C++LAB FILE

Submitted by

Mohd Arslan

2020 – 501 – 033

in partial fulfilment for the award of the degree of

Master of Computer Applications

Under the supervision of

Dr.Tabrez Ahmed Khan

Department of Computer Science & Engineering

School of Engineering Sciences & Technology

JAMIA HAMDARD

(Deemed to be University)

New Delhi-110062

2021

INDEX

S.NO	PROGRAM'S	DATE	SIGN
1	Write a program to print "Hello World" in C++.		
2	Write a program to take two integer number from keyboard and swap them using third variable and without using third variable		
3	Write a program to sum all digits of a given number		
4	Write a program to check whether a number is prime or not		
5	Write a program to print all prime numbers between a given range.		
6	Write a program to swap two values using call by value.		
7	Write a program to swap two values using call by reference.		
8	Write a program to swap two values using call by address.		
9	Write a program to find the factorial of a number using function.		
10	Write a program to create a user defined library function and include this library function in your program.		
11	Write a program for understanding scope, lifetime, initial value of static variable.		
12	Write a program for understanding scope, lifetime, initial value of register variable.		
13	Write a program for understanding scope, lifetime, initial value of external variable.		
14	Write a program to reverse any given array.		
15	Write a program to find the largest element of an array.		
16	Write a program to understand structure in C++.		
17	Write a program to understand class in C++, also use an access specifier (public, private) in your program.		
18	Write a program for understanding inline function.		
19	Create a class named 'Student' with a string variable 'name' and an integer variable 'roll_no'. Assign the value of roll_no as '2' and that of name as "John" by creating an object of the class Student.		
20	Write a program to print the area and perimeter of a triangle having sides of 3, 4 and 5 units by creating a class named 'Triangle' with a function to print the area and perimeter.		
21	Write a program by creating an 'Employee' class having the following functions and print the final salary. 1 - 'getInfo()' which takes the salary, number of hours of work per day of employee as parameters 2 - 'AddSal()' which adds $10 to the salary of the employee if it is less than $500. 3 - 'AddWork()' which adds $5 to the salary of the employee if the number of hours of work per day is more than 6 hours		
22	What do you mean by inline function? what are the advantages and disadvantages of inline function?		
23	Write a program to understand static data members of a class.		
24	Write a program to demonstrate the use of static data members and static functions.		
25	Program to Add two times in hours, minute and second entered by user. (use		

	class and object)		
26	Write a program two add two complex numbers entered by the user. (use class and object)		
27	A class defined for a bank account that includes the following data members and functions. Data members: • Name of the depositor. • Account Number. • Type of account e.g., current account or other. • Balance amount in the Bank. Member functions: • Deposit function to deposit some amount. It should accept the amount as a parameter. • Withdraw function used to withdraw an amount after checking the balance. It should accept the amount as a parameter. • Display function to display name and balance.		
28	Create a class named 'Rectangle' with two data members- length and breadth and a function to calculate the area which is 'length*breadth'. The class has three constructors which are : 1 - having no parameter - values of both length and breadth are assigned zero. 2 - having two numbers as parameters - the two numbers are assigned as length and breadth respectively. 3 - having one number as parameter - both length and breadth are assigned that number. Now, create objects of the 'Rectangle' class having none, one and two parameters and print their areas.		
29	Create a class 'Student' with three data members which are name, age and address. The constructor of the class assigns default values to name as "unknown", age as '0' and address as "not available". It has two functions with the same name 'setInfo'. First function has two parameters for name and age and assigns the same whereas the second function has three parameters which are assigned to name, age and address respectively. Print the name, age and address of 10 students. Hint - Use array of objects		
30	Create a C++ class FLOAT that contains one float data member. Overload all the four arithmetic operators so that they operate on the objects of FLOAT.		
31	Write a program to perform mathematical operations on complex numbers using unary and binary operator overloading.		
32	Write a program to compare two fractional numbers by overloading the relational operator (==, !=, >=, <=)		
33	Write a program to understand single inheritance.		
34	Write a program to understand multilevel inheritance.		

35	Write a program to understand multiple inheritance.		
36	Write a program to understand Function Overriding problem in inheritance. Also write a program for handling function overriding.		
37	Write a program to demonstrate virtual function.		
38	Write a program to demonstrate polymorphism.		
39	Write a program to demonstrate use of this keyword.		
40	Write a program to demonstrate FILE HANDLING		

Q 1. write a program to print hello world.

```cpp
#include<iostream>
using namespace std;
int main()
{
    cout<<"HELLO WORLD" "\n"<<"MOHD ARSLAN";
    return 0;
}
```

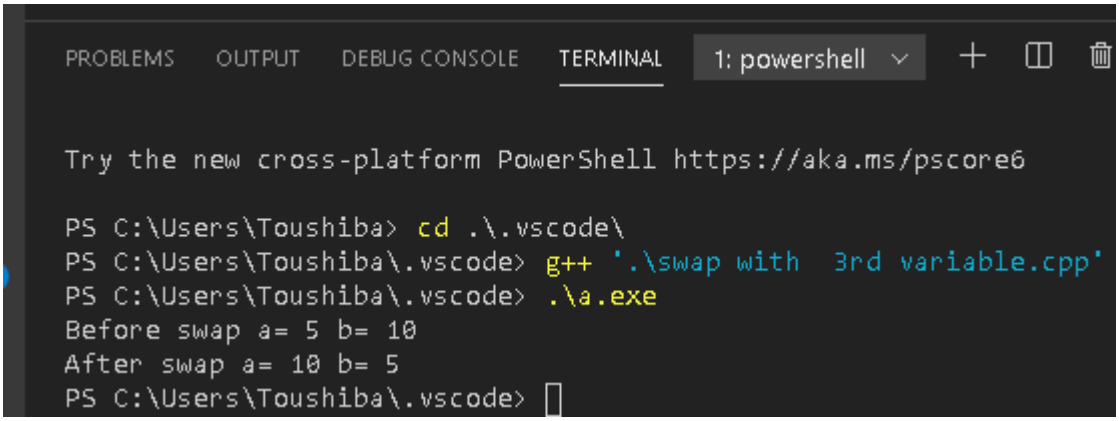
OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\hello.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
HELLO WORLD
MOHD ARSLAN
PS C:\Users\Toushiba\.vscode>
```

Q2 Write a program to take two integer number from keyboard and swap them using third variable and without using third variable

