

C_53 \Rightarrow Two Dimensional Arrays

Introduction

Why 2D array:

* In 1D array; we store only marks of N students.

* But when we want to store 5 subject marks of N students, then we need 2D arrays.

* In 1D array; we should have each declaration of array for each subject.

Eg.: $\text{int } S1[60];$ $N = 60 \text{ students}$
 $\text{int } S2[60];$ $S1, \dots, S5 \rightarrow \text{Subjects}$
 $\text{int } S5[60];$

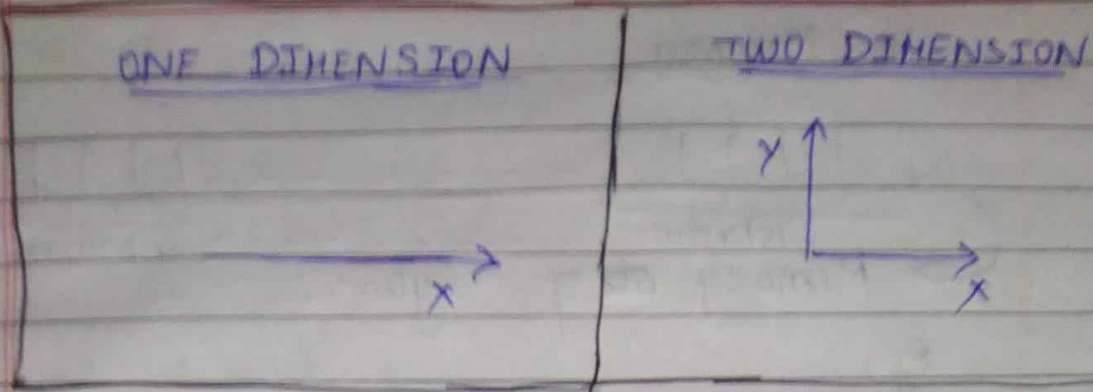
* Instead; in 2D array; with only one variable name we declare both students and no. of subjects.

Eg.: $\text{int marks}[5][60];$

Syntax of 2D array:

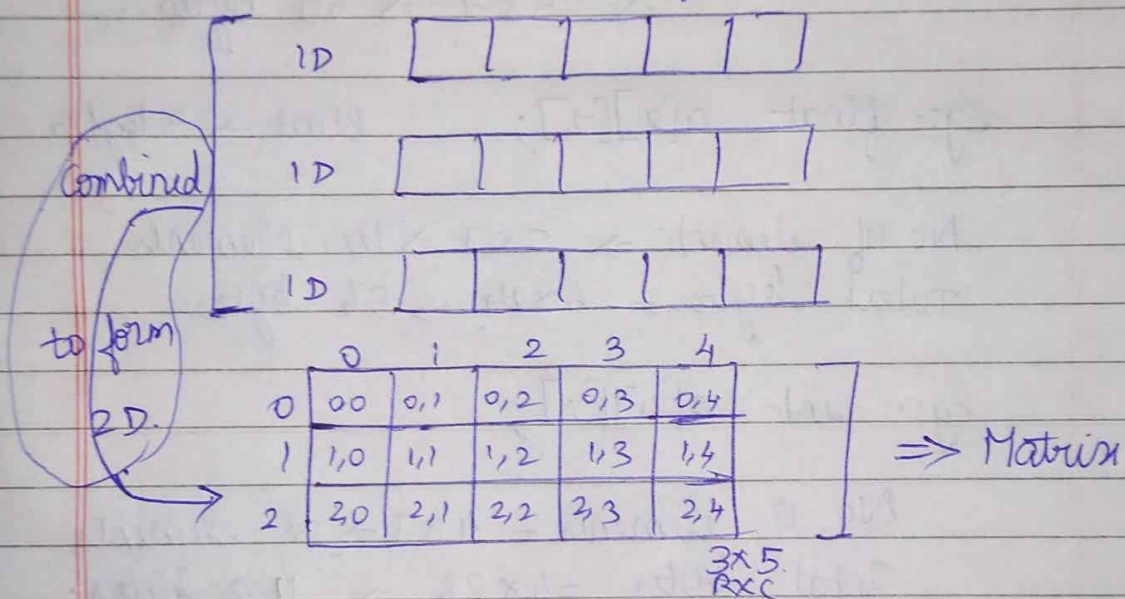
Datatype name of array [row size] [col size];

$\text{int marks}[5][10];$



2D Arrays:

* 2D Arrays are array of several one dimensional arrays.



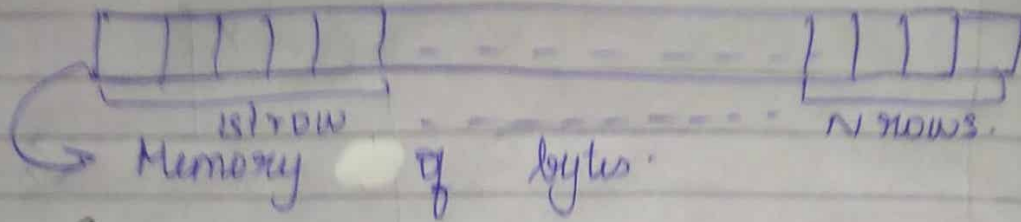
* Accessing the 2D array elements (or) data,

mark[1][2]

↓ ↓
 Row Column

A address will be discussed after one chapter, now how it will be stored in memory.

