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20220040

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(){
```

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```
                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;
```

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```
    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
```

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```
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
```