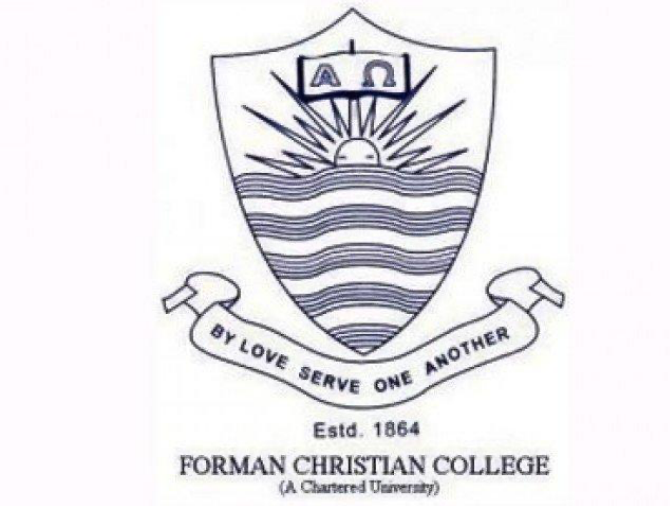
Introduction to C/C++

Comp 295

Spring 2023



Department of Computer Science

Forman Christian College University

Lab 3

More practice on loops + Arrays

Question #	Total Marks
Question 1	10
Question 2	5
Question 3	10
Question 4	15

Example Code

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

int main() {
   int arr[] = {10, 20, 30, 40, 50};
   int n = 5;

   for(int i=0; i<n/2; i++) {
      int temp = arr[i];
      arr[i] = arr[n-i-1];
      arr[n-i-1] = temp;
   }

   cout << "The reversed array is: ";
   for(int i=0; i<n; i++) {
      cout << arr[i] << " ";
   }

   return 0;
}
```

The above code uses a loop to reverse the elements of an array. The loop iterates from the first element of the array to the middle element, swapping each element with its corresponding element on the opposite end of the array. This effectively reverses the order of the elements in the array.

In Lab Problems

Question 1. The problem requires you to write a C++ program that simulates the effect of the corona virus on human DNA. The DNA is represented as a chain of consecutive proteins, where there are four types of proteins denoted as 'A', 'B', 'C', and 'D'. The virus corrupts the DNA by replacing a sequence of n consecutive proteins with 'C'. For example, if n is 10, then the virus replaces any sequence of 10 consecutive proteins with 'C'.

The program should ask for the number of test cases, the size of each DNA chain, and the number of corruptions. Each line represents the DNA chain for a separate person, and the proteins in the DNA sequence are separated by spaces. The program should analyze each DNA chain and determine if it contains a sequence of c consecutive 'C's. If it does, the program should output "Affected". Otherwise, it should output "Healthy".

```
5 30 10
D A B C A C A A C C C C C C C C C C C B A A B A A C A A C
C C C A B C B D A C B B C C A B B D D D C A A A C B C A D D
A D C A C D A D B C A A B A B C C D B A B A B C D C D C C D
C C C C C C C C C C C A C A C B A C A D B B C C C A C A A D
A A B D A A C B A B A C D A A A B A C D A C D D C A C B A C
```

In the above example for c = 10 your program should generate the following output:

```
Affected
Healthy
Healthy
Affected
Healthy
```

Hint: char array initialization

- char str[4] = "C++";
- char str[] = {'C','+','+','\0'};
- char str[4] = {'C','+','+','\0'};
- char arr[] = “C++”

Question 2. Write a program to swap first and last element of an integer 1-d array. Your program should take size of array from the user. After array manipulation, display the size of the array along with the manipulated array. In the program, you must use the **sizeof** operator to calculate the size of the array.

Question 3. Create a program that takes in a string input and identifies whether each of its character is a lowercase, uppercase letter, or a space character.

- If a character is a lowercase letter, the program should output "character 'c' at index[n] is a lowercase alphabet."
- If it's an uppercase letter, the program should output " character 'c' at index[n] is an uppercase alphabet."
- If it's a space character, the program should output " character at index[n] is a space.
- If the character is not a letter in the English alphabet or not a space char, the program should output "character 'c' at index[n] is not a valid English alphabet."

Question 4. Write a program that is designed to receive three inputs from the user - an array, its size, and an integer value, p. The program is intended to cyclically shift the elements of the given array to the right p positions. The program must be able to handle both positive and negative values of p.

To achieve the cyclic shifting, the program should move each element of the array to the right p positions, while the last p elements of the array are moved to the beginning. The output of the program should be the resulting array after the cyclic shifting has been completed.

For example, if the user enters an array of size 6, [1, 2, 3, 4, 5, 6], and a value of p equal to 2, the program should shift the array two positions to the right, resulting in the array [5, 6, 1, 2, 3, 4]. If the user has entered a negative value for p, then your program should end with an appropriate error message, asking user to enter a positive value of p.

It is important to note that the program should be implemented without the use of any built-in functions or libraries that would perform the cyclic shifting automatically. Instead, the program must be able to perform the cyclic shifting using only loops and conditionals.

```
Enter size of array: 6
Enter elements of array: 1 2 3 4 5 6
Enter number of positions to shift right: 2
Shifted array: 5 6 1 2 3 4
```