

Lab 9 Class and Objects

Please test the correctness of your program in Q-1 and Q-3 using PASS.

Q-1. Design and implement a class to compute the area of a triangle using the values of their sides. The design of class (named Triangle) should includes

For the Design of Class

class Triangle

```
{  
  
}
```

- a) Three private members side1, side2 and side3, which present sides of a triangle.
- b) One private member to preserve the computed area of triangle.
- c) A default constructor (i.e. Triangle()) to initialize sides of triangle as zero.
- d) A parameter constructor (i.e. Triangle(double, double, double)) to initialize the values of sides for corresponding triangle.
- e) A set method (i.e. setSides(double, double, double)) to enter the new values for the sides.
- f) A method (i.e. computeArea()) to compute the area of triangle.
- g) A get method (i.e. getArea()) to display the area.

Hint-1. Area of Triangle should be computed through the following Heron's Formula

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}, \text{ where } s = (a+b+c)/2.$$

Hint-2. You need to include `<cmath>` library to use the `sqrt()` function.

For the Implementation of Class

1. Create first Triangle object (i.e. triangle1) with default constructor and display its area.
2. Create second Triangle object (i.e. triangle2) with parameter constructor and display its area.
3. Call the setSides(double, double, double) method using object (i.e. triangle1) and display its area.

Hint. Write code in the main() function for implementation.

Expected Output

Example 1.

```
Area of Triangle (i.e. triangle1): 0
Area of Triangle (i.e. triangle2 with sides 3, 4 and 5): 6.00
Enter New Sides for Triangle (i.e. triangle1):
4
2
3
Area of Triangle (i.e. triangle1 with sides 4.00, 2.00 and
3.00): 2.90
```

Example 2.

```
Area of Triangle (i.e. triangle1): 0
Area of Triangle (i.e. triangle2 with sides 3, 4 and 5): 6.00
Enter New Sides for Triangle (i.e. triangle1):
4.3456
2.13
3
Area of Triangle (i.e. triangle1 with sides 4.35, 2.13 and
3.00): 2.90
```

Q-2. Extend the program in Q-1 to define a non-member function `largertriangle()`, which accepts two Triangle objects (i.e. triangle1 and triangle2) as input. The function should print whether the first Triangle (i.e. triangle1) has a larger area than the second one (i.e. triangle2) or not. You may use the following template for `largertriangle()`.

```
void largertriangle(Triangle t1, Triangle t2)
{
}
```

Modify the implementation part of program in Q-1 by creating two objects with default parameters and call the `setSides(int, int, int)` to enter the new values for the sides of both triangle.

Expected Outputs

Example 1

Enter New Sides for Triangle 1:

423

Enter New Sides for Triangle 2:

323

The Area 2.90 of Triangle 1 is larger than area 2.83 of Triangle 2.

Example 2

Enter New Sides for Triangle 1:

423

Enter New Sides for Triangle 2:

345

The Area 6.00 of Triangle 2 is larger than area 2.90 of Triangle 1.

Q-3. Modify the program such that the program defines an array of triangles:

`Triangle arr[10];`

The program should let the user input the sides of `n` triangles (where `n` is an integer input by the user and $0 < n < 10$) and store them in the array. The program should print the area of all triangles and also print the name of the triangle with the largest area (if there are more than one triangles with the same maximum area, print the first one in the original order that they are defined).

Expected Output**Example 1**Enter the number of triangles in range 1:10: 4

Enter the sides triangle 1:

223

Enter the sides triangle 2:

345

Enter the sides triangle 3:

345

Enter the sides triangle 4:

```
3
2
3

```

Area of triangle 1 is: 1.98

Area of triangle 2 is: 6.00

Area of triangle 3 is: 6.00

Area of triangle 4 is: 2.83

The largest area 6.00 is of triangle 2

Example 2

Enter the number of triangles in range 1:10: 2

Enter the sides triangle 1:

2.5467

2.13

3.45

Enter the sides triangle 2:

3.001

4.09

5.324

Area of triangle 1 is: 2.70

Area of triangle 2 is: 6.10

The largest area 6.10 is of triangle 2