In Memory



* eg: `int marks[3][5];`

→ Total elements $\Rightarrow \text{Rowsize} \times \text{Colsize} \Rightarrow 15 \text{ elements}$

→ Total bytes $\Rightarrow (\text{Rowsize} \times \text{Colsize}) \times \text{Size of int}$
 $\Rightarrow 15 \times 4 \Rightarrow 60 \text{ bytes}$

eg: `float a[2][7];` float $\rightarrow 4 \text{ bytes}$

No of element $\Rightarrow 2 \times 7 \Rightarrow 14 \text{ elements}$

Total bytes $= 4 \times 14 \Rightarrow 56 \text{ bytes}$

eg: `int a[4][7];`

No of elements $= 4 \times 7 \Rightarrow 28 \text{ elements}$

Total bytes $= 4 \times 28 \Rightarrow 112 \text{ bytes}$

How to calculate array elements using sizeof

* When array elements are longer initia^l with unknown (maximum) size then we can calculate total elements using size of operator:

$$\text{No. of elements} = \frac{\text{sizeof (array name)}}{\text{sizeof (arrayname[0])}}$$

↓
(0 index or any other)

Size of (a) \Rightarrow array size \times Size of (int).
 \downarrow given by compiler

Date _____
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* Each index \rightarrow 4 bytes.

int a[] = {5, 4, 3, ..., 10};

* Size of (arrayname)
 \Rightarrow size of (a) \Rightarrow Total bytes.

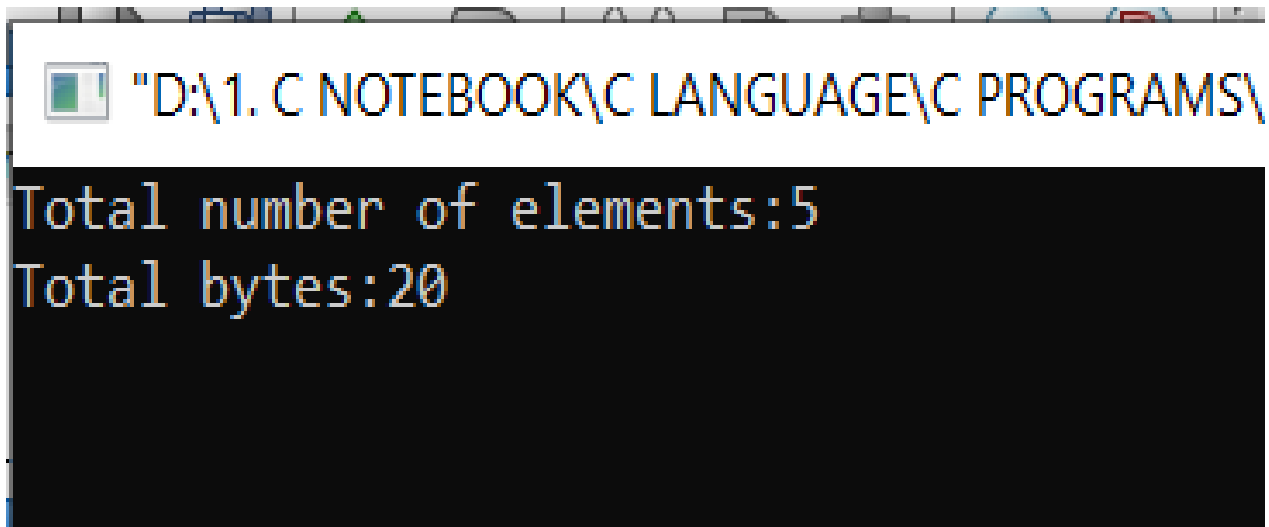
* Size of (arrayname[0]) = size of (a[0])

$$\text{No. of elements} = \frac{\text{size of (a)}}{\text{size of (a[0])}}$$

printf ("%d", size of (a) / size of (a[0]));

CODE 1:

```
1  #include <stdio.h>
2  #include <stdlib.h>
3  /** ARRAY ELEMENTS USING SIZEOF OPERATOR **/
4  int main()
5  {
6      /* int a[]={8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,
7      6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,
8      7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,
9      5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,};*/
10
11      /** no of elements = sizeof(arrayname)/sizeof(arrayname[index]0) **/
12      int a[]={1,2,3,4,5};
13      printf("Total number of elements:%d\n",sizeof(a)/sizeof(a[0]));
14      printf("Total bytes:%d",sizeof(a));
15      getch();
16  }
17
```



The screenshot shows a Windows command prompt window with a title bar that reads "D:\1. C NOTEBOOK\C LANGUAGE\C PROGRAMS\". The command prompt has a black background and displays the output of the program in white text. The output consists of two lines: "Total number of elements:5" and "Total bytes:20".

```
"D:\1. C NOTEBOOK\C LANGUAGE\C PROGRAMS\  
Total number of elements:5  
Total bytes:20
```

CODE 2:

```
1  #include <stdio.h>
2  #include <stdlib.h>
3  /** ARRAY ELEMENTS USING SIZEOF OPERATOR **/
4  int main()
5  {
6      int a[]={8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,
7              6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,
8              7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,
9              5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,8,7,6,5,3,4,5,2,7,4,};
10
11     /** no of elements = sizeof(arrayname)/sizeof(arrayname[index]0) **/
12     /*int a[]={1,2,3,4,5};*/
13     printf("Total number of elements:%d\n",sizeof(a)/sizeof(a[0]));
14     printf("Total bytes:%d",sizeof(a));
15     getch();
16 }
17
```



"D:\1. C NOTEBOOK\C LANGUAGE\C PROGR

```
Total number of elements:140
Total bytes:560_
```