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-038**

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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/sp22bcs038/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:

```
//Anagram strings checker. Two sting having same letters in different
arrangment



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

bool areAnagrams(const string& str1, const string& str2) {
    if (str1.length() != str2.length()) {
        return false;
    }

    string sortedStr1 = str1;
    string sortedStr2 = str2;
    sort(sortedStr1.begin(), sortedStr1.end());
    sort(sortedStr2.begin(), sortedStr2.end());

    return sortedStr1 == sortedStr2;
}

int main() {
    string str1, str2;
    cout << "Enter the first string: ";
    cin >> str1;
    cout << "Enter the second string: ";
    cin >> str2;

    if (areAnagrams(str1, str2)) {
        cout << "The strings are anagrams!" << endl;
    } else {
        cout << "The strings are not anagrams." << endl;
    }

    getchar();
    return 0;
```

```
}
```

```
Enter the first string: silent
Enter the second string: listen
The strings are anagrams!
```

Programme 2:

```
//Aramstrong number checker.

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


bool isArmstrong(int* num) {
    int originalNum = *num;
    int sum = 0;
    int numDigits = 0;

    // Count the number of digits in the number
    int temp = *num;
    while (temp != 0) {
        numDigits++;
        temp /= 10;
    }

    // Calculate the sum of the cubes of each digit
    while (*num != 0) {
        int digit = *num % 10;
        sum += pow(digit, numDigits);
        *num /= 10;
    }

    return originalNum == sum;
}

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

```
    if (isArmstrong(&num)) {
        std::cout << num << " is an Armstrong number." << std::endl;
    } else {
        std::cout << num << " is not an Armstrong number." << std::endl;
    }


    getchar();
    return 0;
}
```

```
Enter a number: 1234
0 is not an Armstrong number.
```

Programme 3:

```
#include<iostream>
using namespace std;
//Copy array into another empty array using pointer.
int main(){
    int arr[5]={1,2,3,4,5};
    int*ptarr = &arr[0];
    int copy[5];
    int *ptcopy =&copy[0];

    for(int i=0;i<5;i++){
        *ptcopy = *ptarr;
        ptcopy++;
        ptarr++;
    }


    cout<<"The array after copying is: ";
    for(int z=0; z<5;z++){
        cout<<copy[z]<<" ";

    }
    getchar();
    return 0;
```

```
}
```

```
The array after copying is: 1 2 3 4 5
```

Programme 4:

```
#include<iostream>
using namespace std;
//Find largest number using pointer
int main(){
    int sample[5]={1,4,6,8,32};
    int *first= &sample[0];
    int largest=*first;

    cout<<"Array is: ";
    for(int z=0; z<5; z++){
        cout<<sample[z];
    }

    cout<<"\n"<<endl;

    for(int i=0;i<5;i++){
        if(largest <= *first){
            largest = *first;
        }
        first++;
    }
    cout<<"Largest number in given array is: "<<largest<<endl;
    getchar();
    return 0;
}
```

```
Array is: 146832

Largest number in given array is: 32
```

Programme 5:

```
#include<iostream>
using namespace std;
//Programme to calculate length of string

int main() {

   // Declare Variables
   char str[20], *pt;
   int i = 0;

   cout << " Calculate Length of String \n";

   cout << "Enter Any string [below 20 chars without spacing] : ";
   cin>>str;

   pt = str;
   while (*pt != '\0') {
      i++;
      pt++;
   }
   cout << "\nLength of String : " << i;

   getchar();
   return 0;
}
```

```
Calculate Length of String
Enter Any string [below 20 chars without spacing] : helloali
Length of String : 8
```

Programme 6:

```
#include<iostream>
using namespace std;
//check if sum of given number is less than 100
int main(){
    int num1,num2;
```

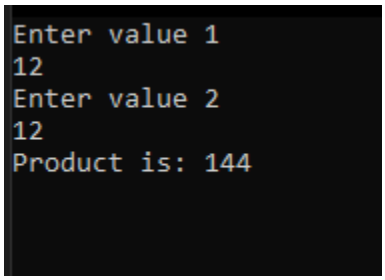
```
    int *ptn1 = &num1, *ptn2 = &num2;

    cout<<"Programme to check wether sum of given numbers is less than 100
or not."<<endl;
    cout<<"Enter first number: ";
    cin>>num1;
    cout<<"ENter number second: ";
    cin>>num2;

    if((*ptn1+ *ptn2) > 100){
        cout<<"Sum of given numbers is not less than 100"<<endl;
    } else if((*ptn1+ *ptn2) < 100 ){
        cout<<"Sum of given numbers is  less than 100"<<endl;

    } else{
        cout<<"Sum of given numbers is 100"<<endl;
    }
    getchar();
    return 0;
}
```

```
Programme to check wether sum of given numbers is less than 100 or not.
Enter first number: 12
ENter number second: 24
Sum of given numbers is  less than 100
```

Programme 7:

