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**Department of (Computer Science)**

**Pak-Austria Fachhochschule: Institute of Applied Sciences and Technology, Haripur, Pakistan**

**COMP-112L Data Structure & Algorithm Lab**

**Lab Journal**

**Class: BS Computer Science**

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**Instructor Signature**

**Lab No. 01**

**Arrays in C++**

**Objectives:**

**Arrays (1-D and 2-D)**

**1-Dimensional Arrays**

* Printing arrays
* Copying array

**2-Dimensional (2-D) Array**

* Initializing a 2-Dimensional Array
* Memory Map of a 2-Dimensional Array

**3-Dimensional (3-D) Array**

* Initializing a 3-Dimensional Array
* Memory Map of a 3-Dimensional Array

**Tools/Software Required:**

* All the tasks are implemented on DEV C++.

**Introduction:**

**Arrays (1-D and 2-D)**

**1-Dimensional Arrays**

A 1D array is a simple data structure that stores a collection of similar type data in a contiguous block of memory

**2-Dimensional (2-D) Array**

The 2D array is a type of array that stores multiple data elements of the same type in matrix or table like format with a number of rows and columns.

**3-Dimensional (3-D) Array**

The 3D array is a type of array that stores multiple data elements like 2D array just it add one more element that decide that how much element will be there in the columns.

**3-Arrays and Functions:** An array can be passed to a function as argument. An array can also be returned by a function. To declare and define that a function takes an array as argument, declare the function as you would do for any regular function and, in its parentheses, specify that the argument is an array.

**Lab Tasks:**

**Lab Task 01:** You’re given with marks of 10 students in Mathematics, write a program to determine the grade of each student. 80, 72, 93, 87, 90, 55, 66, 74, 69, 56

Assume:

Grade is A if score is equal and greater than 90

Grade is B+ if score is less than 90 and greater than 81

Grade is B if score is less than 82 and greater than 71

Grade is C if score is less than 72 and greater than 66

Grade is D if score is less than 66 and greater than 59

Grade is F if score is less than 60.

**Code:**

**#include<iostream>**

**using namespace std;**

**int main()**

**{**

**int arr[10]={80, 72, 93, 87, 90, 55, 66, 74, 69, 56};**

**for(int i=0; i<10; i++)**

**{**

**cout<<"Mathematics Grade of Student "<<i+1<<" is : ";**

**switch(arr[i]/10)**

**{**

**case 9:**

**cout<<"Grade is A"<<endl;**

**break;**

**case 8:**

**(arr[i]>8.1)?cout<<"Grade is B+"<<endl : cout<<"Grade is B"<<endl;**

**break;**

**case 7:**

**(arr[i]>7.1)?cout<<"Grade is B"<<endl : cout<<"Grade is C"<<endl;**

**break;**

**case 6:**

**(arr[i]>6.6)?cout<<"Grade is C"<<endl : cout<<"Grade is D"<<endl;**

**break;**

**case 5:**

**(arr[i]>5.9)?cout<<"Grade is D"<<endl : cout<<"Grade is F"<<endl;**

**break;**

**}**

**}**

**return 0;**

**}**

**Output:**

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**Task # 02:**

Write a program to ask user to enter 5 floating numbers and find the maximum and minimum of all by calling min() and max() functions.

**Code:**

**#include<iostream>**

**using namespace std;**

**void Max(float \*arr);**

**void Min(float \*arr);**

**int main()**

**{**

**float arr[5];**

**cout<<"Enter any 5 floating numbers: "<<endl;**

**for(int i=0; i<5; i++)**

**{**

**cin>>arr[i];**

**}**

**Max(arr);**

**Min(arr);**

**}**

**void Max(float \*arr)**

**{**

**float max=0;**

**for(int i=0; i<5; i++)**

**{**

**if(arr[i]>max)**

**{**

**max=arr[i];**

**}**

**}**

**cout<<"Maximum value you enetered is:"<<max<<endl;**

**}**

**void Min(float \*arr)**

**{**

**float min=arr[0];**

**for(int i=0; i<5; i++)**

**{**

**if(min>arr[i])**

**{**

**min=arr[i];**

**}**

**}**

**cout<<"Minimum value you enetered is:"<<min<<endl;**

**}**

**Output:**

Text

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**Task # 03:**

Write a program that shows following output:

**Code:**

**#include<iostream>**

**using namespace std;**

**int main()**

**{**

**int arr[10];**

**cout<<"Please enter 10 numbers: "<<endl;**

**for(int i=0; i<10; i++){**

**cin>>arr[i];**

**}**

**cout<<"\nElement\t\tValue\t\tHistogram"<<endl;**

**for(int i=0; i<10; i++)**

**{**

**cout<<i<<"\t\t"<<arr[i]<<"\t\t";**

**for(int j=0; j<arr[i]; j++)**

**cout<<"\*";**

**cout<<endl;**

**}**

**return 0;**

**}**

**Output:**

Text

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**Task # 04:**

Write a program that will print multi-subscripted array as shown below using function printArray()

**Code:**

**#include<iostream>**

**using namespace std;**

**void print\_array(int arr1[][3],int arr2[][3],int arr3[][3]);**

**int main()**

**{**

**int arr1[2][3],arr2[2][3],arr3[2][3];**

**cout<<"Please enter 6 numbers in array(1): "<<endl;**

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

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

**cin>>arr1[i][j];}**

**}**

**cout<<"Please enter 6 numbers in array(2): "<<endl;**

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

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

**cin>>arr2[i][j];}**

**}**

**cout<<"Please enter 6 numbers in array(3): "<<endl;**

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

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

**cin>>arr3[i][j];}**

**}**

**print\_array(arr1,arr2,arr3);**

**return 0;**

**}**

**void print\_array(int arr1[][3],int arr2[][3],int arr3[][3] )**

**{**

**cout<<"\nValues in array1 by row are:"<<endl;**

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

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

**cout<<arr1[i][j]<<" ";}**

**cout<<endl;**

**}**

**cout<<"\nValues in array2 by row are:"<<endl;**

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

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

**cout<<arr2[i][j]<<" ";}**

**cout<<endl;**

**}**

**cout<<"\nValues in array3 by row are:"<<endl;**

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

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

**cout<<arr3[i][j]<<" ";}**

**cout<<endl;**

**}**

**}**

**Output:**

**Text

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**Results & Observations:**

In this Lab I’ve learned about the concept of 1-D, 2-D & 3D arrays and understand that how array can be passed to a function as argument & returned by a function. In 2-D arrays we use two parentheses (one for row and other for column) to define the size of array, while using in the function we must enter the size in any row/column otherwise it’ll give an error.