```cpp
#include <iostream>
using namespace std;
int main()
{
int a=5, b=10;
cout<<"Before swap a= "<<a<<" b= "<<b<<endl;
a=a*b; //a=50 (5*10)
b=a/b; //b=5 (50/10)
a=a/b; //a=10 (50/5)
cout<<"After swap a= "<<a<<" b= "<<b<<endl;
return 0;
}
```

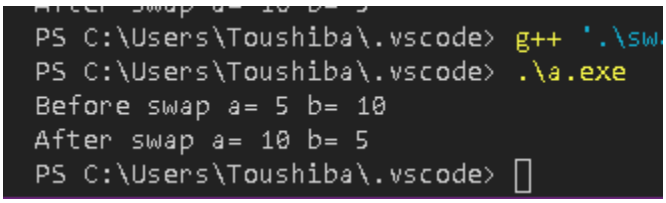
OUTPUT



Q2.2 WITHOUT USING 3RD VARIABLE

```
#include <iostream>
using namespace std;
int main()
{
int a=50, b=10;
cout<<"Before swap a= "<<a<<" b= "<<b<<endl;
a=a+b; //a=15 (5+10)
b=a-b; //b=5 (15-10)
a=a-b; //a=10 (15-5)
cout<<"After swap a= "<<a<<" b= "<<b<<endl;
return 0;
}
```

OUTPUT



Q3 some digit of all numbers

```cpp
#include <iostream>
using namespace std;
int main()
{
int n,sum=0,m;
cout<<"Enter a number: ";
cin>>n;
while(n>0)
{
m=n%10;
sum=sum+m;
n=n/10;
}
cout<<"Sum is= "<<sum<<endl;
return 0;
}
```

OUTPUT

```
  a + b = 68.1
  a - b = -23.1
  a * b = 1026
  a / b = 0.493421
PS C:\Users\Toushiba\.vscode> g++ '.\SUM GIVEN VALUE.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter a number: 13
Sum is= 4
PS C:\Users\Toushiba\.vscode>
```

Q4. write a program to check the given nmber is prime or not.

```cpp
#include <iostream>
using namespace std;
 int main()
{
   int num,i;
    cout<<"enter a number";
    cin >> num ;
    i=2;
    while(i<=num-1)
    {
        if(num%i==0)
        {
            cout<<"not a prime";
            break;
        }
        i++;
    }
    if (i==num)
        cout<<"prime number";
return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\PRIME OR NOT.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
enter a number4
not a prime
```

Q05: Write a program to print all prime numbers between a given range.

```cpp
#include <iostream>
using namespace std;
void primeInRange(int L, int R)
{
    int flag;

    // Traverse each number in the
    // interval with the help of for loop
    for (int i = L; i <= R; i++) {

        // Skip 0 and 1 as they are
        // niether prime nor composite
        if (i == 1 || i == 0)
            continue;

        // flag variable to tell
        // if i is prime or not
        flag = 1;

        // Iterate to check if i is prime
        // or not
        for (int j = 2; j <= i / 2; ++j) {
            if (i % j == 0) {
                flag = 0;
                break;
            }
        }

        // flag = 1 means i is prime
        // and flag = 0 means i is not prime
        if (flag == 1)
            cout << i << " ";
    }
}

// Driver Code
int main()
{
    // Given Range
    int L = 1;
```

```
    int R = 10;

    // Function Call
    primeInRange(L, R);

    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\given range prime checking.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
2 3 5 7
PS C:\Users\Toushiba\.vscode>
```

Q6.WAP to swap two value using call by value

```cpp
#include <iostream>
using namespace std;
void swap(int , int );
int main()
{
    int a=200;
    int q=33;
    cout<<"before swap value of a:"<<a<<endl;
    cout<<"before swap value of q:"<<q<<endl;
    /*calling a function*/
    swap(a,q);
    cout<<"after swap value of a:"<<a<<endl;
    cout<<"after swap value of q:"<<q<<endl;
    return 0;
}
/*fuction definition to swap the values*/
void swap(int y, int z)
    {
    int t;
    t=y;//save the value of y//
    y=z;//put z into y//
    z=t;//put z into y//
        return;     }
```

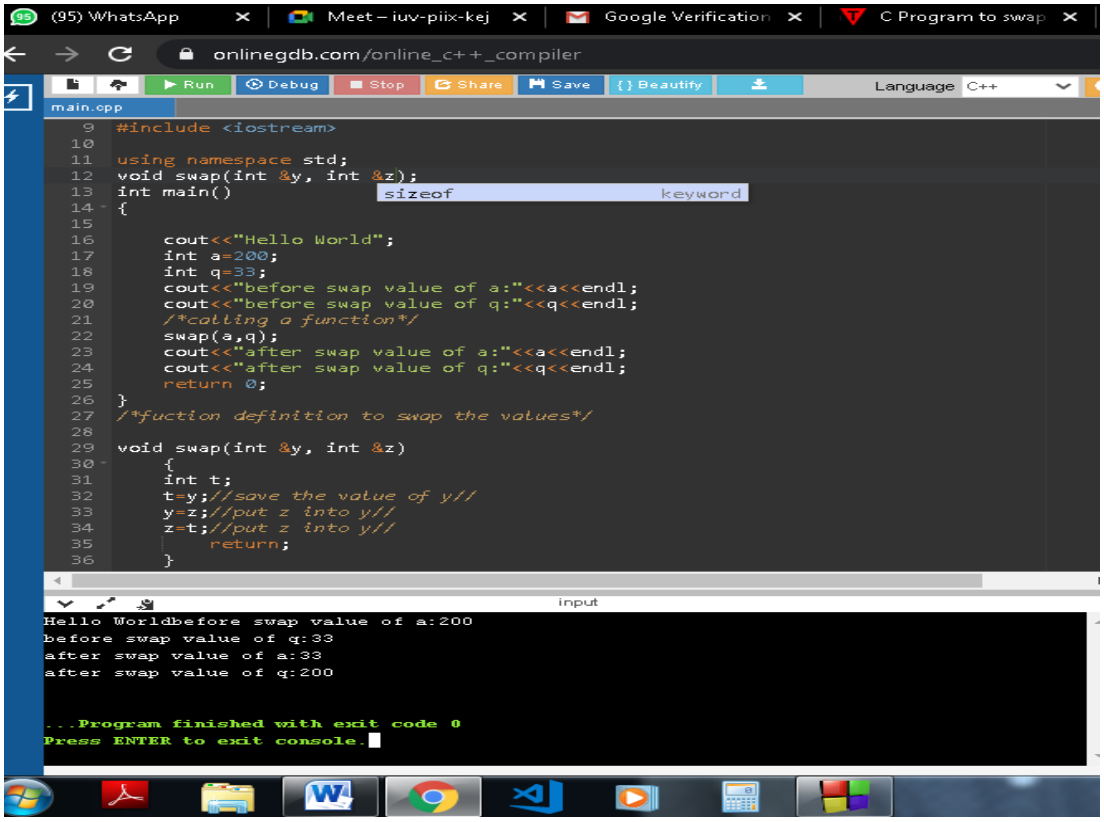
OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\call by value.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
before swap value of a:200
before swap value of q:33
after swap value of a:200
after swap value of q:33
PS C:\Users\Toushiba\.vscode>
```

