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Introduction to 'C' Language

Arrays and Strings in C Language

Module 03 - Two - dimensional Array in C Language



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Two-Dimensional Arrays in C

A two-dimensional array in C is essentially a collection of elements arranged in a grid, similar to a table or matrix. It is used to store data in a tabular form, where data is stored in rows and columns.



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Declaration of a Two-Dimensional Array

To declare a two-dimensional array in C, you specify the number of rows and columns.

```
c  
  
data_type array_name[rows][columns];
```

Example:

```
c  
  
int matrix[3][4]; // Declares a 2D array with 3 rows and 4 columns.
```

Initialization

You can initialize a two-dimensional array during its declaration:

```
c  
  
int matrix[3][3] = {  
    {1, 2, 3}, // Row 0  
    {4, 5, 6}, // Row 1  
    {7, 8, 9} // Row 2  
};
```

Alternatively, you can initialize it manually:

```
c  
  
matrix[0][0] = 1;  
matrix[0][1] = 2;  
// And so on...
```



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Example:

```
int a[4][5];
```

This is a 2-D array of 4 rows and 5 columns. Here the first element of the array is a[0][0] and last element of the array is a[3][4] and total no.of elements is 4*5=20.

	col 0	col 1	col 2	col 3	col 4
row 0	a[0][0]	a[0][1]	a[0][2]	a[0][3]	a[0][4]
row 1	a[1][0]	a[1][1]	a[1][2]	a[1][3]	a[1][4]
row 2	a[2][0]	a[2][1]	a[2][2]	a[2][3]	a[2][4]
row 3	a[3][0]	a[3][1]	a[3][2]	a[3][3]	a[3][4]

Processing: For processing of 2-D arrays we need two nested for loops.

Example:

```
int a[4][5];
```

- a) Reading values in a


```
for(i=0;i<4;i++)
  for(j=0;j<5;j++)
    scanf("%d",&a[i][j]);
```
- b) Displaying values of a


```
for(i=0;i<4;i++)
  for(j=0;j<5;j++)
    printf("%d",a[i][j]);
```

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Iterating Through a Two-Dimensional Array

A nested loop is typically used to iterate through all elements.

```
c Copy code
for (int i = 0; i < 3; i++) { // Iterating through rows
    for (int j = 0; j < 4; j++) { // Iterating through columns
        printf("%d ", matrix[i][j]); // Access each element
    }
    printf("\n");
}
```

Solved Example: To read a 2D array and display it:

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

int main() {
    int matrix[2][3];

    // Reading values
    printf("Enter 6 elements:\n");
    for (int i = 0; i < 2; i++) {
        for (int j = 0; j < 3; j++) {
            scanf("%d", &matrix[i][j]);
        }
    }

    // Displaying the array
    printf("The 2D array is:\n");
    for (int i = 0; i < 2; i++) {
        for (int j = 0; j < 3; j++) {
            printf("%d ", matrix[i][j]);
        }
        printf("\n");
    }

    return 0;
}
```



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Assignment

- Ques 1: Write a C program to input two 2x2 matrices from the user and display them.
Ques 2: Write a C program to input two 6x8 matrices from the user and display them.
Ques 3: Write a C program to input two 5x3 matrices from the user and display them.

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