

PW Sheet N° 5- Part 2

[Algorithms and data structures 1]

Part 5: Records in C language

Date Comparison

The following program compares and displays whether a date **d1** is strictly anterior to (before) a date **d2**.

1. Create a new project.
2. Type this code, complete it, then compile and run.

1

```
#include <stdio.h>
#include <stdlib.h>
typedef struct    /*Sets the record type*/
{
    int day;
    int month;
    int Year;
}date;

Main ()
{
    date d1          /*declares a variable d1 of the defined type date*/
    date d2          /* declares a variable d2 of the defined type date*/
    printf("Please enter the first date \n");          /* entering the variable d2*/
    printf("Please enter the day \n");
    scanf("%d ", d1.day );
    printf("Please enter the month \n");
    scanf("%d", d1.month );
    printf("Please enter the year \n");
    scanf("%d ", d1.Year );
    printf("Please enter the second date \n");          /* entering the variable d2*/
    .....
}
```

Concluding remarks

1. In the C programming language, records are a collection of data of different types grouped under a logical entity called a structure.

2. A structure type can be defined using either the reserved words **struct** or **typedef**:

Definition by struct

```
struct Structure_Name
{
    Type1 Field1;
    Type2 Field2;
    ...
    Typen Fieldn;
};
```

Definition by typedef

```
typedef struct
{
    Type1 Field1;
    Type2 Field2;
    ...
    Typen Fieldn;
} Name_Type_Structure ;
```

3. The declaration of a structure variable can use the keyword "struct" or not, depending on whether the structure type was defined using "struct" or "typedef".

- a. Using **struct** to define the structure type:

- When defining the structure type using **struct**:

```
struct Structure_Name
{
    Type1 Field1;
    Type2 Field2;
    ...
    Typen Fieldn;
} Variable_Name;
```

- After defining the structure type using **struct**:

```
struct Structure_Name Variable_Name;
```

- b. Using **typedef** to define the structure type:

```
Name_Type_Structure Variable_Name;
```

4. A struct variable field is accessed by specifying the variable name, followed by a dot, and then the field name.

```
Variable_Name.Field_Name
```

Part 5 : Application Exercises

1. A complex number Z is defined by its real part a and imaginary part b :

$$Z = a + bi$$

Write a program that reads two complex numbers **Z1** and **Z2** and calculates and displays their modules, sum, and conjugate.

Note that :

- The module of a complex number Z is defined as: $|Z| = \sqrt{a^2 + b^2}$
 - The conjugate of a complex number $Z = a + bi$ is the complex number $Z' = a - bi$.
 - The sum of two complex numbers $Z1 = a1 + b1i$ and $Z2 = a2 + b2i$ is the complex number $Z = (a1+a2) + (b1+b2)i$.
2. To manage the grades of the ASD1 course for the students in his group, the teacher uses an array of 20 students. Each student is characterized by his name, first name, registration number, and his grades for tutorial work, Practical Work, and Exam, as well as their average.
- Write a C program that allows you to enter the information for all students, then calculate their averages, and finally display all students with an average of 10 or higher.
 - Modify this program to display the registration number, name, first name and average of the student with the highest average.