Q7.WAP to swap two value using call by reference.

```
#include <iostream>
using namespace std;
void swap(int &y, int &z);
int main()
{
    int a=200;
    int q=33;
    cout<<"before swap value of a:"<<a<<endl;
    cout<<"before swap value of q:"<<q<<endl;
    /*calling a function*/
    swap(a,q);
    cout<<"after swap value of a:"<<a<<endl;
    cout<<"after swap value of q:"<<q<<endl;
    return 0;
}
/*fuction definition to swap the values*/
void swap(int &y, int &z)
    {
    int t;
    t=y;//save the value of y//
    y=z;//put z into y//
    *z=t;//put z into y//
        return;
    }
}
```

OUTPUT


(95) WhatsApp
Meet – iuv-piix-kej
Google Verification
C Program to swap
onlinegdb.com/online_c++_compiler
Run
Debug
Stop
Share
Save
{} Beautify
Language C++
main.cpp
#include <iostream>
using namespace std;
void swap(int &y, int &z);
int main()
sizeof keyword
{
cout<<"Hello World";
int a=200;
int q=33;
cout<<"before swap value of a:"<<a<<endl;
cout<<"before swap value of q:"<<q<<endl;
/*calling a function*/
swap(a,q);
cout<<"after swap value of a:"<<a<<endl;
cout<<"after swap value of q:"<<q<<endl;
return 0;
}
/*fuction definition to swap the values*/
void swap(int &y, int &z)
{
int t;
t=y;//save the value of y//
y=z;//put z into y//
z=t;//put z into y//
return;
}
input
Hello Worldbefore swap value of a:200
before swap value of q:33
after swap value of a:33
after swap value of q:200
...Program finished with exit code 0
Press ENTER to exit console.

Q8.WAP to swap two value using call by address

```cpp
#include <iostream>
using namespace std;
void swap(int *, int *);
int main()
{
    int a=200;
    int q=33;
 cout<<"before swap value of a:"<<a<<endl;
    cout<<"before swap value of q:"<<q<<endl;
    /*calling a function*/
    swap(a,q);
    cout<<"after swap value of a:"<<a<<endl;
    cout<<"after swap value of q:"<<q<<endl;
        return 0;
}
/*fuction definition to swap the values*/
void swap(int *y, int *z)
    {
  int t;
    t=*y;//save the value of y//
    *y=*z;//put z into y//
    *z=t;//put z into y//
   return;
    }
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\BY ADDRESS.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
before swap value of a:200
before swap value of q:33
after swap value of a:33
after swap value of q:200
```

Q09.WAP to find factorial of a number using function

```cpp
#include <iostream>
using namespace std;
int main()
{
   int i,ars=1,num;
  cout<<"Enter any Number: ";
 cin>>num;
  for(i=1;i<=num;i++){
      ars=ars*i;
  }
  cout<<"Factorial of " <<num<<" is: "<<ars<<endl;
  return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\FACTORIAL.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter any Number: 6
Factorial of 6 is: 720
PS C:\Users\Toushiba\.vscode> g++ .\FACTORIAL.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter any Number: 13
Factorial of 13 is: 1932053504
```

Q10 Write a program to create a user defined library function and include this library function in your program.

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


void findSum(int a, int b)
{


    cout << "Sum is: " << a + b;
}


int main()
{

    int a = 3, b = 5;
```

```
    findSum(a, b);
    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\user defined.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
Sum is: 8
PS C:\Users\Toushiba\.vscode>
```

Q11 : Write a program for understanding scope, lifetime, initial value of static variable.

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

void demo()
{
    // static variable
    static int count = 0;
    cout << count << " ";



    count++;
}

int main()
{
    for (int i=0; i<5; i++)
        demo();
    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\static.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
0 1 2 3 4
PS C:\Users\Toushiba\.vscode>
```

Q12: Write a program for understanding scope, lifetime, initial value of register variable.

```cpp
#include <iostream>

using namespace std;

int main() {
  int factor = 5;
  for (register int i = 1; i <= 50; i++) {
    cout << i * factor << " ";
  }
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\Q12.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 1
30 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 23
0 235 240 245 250
PS C:\Users\Toushiba\.vscode>
```

Q13: Write a program for understanding scope, lifetime, initial value of external variable.

```cpp
#include <iostream>

using namespace std;

int main()
 {
  extern int i;
  cout << "Counting till 10:" << endl;
  for (i = 0; i <= 10; ++i)
   {
    cout << i << " ";
  }
  return 0;
}
int i;
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\Q13FINAL.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Counting till 10:
0 1 2 3 4 5 6 7 8 9 10
PS C:\Users\Toushiba\.vscode>
```

Q14: Write a program to reverse any given array.

```cpp
#include<iostream>
using namespace std;
int main()
{
    int arr[10], i;
    cout<<"Enter 10 Array Elements: ";
    for(i=0; i<10; i++)
        cin>>arr[i];
    cout<<"\nThe Original Array is:\n";
    for(i=0; i<10; i++)
        cout<<arr[i]<<" ";
    cout<<"\n\nThe Reverse of Given Array is:\n";
    for(i=(10-1); i>=0; i--)
        cout<<arr[i]<<" ";
    cout<<endl;
    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba> cd .\.vscode\
PS C:\Users\Toushiba\.vscode> g++ '.\reverse array.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter 10 Array Elements: 123
223
654
1
44
44
44
65
22
11

The Original Array is:
123 223 654 1 44 44 44 65 22 11

The Reverse of Given Array is:
11 22 65 44 44 44 1 654 223 123
```

Q15: Write a program to find the largest element of an array.

```cpp
#include <bits/stdc++.h>
using namespace std;

int largest(int arr[], int n)
{
    int i;


    int max = arr[0];


    for (i = 1; i < n; i++)
        if (arr[i] > max)
            max = arr[i];

    return max;
}


int main()
{
    int arr[] = {10, 324, 45, 90, 9808};
    int n = sizeof(arr) / sizeof(arr[0]);
    cout << "Largest in given array is "
         << largest(arr, n);
    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> ^C
PS C:\Users\Toushiba\.vscode> g++ '.\find largest array.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
Largest in given array is 9808
```

Q16: Write a program to understand structure in C++.

```cpp
#include <iostream>
```

```cpp
using namespace std;
struct arsalan
{
    int roll;
    char name[20];

};
int main()
{
    struct arsalan rbn;
    cout << "enter name:";
    cin >> rbn.name;
    cout << "enter roll:";
    cin >> rbn.roll;
    cout << "Name:" << rbn.name << endl;
    cout << "roll:" << rbn.roll << endl;
    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\define structure.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
enter name:arslan
enter roll:13
Name:arslan
roll:13
```

