

6.12 Two-dimensional arrays

Instructor created

6.13 2D Vector In C++ With User Defined Size

Extracted from Geeksforgeeks.com

A 2D vector is a **vector** of vector. Like 2D arrays, we can declare and assign values to a 2D vector!

Assuming you are familiar with a normal vector in C++, with the help of an example we demonstrate how a 2D vector differs from a normal vector below:

Code Editor 6.13.1: Create 2D vector

Click run.

Load default template...

```
1 // CPP program
2 #include <iostream>
3
4 /* Vectors belong to a C++ Library
5 called STL so we need to import
6 it first! */
7 #include <vector>
8 using namespace std;
9 int main()
10 {
11     /*
12     In the case of a normal vector we initialize it as:
13     1. vector<datatype> variable_name
14     Now in the case of a 2D vector all we do is create
15     a vector of datatype vector.
16
17
18
```

Run

In a 2D vector, every element is a vector.

Code Editor 6.13.2: Initialize 2D Vector

Click run.

Load default template...

```
1 /* C++ code to demonstrate a 2D vector
2 with elements(vectors) inside it. */
3 #include <iostream>
4 #include <vector>
5 using namespace std;
6
7 int main()
8 {
9     /*
10     Below we initialize a 2D vector
11     named "vect" on line 12 and then
12     we declare the values on
13     line 14, 15 and 16 respectively.
14     */
15
16     vector<vector<int>> vect
17     {
18         {1, 2, 3},
19     }
20
21
22
```

Run

Each element of a 2D vector can contain a different number of values also known as jagged arrays.

Code Editor 6.13.3: Jagged vectors

Click run.

Load default template...

```
1 /*
2 C++ program to demonstrate a 2D vector where
3 each of its elements is of different size.
4 */
5 #include <iostream>
6 #include <vector>
7 using namespace std;
8 int main()
9 {
10    /*
11    We initialize a 2D vector
12    named "vect" on line 16 with
13    different number of values
14    in each element.
15    */
16    vector<vector<int>> vect
17    {
18        {1, 2, 3,
19        {1, 2, 3, 4,
20        {1, 2, 3, 4, 5,
21        {1
22    }
23
24
25
```

Run

Code Editor 6.13.4: Define the 2D vector with different sizes of column.

Practice: Type in the code to produce the outputs.

Load default template...

```
1 /*
2 Input : Number of rows : 5
3           | Number of columns in rows :
4           |   2 3 4 5 1
5 Output : 1 2
6           |   1 2 3
7           |   1 2 3 4
8           |   1 2 3 4 5
9           |   1
10
11 Input : Number of rows : 3
12           | Number of columns in rows :
13           |   3 2 1
14
15 Output : 1 2 3
16           |   1 2
17           |   1
18 */

Run
```

2D vectors are often treated as a matrix with "rows" and "columns" inside it. Under the hood they are actually elements of the 2D vector. We first declare an integer variable named "row" and then an array named "column" which is going to hold the value of the size of each row. After that we proceed to initialize the memory of every row by the size of column.

Code Editor 6.13.5: Initialize 2D Vector

Click run.

Load default template...

```
1 /*
2 C++ program to create a 2D vector where
3 every row has a certain number of values
4 as defined by the user.(On line 15)
5 */
6
7 #include <iostream>
8 #include <vector>
9 using namespace std;
10 int main()
11 {
12     /*
13     Here we tell how many rows
14     the 2D vector is going to have. */
15     int row = 5;
16
17     /* We define the number of values
18     each row is supposed to have. */
19
```

Run

Another Approach

Suppose we want to initialize a 2D vector of "n" rows and "m" columns, with a value 0.

Code Editor 6.13.6: Create 2D vector with NXM elements

Click run.

Load default template...

```
1 // CPP program
2 #include <iostream>
3 #include <vector>
4 using namespace std;
5 int main()
6 {
7     int n = 3;
8     int m = 4;
9
10    /*
11    We create a 2D vector containing "n"
12    elements each having the value "vector<int> (m, 0)".
13    "vector<int> (m, 0)" means a vector having "m"
14    elements each of value "0".
15    Here these elements are vectors.
16    */
17    vector<vector<int>> vec( n , vector<int> (m, 0));
18
```

Run

Yet Another Approach:

Suppose we want to create a 2D vector of "n" rows and "b" columns and input values.

Code Editor 6.13.7: 2D Vector with N rows and M columns

Click run.

Load default template...

```
1 // CPP program
2 #include <iostream>
3 #include <vector>
4 using namespace std;
5 int main()
6 {
7     int n = 4;
8     int m = 5;
9
10    /*
11    Create a vector containing "n"
12    vectors each of size "m".
13    */
14    vector<vector<int>> vec( n , vector<int> (m));
15
16    for(int i = 0; i < n; i++)
17    {
18        for(int j = 0; j < m; j++)
19    }
```

Run

Feedback?

↓ 6.14 Char arrays / C strings