

Homework Assignment #9 – Classes

Reading Assignment:

Read Chapter 8 in Programming In C++, by D'Orazio

Problem Assignment:

1. Write **class Point** as described below:
 - Include data members for x, y, and z coordinates
 - Include member functions as described below:
 - Prompt the user to enter the coordinates for a point
 - Display a point - with parentheses and commas, such as (2,4,5)
 - Find the distance between two points
 - Determine if two points are equal (return an integer = 1 if they are equal)
 - Write a main program to test the class. In particular,
 - Use member functions to enter two points.
 - Display the two points.
 - Use the member function to see if the points are equal. Display a message stating if they are equal or not.
 - If the points are not equal, use a member function to find the distance between the two points. Display the distance.
 - Test the program for two cases (one with equal points and one with non-equal points).

(continued)

2. Use **class Point** again with a different main program. Class point should still have the exact same member functions.
- In addition to the main program and the class (with its member functions), write three non-member functions as follows. Note that the functions may call member functions to perform various subtasks.
 - A function to determine if three points form a triangle. The function should return a 1 if they form a triangle and return a 0 otherwise. In order to form a triangle,
 - No two points can be equal.
 - Find the distance between each pair of points. If the largest of the three distances equals the sum of the other two distances, then the points are on a line.
 - A function to find the perimeter of a triangle formed by three points (if they are not in a line). Again use the member function in class Point to first find the distances.
 - A function to find the area of the triangle formed by three points (if they are not in a line) using the following formula, where a, b, and c are the lengths of the three sides and s is the perimeter of the triangle.

$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$

- Write a main program that tests the the non-member functions as follows:
 1. Declare three objects in class Point.
 2. Prompt the user to enter three points.
 3. Display the points.
 4. Test to see if the points are in a line (display the result).
 - A. If the three points are not in a line, the program should display the perimeter and area of the triangle formed by the points.
 - B. If the points are in a line, the program should display a message that they are in a line and should not attempt to calculate the perimeter or area of the triangle.
- Test the program for the following cases:

Case	Point 1	Point 2	Point 3
1	(0,0,0)	(2,3,0)	(6,9,0)
2	(0,0,0)	(4,0,0)	(4.3,0)
3	(1,2,3)	(10,8,2)	(12,-1,4)
4	(1,2,3)	(8,4,2)	(-6,0,4)