



## **COMSATS University Islamabad, Vehari Campus**

Department of Computer Science

**Class: BCS-SP22-4B**

**Submission Deadline: 10 Sep 2023**

**Subject: Data Structures and Algorithms-Lab**

**Instructor: Yasmeen Jana**

**Max Marks: 10**

**Reg. No: SP22-BCS-031**

-

**Email: [yasmeenjana@cuivehari.edu.pk](mailto:yasmeenjana@cuivehari.edu.pk)**

**You can ask queries related to Lab Activities on the above email.**

### **Activity 1:**

Create a GitHub Account. Make a repository with the name “**DSA\_Lab**”. **Mention the link here after the account creation.**

### **Solution:**

**<https://github.com/sp22bcs031/DSA-LAB>**

### **Activity 2:**

Write any 15 programs that will explain the concepts of pointers.

In this file, you should place the code and its output screenshot.

After completing the activities, Upload the final pdf and code to the “**DSA\_Lab**” repository.

## ***Programme 1: Add elements of two arrays***

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

int main() {
    int arr1[5] = {1, 2, 3, 4, 5}, arr2[5] = {5, 6, 7, 8, 9}, result[5];
    int *pta1 = &arr1[0], *pta2 = &arr2[0], *ptres = &result[0];

    for (int i = 0; i < 5; i++) {
        *ptres = *pta1 + *pta2;
        ptres++;
        pta1++;
        pta2++;
    }

    cout << "First array is: ";
    for (int i = 0; i < 5; i++) {
        cout << arr1[i] << " ";
    }
    cout << endl;

    cout << "Second array is: ";
    for (int i = 0; i < 5; i++) {
        cout << arr2[i] << " ";
    }
    cout << endl;

    cout << "Resulting array is: ";
    for (int i = 0; i < 5; i++) {
        cout << result[i] << " ";
    }
    cout << endl;

    getchar();
    return 0;
}
```

```
First array is: 1 2 3 4 5
Second array is: 5 6 7 8 9
Resulting array is: 6 8 10 12 14
```

## ***Programme 2: ASCII Calculator***

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

void getASCII(char* character, int* asciiValue) {
    *asciiValue = static_cast<int>(*character);
}

int main() {
    char character;
    cout << "Enter a character: ";
    cin >> character;

    int asciiValue;
    getASCII(&character, &asciiValue);

    cout << "The ASCII value of " << character << " is: " << asciiValue <<
endl;

    getchar();
    return 0;
}
```

```
Enter a character: m
The ASCII value of m is: 109
```

## ***Programme 3: Check if number is zero***

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

int main(){
    int num;
    int *ptnum = &num;
    cout<<"Enter a number and don't tell it to anyone."<<endl;
```

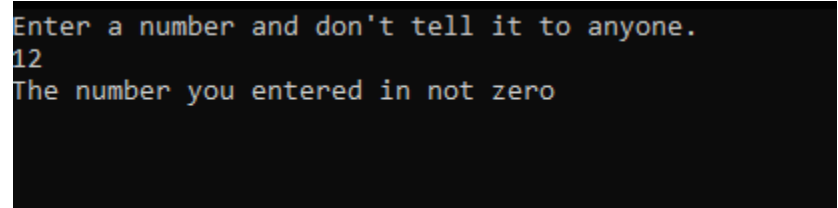
```

    cin>>num;

    if(*ptnum == 0){
        cout<<"The number you entered is zero"<<endl;
    }else{
        cout<<"The number you entered in not zero"<<endl;
    }

    getchar();
    return 0;
}

```



```

Enter a number and don't tell it to anyone.
12
The number you entered in not zero

```

## ***Programme 4: Count number of vowels***

```

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

int countVowels(const string& str) {
    int count = 0;
    const char* ptr = str.c_str();

    while (*ptr != '\0') {
        if (*ptr == 'a' || *ptr == 'e' || *ptr == 'i' || *ptr == 'o' ||
*ptr == 'u' ||
            *ptr == 'A' || *ptr == 'E' || *ptr == 'I' || *ptr == 'O' ||
*ptr == 'U') {
            count++;
        }
        ptr++;
    }

    return count;
}

```

```

int main() {
    string str;
    cout << "Enter a string: ";
    cin >> str;

    int vowelCount = countVowels(str);
    cout << "The number of vowels in the string is: " << vowelCount <<
endl;

    getchar();
    return 0;
}

```

```

Enter a string: hello
The number of vowels in the string is: 2

```

## ***Programme 5: Factorial Calculation***

