



Programming Fundamentals

(Lab Manual)



Lab Manual

Computer Engineering for Session 2019 (Semester Fall-2019)

Programing Fundamentals

This course is a comprehensive introductory course that is intended for students who have no background in computer programming. The aim of this course is to provide students with a firm foundation of “Basics of Programing Fundamentals” and to make them able to design C++ code of algorithms. The aim is to provide foundation of programing and to polish the skills of understanding computational problems in algorithmic way. The programming language used in this programming course is C++.

Instructor: Ms. Sahar Waqar

Graduate Assistant: Muhammad Nazam Maqbool, Mr. Usman Ghani



Programming Fundamentals (Lab Manual)



Lab Manual

Computer Engineering for Session 2019 (Semester Fall-2019)

Programming Fundamentals

(Lab 7)

Target: Arrays, Searching & Sorting in Arrays.

i) **Guidelines/Instructions:**

- Develop all programs for your practice.
- Follow indentation and readability instructions shared in previous labs.

ii) **Reading Material:**

- Consult Chapter No 9/Chap 8 “Arrays and Strings” of book “C++: Programming from Problem Analysis to Program Design by D.S Malik (latest edition)” for better understanding of given problems.
- C++ Arrays:
(<http://www.cplusplus.com/doc/tutorial/arrays/>)

iii) **Description**

The statement: `int num[5];` declares an array `num` of five components. Each component is of type `int`. The components are `num[0]`, `num[1]`, `num[2]`, `num[3]`, and `num[4]` as in fig 1.

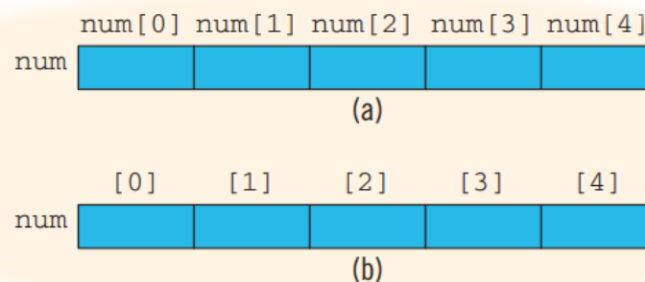


Fig 1

iv) **Tasks to be completed in lab:**

// Example program 1

Take 10 integer inputs from user and store them in an array and print them on screen.

```
#include<iostream>
using namespace std;
```

Instructor: Ms. Sahar Waqar

Graduate Assistant: Muhammad Nazam Maqbool, Mr. Usman Ghani



Programming Fundamentals

(Lab Manual)



```
int main()
{
    int a[10];
    for(int i=0;i<10;i++)
    {
        cout << "Enter a number\n";
        cin >> a[i];
    }
    cout << "Numbers are:\n";
    for(int i=0;i<10;i++)
    {
        cout << a[i] << "\n";
    }
    return 0;
}
```

// Example program 2

Take 10 integer inputs from user and store them in an array. Now, copy all the elements in another array but in reverse order.

```
#include<iostream>
using namespace std;

int main()
{
    int a[10], b[10];
    for(int i=0;i<10;i++)
    {
        cout << "Enter a number\n";
        cin >> a[i];
    }
    int j = 0;
    for(int i=9;i>=0;i--)
    {

```

Instructor: Ms. Sahar Waqar

Graduate Assistant: Muhammad Nazam Maqbool, Mr. Usman Ghani



Programming Fundamentals (Lab Manual)



```
b[i] = a[j];  
j++;  
}  
for(int i=0;i<10;i++)  
{  
    cout << b[i] << "\n";  
}  
return 0;  
}
```

1. Write a program to find the sum and product of all elements of an array.
2. Write a C++ program to find the element that appears once in an array of integers.
3. Take an array of 10 elements. Split it into middle and store the elements in two different arrays. E.g.-

Initial array :

58	24	13	15	63	9	8	81	1	78
----	----	----	----	----	---	---	----	---	----

After splitting :

58	24	13	15	63
9	8	81	1	78

5. Find largest and smallest elements of an array.
6. Write a C++ program to find the largest three elements in an array.
7. Write a C++ program to find k largest elements in a given array of integers. Where k is the input given by user.
8. Write a C++ program to update every array element by multiplication of next and previous values of a given array of integers.
9. Write a C++ program to separate even and odd numbers of an array of integers. Put all even numbers first, and then odd numbers.
10. Write a C++ program to move all negative elements of an array of integers to the end of the array without changing the order of positive element and negative element.
11. Write a program that uses four arrays **numbers**, **squares**, **cubes** and **sums** each consisting of 5 elements. The **numbers** array stores the values of its indexes, the **squares** array stores the squares of its indexes, the **cubes** array stores the cubes of its indexes and **sums** array stores the sum of corresponding indexes of three arrays. The program should display the values of all arrays and the total of all values in **sums** array.

Output:

Numbers:	0	1	2	3	4
Squares:	0	1	4	9	16
Cubes:	0	1	8	27	64
Sums:	0	3	14	39	84

Instructor: Ms. Sahar Waqar

Graduate Assistant: Muhammad Nazam Maqbool, Mr. Usman Ghani



Programming Fundamentals (Lab Manual)



Grand total: 140

12. Write a program that initializes an array. It inputs a value from the user and searches the number in the array. Finally, it will display the location of number in array if it exists. (using sequential search)
13. Write a program that initializes an array. It inputs a value from the user and searches the number in the array. Finally, it will display the location of number in array if it exists. (using binary search)

v) **Tasks to be submitted:**

1. Take 20 integer inputs from user and print the following:
number of positive numbers
number of negative numbers
number of odd numbers
number of even numbers
number of 0.
2. Write a program that initializes an array of integers having at-least 10 elements. Write a program to find those pair of elements that has the maximum and minimum difference among all element pairs.
3. Write a C++ program to print all the repeated numbers with frequency in an array.
4. Write a program that asks the user to type 10 integers of an array and an integer value V and an index value i between 0 and 9. The program must put the value V at the place i in the array, shifting each element right and dropping off the last element. The program must then write the final array. For Example, if user enter index: 4 and value 59 then

Initial array :

58	24	13	15	63	9	8	81	1	78
----	----	----	----	----	---	---	----	---	----

After updating :

58	24	13	15	59	63	9	8	81	1
----	----	----	----	----	----	---	---	----	---

6. Write a program that asks the user to type 10 integers of an array. The program will then display either "the array is growing", "the array is decreasing", "the array is constant", or "the array is growing and decreasing."
7. Write a program that uses three arrays **Mango**, **Orange** and **Banana** to store the number of fruits purchased by customer. The program inputs the number of mangos, oranges and bananas to be purchased by customer and stores them in corresponding array. The program finally displays the total bill of each customer according to the following prices:
Rs. 20 per mango
Rs. 10 per orange
Rs. 5 per banana
The output should appear as follows:

```
*****
Customer No.      Mangoes      Oranges      Bananas      Total Bill
*****
1                  5             10           12           Rs.260
```

Instructor: Ms. Sahar Waqar

Graduate Assistant: Muhammad Nazam Maqbool, Mr. Usman Ghani



Programming Fundamentals

(Lab Manual)



vi) Submission instructions:

- See manual 1 for understanding “How to submit your assignment”.
- All rules discussed in lab1 for grading assignments will apply for all labs of this course.

V) Office hours and email address for communication:

- See lab manual 1

Instructor: Ms. Sahar Waqar

Graduate Assistant: Muhammad Nazam Maqbool, Mr. Usman Ghani