Q17: Write a program to understand class in C++, also use an access specifier (public, private) in your program.

```cpp
#include <iostream>
```

```cpp
#include <string>
using namespace std;
class Student {
  int rollno;
  double marks;
  string name;
  void _print() {
    cout << " " << this->rollno << " " << this->name << "\t\t " << this-
>marks
         << endl;
  }
 public:
  void UpdateRollNo(int rollno) { this->rollno = rollno; }
  void UpdateMarks(double marks) { this->marks = marks; }
  void UpdateName(string name) { this->name = name; }
  int RollNo() { return this->rollno; }
  double Marks() { return this->marks; }
  string Name() { return this->name; }

  void PrintDetails() { this->_print(); }
  void GetDetails() {
    cout << "\n\nEnter Name: ";
    cin.ignore();
    getline(cin, this->name);
    cout << "Enter rollno: ";
    cin >> this->rollno;
    cout << "Enter Marks: ";
    cin >> this->marks;
  }
};

int main() {
  int n;
  cout << "Enter number of students: ";
  cin >> n;

  Student students[n];

  for (int i = 0; i < n; i++) {
    students[i].GetDetails();
  }

  students[0].UpdateName("ARSALAN");
  cout << "\n\nStudents:\n";
  for (int i = 0; i < n; i++) {
```

```
    students[i].PrintDetails();
  }
  double sum;
  for (int i = 0; i < n; i++) {
    sum += students[i].Marks();
  }
  cout << "\nClass average: " << sum / n << endl;
  return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\access speifier.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter number of students: 123


Enter Name: mohdarslan
Enter rollno: 13
Enter Marks: 511


Enter Name: mohd farhan
Enter rollno: 14
Enter Marks: 510


Enter Name: mohd muzzammil
Enter rollno: 333
Enter Marks: 515


Enter Name: nabeela
Enter rollno: 18
Enter Marks: 509
```

Q18: Write a program for understanding inline function.

```
#include <iostream>
```

```cpp
using namespace std;
inline int cube(int s)
{
    return s*s*s;
}
int main()
{
    cout << "The cube of 3 is: " << cube(3) << "\n";
    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba> cd .\.vscode\
PS C:\Users\Toushiba\.vscode> g++ '.\access speifier.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
The cube of 3 is: 27
PS C:\Users\Toushiba\.vscode>
```

Q19: Create a class named 'Student' with a string variable 'name' and an integer variable 'roll_no'. Assign the value of roll_no as '2' and that of name as "John" by creating an object of the class Student.

```cpp
#include <iostream>
#include <string>
using namespace std;
class Student {
  int rollno;
  double marks;
  string name;
  void _print() {
    cout << " " << this->rollno << " " << this->name << "\t\t " << this-
>marks
         << endl;
  }
 public:
  void UpdateRollNo(int rollno) { this->rollno = rollno; }
  void UpdateMarks(double marks) { this->marks = marks; }
  void UpdateName(string name) { this->name = name; }
  int RollNo() { return this->rollno; }
  double Marks() { return this->marks; }
  string Name() { return this->name; }

  void PrintDetails() { this->_print(); }
  void GetDetails() {
```

```
    cout << "\n\nEnter Name: ";
    cin.ignore();
    getline(cin, this->name);
    cout << "Enter rollno: ";
    cin >> this->rollno;
    cout << "Enter Marks: ";
    cin >> this->marks;
  }
};

int main() {
  int n;
  cout << "Enter number of students: ";
  cin >> n;

  Student students[n];

  for (int i = 0; i < n; i++) {
    students[i].GetDetails();
  }

  students[0].UpdateName("ARSALAN");
  cout << "\n\nStudents:\n";
  for (int i = 0; i < n; i++) {
    students[i].PrintDetails();
  }
  double sum;
  for (int i = 0; i < n; i++) {
    sum += students[i].Marks();
  }
  cout << "\nClass average: " << sum / n << endl;
  return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\p19.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter number of students: marslan


Students:

Class average: inf
```

Q20: Write a program to print the area and perimeter of a triangle having sides of 3, 4 and 5 units by creating a class named 'Triangle' with a function to print the area and perimeter.

```
#include<iostream>
 using namespace std;
  class aamir
  {
       public: string name;
        int roll_no;
         };
          int main()
           {
                aamir arslan;
                arslan.name = "tabrezsir";
                 arslan.roll_no = 13;
cout << arslan.roll_no << " tabrez sir"
<< endl; //arslan.name ="rbn";
 return 0;
 }
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\parameter print.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
13 tabrez sir
PS C:\Users\Toushiba\.vscode>
```

Q21: Write a program by creating an 'Employee' class having the following functions and print the final salary.

1 - 'getInfo()' which takes the salary, number of hours of work per day of employee as parameters

2 - 'AddSal()' which adds $10 to the salary of the employee if it is less than $500.

3 - 'AddWork()' which adds $5 to the salary of the employee if the number of hours of work per day is more than 6 hours

```
#include <iostream>
using namespace std;
class Employee {
 float salary;
 int hours;
 public:
 void getInfo(float, int);
 float getSalary();
 int getHours();
 void addSal();
 void addWork();
};
void Employee::getInfo(float salary, int hours) {
 this->salary = salary;
 this->hours = hours;
}
float Employee::getSalary() { return this->salary; }
int Employee::getHours() { return this->hours; }
void Employee::addSal()

{
 if (this->salary < 500)
 {
 this->salary += 10;
 }
}
void Employee::addWork() {
 if (this->hours > 6) {
 this->salary += 5;
 }
}
int main() {
 Employee e1, e2, e3;
 e1.getInfo(400, 5);
 e2.getInfo(400, 7);
 e3.getInfo(700, 9);
 e1.addSal();
 e2.addSal();
 e3.addSal();
```

```
 e1.addWork();
 e2.addWork();
 e3.addWork();
 cout << "Employee 1" << endl;
 cout << " Salary: $" << e1.getSalary() << endl;
 cout << " Hours per day: " << e1.getHours() << endl;
 cout << "Employee 2" << endl;
 cout << " Salary: $" << e2.getSalary() << endl;
 cout << " Hours per day: " << e2.getHours() << endl;
 cout << "Employee 3" << endl;
 cout << " Salary: $" << e3.getSalary() << endl;
 cout << " Hours per day: " << e3.getHours() << endl;
 return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\p21.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Employee 1
 Salary: $410
 Hours per day: 5
Employee 2
 Salary: $415
 Hours per day: 7
Employee 3
 Salary: $705
 Hours per day: 9
```

Q22. What do you mean by inline function? what are the advantages and disadvantages of inline function?

Inline functions provide following advantages:

1) Function call overhead doesn’t occur.

2) It also saves the overhead of push/pop variables on the stack when function is called.

3) It also saves overhead of a return call from a function.

4) When you inline a function, you may enable compiler to perform context specific optimization on the body of function. Such optimizations are not possible for normal function calls. Other optimizations can be obtained by considering the flows of calling context and the called context.

5) Inline function may be useful (if it is small) for embedded systems because inline can yield less code than the function call preamble and return.

