Tutorial 9 : Structures

Exercise 1:

A point in the plane is defined by its x and y coordinates (integers). A rectangle is defined by two points (the top left point and the bottom right point). A circle is defined by a center (a point) and a radius.

Write a C program that defines three structures Point, Rectangle, and Circle. The program should read and display the respective fields of the variables of type structure Point, Circle, and Rectangle (for example: 2 points p1 and p2, 2 circles c1 and c2, 2 rectangles R1 and R2).

Exercise 2:

Define a date structure containing three integer fields to identify the day, month, and year. Initialize a variable of type date structure. Display this structure using the variable and using a pointer.

Define an array of date structures. Initialize this array and display the contents of the array using a pointer.

Exercise 3:

Define a data structure Hour to represent an hour in the format hh/mm/ss, then write the following functions:

- Conversion of an element of type Hour to an integer number of seconds.
- Conversion of an integer number of seconds to an element of type Hour
- Addition of two elements of type Hour.
- Subtraction of two elements of type Hour.

Exercise 4:

We want to manage a marathon. Each marathon runner is defined by their name (a string), start time, finish time, and race time (use the hour structure from exercise 3).

Write a C program that reads the data corresponding to the N runners in the marathon and sorts them in ascending order by race time.

Use functions to:

- Read the runner data (name, start time, and finish time);
- Calculate the runners' race times;
- Compare the times made by two runners;
- Sort the runners;
- Display the results.