```

#include <iostream>
using namespace std;

void factorial(int* num, int* result) {
    *result = 1;

    for (int i = 1; i <= *num; i++) {
        *result *= i;
    }
}

int main() {
    int num;
    cout << "Enter a number: ";
    cin >> num;

    int result;
    factorial(&num, &result);

    cout << "The factorial of " << num << " is: " << result << endl;

    getchar();
    return 0;
}

```

```
}
```

```
Enter a number: 4  
The factorial of 4 is: 24
```

## ***Programme 6: Largest of three numbers***

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

```
void findLargest(int* num1, int* num2, int* num3) {  
    int largest = *num1;  
    if (*num2 > largest) {  
        largest = *num2;  
    }  
    if (*num3 > largest) {  
        largest = *num3;  
    }  
    cout << "The largest number is: " << largest << endl;  
}
```

```
int main() {  
    int num1, num2, num3;  
    cout << "Enter first number: ";  
    cin >> num1;  
    cout << "Enter second number: ";  
    cin >> num2;  
    cout << "Enter third number: ";  
    cin >> num3;  
  
    findLargest(&num1, &num2, &num3);  
  
    getchar();  
    return 0;  
}
```

```
Enter first number: 12  
Enter second number: 13  
Enter third number: 14  
The largest number is: 14
```

## ***Programme 7: Leap year checker***

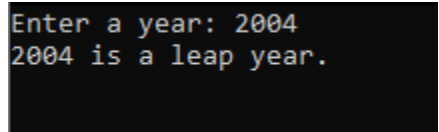
```
#include <iostream>
using namespace std;

bool isLeapYear(int* year) {
    if ((*year % 4 == 0 && *year % 100 != 0) || *year % 400 == 0) {
        return true;
    } else {
        return false;
    }
}

int main() {
    int year;
    cout << "Enter a year: ";
    cin >> year;

    if (isLeapYear(&year)) {
        cout << year << " is a leap year." << endl;
    } else {
        cout << year << " is not a leap year." << endl;
    }

    getchar();
    return 0;
}
```

A screenshot of a terminal window with a black background and white text. It shows the program's output for the input year 2004. The first line is 'Enter a year: 2004' and the second line is '2004 is a leap year.'.

```
Enter a year: 2004
2004 is a leap year.
```

## ***Programme 8: Count number of digits***

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

void countDigits(int* number, int* digitCount) {
    int temp = *number;
    *digitCount = 0;
```

```

        while (temp != 0) {
            temp /= 10;
            (*digitCount)++;
        }
    }

int main() {
    int number;
    cout << "Enter a number: ";
    cin >> number;

    int digitCount;
    countDigits(&number, &digitCount);

    cout << "The number of digits in " << number << " is: " << digitCount
    << endl;

    getchar();
    return 0;
}

```

```

Enter a number: 1256
The number of digits in 1256 is: 4

```

## ***Programme 9: Palindrom checker***

```

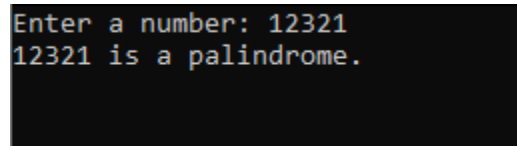
#include <iostream>
using namespace std;

bool isPalindrome(int* num) {
    int originalNum = *num;
    int reversedNum = 0;
    while (*num != 0) {
        int digit = *num % 10;
        reversedNum = reversedNum * 10 + digit;
        *num /= 10;
    }
    return originalNum == reversedNum;
}

```



```
int main() {  
    int num,onum;  
    cout << "Enter a number: ";  
    cin >> num;  
    onum = num;  
  
    if (isPalindrome(&num)) {  
        cout << onum << " is a palindrome." << endl;  
    } else {  
        cout << onum << " is not a palindrome." << endl;  
    }  
  
    getchar();  
    return 0;  
}
```



A screenshot of a terminal window with a black background and white text. It shows the output of the program: "Enter a number: 12321" followed by "12321 is a palindrome." on the next line.

```
Enter a number: 12321  
12321 is a palindrome.
```

## ***Programme 10: Second largest number***

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

int findSecondLargest(int* arr, int size) {
    int largest = arr[0];
    int secondLargest = arr[0];

    for (int i = 1; i < size; i++) {
        if (arr[i] > largest) {
            secondLargest = largest;
            largest = arr[i];
        } else if (arr[i] > secondLargest && arr[i] < largest) {
            secondLargest = arr[i];
        }
    }

    return secondLargest;
}

int main() {
    int size;
    cout << "Enter the size of the array: ";
    cin >> size;

    int* arr = new int[size];

    for (int i = 0; i < size; i++) {
        cout<<"Enter element of array: ";
        cin >> arr[i];
    }

    int secondLargest = findSecondLargest(arr, size);
    cout << "The second largest element in the array is: " <<
secondLargest << endl;

    delete[] arr;

    getchar();
}
```

```
    return 0;
}
```

```
Enter the size of the array: 5
Enter element of array: 1
Enter element of array: 2
Enter element of array: 3
Enter element of array: 4
Enter element of array: 5
The second largest element in the array is: 4
```

### ***Programme 11: Smallest number in array***

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

int findSmallest(int* arr, int size) {
    int smallest = *arr;

    for (int i = 1; i < size; i++) {
        if (*(arr + i) < smallest) {
            smallest = *(arr + i);
        }
    }

    return smallest;
}

int main() {
    int size;
    cout << "Enter the size of the array: ";
    cin >> size;

    int* arr = new int[size];

    for (int i = 0; i < size; i++) {
        cout << "Enter the element of the array: ";

        cin >> *(arr + i);
    }
}
```

