

# Object Oriented Programming Lab

Spring2025



## Assignment #11

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BSE-2B

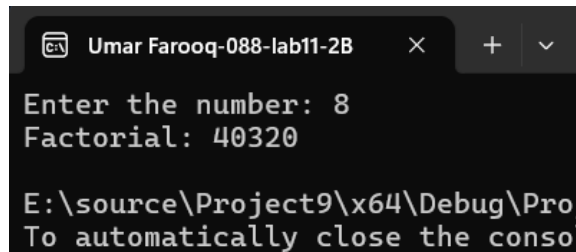
DEPARTMENT OF SOFTWARE ENGINEERING  
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**Task 01:** Write a program to find the factorial of a number using the concept of virtual function.

Code:

```
#include <iostream>
using namespace std;
class Factorial {
public:
    virtual int calculate(int n)
    {
        return 0;
    }
};
class calcFactorial : public Factorial {
public:
    int calculate(int n) override
    {
        if (n == 0 || n == 1)
        {
            return 1;
        }
        else
        {
            return n * calculate(n - 1);
        }
    }
};
int main()
{
    Factorial* f;
    calcFactorial fact;
    f = &fact;
    int num;
    cout << "Enter the number: ";
    cin >> num;
    cout << "Factorial: " << f->calculate(num) << endl;
    return 0;
}
```

Output:



```
Umar Farooq-088-lab11-2B
Enter the number: 8
Factorial: 40320
E:\source\Project9\x64\Debug\Pro
To automatically close the conso
```

**Task 02:** Write a program that consists of an abstract class **“Polygon”**. This class contains two member functions:

**void set\_values**

**double area**

Derive two classes **“Rectangle”** and **“Triangle”** from it. Calculate the area of rectangle (width\*height) and triangle (width\*height/2) and then display it.

Code:

```
#include <iostream>
using namespace std;
class Polygon {
protected:
    double width;
    double height;
public:
    virtual void setValue() = 0;
    virtual double Area() = 0;
};
class Rectangle : public Polygon {
public:
    void setValue() override
    {
        cout << "Enter the width: ";
        cin >> width;
        cout << "Enter the height: ";
        cin >> height;
    }
    double Area() override
    {
        return (width * height);
    }
};
```

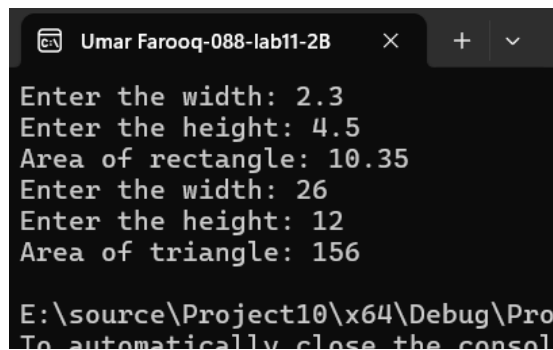
```

class Triangle : public Polygon {
public:
    void setValue() override
    {
        cout << "Enter the width: ";
        cin >> width;
        cout << "Enter the height: ";
        cin >> height;
    }
    double Area() override
    {
        return (width * height / 2);
    }
};

int main()
{
    Polygon* Rect = new Rectangle();
    Rect->setValue();
    cout << "Area of rectangle: " << Rect->Area() << endl;
    Polygon* Tri = new Triangle();
    Tri->setValue();
    cout << "Area of triangle: " << Tri->Area() << endl;
    return 0;
}

```

Output:



```

Umar Farooq-088-lab11-2B
Enter the width: 2.3
Enter the height: 4.5
Area of rectangle: 10.35
Enter the width: 26
Enter the height: 12
Area of triangle: 156
E:\source\Project10\x64\Debug\Pro
To automatically close the consol

```

**Task 03:** Write a program using Polymorphism technique to define the class of **Person** as a base class and hence derive **Student** and **Lecturer** classes from it. The base class consists of two pure virtual functions: **getdata** and **show**. Override these two functions in the derive classes.