```
#include<iostream>
using namespace std;
//Multiply two numbers using pointers


int mult(int *x,int *y){
    return ((*x)*(*y));
}

int main(){
```

```
    int var1,var2,result;
    int *ptvar1,*ptvar2;

    ptvar1 = &var1;
    ptvar2 = &var2;

    cout<<"Enter value 1"<<endl;
    cin>>var1;
    cout<<"Enter value 2"<<endl;
    cin>>var2;

    result =mult(ptvar1,ptvar2);

    cout<<"Product is: "<<result<<endl;



getchar();
    return 0;
}
```



Programme 8:

```
#include <iostream>
using namespace std;
//Multiplying all the elements in array with 2
int main() {
    int sample[5]={1,2,3,4,5};
    int *firstarr=&sample[0];
    int num;
    cout<<"Array : ";
    for(int i=0; i<5;i++){
        cout<<*firstarr;
```

```
        firstarr++;
    }
    firstarr = &sample[0];
    cout<<endl;

    cout<<"Multiplying array with 2. Result: ";
    for(int z=0; z<5;z++){

        cout<<(*firstarr)*2;
        firstarr++;
    }



    getchar();
    return 0;
}
```

```
Array : 12345
Multiplying array with 2. Result: 246810
```

Programme 9:

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

bool isPrime(int* num) {
    if (*num <= 1) {
        return false;
    }

    for (int i = 2; i <= (*num / 2); i++) {
        if (*num % i == 0) {
            return false;
        }
    }

    return true;
```

```
}

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

    bool prime = isPrime(&num);

    if (prime) {
        cout << num << " is a prime number." << endl;
    } else {
        cout << num << " is not a prime number." << endl;
    }

    getchar();
    return 0;
}
```

```
Enter a number: 9
9 is not a prime number.
```

Programme 10:

```
#include <iostream>
using namespace std;
//Printing 2D array using pointers
const int ROWS = 3;
const int COLS = 4;

void print2DArray(int arr[][COLS]) {
    for (int i = 0; i < ROWS; i++) {
        for (int j = 0; j < COLS; j++) {
            cout << *(*(arr + i) + j) << " ";
        }
        cout << endl;
    }
}
```

```
int main() {
    int arr[ROWS][COLS] = {
        {1, 2, 3, 4},
        {5, 6, 7, 8},
        {9, 10, 11, 12}
    };

    print2DArray(arr);


    getchar();
    return 0;
}
```

```
1 2 3 4
5 6 7 8
9 10 11 12
```

Programme 11:

```
#include<iostream>
using namespace std;
//REversing array using pointers
int main(){
    int sam[5]={1,2,3,4,5};
    int *first= &sam[0];
    int *last = &sam[4];

    cout<<"Array in correct order is: ";
    for(int i=0;i<5;i++){
        cout<<" "<<*first;
        first++;
    }

    cout<<endl;
    cout<<"Array in reverse order is: ";
    for(int i=0;i<5;i++){
        cout<<" "<<*last;
        last--;
```

```
    }

    getchar();
    return 0;
}
```

```
Array in correct order is:  1 2 3 4 5
Array in reverse order is:  5 4 3 2 1
```

Programme 12:

```
#include <iostream>
#include <string.h>
using namespace std;
//Reverse string using pointers
void reverseString(char* str) {
    int length = strlen(str);
    for (int i = 0; i < length / 2; i++) {
        char temp = str[i];
        str[i] = str[length - i - 1];
        str[length - i - 1] = temp;
    }
}

int main() {
    char str[] = "Hello, World!";
    cout << "Original string: " << str << endl;

    reverseString(str);

    cout << "Reversed string: " << str << endl;

    getchar();
    return 0;
}
```

```
Original string: Hello, World!
Reversed string: !dlroW ,olleH
```

Programme 13:

```
#include <iostream>
using namespace std;
//Convert unit of speed
void speedconvert(double* speed) {
    *speed *= 0.621371;
}

int main() {
    double kmph;
    cout << "Enter speed in kilometers per hour (km/h): ";
    cin >> kmph;

    speedconvert(&kmph);

    cout << "Speed in miles per hour (mph): " << kmph << endl;


    getchar();
    return 0;
}
```

```
Enter speed in kilometers per hour (km/h): 100
Speed in miles per hour (mph): 62.1371
```

Programme 14:

```
#include<iostream>
using namespace std;
//Add all the elements of array using pointers
int main(){
    int arr[5]= {1,2,3,4,5},sum=0;
    int* element = &arr[0];

    for(int i=0;i<5;i++){
        sum += *element;
        element++;
    }
```

```
    cout<<"Sum of all the elements in array is: "<<sum<<endl;
    getchar();
    return 0;
}
```

```
Sum of all the elements in array is: 15
```

Programme 15:

```
#include<iostream>
using namespace std;
//Calculate area of triangle
int main(){
    int len, wid, result;
    int* ptresult = &result;
    cout << "Enter length of triangle: ";
    cin >> len;
    cout << "Enter width of triangle: ";
    cin >> wid;
    result = (1.0/2) * len * wid;
    cout << "Area of triangle is: " << *ptresult << endl;
    getchar();
    return 0;
}
```

```
Enter length of triangle: 4
Enter width of triangle: 3
Area of triangle is: 6
```