



COMSATS University Islamabad, Vehari Campus

Department of Computer Science

Class: BCS-SP22-4A

Submission Deadline: 10 Sep 2023

Subject: Data Structures and Algorithms-Lab

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Max Marks: 10

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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/AhmadHussain2003/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.

Program # 1

// Program for Area Of Circle Using Pointer

```
#include <iostream>
```

```
#include<conio.h>
```

```

using namespace std;
// Declare Area of Circle Function Using Pointer
void area_of_circle(float *value, float *result) {
    *result = 3.14 * (*value) * (*value);
}
int main() {
    float radius, area;
    cout << " Area Of Circle Using Pointer and Functions\n";
    cout << "\nEnter the radius of Circle : ";
    cin>>radius;
    //area = 3.14 * radius * radius;
    area_of_circle(&radius, &area);
    cout << "\nArea of Circle : " << area;
    getch();
    return 0;
}

```

Output:

Program # 2

```

// Traversing the array using Pointers
#include <iostream>
using namespace std;
int main(){
//Pointer declaration

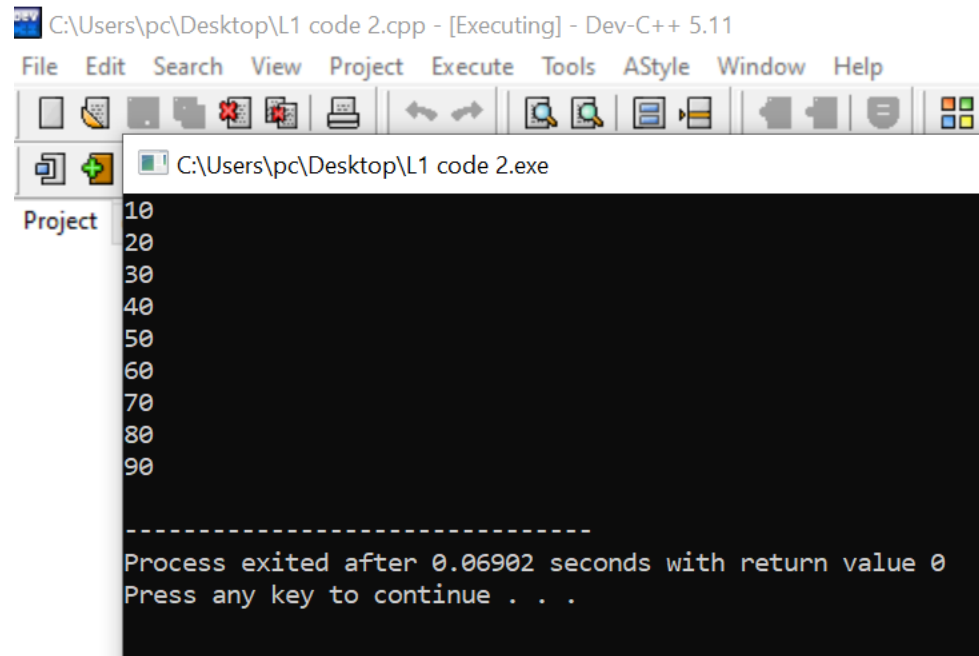
```

```

int *p;
//Array declaration
int arr[]={10,20,30,40,50,60,70,80,90};
//Assignment
p = arr;
for(int i=0; i<9;i++){
cout<<*p<<endl;
//++ moves the pointer to next int position
p++;
}
return 0;
}

```

Output:



```

C:\Users\pc\Desktop\L1 code 2.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
C:\Users\pc\Desktop\L1 code 2.exe
Project
10
20
30
40
50
60
70
80
90
-----
Process exited after 0.06902 seconds with return value 0
Press any key to continue . . .

