COMSATS University Islamabad, Vehari Campus

Department of Computer Science

Class: BCS-SP22-4A **Submission Deadline: 10 Sep 2023**

Subject: Data Structures and Algorithms-Lab **Instructor: Yasmeen Jana**

Max Marks: 10

Name: Ahmad Hussain **Reg. No: SP22-BCS-008**

Email: 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/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.

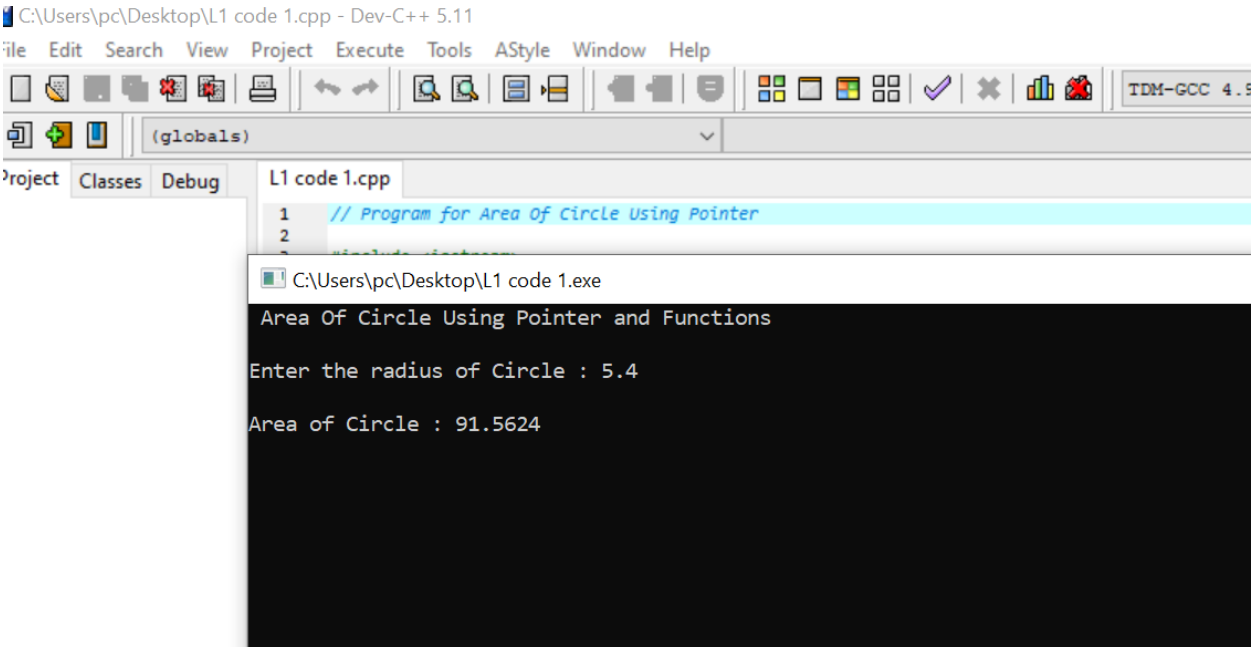
After completing the activities, Upload the final pdf and code to the "**DSA_Lab"** repository.

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:

