



Level: 1st year computer science
Material: ADS2

TD/TP Series N: 02

Academic year: 2024/2025
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 `prod` procedure into a function.

```
1 #include <string.h>
2 prod(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    prod(a, b, r);
14    printf("the result is %d", r);
15 }
```

Exercise 2: (TP)

Write a recursive subroutine “**conv10to8**” to convert from decimal system 10 to octal system 8 (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.

Write the main program to display all locations of the character 'x' in string 's' starting from 0

Exercise 4: (TP)

If you know that the largest common divisor is defined as follows:

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

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.