>>Inline function disadvantages:

1) If you use too many inline functions then the size of the binary executable file will be large, because of the duplication of same code.

2) Too much inlining can also reduce your instruction cache hit rate, thus reducing the speed of instruction fetch from that of cache memory to that of primary memory.

3) Inline function may increase compile time overhead if someone changes the code inside the inline function then all the calling location has to be recompiled because compiler would require toreplace all the code once again to reflect the changes, otherwise it will continue with old functionality.

4) Inline functions may not be useful for many embedded systems. Because in embedded systems code size is more important than speed. 6) Inline functions might cause thrashing because inlining might increase size of the binary executable file. Thrashing in memory causes performance of computer to degrade.

Q23 Write a program to understand static data members of a class .

```
#include <iostream>
```

```
using namespace std;

class Box {
   public:
      static int objectCount;

      // Constructor definition
      Box(double l = 2.0, double b = 2.0, double h = 2.0) {
         cout <<"Constructor called." << endl;
         length = l;
         breadth = b;
         height = h;

         // Increase every time object is created
         objectCount++;
      }
      double Volume() {
         return length * breadth * height;
      }

   private:
      double length;
      double breadth;
      double height;
       };


int Box::objectCount = 0;

int main(void) {
   Box Box1(3.3, 1.2, 1.5);
   Box Box2(8.5, 6.0, 2.0);
      cout << "Total objects: " << Box::objectCount << endl;

   return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\P23.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Constructor called.
Constructor called.
Total objects: 2
PS C:\Users\Toushiba\.vscode>
```

Q24 Write a program to demonstrate the use of static data members and static functions.

```cpp
#include <iostream>

using namespace std;

class Box {
   public:
      static int objectCount;


      Box(double l = 2.0, double b = 2.0, double h = 2.0) {
         cout <<"Constructor called." << endl;
         length = l;
         breadth = b;
         height = h;

          objectCount++;
      }
      double Volume() {
         return length * breadth * height;
      }
      static int getCount() {
         return objectCount;
      }

   private:
      double length;
      double breadth;
      double height;
       };


int Box::objectCount = 0;
```

```cpp
int main(void) {

   cout << "Inital Stage Count: " << Box::getCount() << endl;

   Box Box1(3.3, 1.2, 1.5);
   Box Box2(8.5, 6.0, 2.0);

   cout << "Final Stage Count: " << Box::getCount() << endl;

   return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\p24.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Inital Stage Count: 0
Constructor called.
Constructor called.
Final Stage Count: 2
PS C:\Users\Toushiba\.vscode>
```

Q25: Program to Add two times in hours, minute and second entered by user. (use class and object)

```cpp
#include <iostream>
using namespace std;
class Time {
    int hours, minutes;

public:
    Time(int hours = 0, int minutes = 0) {
        this->hours = hours;
        this->minutes = minutes;
    }

    Time add(Time);
    void print();
};

Time Time::add(Time t) {
    int h, m = this->minutes + t.minutes;
    h = m / 60;
    m %= 60;
    h += this->hours + t.hours;
```

```
    return Time(h, m);
}

void Time::print() {
    cout << hours << " hours and " << minutes << " minutes" << endl;
}

int main() {
    int h, m;

    cout << "Enter hours and minutes for a: ";
    cin >> h >> m;

    Time a(h, m);

    cout << "Enter hours and minutes for b: ";
    cin >> h >> m;

    Time b(h, m);

    a.print();
    b.print();

    cout << "SUM:";
    a.add(b).print();
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\p25.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter hours and minutes for a: 3
12
Enter hours and minutes for b: 4
22
3 hours and 12 minutes
4 hours and 22 minutes
SUM:7 hours and 34 minutes
```

Q26: Write a program two add two complex numbers entered by the user. (use class and object)

```
#include <iostream>
```

```cpp
using namespace std;
class Complex {
  float n;
  float i;
 public:
  Complex(float n = 0, float i = 0) { set(n, i); }
  void set(float n, float i);
  void print();
  Complex sum(Complex);
};

void Complex::set(float n, float i) {
  this->n = n;
  this->i = i;
}

void Complex::print() { std::cout << n << " + " << i << "i" << endl; }

Complex Complex::sum(Complex x) {
  return Complex(this->n + x.n, this->i + x.i);
}

int main() {
  Complex a, b, c;
  float n, i;

  cout << "Enter a number and its imaginary part: ";
  cin >> n >> i;
  a.set(n, i);

  cout << "Enter another number and its imaginary part: ";
  cin >> n >> i;
  b.set(n, i);
  c = a.sum(b);
  cout << "Complex a = ";
  a.print();
  cout << "Complex b = ";
  b.print();
  cout << "Complex c = ";
  c.print();
  return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\P26.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter a number and its imaginary part: 2
13
Enter another number and its imaginary part: 33
66
Complex a = 2 + 13i
Complex b = 33 + 66i
Complex c = 35 + 79i
```

Q27: A class defined for a bank account that includes the following data members and functions.

Data members:

• Name of the depositor.

• Account Number.

• Type of account e.g., current account or other.

• Balance amount in the Bank.

Member functions:

• Deposit function to deposit some amount. It should accept the amount as a parameter.

• Withdraw function used to withdraw an amount after checking the balance. It should accept the amount as a parameter.

• Display function to display name and balance.

```cpp
#include<iostream>
using namespace std;
class Bank
{
    string name;
    int account;
    string typeAcc;
    float balance;
    public:
    Bank()
    {
        name = typeAcc;
        account =0;
        balance= 0;
```

```
    }

   void data();

    void deposit (int amount);
    void widraw (int amount);
    void display();

};
void Bank :: data()
{
    cout<<"Enter depositer name:--";
    getline(cin,name);
    cout<<"Enter account number:--";
    cin>>account;
    cout<<"Enter balance:--";
    cin>>balance;


}
void Bank::deposit(int amount)
{

    balance+=amount;
}
void Bank::widraw(int amount)
{
    if(balance<amount)
    {
        cout<<"Balance not correct give meaningful amount";
    }
    else{
        balance-=amount;
    }
}
void Bank::display()
    {
        cout<<"name of depositor:-- "<< name<< "\n current balance:--
"<<balance;
    }

int main()
{

    Bank a,c,b;
```

```
    b.data();


    b.deposit(2000);
        b.widraw(100);
        b.display();
    return 0;

}
```

OUTPUT

```
15      }
16
17      void data();
18
19       void deposit (int amount);
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
PS C:\Users\Toushiba\.vscode> g++ .\BankRBN.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter depositer name:--mohd arslan
Enter account number:--3467
Enter balance:--10000
name of depositor:-- mohd arslan
 current balance:--11900
PS C:\Users\Toushiba\.vscode>
```

Q28: Create a class named 'Rectangle' with two data members- length and breadth and a function to calculate the area which is 'length*breadth'. The class has three constructors which are :

1 - having no parameter - values of both length and breadth are assigned zero.