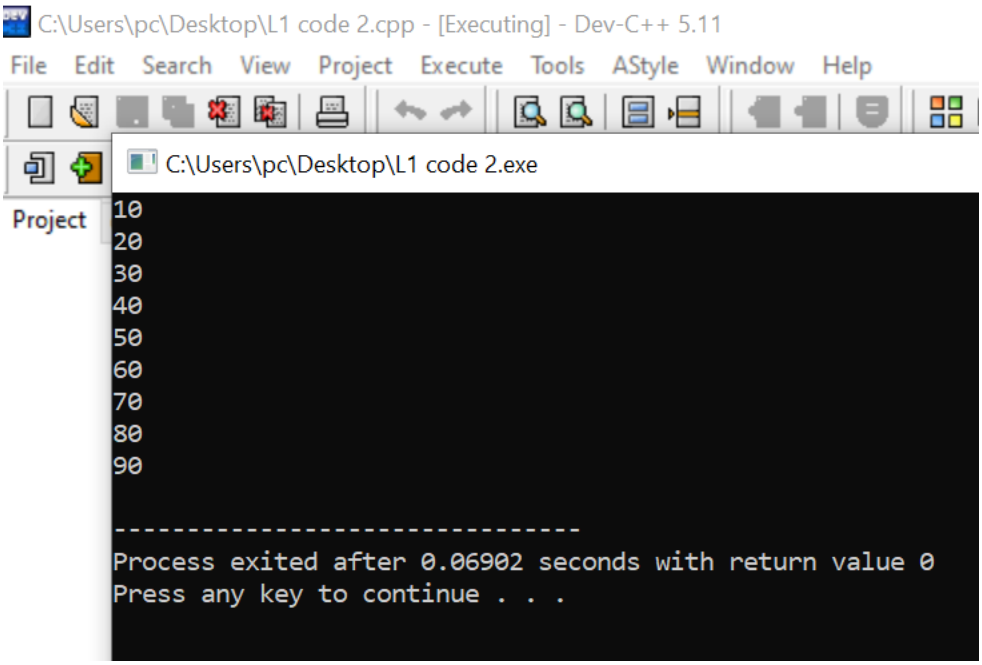


Program # 2

```
// 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:

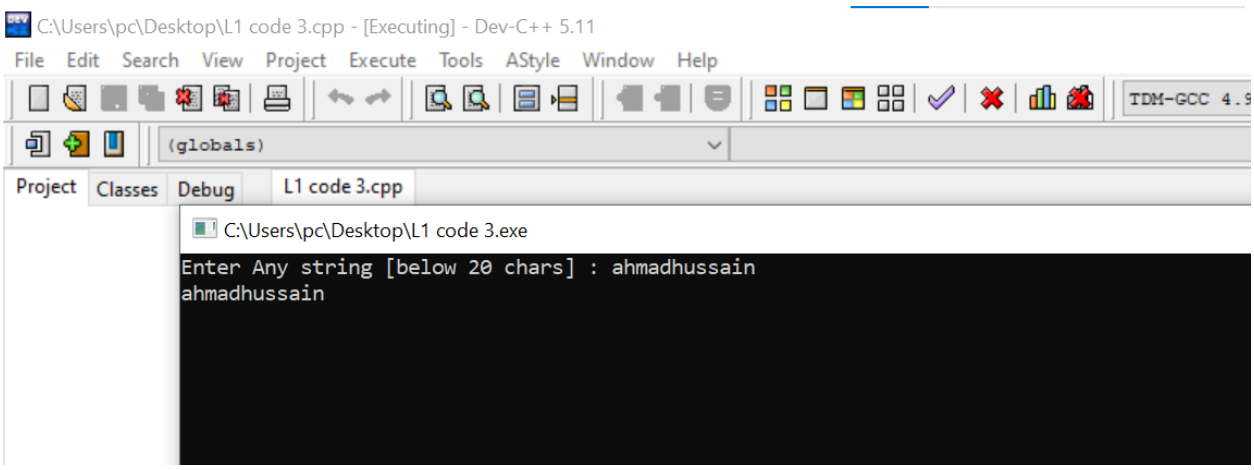


Program #3

```
//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:

