

College of Engineering & Information Technology
Department of Computer Science
Data Structures – HW#2

Declare a class named **Shape** that stores the centre coordinates for any geometric shape. The geometric shape could be a **Rectangle**, **Triangle**, or **Circle**. Each of those shapes has its own dimensions as follows:

- A circle has a radius (r)
- A rectangle has length and width (l, w)
- A triangle has a length and height. (l, h).

In addition, we need to calculate the area for each of those shapes as follows:

- Circle area equals to πr^2
- A rectangle area equals to $l * w$
- A triangle area equals to $(1/2) * l * h$

Furthermore, you have to allow summing the area of two shapes of the same type with properly overloading the $+$ operator. For example, let **R1** and **R2** be two rectangles, then your program should allow:

double x=R1+R2;

Where x stores the summation of the areas for rectangles **R1** and **R2**.

Also, Find the difference in the areas of two shapes of the same type $R1-R2$, by subtracting the smaller area from the larger area.

You have to:

1. Implement the class **Shape** with the member functions **getCoordinates()** to print the (x,y) coordinates for the shape and **getArea()** to calculate and return its area. Make sure that your implementation respects abstraction principles.
2. Implement the classes **Rectangle**, **Triangle**, and **Circle** with their own dimensions with proper functions.
3. Implement the operator overloading function for the $+$ operator in the proper location in your code.
4. Implement a non-member function named **getShapeArea()** that takes an object of any shape as an argument and returns its area.
5. Write a main program to test your code. Make sure to set the (x,y) coordinates for any shape to the first and last digit of your university ID.