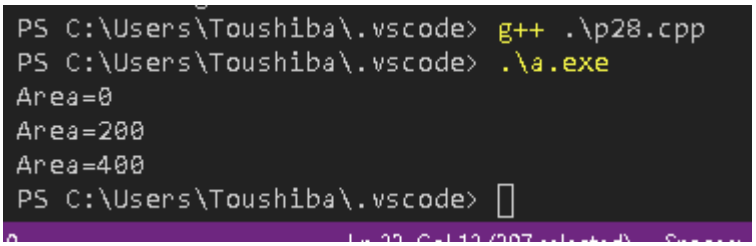
2 - having two numbers as parameters - the two numbers are assigned as length and breadth respectively.

3 - having one number as parameter - both length and breadth are assigned that number.

Now, create objects of the 'Rectangle' class having none, one and two parameters and print their areas.

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

class Rectangle{
int len,bre;
public:
Rectangle()
{
len=0; bre=0;
}
Rectangle(int l,int b){
bre=b;
}
Rectangle(int l)
{
      len=bre=l;
}
void area(){
cout<<"Area="<<len*bre<<endl;
}
};

int main(){
Rectangle A,B(10, 20),C(20);
A.area();
B.area();
C.area();cd
```

OUTPUT



Q29 Create a class 'Student' with three data members which are name, age and address. The constructor of the class assigns default values to name as "unknown", age as '0' and address as "not available". It has two functions with the same name 'setInfo'. First function has two parameters for name and age and assigns the same whereas the second function has three parameters which are assigned to name, age and address respectively. Print the name, age and address of 10 students.

Hint - Use array of objects

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

class Student
{
    string name;
public:
    Student(string s)
    {
        name = s;
    }
    Student()
    {
        name = "Unknown";
    }
    void print_name()
    {
        cout << name << endl;
    }
};
```

```cpp
int main()
{
    Student s1("John");
    Student s2;
    s1.print_name();
    s2.print_name();
    return 0;
}
```

OUTPUT

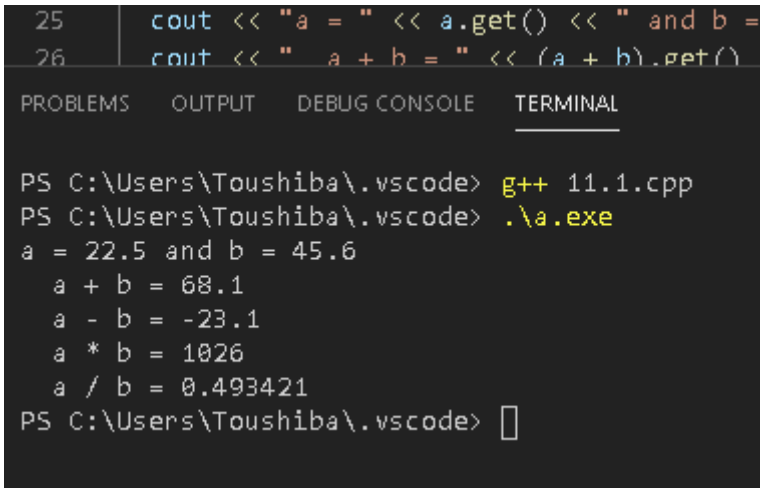
```
PS C:\Users\Toushiba\.vscode> g++ .\p29.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
John
Unknown
```

Q30. Create a C++ class FLOAT that contains one float data member. Overload all the four arithmetic operators so that they operate on the objects of FLOAT.

```cpp
#include <iostream>

#define NL << endl

using namespace std;

class FLOAT {
  float f;

 public:
  FLOAT(float x) : f(x) {}
  FLOAT() : f(0) {}
```

```
  FLOAT operator+(FLOAT n) { return FLOAT(f + n.f); }
  FLOAT operator-(FLOAT n) { return FLOAT(f - n.f); }
  FLOAT operator/(FLOAT n) { return FLOAT(f / n.f); }
  FLOAT operator*(FLOAT n) { return FLOAT(f * n.f); }

  float get() { return f; }
};

int main() {
  FLOAT a = 22.5, b = 45.6;

  cout << "a = " << a.get() << " and b = " << b.get() NL;
  cout << "  a + b = " << (a + b).get() NL;
  cout << "  a - b = " << (a - b).get() NL;
  cout << "  a * b = " << (a * b).get() NL;
  cout << "  a / b = " << (a / b).get() NL;

  return 0;
}
```

OUTPUT



Q31: Write a program to perform mathematical operations on complex numbers using unary and binary operator overloading.

```
#include <iostream>
using namespace std;
class Complex {
  float n;
  float i;
 public:
  Complex(float n = 0, float i = 0) { set(n, i); }
  void set(float n, float i);

  friend ostream& operator<<(ostream&, Complex&);

  void operator++() {
    n++;
    i++;
  }
  void operator--() {
    n--;
    i--;
  }

  Complex operator+(Complex x) {
    n += x.n;
    i += x.i;
    return Complex(n, i);
  }

  Complex operator-(Complex x) {
    n -= x.n;
    i -= x.i;
    return Complex(n, i);
  }
};

ostream& operator<<(ostream& o, Complex& c) {
  return (o << c.n << " + " << c.i << "i");
}

void Complex::set(float n, float i) {
  this->n = n;
  this->i = i;
}
```

```
int main() {
  Complex a, b, c;
  float n, i;

  cout << "Enter a number and its imaginary part (a): ";
  cin >> n >> i;
  a.set(n, i);

  cout << "Enter a number and its imaginary part (b): ";
  cin >> n >> i;
  b.set(n, i);

  ++a;
  --b;
  cout << "Incrementing a: " << a << endl;
  cout << "Decrementing b: " << b << endl;

  c = a + b;
  cout << "  a + b = " << c << endl;

  c = a - b;
  cout << "  a - b = " << c << endl;

  return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\P31.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter a number and its imaginary part (a): 23
13
Enter a number and its imaginary part (b): 61
10
Incrementing a: 24 + 14i
Decrementing b: 60 + 9i
  a + b = 84 + 23i
  a - b = 24 + 14i
PS C:\Users\Toushiba\.vscode>
```

