

# LAB 11

**Summary**

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| **Items** | **Description** |
| Course Title | Programming Fundamentals |
| Lab Title | Multi-dimensional Arrays |
| Duration | 3 Hours |
| Operating  System/Tool/ Language | Ubuntu/ g++/ C++ |
| Objective | To get familiar with multi-Dimensional Arrays in C++ |

# Lab Description

## Multi-Dimensional Arrays

A multi-dimensional array is an array of arrays.

## Declaring a Multi-Dimensional Array:

To declare a multi-dimensional array, define the variable type, specify the name of the array followed by square brackets which specify how many elements the main array has, followed by another set of square brackets which indicates how many elements the sub-arrays have.

For example:

1. int array [3][4];

0 1 2 3

0

|  |  |  |  |
| --- | --- | --- | --- |
| [0][0] | [0][1] | [0][2] | [0][3] |
| [1][0] | [1][1] | [1][2] | [1][3] |
| [2][0] | [2][1] | [2][2] | [2][3] |

1

2

1. char Names [2][3]={

};

{ ‘A’, ‘L’, ‘I’},

{ ‘Z’, ‘I’, ‘A’}

**Access the Elements of a Multi-Dimensional Array**

To access an element of a multi-dimensional array, specify an index number in each of the array's dimensions.



This statement accesses the value of the element in the **first row (0)** and **third column (2)** of the **letters** array.

## Example

string letters[2][4] = {

{"A","B","C","D"},

{"E","F","G","H"}

};

cout << letters[0][2]; // Outputs "C"

**Change Elements in a Multi-Dimensional Array**

To change the value of an element, refer to the index number of the element in each of the dimensions:

## Example

String letters[2][4]=

{

{"A","B","C","D"},

{"E","F","G","H"}

};

letters[0][0]="Z";

cout << letters[0][0]; // Now outputs "Z" instead of "A"

**Loop Through a Multi-Dimensional Array**

To loop through a multi-dimensional array, you need one loop for each of the array's dimensions. The following example outputs all elements in the **letters** array:

## Example

string letters[2][4] =

{

{"A","B","C","D"},

{"E","F","G","H"}

};

for (int i = 0; i < 2; i++) { for (int j = 0; j < 4; j++) { cout<<letters[i][j]<<"\n";

}}

Sample Program 1

#include <iostream> **using namespace** std; int main() {

int test[3][2] = {{2, -5}, {4, 0}, {9, 1}};

*// use of nested for loop*



*// access rows of the array*

**for** (int i = 0; i < 3; ++i) {

*// access columns of the array*

**for** (int j = 0; j < 2; ++j) {

cout << "test[" << i << "][" << j << "] = " << test[i][j] << endl; }

}

**return** 0;

}

**Lab Task**

Task1

Write a program to declare two square matrices, initialize them with random values and perform following operations:

* Find sum of all elements in an array
* Find transpose of 2D matrix
* Search specific element in 2D array
* Find sum of each row and each column in 2D array
* Calculate sum of main diagonal elements in an array
* Rotate given 2D array by 180 degrees clockwise
* Check whether given matrix is identity matrix or not

**Note:**

Your program should work on all size of square matrix. All tasks must be done in **single .cpp** file.

**Submission instructions:**

Submit single .cpp file.

Naming convention of file is: Rollnum\_Lab11\_B.cpp

Good Luck