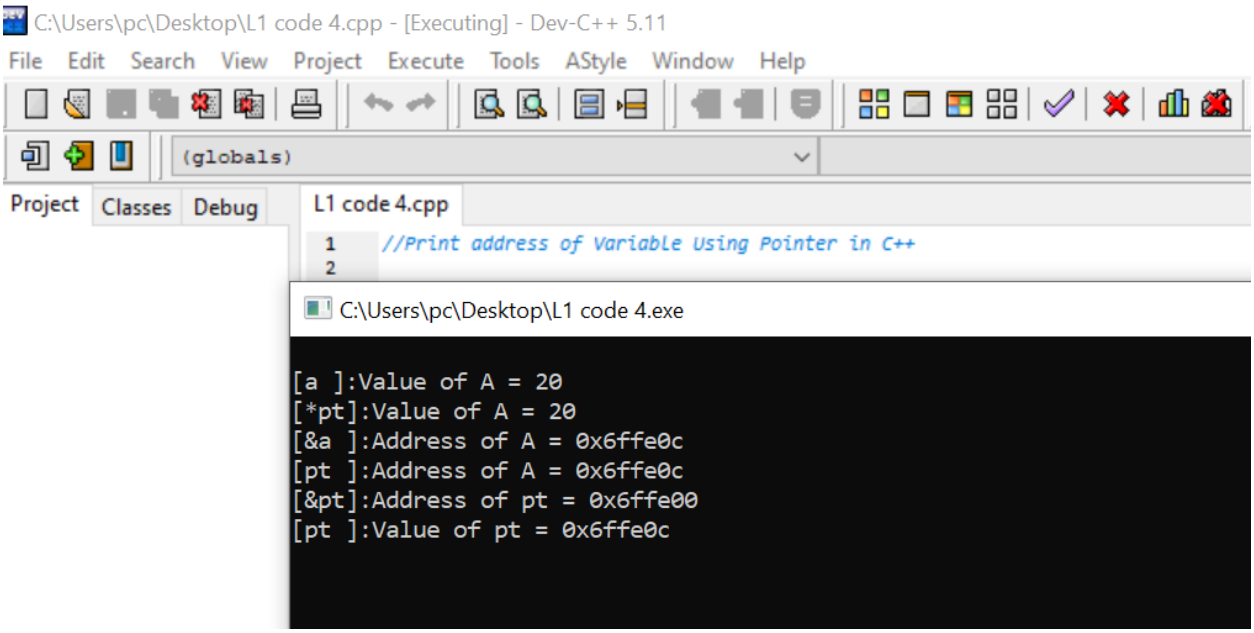


Program #4

```
//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:

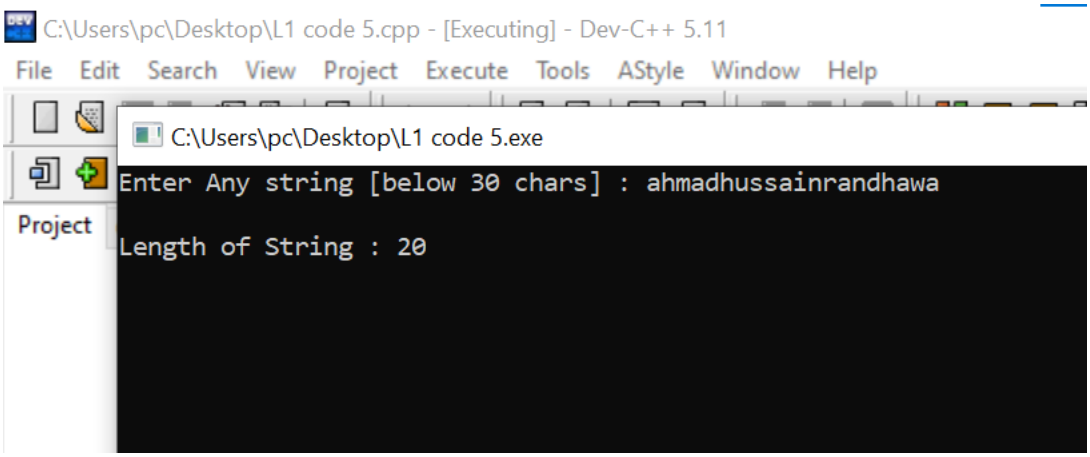


Program #5