```

Program #3

//Program for Print String Using Pointer

```

#include <iostream>
#include<conio.h>
using namespace std;
int main() {
// Declare Variables
char str[20], *pt;

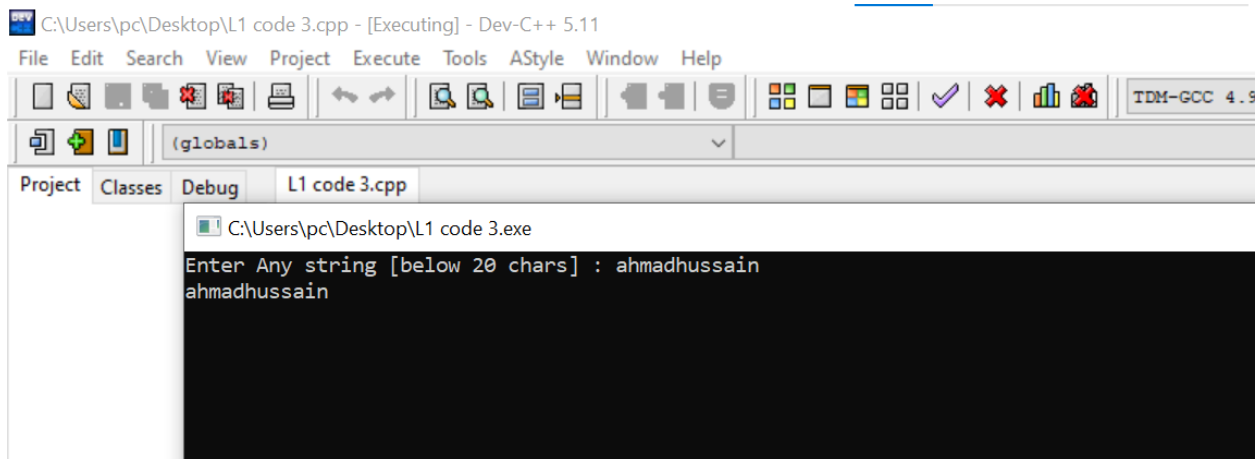
```

```

cout << "Enter Any string [below 20 chars] : ";
cin>>str;
// Assign to Pointer Variable
pt = str;
while (*pt != '\0') {
cout << *pt;
pt++;
}
getch();
return 0;
}

```

Output:



Program #4

//Print address of Variable Using Pointer in C++

```

#include <iostream>
#include<conio.h>
using namespace std;
int main() {
// Declare Variables
int a;
int *pt;
a = 20;
pt = &a;
cout << "\n[a ]:Value of A = " << a;
cout << "\n[*pt]:Value of A = " << *pt;
cout << "\n[&a ]:Address of A = " << &a;

```

```

cout << "\n[pt ]:Address of A = " << pt;
cout << "\n[&pt]:Address of pt = " << &pt;
cout << "\n[pt ]:Value of pt = " << pt;
getch();
return 0;
}

```

Output:

```

C:\Users\pc\Desktop\L1 code 4.exe

[a ]:Value of A = 20
[*pt]:Value of A = 20
[&a ]:Address of A = 0x6ffe0c
[pt ]:Address of A = 0x6ffe0c
[&pt]:Address of pt = 0x6ffe00
[pt ]:Value of pt = 0x6ffe0c

```

Program #5

// Simple Program for Length of String Using Pointer

```

#include <iostream>
#include<conio.h>
using namespace std;
int main() {
// Declare Variables
char str[30], *pt;
int i = 0;
cout << "Enter Any string [below 30 chars] : ";
cin>>str;
// Assign to Pointer Variable
pt = str;
while (*pt != '\0') {
i++;

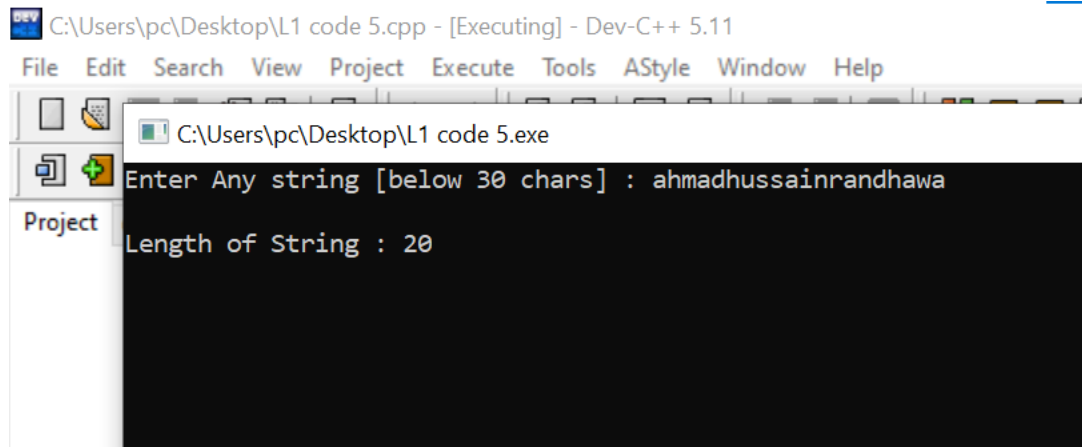
```

```

pt++;
}
cout << "\nLength of String : " << i;
getch();
return 0;
}

```

Output:



