

Don Bosco Institute of Technology, Kurla(W)
Department of Electronics and Tele-Communication Engineering
ECL304 - Skill Lab: C++ and Java Programming
Sem III
2021-22

Lab Number:	4
Student Name:	Siddhant Kedar
Roll No :	E-05

Title:

1) To perform Multiple Inheritance in C++. Create a student class representing student roll number, name and branch and an exam class (derived class of student) representing the scores of the student in various subjects (maths, physics and chemistry) and sports class representing the score in sports. The sports and exam class is inherited by a result class which adds the exam marks and sports score to generate the final result.

2) To perform Hierarchical Inheritance in C++. Create an employee class with attributes EmpID and EmpSalary. Also create necessary methods/constructors to accept these values from the user. Create classes permanentEmployee and TemporaryEmployee which will be derived classes of Employee. Mention hike attribute in these derived classes and calculate the total salary using generate salary () method for respective types of employees.

Learning Objective:

- Students will be able to perform Multiple Inheritance and Hierarchical Inheritance in C++.

Learning Outcome:

- Understanding the concept of Multiple and Hierarchical Inheritance and implementing them in a program.

Theory:

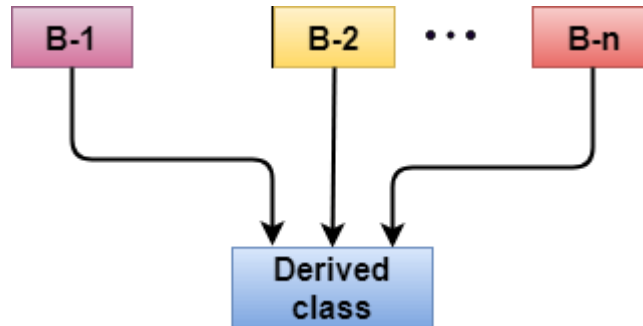
In C++, inheritance is a process in which one object acquires all the properties and behaviours of its parent object automatically. In such way, you can reuse, extend or modify the attributes and behaviours which are defined in other class.

In C++, the class which inherits the members of another class is called derived class and the class whose members are inherited is called base class. The derived class is the specialized class for the base class.

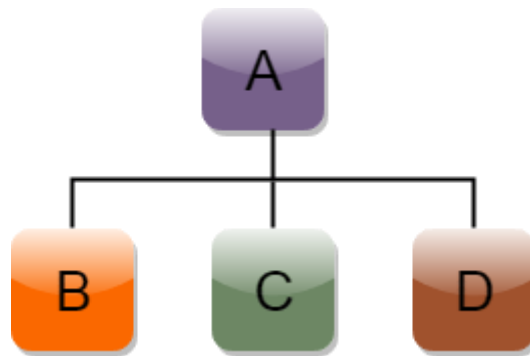
Multiple Inheritance: Multiple Inheritance is a feature of C++ where a class can inherit from more than one classes. i.e one sub class is inherited from more than one base class.

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Hierarchical Inheritance: Hierarchical inheritance is defined as the process of deriving more than one class from a base class.



Program 1: Multiple inheritance

Algorithm:

- 1) Create a parents class and initialize its data members.
- 2) Create the derived class of student class – exam class to take inputs.
- 3) Create sports class to take marks.
- 4) Create the result class to inherit the exam class and sport class publically and to calculate the total.
- 5) To display the result create a main function to call the class.
- 6) End

```
#include<iostream>
#include<conio.h>
using namespace std;
```

```
class student {
```

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protected:

```
int rollno;  
char name[50];  
char branch[10];
```

public:

```
void getdata()  
{  
    cout << "Enter your roll no. ";  
    cin >> rollno;  
    cout << "Enter your name: ";  
    cin >> name;  
    cout << "Enter your branch: ";  
    cin >> branch;  
}  
};
```

class exam : public student {

public:

```
int math, physics, chemistry;
```

public:

```
void getmarks() {  
    cout << "Enter marks in maths: ";  
    cin >> math;  
    cout << "Enter marks in physics: ";  
    cin >> physics;  
    cout << "Enter marks in chemistry: ";  
    cin >> chemistry;  
}  
};
```

class sports {

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```
public:
    int sportscore;
public:
    void getsportsmarks() {
        cout<<endl<<"Enter your sports marks: ";
        cin>>sportscore;
    }
};

class result: public exam, public sports{
    float finalresult;
public:
    void display(){
        finalresult = math+physics+chemistry+sportscore;
        cout<<"\n Final Result: "<< finalresult<<endl;
    }
};

int main(){
    student s1;
    s1.getdata();
    result obj;
    obj.getmarks();
    obj.getsportsmarks();
    obj.display();