```
// 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;
}
```

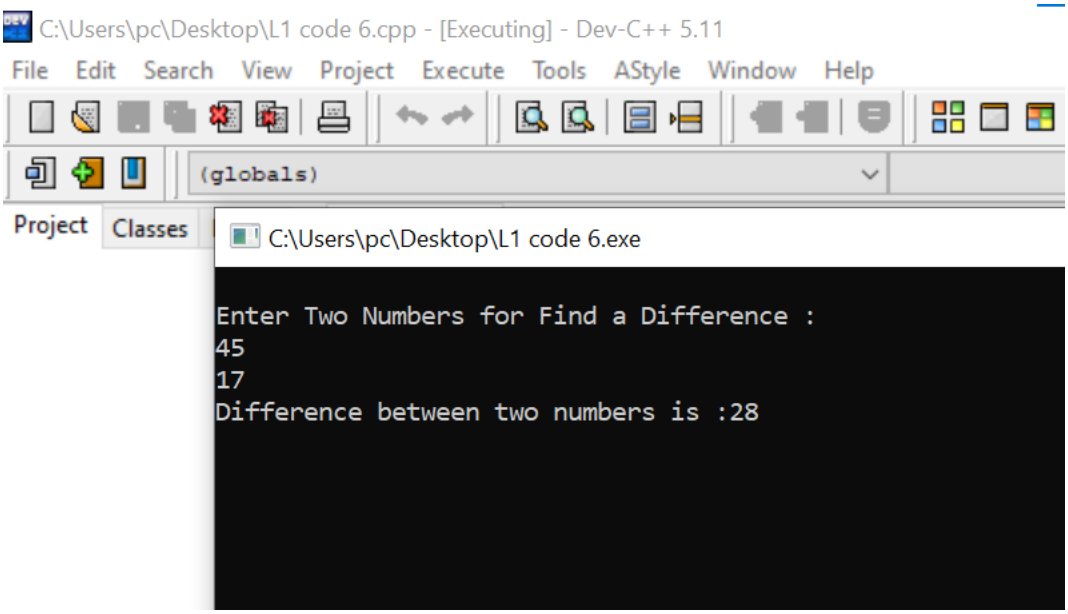
Output:



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:

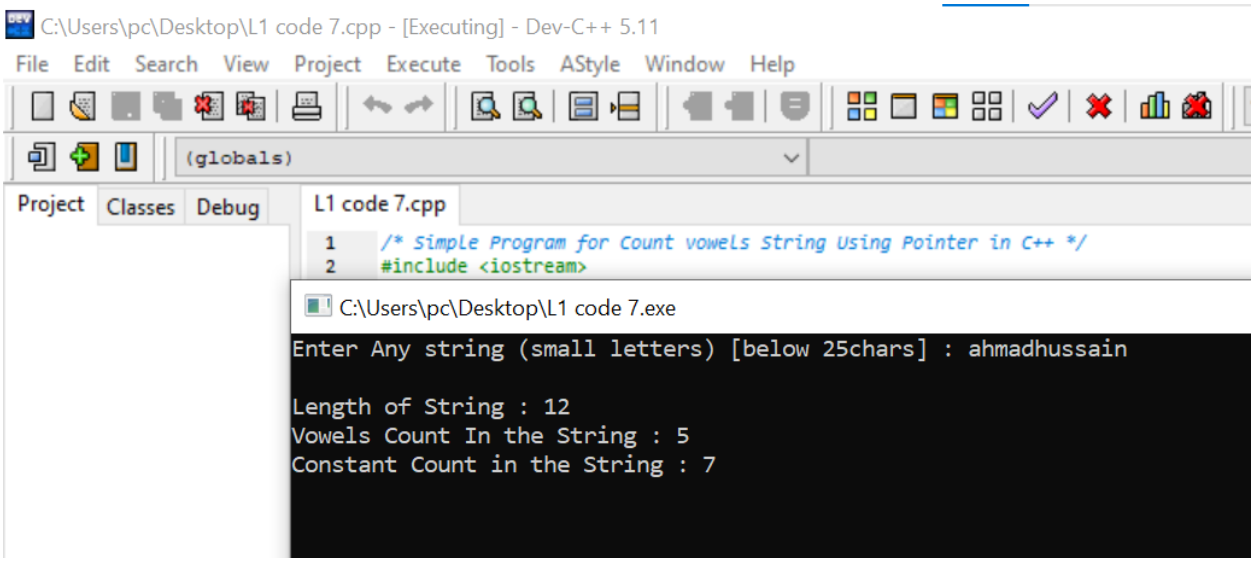


Program # 7