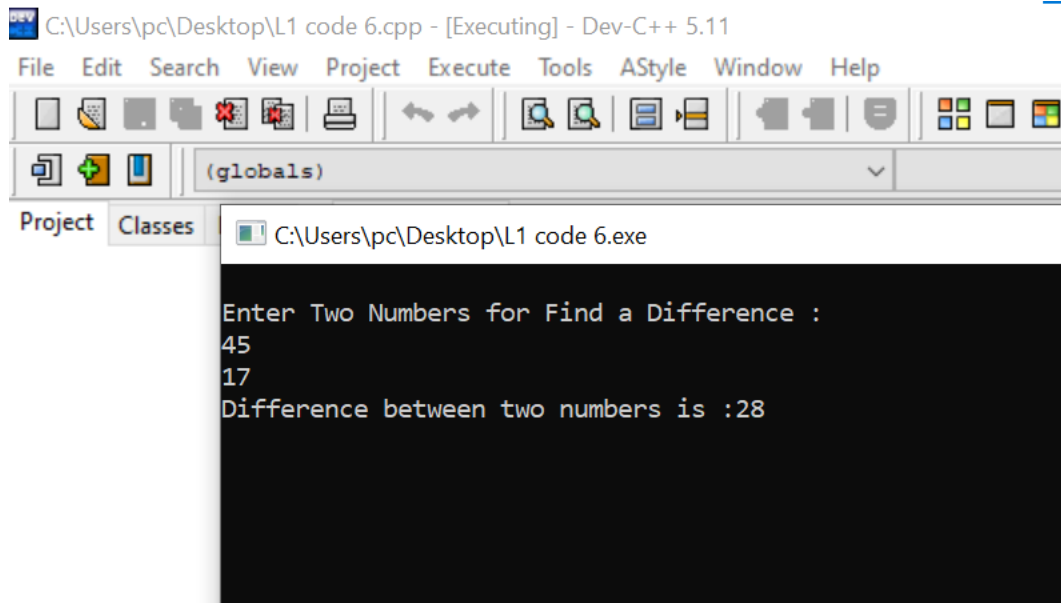
Program # 6

```

// Find a difference between two Numbers Using Pointer
#include <iostream>
#include<conio.h>
using namespace std;
int main() {
// Declare Variables
int *p1, *p2;
int num1, num2, diff;
cout << "\nEnter Two Numbers for Find a Difference : \n";
cin>>num1;
cin>>num2;
p1 = &num1;
p2 = &num2;
diff = *p1 - *p2;
cout << "Difference between two numbers is :" << diff;
getch();
return 0;
}

```

Output:



```
C:\Users\pc\Desktop\L1 code 6.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
(globals)
Project Classes
C:\Users\pc\Desktop\L1 code 6.exe

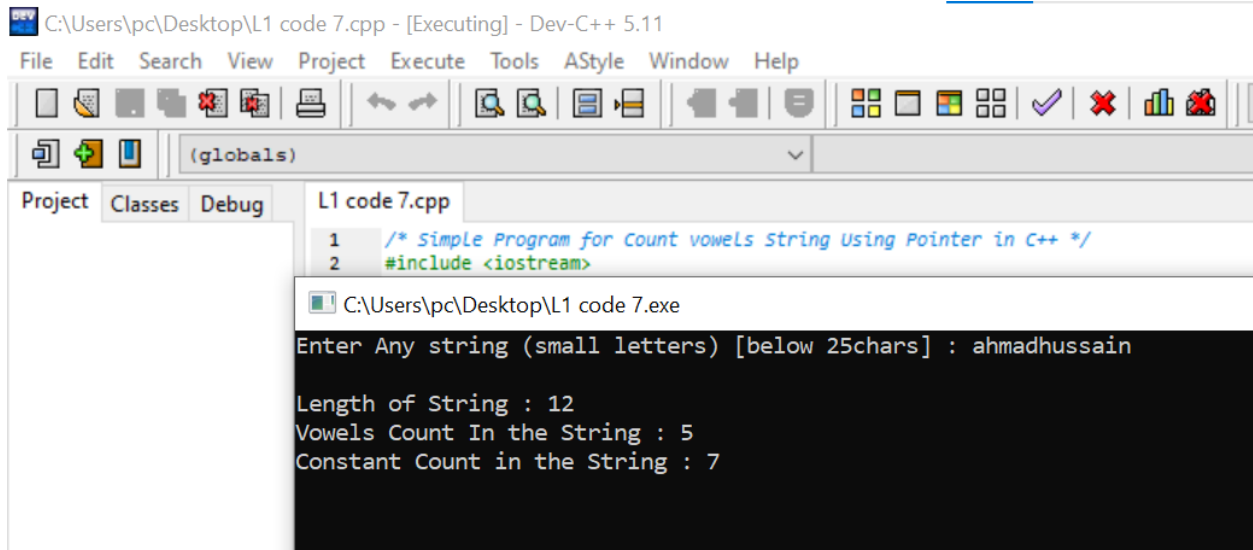
Enter Two Numbers for Find a Difference :
45
17
Difference between two numbers is :28
```