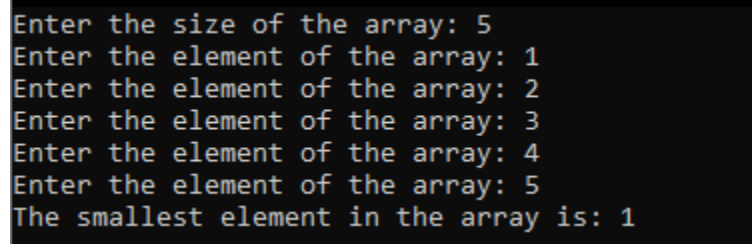
```

    int smallest = findSmallest(arr, size);
    cout << "The smallest element in the array is: " << smallest << endl;

    delete[] arr;

    getchar();
    return 0;
}

```



```

Enter the size of the array: 5
Enter the element of the array: 1
Enter the element of the array: 2
Enter the element of the array: 3
Enter the element of the array: 4
Enter the element of the array: 5
The smallest element in the array is: 1

```

## ***Programme 12: Square root calculator***

```

#include <iostream>
#include<math.h>
using namespace std;

void squareRoot(double* num, double* result) {
    *result = sqrt(*num);
}

int main() {
    double num;
    cout << "Enter a number: ";
    cin >> num;

    double result;
    squareRoot(&num, &result);

    cout << "The square root of " << num << " is: " << result << endl;

    getchar();
    return 0;
}

```

```
Enter a number: 16
The square root of 16 is: 4
```

### ***Programme 13: Sum of digits in number***

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

void sumDigits(int* number, int* digitSum) {
    int temp = *number;
    *digitSum = 0;

    while (temp != 0) {
        *digitSum += temp % 10;
        temp /= 10;
    }
}

int main() {
    int number;
    cout << "Enter a number: ";
    cin >> number;

    int digitSum;
    sumDigits(&number, &digitSum);

    cout << "The sum of the digits in " << number << " is: " << digitSum
    << endl;

    getchar();
    return 0;
}
```

```
Enter a number: 1223
The sum of the digits in 1223 is: 8
```

## ***Programme 14: Sum of even numbers in array***

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

int sumOfEvenNumbers(int* arr, int size) {
    int sum = 0;
    int* ptr = arr;

    for (int i = 0; i < size; i++) {
        if (*ptr % 2 == 0) {
            sum += *ptr;
        }
        ptr++;
    }

    return sum;
}

int main() {
    int size;
    cout << "Enter the size of the array: ";
    cin >> size;

    int* arr = new int[size];

    for (int i = 0; i < size; i++) {
        cout << "Enter the element of the array: ";

        cin >> arr[i];
    }

    int sum = sumOfEvenNumbers(arr, size);
    cout << "The sum of even numbers in the array is: " << sum << endl;

    delete[] arr;

    getchar();
    return 0;
}
```

```
Enter the size of the array: 5
Enter the element of the array: 1
Enter the element of the array: 2
Enter the element of the array: 3
Enter the element of the array: 4
Enter the element of the array: 5
The sum of even numbers in the array is: 6
```

### ***Programme 15: Sum of odd numbers in array***

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

int sumOfOddNumbers(int* arr, int size) {
    int sum = 0;
    int* ptr = arr;

    for (int i = 0; i < size; i++) {
        if (*ptr % 2 != 0) {
            sum += *ptr;
        }
        ptr++;
    }

    return sum;
}

int main() {
    int size;
    cout << "Enter the size of the array: ";
    cin >> size;

    int* arr = new int[size];

    for (int i = 0; i < size; i++) {
        cout << "Enter the element of the array: ";

        cin >> arr[i];
    }

    int sum = sumOfOddNumbers(arr, size);
    cout << "The sum of odd numbers in the array is: " << sum << endl;
```

```
delete[] arr;  
  
getchar();  
return 0;  
}
```

```
Enter the size of the array: 5  
Enter the element of the array: 1  
Enter the element of the array: 2  
Enter the element of the array: 3  
Enter the element of the array: 4  
Enter the element of the array: 5  
The sum of odd numbers in the array is: 9
```