```
/* 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;
}
```

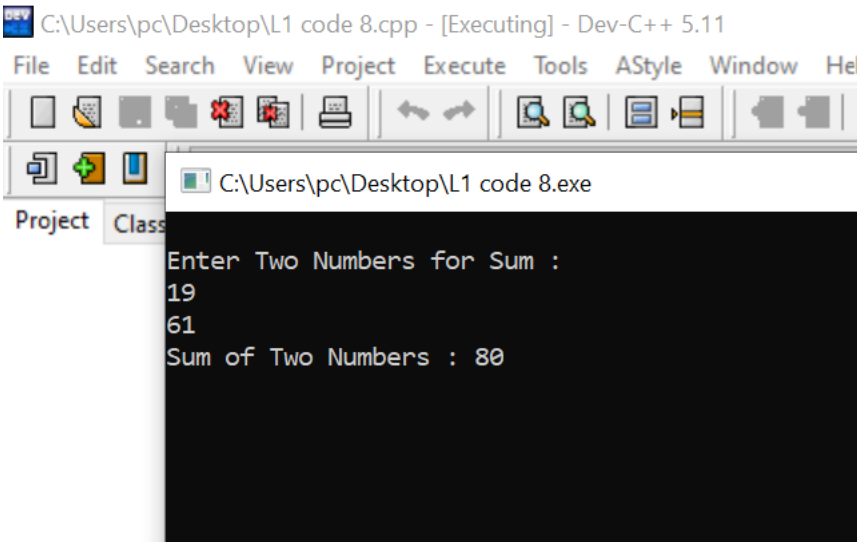
Output:



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:

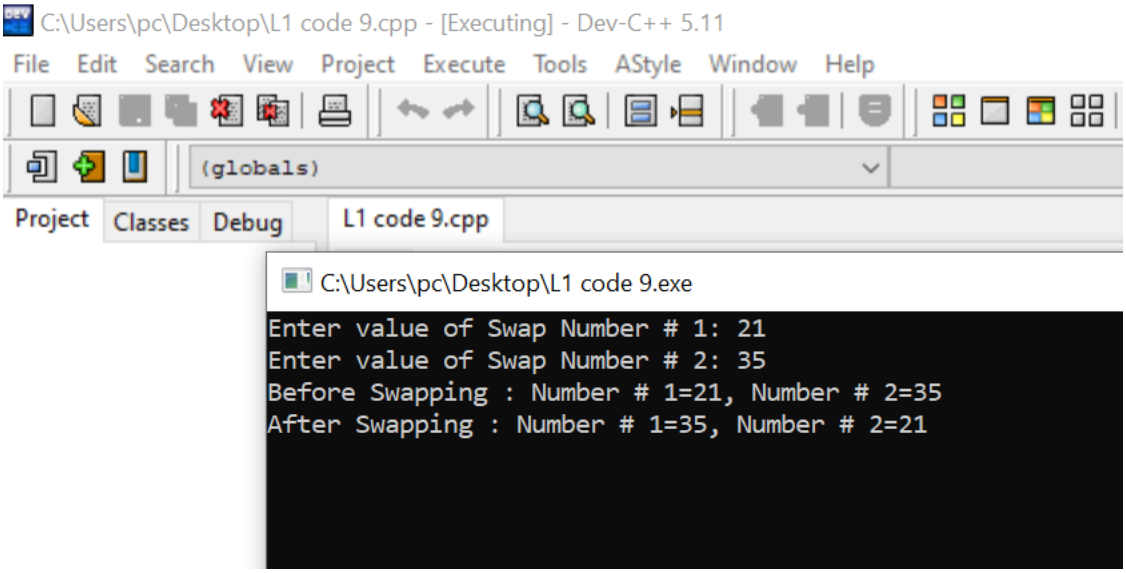


Program # 9

```
// 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:

