

# STRUCTURES

C++ allows aggregating of variables belonging to different data types into heterogeneous data structures called Structures.

Structure (the keyword **struct** is used in C++) is use to group variables into a single record. Keyword struct is a data-type, like the following C++ data-types ( int, float, char, etc... ).

## General Form of Structure:

```
struct name
{
  Variables1;
  Variables2;
};
```

## Structure Declarations

There are three Ways for Declare the Structure

- ✓ The first way to define the struct, as shown:

```
#include <iostream.h>
struct data
{
  char *a;
  int age;
};
void main()
{
  struct data student;
```

To access elements in a structure, use a record selector (.).

```
student . a="Omar";
student . age=21;
}
```

- ✓ The second way to define the struct, as shown:

```
struct data
{
  char *a;
  int age;
} student;
```

- ✓ The third-way to define the struct, as shown:

```
typedef struct
{
    char *a;
    int age;
} student;
```

**Note:** we can assign more than one name as a structure-name, to the one structure. For example:

```
typedef struct
{
    char *a;
    int age;
} student , lecturer;
```

**Example:**

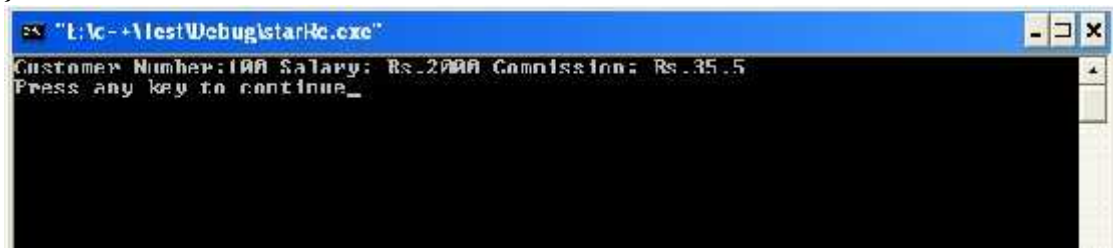
```
#include <iostream.h>
struct d
{
    char *name;
    int age;
};
void main()
{
    struct d student;
    student.name="Omar";
    student.age=21;
    cout<<student.age<<endl;
    cout<<student.name<<endl;
}
```



**Example:**

```
#include <iostream.h>
struct Customer
{
int custnum;
int salary;
float commission;
};

void main()
{
Customer cust1={ 100,2000,35.5};
cout<<"Customer Number:"<<cust1.custnum<<" Salary: Rs."
<<cust1.salary<<" Commission: Rs."<<cust1.commission<<endl;
}
```

**Nesting of structures:**

Nesting of structures is placing structures within structure. How to declare nesting of structures? How to access structure members in case of nesting of structures?

**Example:**

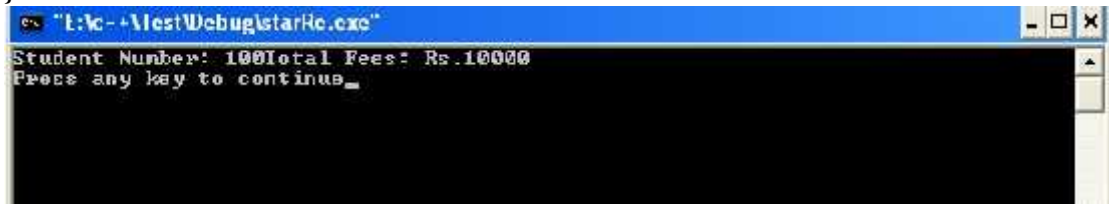
```
#include <iostream.h>
struct course
{
int couno;
int coufees;
};
struct student
{
int studno;
course sc;
course sc1;
};

void main( )
{
```

```

student s1;
s1.studno=100;
s1.sc.couno=123;
s1.sc.coufees=5000;
s1.sc1.couno=200;
s1.sc1.coufees=5000;
int x = s1.sc.coufees + s1.sc1.coufees;
cout<<"Student Number: "<<s1.studno<<"Total Fees: Rs."<< x<<endl;
}

```



## Array of Structures:

The **struct** is a data-type. So we can define an array as an array of struct, like define an array as an array of int, or of any other C++ data-types.

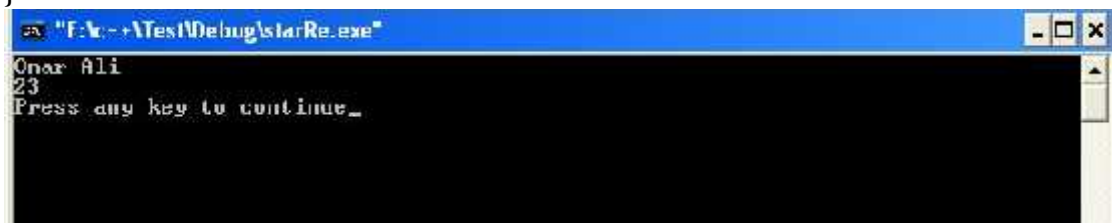
The following simple example shown how can create and use an *array of struct*.