Q32: Write a program to compare two fractional numbers by overloading the relational operator (==, !=, >=, <=)

```cpp
#include <iostream>

using namespace std;

class fraction {
  double n, d;

 public:
  fraction(double n, double d) : n(n), d(d) {}
  fraction() : n(0), d(1) {
    cout << "  Enter numerator part of fraction: ";
    cin >> n;
    cout << "  Enter denominator part of fraction: ";
    cin >> d;
  }
  friend ostream& operator<<(ostream&, fraction&);

  bool operator==(fraction f) { return (n / d) == (f.n / f.d); }
  bool operator!=(fraction f) { return (n / d) != (f.n / f.d); }
  bool operator>=(fraction f) { return (n / d) >= (f.n / f.d); }
  bool operator<=(fraction f) { return (n / d) <= (f.n / f.d); }
  bool operator<(fraction f) { return (n / d) < (f.n / f.d); }
  bool operator>(fraction f) { return (n / d) > (f.n / f.d); }
};

ostream& operator<<(ostream& o, fraction& f) {
  return (o << f.n << "/" << f.d);
}

string Boolean(bool i) { return i ? "True" : "False"; }

int main() {
  cout << "Enter fraction a: " << endl;
  fraction a;

  cout << "\nEnter fraction b: " << endl;
  fraction b;

  cout << "\nGot:\n a = " << a << "\n b = " << b << endl << endl;

  cout << "Performing relational operations on a and b: " << endl;
  cout << "  a <  b = " << Boolean(a < b) << endl;
  cout << "  a  > b = " << Boolean(a > b) << endl;
  cout << "  a == b = " << Boolean(a == b) << endl;
  cout << "  a != b = " << Boolean(a != b) << endl;
```

```
  cout << "  a >= b = " << Boolean(a >= b) << endl;
  cout << "  a <= b = " << Boolean(a <= b) << endl;

  return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\P32.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter fraction a:
  Enter numerator part of fraction: 2
  Enter denominator part of fraction: 3

Enter fraction b:
  Enter numerator part of fraction: 4
  Enter denominator part of fraction: 6

Got:
 a = 2/3
 b = 4/6

Performing relational operations on a and b:
  a <  b = False
  a  > b = False
  a == b = True
  a != b = False
  a >= b = True
  a <= b = True
PS C:\Users\Toushiba\.vscode>
```

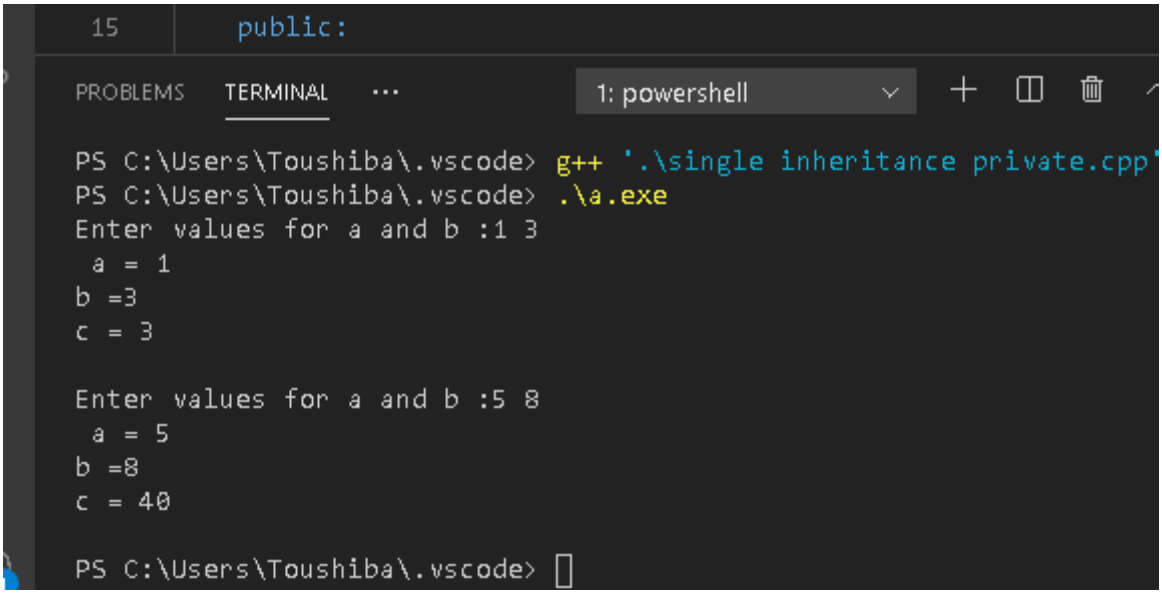
Q33: Write a program to understand single inheritance. With private

```
#include<iostream>
```

```
using namespace std;
class B
{
    int a;
    public:
    int b;
    void get_ab();
    int get_a(void);
    void show_a(void);
};
class D:public B
{
    int c;
    public:
    void mul(void);
    void display(void);
};
void B :: get_ab(void)
    {
        a=5;
        b=10;
    }
    int B :: get_a()
        {
            return a;

        }
        void B ::show_a()
        {
         cout<<"a=" <<a<< "\n";

        }
        void D :: mul()
        {
            c = b *get_a();
        }
        void D:: display()
        {
            cout <<"a =" <<get_a() << "\n" ;
            cout<<"b ="<<b << "\n";
            cout<<"c =" <<c << "\n";

        }
          int main()
          {
```

```
        D d;
        d.get_ab();
        d.mul();
        d.show_a();
        d.display();
        d.b =20;
        d.mul();
        d.display();

         return 0;
```

OUTPUT



Q33.2 With public

```
#include<iostream>
using namespace std;
class B
{
        int a;
        public:
        int b;
        void get_ab();
        int get_a(void);
        void show_a(void);
};
class D : private B
{
    int c;
    public:
    void mul(void);
    void display(void);

};
void B :: get_ab(void)
    {
        cout<<"Enter values for a and b :";
        cin>>a>>b;
    }
    int B :: get_a()
    {
        return a;
    }
    void B :: show_a()
    {
        cout<<" a = " << a << "\n";

    }
    void  D :: mul()
    {
        get_ab();
        c = b * get_a();
    }
    void D :: display()
    {
        show_a();
        cout <<"b =" << b << "\n"
             <<"c = " <<c << "\n\n" ;

    }
```

```cpp
int main()
{
    D d;
   // d.get_ab();
    d.mul();
    //d.show_a();
    d.display();
   // d.b =20;
    d.mul();
    d.display();

     return 0;


}
```

OUTPUT

```
 a = 5
b =8
c = 40

PS C:\Users\Toushiba\.vscode> g++ '.\single inheritance private.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
Enter values for a and b :23 13
 a = 23
b =13
c = 299

Enter values for a and b :13 1
 a = 13
b =1
c = 13

PS C:\Users\Toushiba\.vscode>
```