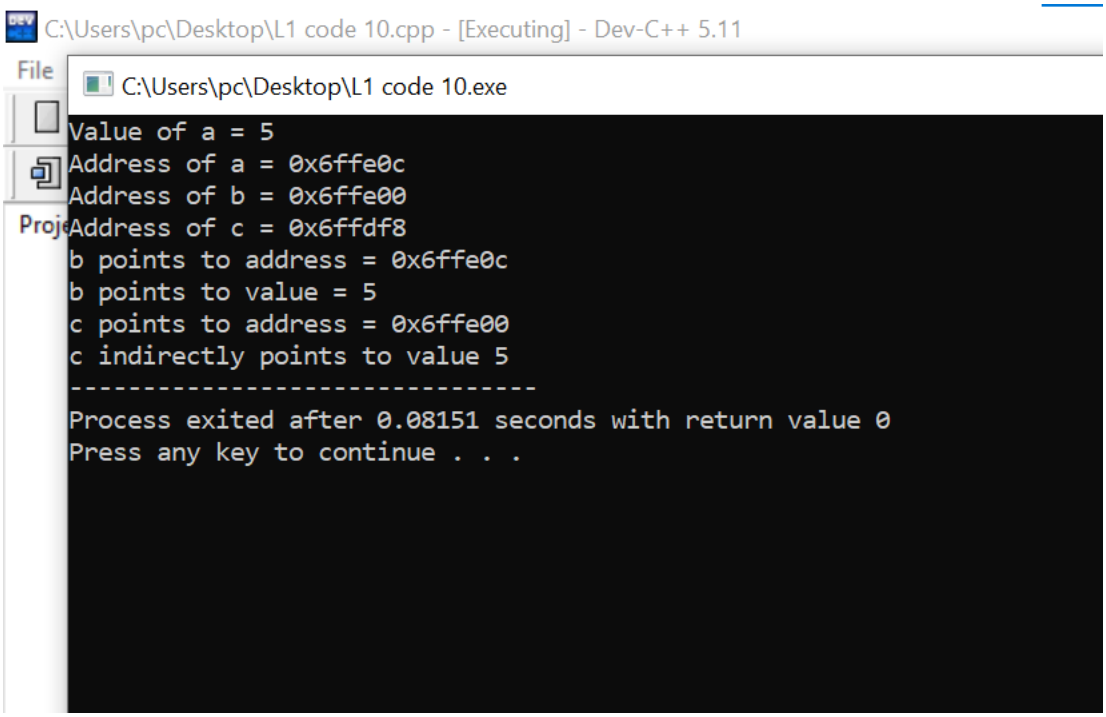


Program # 10

```
//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:

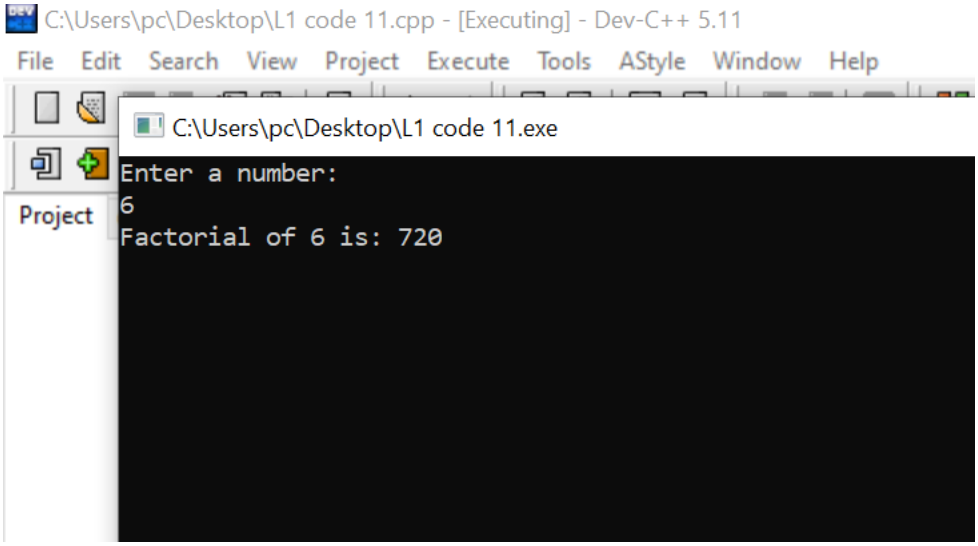


Program # 11

