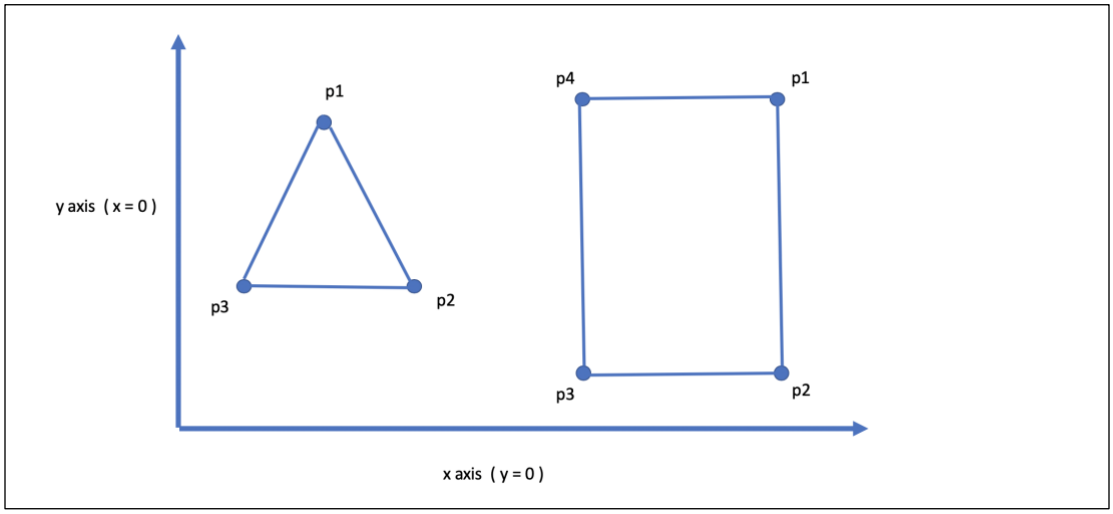
CSCI 4631/5631

Homework One – C++ practice - Shapes

For this assignment, you will be writing classes that model different kinds of 2 dimensional shapes, and each shape will be able to calculate its perimeter and area. We'll define classes that consists of a set of points in 2 dimensional space (Point2D), which represent the vertices and are ordered such that any given Point2D and the next Point2D represent an edge (a side) of the shape, **in a clockwise manner**. The last point and the first point are also assumed to define an edge. The Point2D objects should be fed into the constructor for each shape IN THAT ORDER. For example:



Submission:

If you haven't done so already, create a new repository on gitlab for the assignments for this course. Create a new directory within your repository. Name this directory HW1. As you write the program, add, commit, and push your files to the remote repository on the GitLab server. When you have finished the assignment, make sure you've uploaded the most up to date version of your files (check the website to see).

Assignment Statement:

1) Create classes for Rectangle and Triangle. For the purposes of this assignment, you'll make the assumption that at least one edge is parallel to the x axis … your code will need to figure out which edge that is, and you should store the length of that edge as the "base". (*Hint – if the y values of 2 vertices are roughly the same, say within 0.001 of one another in value, that edge is parallel to the x axis*) Based on this, and the strict ordering rules of the points, as mentioned above, calculate the "height" and store it. Make the base and height instance variables of Triangle and Rectangle.

2) Provide methods to Rectangle and Triangle that will calculate and return the area, and the perimeter.

3) The constructor for Triangle should take 3 points, and the constructor for Rectangle should take 4 points.

5) Based on this, you should be able to write a main method that will test all your public methods works correctly.

This assignment will consist of two parts:

1. Classed that define your classes Rectangle, and Triangle, and **these classes will be fully documented using comments**
2. A main method to show that your classes perform exactly as one would expect - I will expect **extensive** testing and that the tester also has documentation explaining the point of each test.

Writing the Tester

In a separate file, Main.cpp, implement a main method to test for your shape classes, and provide output comparing expected values/behaviors vs reality. You should provide at least one test for each of the public methods in Triangle and Rectangle. Each test method should verify the correctness of the method it is testing using multiple instances as input. Be sure to test for a wide variety of input combinations to ensure adequate testing.

Due Date

You need to complete this assignment and have it pushed to the remote repository on the Git server by the date/time specified on Moodle.

There should be a README.txt file stating exactly how to compile, run, and test your code. **Bonuses, if you chose to do them, should be separate (in subdirectories of HW1 labeled bonus1, bonus2, etc.) and fully complete implementations beyond the**

required one (in other words, start working from a fully implemented original copy in the subdirectory to do the bonus).

BONUS 1 (10 points): give the shapes methods that overrides the operator == and measures equality based on the values of the base and the height. Provide tests for this in your main method.

BONUS 2 (10 points): write another class called Circle, that is fully implemented as per the guidelines above. A circle only has one vertex (its center) and a radius. Provide tests for this in your main method.