \gcd(y, \text{remainder}(x,y)) & \text{if } x \geq y \text{ and } y > 0 \end{cases}$$

Write 'PGCD', a recursive subroutine to calculate the greatest common divisor of two numbers.
Write the main program to reduce the fraction $\frac{A}{B}$ using the ***PGCD***

Exercise 5: (TD/TP)
If you know that the square root of any number 'a' is defined by the following formula:

$$x_0 = 1$$
$$x_{i+1} = \frac{1}{2}\left(x_i + \frac{a}{x_i}\right)$$

Write "root", a recursive subroutine to calculate the square root of ***a***

Exercise 6: (TD)
Write "***Sum",*** a recursive subroutine to calculate the following sum:

$$s = \sum_{i=1}^{n} \frac{-1^{i+1}}{i} x^i$$

Exercise 7: (at home)

- Rewrite all subroutines of series N01 using recursion.
- Rewrite all subroutines in series N02 iteratively.