```
//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:

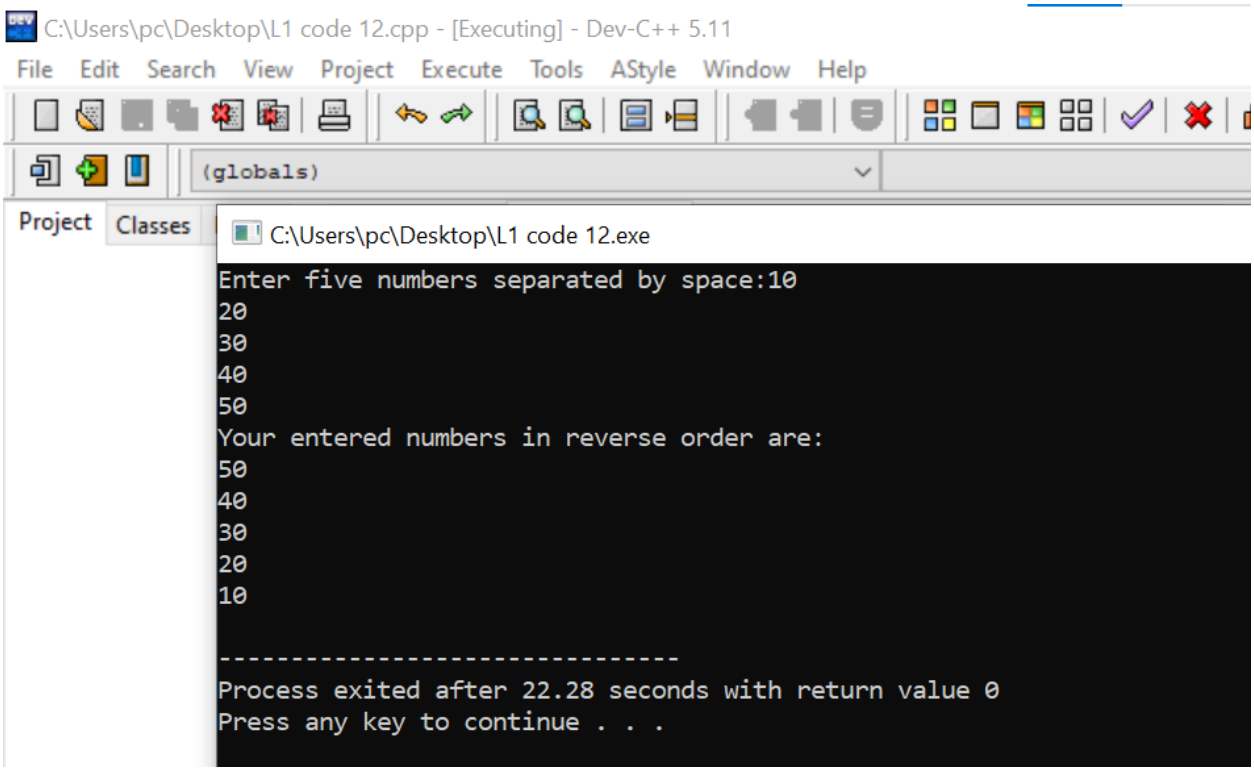


Program # 12

```
//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:

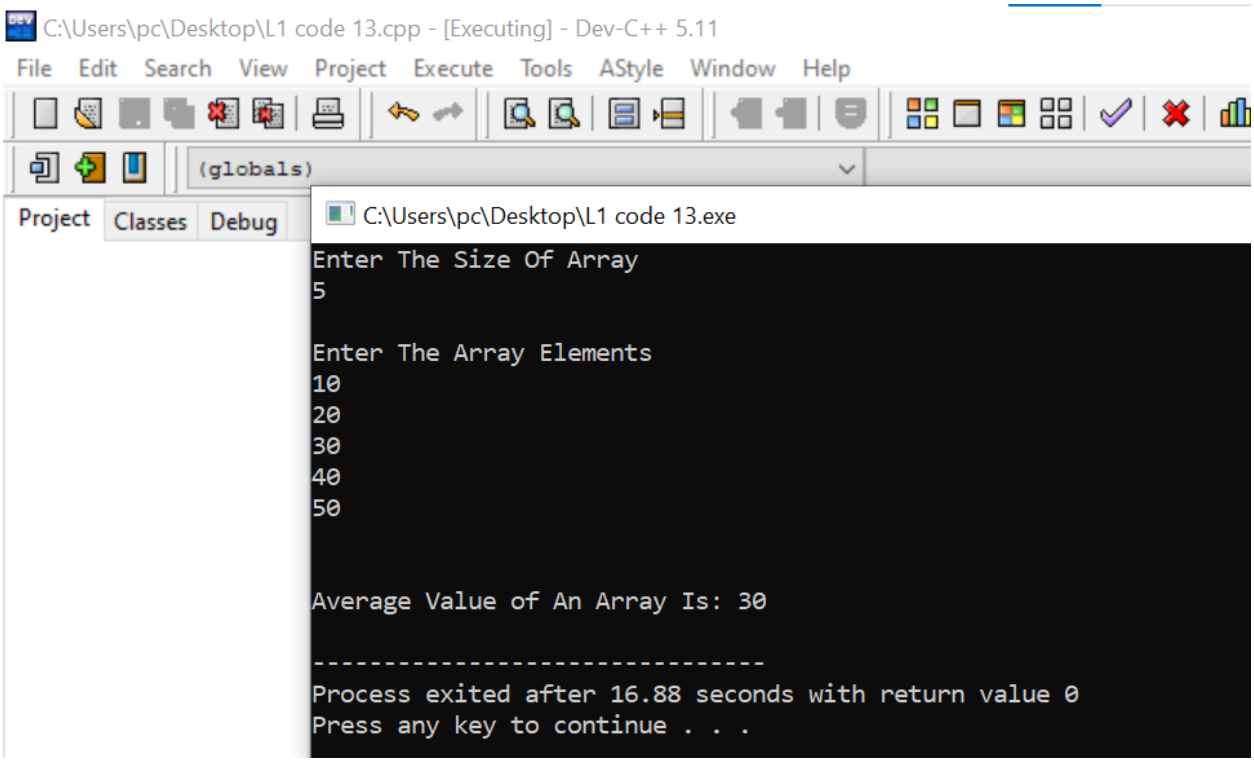


Program # 13

