Object Oriented Programming Lab

Spring2025

Assignment #11

Umar Farooq
09-131242-088
BSE-2B

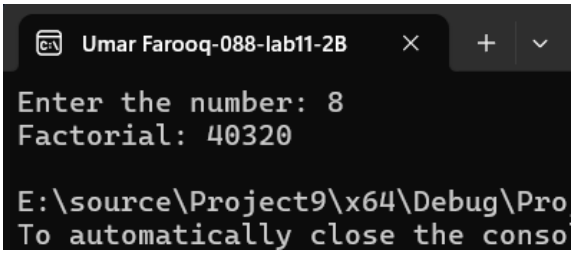
DEPARTMENT OF SOFTWARE ENGINEERING
BAHRIA UNIVERSITY ISLAMABAD CAMPUS

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:



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

void set_values

double area

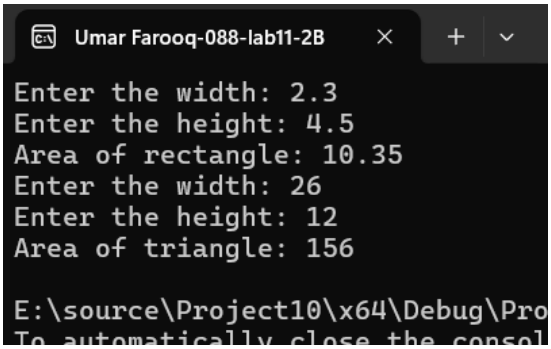
Derive two classes **"Rectangle" and "Triangle"** from it. Calculate the area of rectangle (width*height) and triangle (width*height/2) and then display it.

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:



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.

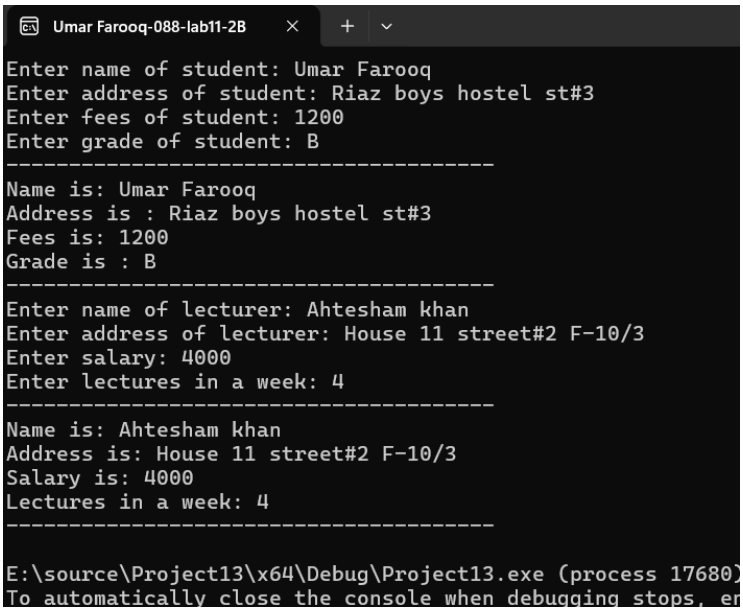
Code:

```
#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:



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.

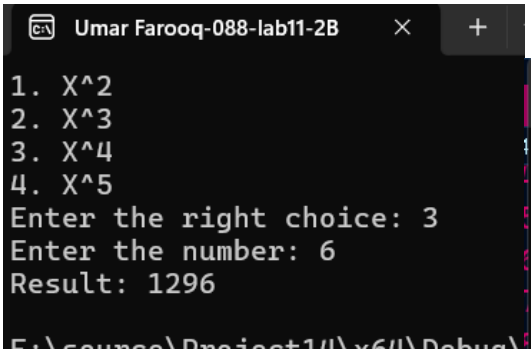
Code:

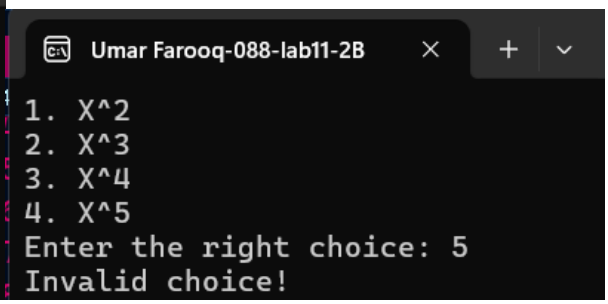
```
#include <iostream>
#include <cmath>
using namespace std;
class Power {
protected:
	double num;
public:
	void getData()
	{
		cout << "Enter the number: ";
```

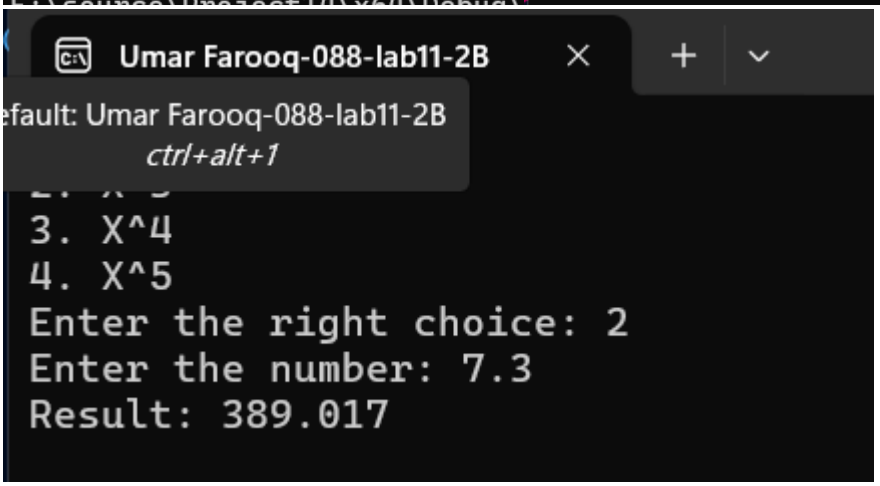
```
		cin >> num;
	}
	virtual double result() = 0;
};
class Sqaure : public Power {
public:
	double result() override
	{
		return pow(num, 2);
	}
};
class Cube : public Power {
public:
	double result() override
	{
		return pow(num, 3);
	}
};
class Four : public Power {
public:
	double result() override
	{
		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:


Umar Farooq-088-lab11-2B
1. X^2
2. X^3
3. X^4
4. X^5
Enter the right choice: 3
Enter the number: 6
Result: 1296


Umar Farooq-088-lab11-2B
1. X^2
2. X^3
3. X^4
4. X^5
Enter the right choice: 5
Invalid choice!


Umar Farooq-088-lab11-2B
efault: Umar Farooq-088-lab11-2B
ctrl+alt+1
3. X^4
4. X^5
Enter the right choice: 2
Enter the number: 7.3
Result: 389.017