

Structure and Union in C Language

Module 01 - Structures in C Language



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In C programming, **structures** and **unions** are user-defined data types that allow grouping of different data types together. They are essential for organizing complex data in a more manageable and efficient way.



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Definition:

A Structure is a user defined data type that can store related information together. The variable within a structure are of different data types and each has a name that is used to select it from the structure.



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C arrays allow you to define type of variables that can hold several data items of the same kind but structure is another user defined data type available in C programming, which allows you to combine data items of different kinds.



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Structures are used to represent a record. Suppose you want to keep track of your books in a library.



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You might want to track the following attributes about each book: • Title • Author • Subject • Book ID

Structure Declaration:



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It is declared using a “keyword struct” followed by the name of the structure. The variables of the structure are declared within the structure. Each item in a structure is called a **member** or **field**. These members can have different data types (int, float, char, etc.), and the structure itself acts like a custom data type.



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**Syntax:**

```
c
struct StructureName {
    data_type member1;
    data_type member2;
    ...
};
```



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Structure Initialization:

In C, **structure initialization** refers to the process of assigning values to the members of a structure at the time of its creation. You can initialize a structure in different ways, depending on the needs of your program.

**Syntax:**

```
c
struct StructureName {
    data_type member1;
    data_type member2;
    // ... other members
};

// Structure initialization during declaration
struct StructureName variable_name = {value1, value2, ...};
```

**Accessing the Members of a Structure in C**

In C, once a structure is defined and initialized, you can access its individual members to either read or modify their values.

The **dot operator** (.) is used to access the members of a **structure** when you have an **instance** (**variable**) of the structure.

When you define a structure, it contains several members (variables of different data types). To access these members, you use the dot operator (.) along with the structure variable name.

**Syntax:**

```
c
structure_variable.member_name
```

Copy code

- **structure\_variable** is the name of the structure variable (instance).
- **member\_name** is the name of the member you want to access within the structure.

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## Introduction to 'C' Language

### Solved Example: Simple Structure to store Student information

```
c Copy code  
  
#include <stdio.h>  
  
// Define a structure called Student  
struct Student {  
    char name[50]; // Character array for name  
    int age; // Integer for age  
    float grade; // Float for grade  
};  
  
int main() {  
    // Declare a structure variable and initialize its members directly  
    struct Student student1 = {"John Doe", 20, 85.5};  
  
    // Accessing and displaying members using the dot operator  
    printf("Name: %s\n", student1.name);  
    printf("Age: %d\n", student1.age);  
    printf("Grade: %.2f\n", student1.grade);  
  
    // Modifying a member using the dot operator  
    student1.age = 21; // Update the age of student1  
  
    // Display the updated information  
    printf("\nUpdated Age: %d\n", student1.age);  
  
    return 0;  
}
```

#### Output:

```
yaml Copy code  
  
Name: John Doe  
Age: 20  
Grade: 85.50  
  
Updated Age: 21
```

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Solved Example: To Access Elements in a Structure

Example: Accessing and Modifying Structure Members

```
c Copy code
#include <stdio.h>

// Define a structure called "Book"
struct Book {
    char title[50];
    char author[50];
    int pages;
    float price;
};

int main() {
    // Declare and initialize a structure variable for a book
    struct Book book1 = {"C Programming", "Dennis Ritchie", 300, 299.99};

    // Accessing and displaying structure members using dot operator
    printf("Book Title: %s\n", book1.title); // Accessing title
    printf("Author: %s\n", book1.author); // Accessing author
    printf("Number of Pages: %d\n", book1.pages); // Accessing number of pages
    printf("Price: %.2f\n", book1.price); // Accessing price

    // Modifying structure members using dot operator
    book1.pages = 350; // Updating number of pages
    book1.price = 349.99; // Updating price

    // Displaying the updated values
    printf("\nUpdated Book Information:\n");
    printf("Number of Pages: %d\n", book1.pages); // Displaying updated pages
    printf("Price: %.2f\n", book1.price); // Displaying updated price

    return 0;
}
```

Output:

```
Copy code
Book Title: C Programming
Author: Dennis Ritchie
Number of Pages: 300
Price: 299.99

Updated Book Information:
Number of Pages: 350
Price: 349.99
```

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## Introduction to 'C' Language

### Assignment

**Ques 1:** Define a structure named Student that contains the following members:

1. name (string, to store the student's name)
2. age (integer, to store the student's age)
3. marks (float, to store the student's marks in a subject)

Write a program to do the following:

1. Declare a variable of type Student.
2. Prompt the user to enter the student's details: name, age and marks.
3. Display the student's details using the dot operator.
4. Update the student's marks and age, then display the updated details.

**Ques 2:** Define a structure named Book that contains the following members:

1. title (string, to store the title of the book)
2. author (string, to store the author's name)
3. price (float, to store the price of the book)
4. pages (integer, to store the number of pages in the book)

Write a program to do the following:

1. Declare a variable of type Book.
2. Prompt the user to enter the details of a book: title, author, price, and number of pages.
3. Display the entered book details using the dot operator.
4. Allow the user to update the price and number of pages, then display the updated details.

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