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Multidimensional array

- 1. Array having more than one subscript variable is called multidimensional array.
- 2. Multidimensional array is also called as matrix.

Consider the Two dimensional array –

- 1. Two Dimensional Array requires **Two Subscript Variables**
- 2. Two Dimensional Array stores the values in the form of matrix.
- 3. One Subscript Variable denotes the “**Row**” of a matrix.
- 4. Another Subscript Variable denotes the “**Column**” of a matrix.

	Column 0	Column 1	Column 2	Column 3
Row 0	a[ 0 ][ 0 ]	a[ 0 ][ 1 ]	a[ 0 ][ 2 ]	a[ 0 ][ 3 ]
Row 1	a[ 1 ][ 0 ]	a[ 1 ][ 1 ]	a[ 1 ][ 2 ]	a[ 1 ][ 3 ]
Row 2	a[ 2 ][ 0 ]	a[ 2 ][ 1 ]	a[ 2 ][ 2 ]	a[ 2 ][ 3 ]

Declaration and Use of Two Dimensional Array :

```
int a[3][4];
```

Use :

```
for(i=0;i<row,i++)
    for(j=0;j<col,j++)
    {
        printf("%d",a[i][j]);
    }
```

Meaning of Two Dimensional Array :

- 1. Matrix is having 3 rows ( i takes value from 0 to 2 )
- 2. Matrix is having 4 Columns ( j takes value from 0 to 3 )
- 3. Above Matrix 3×4 matrix will have 12 blocks having 3 rows & 4 columns.
- 4. Name of 2-D array is ‘a’ and each block is identified by the row & column number.
- 5. Row number and Column Number Starts from 0.

Cell Location	Meaning
---------------	---------

Cell Location	Meaning
a[0][0]	0th Row and 0th Column
a[0][1]	0th Row and 1st Column
a[0][2]	0th Row and 2nd Column
a[0][3]	0th Row and 3rd Column
a[1][0]	1st Row and 0th Column
a[1][1]	1st Row and 1st Column
a[1][2]	1st Row and 2nd Column
a[1][3]	1st Row and 3rd Column
a[2][0]	2nd Row and 0th Column
a[2][1]	2nd Row and 1st Column
a[2][2]	2nd Row and 2nd Column
a[2][3]	2nd Row and 3rd Column

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### Two-Dimensional Array : Summary with Sample Example

Summary Point	Explanation
No of Subscript Variables Required	2
Declaration	a[3][4]
No of Rows	3
No of Columns	4
No of Cells	12
No of for loops required to iterate	2

### Memory Representation

1. 2-D arrays are Stored in contiguous memory location row wise.
2. 3 X 3 Array is shown below in the first Diagram.
3. Consider **3x3 Array is stored in Contiguous memory** location which starts from 4000 .
4. Array element **a[0][0]** will be stored at address **4000** again **a[0][1]** will be stored to next memory location i.e Elements stored row-wise
5. After **Elements of First Row are stored** in appropriate memory location , elements of next row get their corresponding mem. locations.

	Col 0	Col 1	Col 2
Row 0	<b>1</b>	<b>2</b>	<b>3</b>
Row 1	<b>4</b>	<b>5</b>	<b>6</b>
Row 2	<b>7</b>	<b>8</b>	<b>9</b>

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6. This is integer array so each element requires 2 bytes of memory.

**Basic Memory Address Calculation :**

```
a[0][1] = a[0][0] + Size of Data Type
```

Element	Memory Location
a[0][0]	4000
a[0][1]	4002
a[0][2]	4004
a[1][0]	4006
a[1][1]	4008
a[1][2]	4010
a[2][0]	4012
a[2][1]	4014
a[2][2]	4016

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<b>1</b> 4000	<b>2</b> 4002	<b>3</b> 4004
<b>4</b> 4006	<b>5</b> 4008	<b>6</b> 4010
<b>7</b> 4012	<b>8</b> 4014	<b>9</b> 4016

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