



Academic year: 2023-2024

Level: 1st year “Computer Science & Mathematics”

Module: Algorithmic and Data Structures 2

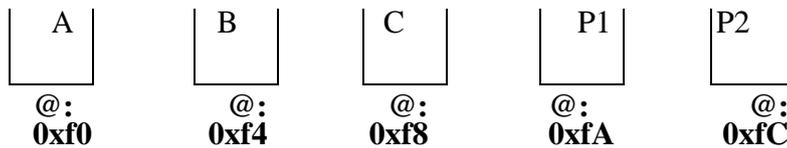
TD n°4

Pedagogic objective

- Understand the declaration, syntax and semantics of pointers, among others: indirect addressing, the content of a dynamic variable as well as arrays using pointers;
- Understand dynamic memory allocation and freeing.

Exercise n°1

Let three integers A, B, C and two pointers of integer type P1 and P2.



Determine the values of the different elements given in the table for each operation.

	A	B	C	&A	&B	&C	P1	P2	*P1	*P2
A←-1, B←-2, C←-3 P1←&A, P2←&B										
P2= &C										
*P1 = *P2										
(*P2)++										
P1= P2										
P2= &B										
*P2 = *P1 - 2* *P2										
(*P2)--										
C = (P2 == &C)										
*P2= *P1 + A										

Exercise n°2

Let a pointer P, which points to an array A:

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int A[] = {12, 23, 34, 45, 56, 67, 78, 89, 90}; int *P; P = A;
```

What values or addresses do the following expressions provide?

- a) *P+2
- b) *(P+2)
- c) &P+1
- d) &A[4]-3
- e) A+3
- f) &A[7]-P
- g) P+(*P-10)
- h) *(P+*(P+8)-A[7])

Exercise n°3

Write an algorithm that allows you to:

- Declare pointers to: an integer, a real number, a character, a “Student” record composed of the following fields: *Registration number, Last name, First name and Result* ;
- Then Read() data that corresponds to the variables pointed to by these pointers.

Exercise n°4

Write an algorithm that arranges the elements of an array of N integers in reverse order. Using two pointers P1 and P2 and a numeric variable HELP (intermediate variable) to swap the array elements.

Exercise n°5

An employer is defined by the following information: *last name, first name, date of birth, number of children and qualification*. We want to establish a list of all employers, knowing that we do not know their number beforehand, however, they will not **exceed 300** (≤ 300).

1. Propose a data structure (records) to be used to manage employers.
2. Write an algorithm to enter all the information.
3. Write an algorithm to sort employers according to increasing order of their ages and only keep in memory 10% of the youngest employers.