### Example:

```

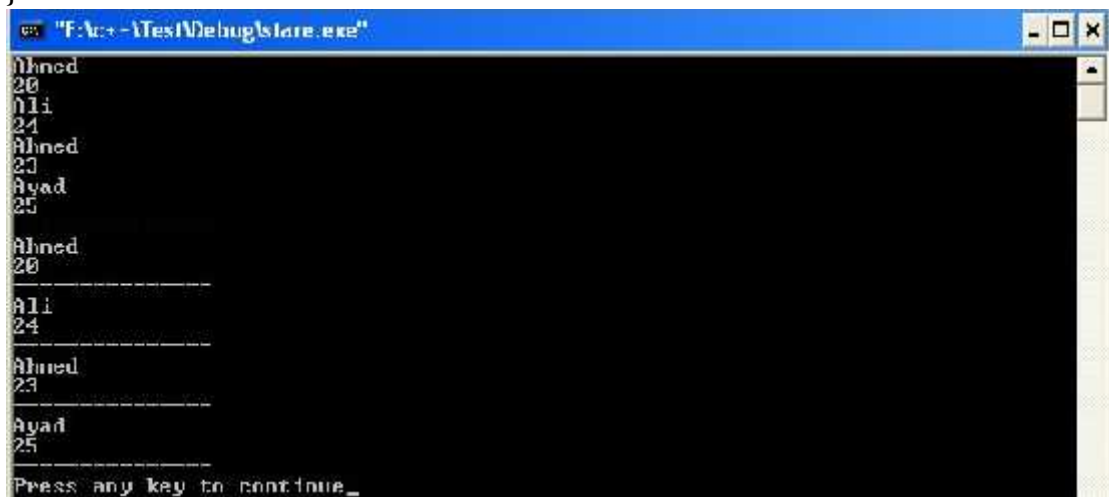
#include<iostream.h>
typedef struct
{
    char *name;
    int age;
} student;
void main ( )
{
    student array [10];
    array [1] . name = "Omar Ali";
    array [1] . age = 23;
    cout << array[1] . name << endl;
    cout << array[1] . age<<endl;
}

```



**Example:** Write a C++ Program, using structure type, to read name and Age for four students.

```
#include<iostream.h>
typedef struct
{
    char name[10];
    int age;
} student;
void main ()
{
    student array [4];
    for (int i = 0 ; i < 4 ; i++ )
    {
        cin >> array [i].name;
        cin >> array [i].age;
    }
    cout<<"-----\n";
    for ( i = 0 ; i < 4 ; i++ )
    {
        cout << array[i].name << endl;
        cout << array[i].age<< endl;
        cout<<"-----\n";
    }
}
```

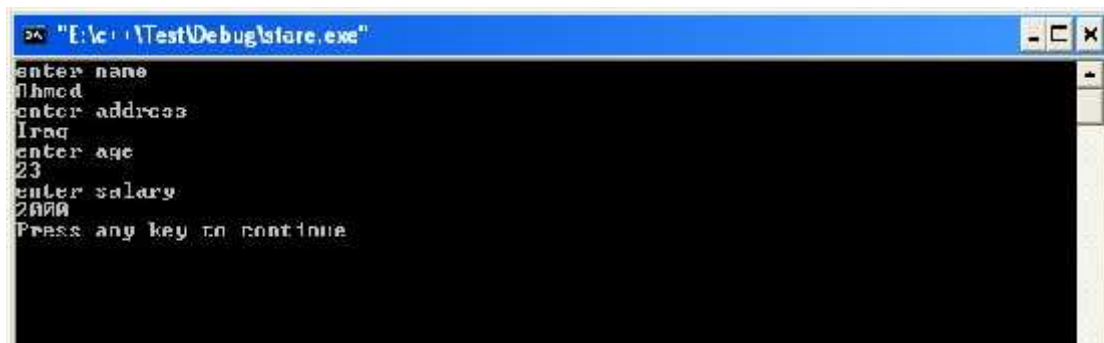


```
"F:\C++ - \Test\Debug\stare.exe"
Ahmed
20
Ali
24
Ahmed
23
Ayad
25

Ahmed
20
-----
Ali
24
-----
Ahmed
23
-----
Ayad
25
-----
Press any key to continue.
```

**Example:**

```
#include<iostream.h>
struct employee
{
    char name[40];
    char address[40];
    int age;
    float salary;
};
void main()
{
    struct employee emp;
    cout<<"enter name"<<endl;
    cin>>emp.name;
    cout<<"enter address"<<endl;
    cin>>emp.address;
    cout<<"enter age"<<endl;
    cin>>emp.age;
    cout<<"enter salary"<<endl;
    cin>>emp.salary;
}
```



```
"E:\c++\Test\Debug\stare.exe"
enter name
Ahmed
enter address
Iraq
enter age
23
enter salary
2000
Press any key to continue
```

**Example:**

```
#include<iostream.h>
struct employee
{
    char name[40];
    char address[40];
    int age;
    float salary;
};
void main()
{
    struct employee emp[13];
    for(int i=0;i<13;i++)
    {
        cout<<"enter name"<<endl;
        cin>>emp[i].name;
        cout<<"enter address"<<endl;
        cin>>emp[i].address;
        cout<<"enter age"<<endl;
        cin>>emp[i].age;
        cout<<"enter salary"<<endl;
        cin>>emp[i].salary;
    }
    for(i=0;i<13;i++)

        cout<<emp[i].name<<emp[i].address<<emp[i].age<<emp[i].salary
        <<endl;
    }
```