**Cycle 3 Program 8**

**Aim:** To write a program to implement the base class Shape and derive triangle, rectangle, circle and square classes from it and implement functions to compute the area and perimeter of the polygon using concept of pure virtual functions.

#include<iostream>

#include<math.h>

#include<string>

using namespace std;

class Shape{

    protected:

        float side[100],area,perimeter;

    public:

        Shape(int n){

            for(int i=0;i<n;i++){

                cout<<"Enter side "<<i+1<<" value: ";

                cin>>side[i];

            }

        }

        virtual void calcArea()=0;

        virtual void calcPerimeter()=0;

        void display(string shape\_name){

            cout<<endl<<"Area of "<<shape\_name<<" is : "<<area<<endl;

            cout<<endl<<"Perimeter of "<<shape\_name<<" is : "<<perimeter<<endl;

        }

};

class Triangle:public Shape{

    float s=0;

    public:

        Triangle():Shape(3){

        }

        bool validate(){

             if((side[0]+side[1])<=side[2]||(side[1]+side[2])<=side[0]||(side[2]+side[0])<=side[1]){

                return false;

            }else{

                return true;

            }

        }

        void calcArea(){

                 s=(side[0]+side[1]+side[2])/2;

                 area=sqrt(s\*(s-side[0])\*(s-side[1])\*(s-side[2]));

        }

        void calcPerimeter(){

               perimeter=side[0]+side[1]+side[2];

            }

};

class Square:public Shape{

    float s=0;

    public:

        Square():Shape(1){

        }

        void calcArea(){

            area=side[0]\*side[0];

        }

        void calcPerimeter(){

               perimeter=3\*side[0];

            }

};

class Rectangle:public Shape{

    public:

        Rectangle():Shape(2){

        }

        void calcArea(){

            area=side[0]\*side[1];

        }

        void calcPerimeter(){

               perimeter=2\*(side[0]+side[1]);

        }

};

class Circle:public Shape{

    float s=0;

    public:

        Circle():Shape(1){

        }

        void calcArea(){

            area=side[0]\*side[0]\*3.14;

        }

        void calcPerimeter(){

               perimeter=2\*3.14\*side[0];

            }

};

int main(){

    Shape \*sh;

    cout<<endl<<"Triangle"<<endl;

    Triangle t;

    sh=&t;

    if(t.validate()){

        sh->calcArea();

        sh->calcPerimeter();

        sh->display("Triangle");

    }else{

        cout<<"Triangle is not valid";

    }

    cout<<endl<<"Rectangle"<<endl;

    Rectangle r;

    sh=&r;

    sh->calcArea();

    sh->calcPerimeter();

    sh->display("Rectangle");

    cout<<endl<<"Square"<<endl;

    Square s;

    sh=&s;

    sh->calcArea();

    sh->calcPerimeter();

    sh->display("Square");

    cout<<endl<<"Circle"<<endl;

    Circle c;

    sh=&c;

    sh->calcArea();

    sh->calcPerimeter();

    sh->display("Circle");

    return 0;

}

**Sample Input/Output:**

Triangle

Enter side 1 value: 3

Enter side 2 value: 4

Enter side 3 value: 5

Area of Triangle is : 6

Perimeter of Triangle is : 12

Rectangle

Enter side 1 value: 3

Enter side 2 value: 4

Area of Rectangle is : 12

Perimeter of Rectangle is : 14

Square

Enter side 1 value: 3

Area of Square is : 9

Perimeter of Square is : 9

Circle

Enter side 1 value: 1

Area of Circle is : 3.14

Perimeter of Circle is : 6.28

2.

Triangle

Enter side 1 value: 1

Enter side 2 value: 10

Enter side 3 value: 12

Triangle is not valid

Rectangle

Enter side 1 value: 3

Enter side 2 value: 2

Area of Rectangle is : 6

Perimeter of Rectangle is : 10

Square

Enter side 1 value: 4

Area of Square is : 16

Perimeter of Square is : 12

Circle

Enter side 1 value: 2

Area of Circle is : 12.56

Perimeter of Circle is : 12.56