Program # 7

```
/* Simple Program for Count vowels String Using Pointer in C++ */
#include <iostream>
#include<conio.h>
using namespace std;
int main() {
// Declare Variables
char str[25], *pt;
int i = 0, c = 0;
cout << "Enter Any string (small letters) [below 25chars] : ";
cin>>str;
// Assign to Pointer Variable
pt = str;
while (*pt != '\0') {
if (*pt == 'a' || *pt == 'e' || *pt == 'i' || *pt == 'o' || *pt == 'u')
c++;
i++;
pt++;
}
cout << "\nLength of String : " << i;
cout << "\nVowels Count In the String : " << c;
cout << "\nConstant Count in the String : " << (i - c);
```

```
getch();
return 0;
}
```

Output:



C:\Users\pc\Desktop\L1 code 7.cpp - [Executing] - Dev-C++ 5.11

File Edit Search View Project Execute Tools AStyle Window Help

(globals)

Project Classes Debug L1 code 7.cpp

```
1  /* Simple Program for Count vowels String Using Pointer in C++ */
2  #include <iostream>
```

C:\Users\pc\Desktop\L1 code 7.exe

Enter Any string (small letters) [below 25chars] : ahmadhussain

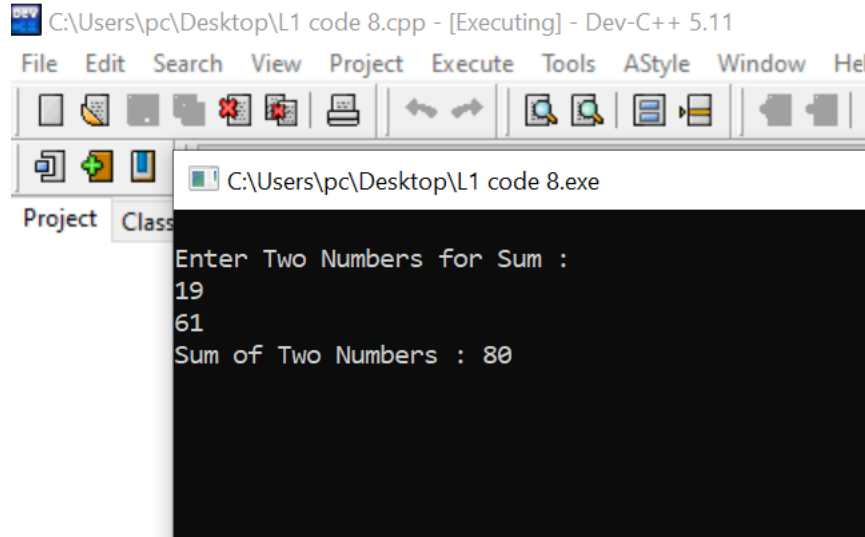
Length of String : 12
Vowels Count In the String : 5
Constant Count in the String : 7

Program # 8

//Simple Program for Add Two Numbers Using Pointer

```
#include <iostream>
#include<conio.h>
using namespace std;
int main() {
int *p1, *p2;
int num1, num2, sum;
cout << "\nEnter Two Numbers for Sum : \n";
cin>>num1;
cin>>num2;
p1 = &num1;
p2 = &num2;
sum = *p1 + *p2;
cout << "Sum of Two Numbers : " << sum;
getch();
return 0;
}
```

Output:



Program # 9

// Simple Program for Swap Numbers Using Pointers

```
#include <iostream>
```

```
#include<conio.h>
```

```
using namespace std;
```

// Declare Swap Function Using Pointer

```
void swap_numbers(int *val1, int *val2) {
```

```
int temp;
```

```
temp = *val1;
```

```
*val1 = *val2;
```

```
*val2 = temp;
```

```
}
```

```
int main() {
```

// Declare Variables

```
int number1, number2;
```

// Read User Input

```
cout << "Enter value of Swap Number # 1: ";
```

```
cin>>number1;
```

```
cout << "Enter value of Swap Number # 2: ";
```

```
cin>>number2;
```

//Print Values before Swapping

```
cout << "Before Swapping : Number # 1=" << number1 << ", Number # 2=" << number2 << "\n";
```

//Call Swap Function By Passing Reference

```
swap_numbers(&number1, &number2);
```