```
//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:

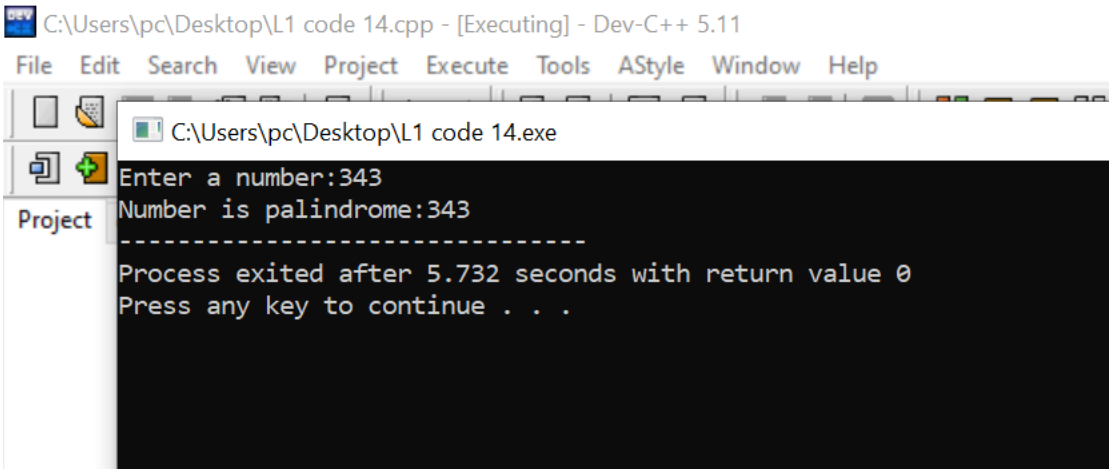


Program # 14

```
//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:



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: