

National University of Computer & Emerging Sciences (NUCES), Islamabad

School of Computing

DATA STRUCTURES

FALL 2021

LAB 03

Learning Outcomes

In this lab you are expected to learn the following:

- Arrays
- Google Testing

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In this laboratory, you will implement Multi-dimensional Arrays

Arrays:

Consider a situation where we need to store five integer numbers. If we use programming's simple variable and data type concepts, then we need five variables of integer data type. To handle such situations, almost all programming languages provide a concept called array.

An array is a data structure, which can store a fixed-size collection of elements of the same data type.

Types of Arrays:

The various types of arrays are as follows.

- One dimensional array
- Multi-dimensional array

Task 1:

Make a menu of the following operations using two dimensional array of size $m \times n$. You should use user-defined functions which accept 2-D array A, and its size m and n as arguments. The options are:

- To input elements into matrix of size $m \times n$
- To display elements of matrix of size $m \times n$
- Sum of all elements of matrix of size $m \times n$
- To display row-wise sum of matrix of size $m \times n$
- To display column-wise sum of matrix of size $m \times n$
- To create transpose of matrix of size $n \times m$

Task 2:

Write a C++ program for two dimensional arrays A and B of size $m \times n$ to calculate,

- Addition of A and B
- Multiplication of A and B

Task 3:

Write a C++ program for two dimensional array A of size $m \times n$ to calculate,

- Left diagonal sum
- Right diagonal sum

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Task 4:

Write a program in C++ which accepts a 2 dimensional array of integers and its size as arguments and displays the elements of middle row and the elements of middle column.

[Assuming the 2D Array to be a square matrix with odd dimension i.e. 3x3, 5x5, 7x7 etc...]

2 Dimensional Array:

2 6 9

3 8 5

2 1 8

Output:

Middle Row: 3 8 5

Middle Column: 6 8 1

Task 5:

Create a text file and store integer data in it. You have to read the data from the text file and store it into two-dimensional array of 5x5, then calculate the row-wise sum of two-dimensional array which you read from the text file and store the sum in new one-dimensional array.