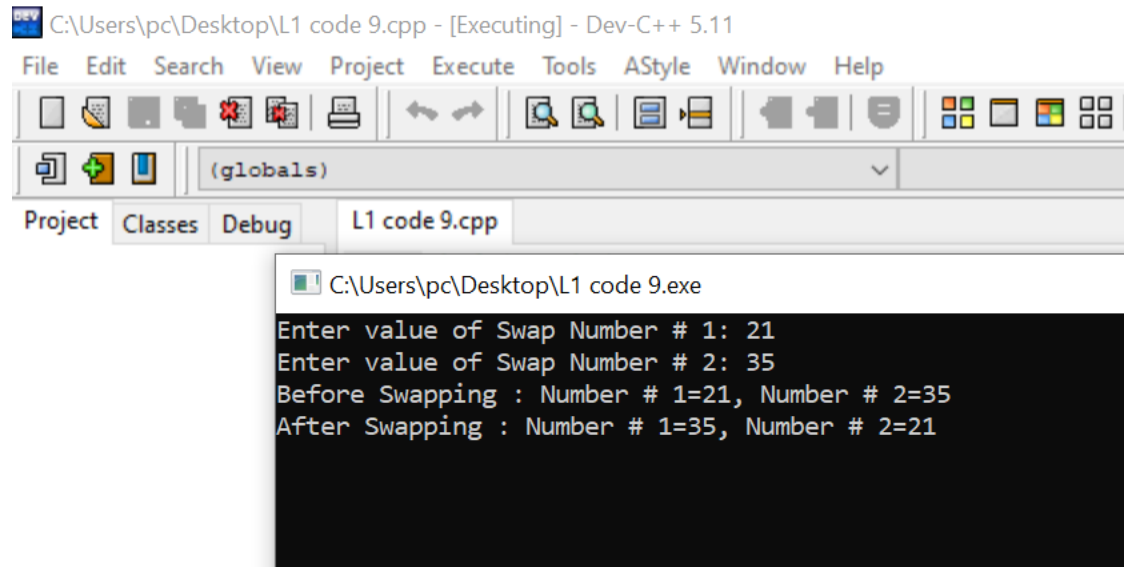
//Print Values after Swapping

```

cout << "After Swapping : Number # 1=" << number1 << ", Number # 2=" << number2 << "\n";
getch();
return 0;
}

```

Output:



Program # 10

//C++ program to show the use of pointer to pointer variable

```

#include <iostream>
#include <conio.h>
using namespace std;
int main()
{
    int a=5,*b,**c;

    b=&a;    // store the address of variable a
    c=&b;    // store the address of variable b

    cout<<"Value of a = "<<a<<endl;

    cout<<"Address of a = "<<&a<<endl;
    cout<<"Address of b = "<<&b<<endl;
    cout<<"Address of c = "<<&c<<endl;

    cout<<"b points to address = "<<b<<endl;

```

```

cout<<"b points to value = "<<*b<<endl;

cout<<"c points to address = "<<c<<endl;
cout<<"c indirectly points to value "<<**c;
return 0;
}

```

Output:

```

C:\Users\pc\Desktop\L1 code 10.cpp - [Executing] - Dev-C++ 5.11
File C:\Users\pc\Desktop\L1 code 10.exe
Value of a = 5
Address of a = 0x6ffe0c
Address of b = 0x6ffe00
Address of c = 0x6ffdf8
b points to address = 0x6ffe0c
b points to value = 5
c points to address = 0x6ffe00
c indirectly points to value 5
-----
Process exited after 0.08151 seconds with return value 0
Press any key to continue . . .