Code:

```
#include <iostream>
#include <string>
using namespace std;
class person {
protected:
    string name;
    string address;
public:
    virtual void getData() = 0;
    virtual void display() = 0;
};
class Student : public person {
private:
    string grade;
    int fee;
public:
    void getData() override
    {
        cout << "Enter name of student: ";
        getline(cin, name);
        cout << "Enter address of student: ";
        getline(cin, address);
        cout << "Enter fees of student: ";
        cin >> fee;
        cout << "Enter grade of student: ";
        cin >> grade;
        cin.ignore();
    }
    void display() override
    {
        cout << "-----" << endl;
        cout << "Name is: " << name << endl;
        cout << "Address is : " << address << endl;
        cout << "Fees is: " << fee << endl;
        cout << "Grade is : " << grade << endl;
        cout << "-----" << endl;
    }
}
```

```

};
class Lecturer : public person {
private:
    int salary;
    int lectures;
public:
    void getData() override
    {
        cout << "Enter name of lecturer: ";
        getline(cin, name);
        cout << "Enter address of lecturer: ";
        getline(cin, address);
        cout << "Enter salary: ";
        cin >> salary;
        cout << "Enter lectures in a week: ";
        cin >> lectures;
        cin.ignore();
    }
    void display() override
    {
        cout << "-----" << endl;
        cout << "Name is: " << name << endl;
        cout << "Address is: " << address << endl;
        cout << "Salary is: " << salary << endl;
        cout << "Lectures in a week: " << lectures << endl;
        cout << "-----" << endl;
    }
};

int main()
{
    person* p;

    Student s;
    p = &s;
    p->getData();
    p->display();

    Lecturer l;

```

```

        p = &l;
        p->getData();
        p->display();

    return 0;
}

```

Output:

```

Umar Farooq-088-lab11-2B
Enter name of student: Umar Farooq
Enter address of student: Riaz boys hostel st#3
Enter fees of student: 1200
Enter grade of student: B
-----
Name is: Umar Farooq
Address is : Riaz boys hostel st#3
Fees is: 1200
Grade is : B
-----
Enter name of lecturer: Ahtesham khan
Enter address of lecturer: House 11 street#2 F-10/3
Enter salary: 4000
Enter lectures in a week: 4
-----
Name is: Ahtesham khan
Address is: House 11 street#2 F-10/3
Salary is: 4000
Lectures in a week: 4
-----
E:\source\Project13\x64\Debug\Project13.exe (process 17680)
To automatically close the console when debugging stops, er

```

**Task 04:** Write a program using polymorphism technique to define the class “**Power**” as base class. The base class contains two member functions: “**getdata**” to input data from the user and another function “**double result**” which is declared as virtual. Derive Square, Cube, Four and Five from the base class **Power**. Each of these four derive classes contain the function “**double result**”. Calculate the square, cube, fourth power and five power of the number entered by the user.

Code:

```

#include <iostream>
#include <cmath>
using namespace std;
class Power {
protected:
    double num;
public:
    void getData()
    {
        cout << "Enter the number: ";
    }
}

```

```

        cin >> num;
    }
    virtual double result() = 0;
};
class Sqaure : public Power {
public:
    double result() override
    {
        return pow(num, 2);
    }
};
class Cube : public Power {
public:
    double result() override
    {
        return pow(num, 3);
    }
};
class Four : public Power {
public:
    double result() override
    {
        return pow(num, 4);
    }
};
class Five : public Power {
public:
    double result() override
    {
        return pow(num, 5);
    }
};
int main()
{
    Power* ptr = nullptr;
    int choice;

    cout << "1. X^2" << endl;

```



```
cout << "2. X^3" << endl;
cout << "3. X^4" << endl;
cout << "4. X^5" << endl;
cout << "Enter the right choice: ";
cin >> choice;

switch (choice)
{
case 1:
    ptr = new Sqaure();
    break;
case 2:
    ptr = new Cube();
    break;
case 3:
    ptr = new Four();
    break;
case 4:
    ptr = new Five();
    break;
default:
    cout << "Invalid choice!" << endl;
}
ptr->getData();
cout << "Result: " << ptr->result() << endl;
}
```

Output:

The image displays three screenshots of a C# console application running in Visual Studio. The application is titled 'Umar Farooq-088-lab11-2B'.

**Top Left Screenshot:** Shows the program's menu with four options: 1.  $X^2$ , 2.  $X^3$ , 3.  $X^4$ , and 4.  $X^5$ . The user has entered '3' for the choice and '6' for the number. The output is 'Result: 1296'.

**Top Right Screenshot:** Shows the same menu. The user has entered '5' for the choice, which is outside the valid range. The output is 'Invalid choice!'.

**Bottom Screenshot:** Shows the program's menu. The user has entered '2' for the choice and '7.3' for the number. The output is 'Result: 389.017'. A tooltip for the 'ctrl+alt+1' keyboard shortcut is visible over the first menu item.