Q34: Write a program to understand multilevel inheritance.

```
#include<iostream>
using namespace std;
class student
{
    protected:
    int roll_number;
    public:
    void get_number(int);
    void put_number(void);
};
void student ::get_number(int a)
    {
        roll_number =a;

    }
    void student :: put_number()
    {
        cout << "Roll Number :" << roll_number <<"\n";
    }
    class test : public student
    {
        protected:
        float sub1;
        float sub2;
        public:
        void get_marks(float,float);
        void put_marks(void);
    };

    void test :: get_marks(float x,float y)
        {
            sub1 =x;
            sub2 =y;
        }
    void test ::put_marks()
    {
        cout << "Marks in SUB1 = " << sub1 <<"\n";
        cout<< "Marks in SUB2  =" <<sub2 << "\n";
    }
    class result : public test
    {
      float total ;
      public:
      void display(void);
    };
```

```
void result :: display(void)
{
     int total = sub1 +sub2;
    put_number();
    put_marks();
    cout << "Total  = "<< total << "\n";
}
int main()
{
    result student1;
    student1.get_number(111);
    student1.get_marks(75.0, 59.5);
    student1.display();

    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\multilevel inheritance.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
Roll Number :111
Marks in SUB1 = 75
Marks in SUB2  =59.5
Total  = 134
PS C:\Users\Toushiba\.vscode>
```

Q35: Write a program to understand multiple inheritance.

```cpp
#include<iostream>
using namespace std;
class M
{
    protected:
    int m;
     public:
     void get_m(int);
};
class N
{
    protected:
    int n;
    public:
    void  get_n(int);
};
class P : public M , public N
{
    public:
    void display(void);
};
  void M :: get_m(int x)
{
    m = x;
}
void N :: get_n(int y)
{
    n=y;
}
void P :: display(void)
{
    cout<<"m =" << m << "\n";
    cout<<"n = " <<n << "\n";
    cout <<" m*n = " << m*n << "\n";
}
 int main()
 {
     P p;
     p.get_m(10);
     p.get_n(20);
     p.display();

     return 0;
 }
```

OUTPUT

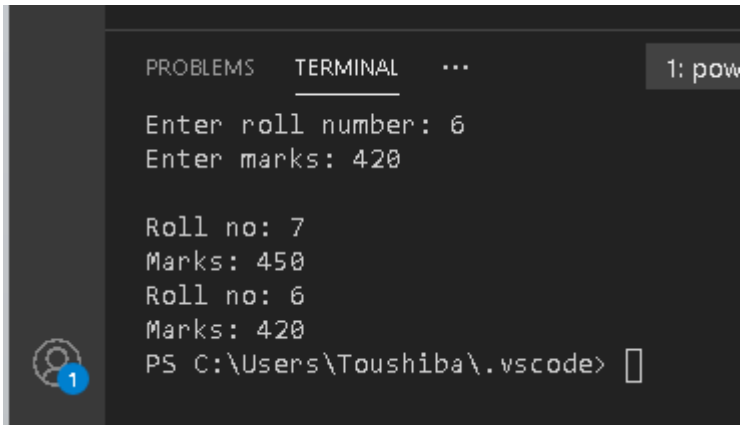
```
PS C:\Users\Toushiba\.vscode> g++ '.\multiple inheritance.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
m =10
n = 20
 m*n = 200
PS C:\Users\Toushiba\.vscode>
```

Q36: Write a program to understand Function Overriding problem in inheritance. Also write a program for handling function overriding.

```
#include <iostream>

using namespace std;

class marks {
 protected:
  int _marks;

 public:
  marks(int m) : _marks(m){};
  marks() {}

  void display() { cout << "Marks: " << _marks << endl; }
};

class student : protected marks {
 protected:
  int _roll_no;

 public:
  student(int r) : _roll_no(r){};
  student() {}

  void display() {
    cout << "Roll no: " << _roll_no << endl;
    cout << "Marks: " << _marks << endl;
  }
};

class school : public student {
 public:
```

```
  void getinfo() { student::display(); }
  void setinfo() {
    cout << "Enter roll number: ";
    cin >> _roll_no;
    cout << "Enter marks: ";
    cin >> _marks;
  }
  school() {}
};

int main() {
  school s1, s2;
  s1.setinfo();
  s2.setinfo();
  cout << endl;
  s1.getinfo();
  s2.getinfo();
}
```

OUTPUT



Q37: Write a program to demonstrate virtual function.

```
#include <iostream>
```

```cpp
using namespace std;

class Base {
   public:
    virtual void print() {
        cout << "Base Function" << endl;
    }
};

class Derived : public Base {
   public:
    void print() {
        cout << "Derived Function" << endl;
    }
};

int main() {
    Derived derived1;

        Base* base1 = &derived1;


    base1->print();

    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba> cd .\.vscode\
PS C:\Users\Toushiba\.vscode> g++ .\p37.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
Derived Function
PS C:\Users\Toushiba\.vscode>
```

Q38: Write a program to demonstrate polymorphism.

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

```
class Shape {
    public:
virtual void draw(){
cout<<"drawing..."<<endl;
    }
};
class Rectangle: public Shape
{
 public:
 void draw()
   {
       cout<<"drawing rectangle..."<<endl;
    }
};
class Circle: public Shape                          .

{
 public:
 void draw()
   {
      cout<<"drawing circle..."<<endl;
   }
};
int main(void) {
    Shape *s;
    Shape sh;
       Rectangle rec;
        Circle cir;
      s=&sh;
     s->draw();
        s=&rec;
     s->draw();
    //s=? ;
    s->draw();
    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\p38.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
drawing...
drawing rectangle...
drawing rectangle...
PS C:\Users\Toushiba\.vscode>
```

Q39: Write a program to demonstrate use of this keyword.

```
#include <iostream>
using namespace std;
class Employee {
   public:
       int id;
       string name;
       float salary;
       Employee(int id, string name, float salary)
        {
             this->id = id;
            this->name = name;
            this->salary = salary;
        }
       void display()
        {
            cout<<id<<"  "<<name<<"  "<<salary<<endl;
        }
};
int main(void) {
    Employee e1 =Employee(101, "ARSLAN", 850000); //creating an object of
Employee
    Employee e2=Employee(102, "MEHWISH", 50000); //creating an object of
Employee
    e1.display();
    e2.display();
    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ .\p39.cpp
PS C:\Users\Toushiba\.vscode> .\a.exe
101  ARSLAN  850000
102  MEHWISH  50000
PS C:\Users\Toushiba\.vscode>
```

Q40 Write a program to demonstrate FILE HANDLING..

```cpp
#include <iostream>
#include <fstream>
using namespace std;
int main() {
    fstream my_file;
    my_file.open("my_file.txt", ios::out);
    if (!my_file) {
        cout << "File not created!";
    }
    else {
        cout << "File created successfully!";
        cout<<"\n mohd arslan mca student";
        my_file << "Guru99";
        my_file.close();
    }
    return 0;
}
```

OUTPUT

```
PS C:\Users\Toushiba\.vscode> g++ '.\P40 WRITE OP.cpp'
PS C:\Users\Toushiba\.vscode> .\a.exe
File created successfully!
 mohd arslan mca student
PS C:\Users\Toushiba\.vscode>
```

MOHD ARSLAN MCA 1ST SEMESTER .. ALLAH HAFIZ UNDER GUIDANCE OF TABREZ SIR..