```

Program # 11

//Factorial program using the pointer in C++ language

```
#include <iostream>
```

```
#include <conio.h>
```

```
using namespace std;
```

```
void findFactorial(int, int *);//Function prototype
```

```
int main()
```

```
{
```

```
    int i,fact,num;//variable declaration
```

```
    cout<<"Enter a number: \n";
```

```
    cin>>num;//Takes input from the user
```

```
    findFactorial(num, &fact);//function call
```

```
    cout<<"Factorial of " <<num<< " is: "<<fact;
```

```

//display the factorial of given number
getch();
return 0;
}

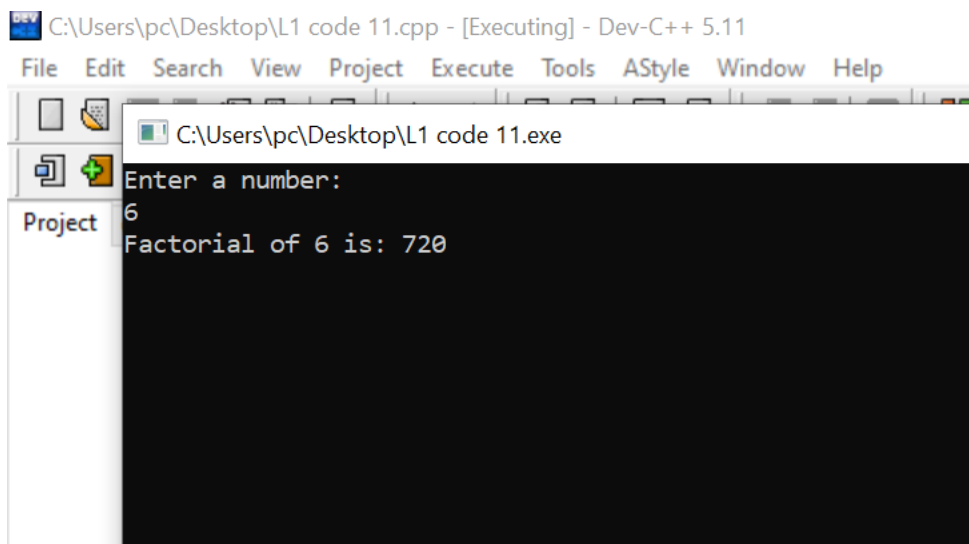
//function definition with parameter
void findFactorial(int num, int *fact){
int i;

*fact=1;

for(i=1; i<=num; i++){//calculate factorial using for loop
*fact=*fact*i;
}
}

```

Output:



Program # 12

//Write C++ program to print the elements of the array in reverse order using a pointer

```

#include <iostream>
using namespace std;

```

```

int main() {

int arr[5],i;
int *p=arr;

```

```

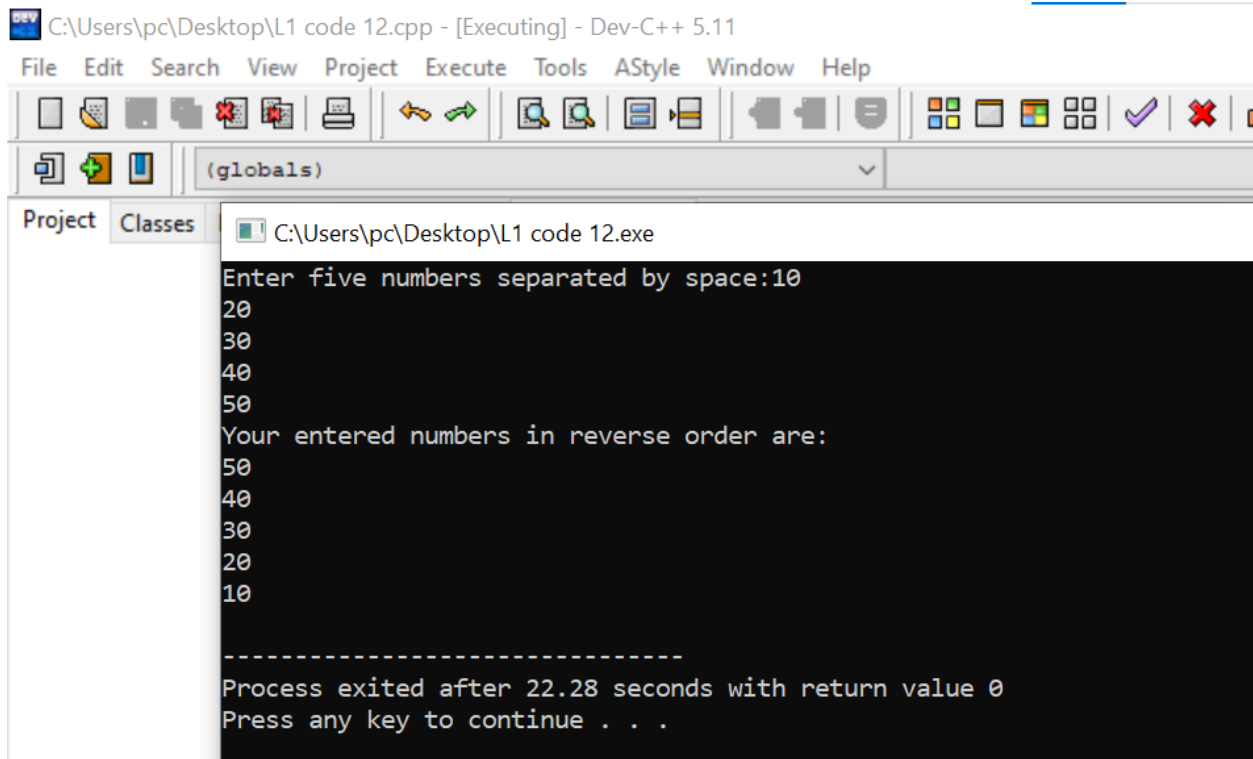
    cout<<"Enter five numbers separated by space:";
    cin>>*p>>*(p+1)>>*(p+2)>>*(p+3)>>*(p+4);
    cout<<"Your entered numbers in reverse order are:\n";
    for(i=4;i>=0;i--)
        cout<<*(p+i)<<endl;

    return 0;

}