    return 0;
}
```

Input Given:

Roll no. 5

Name: Siddhant

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Branch: EXTC

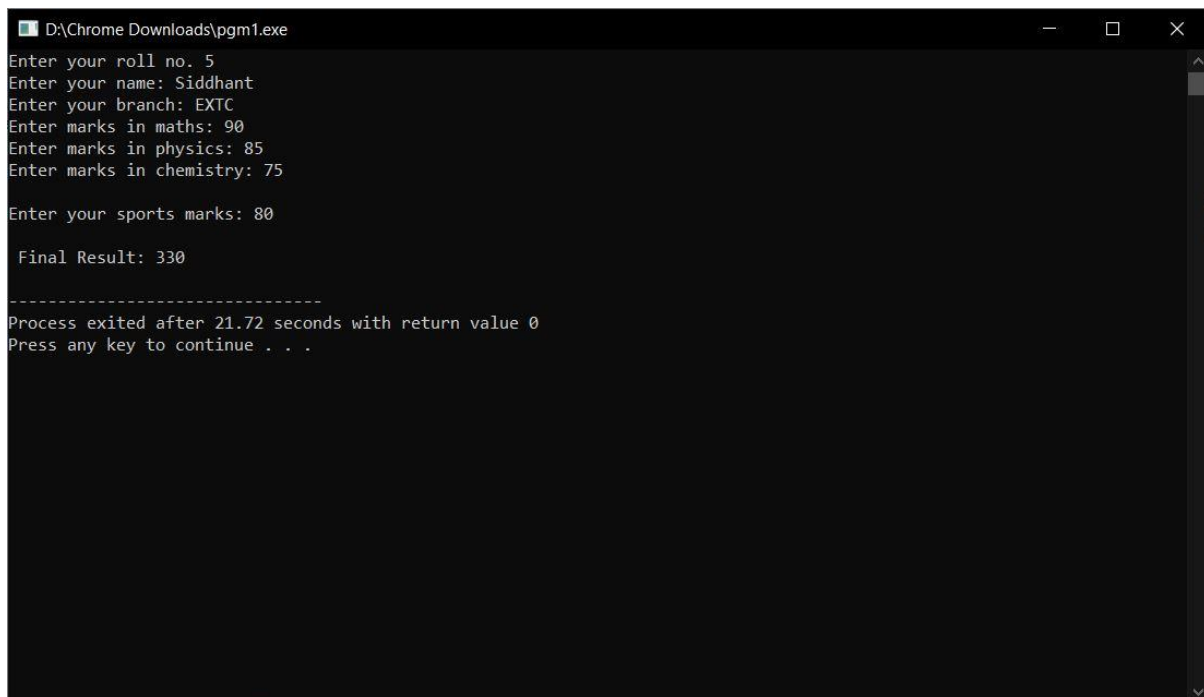
Marks in maths: 90

Marks in physics: 85

Marks in chemistry: 75

Marks in sports: 80

Output:



```
D:\Chrome Downloads\pgm1.exe
Enter your roll no. 5
Enter your name: Siddhant
Enter your branch: EXTC
Enter marks in maths: 90
Enter marks in physics: 85
Enter marks in chemistry: 75

Enter your sports marks: 80

Final Result: 330

-----
Process exited after 21.72 seconds with return value 0
Press any key to continue . . .
```

Program 2: Hierarchical Inheritance

Algorithm:

- 1) Create a parent class employee and initialize its data members.
- 2) Create a basic function to get data.
- 3) Create 2 child class permanent employee and temporary employee that inherits employee class publically.
- 4) Calculate dearness allowance and income takes for both employees.
- 5) In main function, create the object of derived class and display the result.

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```
#include<iostream>

using namespace std;

class Employee{
public:
    int EmpID;
    char Employee_name[50];
    float EmpSalary;
    float DA;
    float IT;
    float Salary;

public:
    void set_details()
    {
        cout<<"Enter Employee ID"<<endl;
        cin>> EmpID ;
        cout<<"Enter Employee name "<<endl;
        cin>>Employee_name;
    }

public:
    int get_empid() {
        return this->EmpID;
    }
};

class PermanentEmployee : public Employee{
public:
    void calculate_details()
    //basic salary for permanent employee= 30000
    {
```

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```
    DA=1.32*30000;
    IT=0.30*(30000+DA);
    Salary=(30000+DA)-IT;
}
public:
    void print_details()
    {
        cout<<"Employ Basic Salary : "<<30000<<endl;
        cout<<"Employ DA : "<<DA<<endl;
        cout<<"Employ IT : "<<IT<<endl;
        cout<<"Employ Salary : "<<Salary<<endl;
    }
};

class TemporaryEmployee : public Employee{
    //basic salary for temporary employee= 20000;
public:
    void calculate_details()
    {
        DA=1.32*20000;
        IT=0.30*(20000+DA);
        Salary=(20000+DA)-IT;
    }

    void print_details()
    {
        cout<<"Employ Basic Salary : "<<20000<<endl;
        cout<<"Employ DA : "<<DA<<endl;
        cout<<"Employ IT : "<<IT<<endl;
        cout<<"Employ Salary : "<<Salary<<endl;
    }
};
```

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```
int main(){
    Employee e;
    e.set_details();
    int a = e.get_empid();
    if(a<=10) {
        PermanentEmployee pe;
        pe.calculate_details();
        pe.print_details();
        cout<<"permanent employee"<<endl;
    }
    else {
        TemporaryEmployee te;
        te.calculate_details();
        te.print_details();
        cout<<"tempereory employee"<<endl;
    }
    return 0;
}
```

Input given:

For Permanent Employee:

Id: 5

Name: Siddhant

For Temporary Employee:

Id: 15

Name: Aditya

Output:

For Permanent Employee:

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```
D:\Chrome Downloads\pgm2 (1).exe
Enter Employee ID
5
Enter Employee name
Siddhant
Employ Basic Salary : 30000
Employ DA : 39600
Employ IT : 20880
Employ Salary : 48720
permanent employee

-----
Process exited after 5.829 seconds with return value 0
Press any key to continue . . .
```

For Temporary Employee:

```
D:\Chrome Downloads\pgm2 (1).exe
Enter Employee ID
15
Enter Employee name
Aditya
Employ Basic Salary : 20000
Employ DA : 26400
Employ IT : 13920
Employ Salary : 32480
temperary employee

-----
Process exited after 5.559 seconds with return value 0
Press any key to continue . . .
```