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Project 2 Phase 2

Implement following requirement for the phase 1 of project 2.

Part 8: Add Area() and Perimeter() pure virtual function to Shape class. Add these two functions to all child classes of Shape class.

Part 9: Update Display() of each class which also prints the area and perimeter of each shape.

Part 10: Write a template based DynamicArray that includes member functions that allow it to emulate the behavior of a vector.

```
template<class T>
class DynamicArray {
public:
    DynamicArray();
    DynamicArray(int s);
    //copy constructor
    DynamicArray(const DynamicArray& d);
    //destructor
    ~DynamicArray();
    //assssignment operator
    DynamicArray<T>& operator=(const DynamicArray& d);
    int getCapacity() const;
    int getNumElements() const;
    T& operator[](int index);
    void add(T &e);
private:
    T *p;
    int capacity;
    int numElements;
};
```

Part 11: Implement separate compilation for phase 2, create a makefile for the phase 2.

Use following main() to test your class.

```
int main(){
  Shape **a = new Shape*[3];
  a[0] = new Triangle(Edge(4),Edge(3),Point(2,3),90);
  a[1] = new Rectangle(Point(2,2),Edge(5),Edge(6));
  a[2] = new Circle(Point(3,3),10);

  DynamicArray<Shape*> shape1;
  shape1.add(a[0]);
  DynamicArray<Shape*> shape2(shape1);
```

```
  shape2.add(a[1]);
  DynamicArray<Shape*> shape3;
  shape3 = shape2;
  shape3.add(a[2]);
  cout<<"--------Shape 1--------"<<endl;
  for(int i=0;i<shape1.getNumElements();i++){
    shape1[i]->Display();
  }
  cout<<"--------Shape 2--------"<<endl;
  for(int i=0;i<shape2.getNumElements();i++){
    shape2[i]->Display();
  }
  cout<<"--------Shape 3--------"<<endl;
  for(int i=0;i<shape3.getNumElements();i++){
    shape3[i]->Display();
  }
  cout<<"-----------------------"<<endl;
  return 0;
}
```

Output from given main: (user input in **bold font**)

```
DynamicArray => Copy constructor was called
DynamicArray => Assignment op was called
--------Shape 1--------
Triangle Details:
Name: Triangle
Length of Edge A: 4
Length of Edge B: 3
Coordinates of Vertex: (2, 3)
Angle (in degrees): 90
Area: 6
Perimeter: 12
--------Shape 2--------
Triangle Details:
Name: Triangle
Length of Edge A: 4
Length of Edge B: 3
Coordinates of Vertex: (2, 3)
Angle (in degrees): 90
Area: 6
Perimeter: 12
Rectangle Details:
Name: Rectangle
Width: 5
Height: 6
Bottom-left Coordinates: (2, 2)
Area: 30
```

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```
Perimeter: 22
--------Shape 3--------
Triangle Details:
Name: Triangle
Length of Edge A: 4
Length of Edge B: 3
Coordinates of Vertex: (2, 3)
Angle (in degrees): 90
Area: 6
Perimeter: 12
Rectangle Details:
Name: Rectangle
Width: 5
Height: 6
Bottom-left Coordinates: (2, 2)
Area: 30
Perimeter: 22
Circle Details:
Center: (3, 3)
Radius: 10
Area: 314.159
Perimeter: 62.8319
-----------------------
DynamicArray => Destructor was called
DynamicArray => Destructor was called
DynamicArray => Destructor was called
```

Phase 1 file list:

```
Shape.h
Shape.cpp
Triangle.h
Triangle.cpp
Rectangle.h
Rectangle.cpp
Circle.h
Circle.cpp
Point.h
Point.cpp
Edge.h
Edge.cpp
DynamicArray.h
DynamicArray.cpp
Main.cpp
makefile
```

Point distribution:

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