```

Output:



The screenshot shows the Dev-C++ 5.11 IDE with the file "C:\Users\pc\Desktop\L1 code 12.cpp" open. The console window displays the following output:

```

Enter five numbers separated by space:10
20
30
40
50
Your entered numbers in reverse order are:
50
40
30
20
10

-----
Process exited after 22.28 seconds with return value 0
Press any key to continue . . .

```

Program # 13

//C++ program to print the average of array function using pointer

```
#include<iostream >
```

```
using namespace std;
```

```
// function declaration:
```

```
double Average(int *arr, int size);
```

```
int main ()
```

```
{
```

```
    int i, n;
```

```

    double avg;
    cout<<"Enter The Size Of Array\n";
    cin>>n;
    int average[n];
    cout<<"\nEnter The Array Elements\n";
    for(i=0; i<n; i++)
    {
        cin>>average[i];
    }

    cout << "\n\nAverage Value of An Array Is: " << Average(average , n)<< endl;
    return 0;
}

double Average(int *arr, int size)
{
    int i, sum = 0;
    double avg;

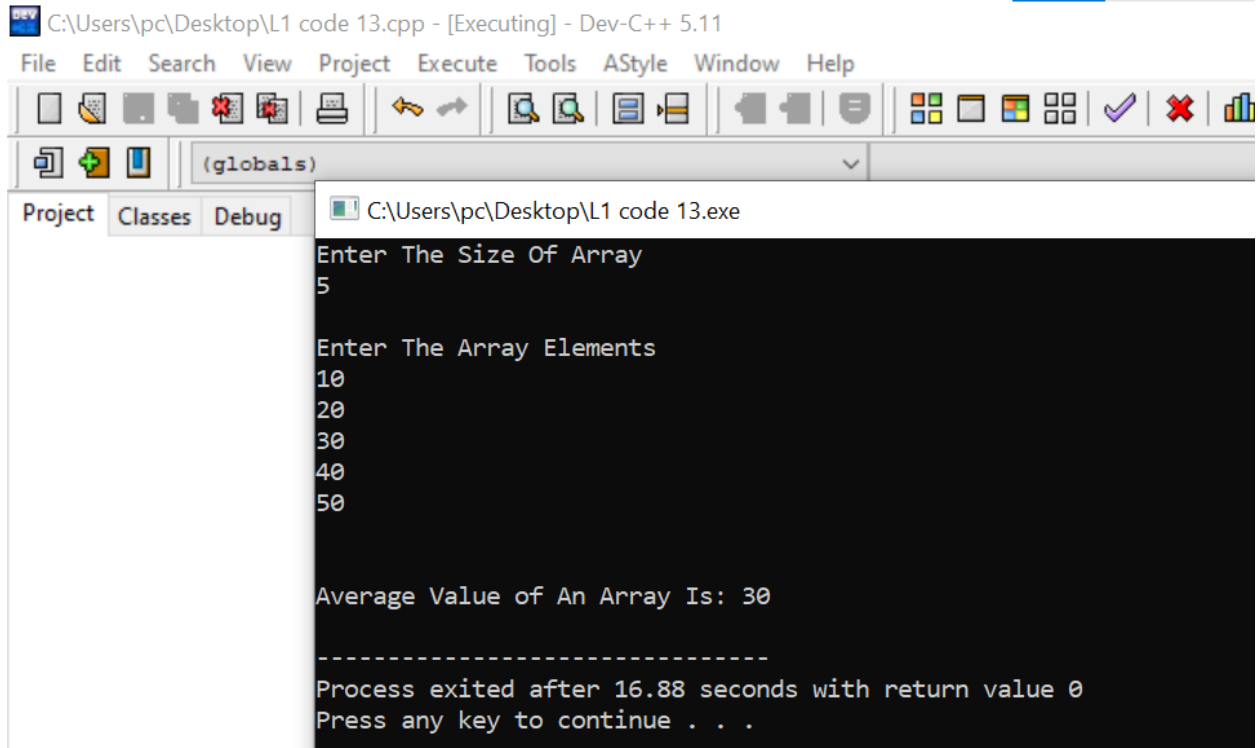
    for (i = 0; i < size; ++i)
    {
        sum += arr[i];
    }

    avg = double(sum) / size;

    return avg;
}

```

Output:



Program # 14

//c++ program to Determine if a number is a palindrome using pointers

```
#include<iostream>
```

```
using namespace std;
```

```
int main() {
```

```
    int n, num1, r, rev = 0;
```

```
    int *num;
```

```
        cout << "Enter a number:";
```

```
    cin >> n;
```

```
        num1 = n;
```

```
    num = &n;
```

```
        while (*num > 0) {
```

```
            r = *num % 10;
```

```
            rev = rev * 10 + r;
```

```
            *num = *num / 10;
```

```
        }
```

```

if (rev == num1) {
    cout << "Number is palindrome:" << num1;
} else {
    cout << "Number is not palindrome:" << num1;
}

return 0;
}

```

Output:

```

C:\Users\pc\Desktop\L1 code 14.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
C:\Users\pc\Desktop\L1 code 14.exe
Enter a number:343
Number is palindrome:343
-----
Process exited after 5.732 seconds with return value 0
Press any key to continue . . .

```

Program # 15

//Simple Program for Increment and Decrement Integer Using Pointer in C++

```

#include <iostream>
#include<conio.h>
using namespace std;
int main() {
    int a;
    int *pt;

    a = 7;

    pt = &a;

    (*pt)++; //Post Increment
    cout << "\n[a++]:Increment Value of A = " << a;

    ++(*pt); //Pre Increment
    cout << "\n[++a]:Increment Value of A = " << a;
}

```



```
(*pt)--; //Post Decrement
```

```
cout << "\n[a--]:Decrement Value of A = " << a;
```

```
--(*pt); //Pre Decrement
```

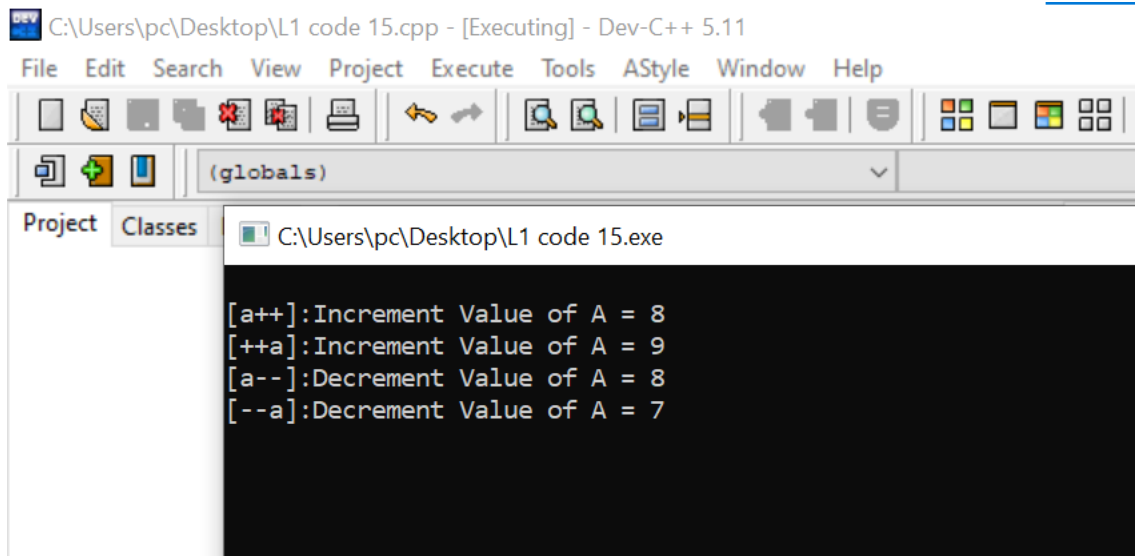
```
cout << "\n[--a]:Decrement Value of A = " << a;
```

```
getch();
```

```
return 0;
```

```
}
```

Output:



The screenshot shows the Dev-C++ 5.11 IDE. The title bar indicates the file is "C:\Users\pc\Desktop\L1 code 15.cpp - [Executing] - Dev-C++ 5.11". The menu bar includes File, Edit, Search, View, Project, Execute, Tools, AStyle, Window, and Help. The toolbar contains various icons for file operations, editing, and execution. The "Project" and "Classes" tabs are visible on the left. The main output window, titled "C:\Users\pc\Desktop\L1 code 15.exe", displays the following output:

```
[a++]:Increment Value of A = 8
[++a]:Increment Value of A = 9
[a--]:Decrement Value of A = 8
[--a]:Decrement Value of A = 7
```