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**COSC 3020 Project 2 – 7.38 Finding Collinear Points**

**Problem**

There exists a 2-demensional Cartesian plane. The plane contains an arbitrary number of points, defined by x and y coordinates. We need to find all groups of 4 or more points that lie on the same horizontal or vertical line. This is equivalent to finding at least 4 equal x coordinates or 4 equal y coordinates in the list of points.

Points are represented by 2 doubles. The size of the plane is bounded only by the limit of the double type. The size of the plane should be irrelevant in this project, because we know about each point, and there are only N points, stored in a known list.

**Potential Problems with the Problem**

We’re not even sure what the “obvious” O(N4) algorithm is, so writing a better one will be a real challenge.

The goal time complexity is O(N2 log N). We know that sorting will be an important part of this project. Sorting a constant number of lists of N decimal values takes O(N log N) time already, which means that the rest of our algorithm must complete in O(N) or less.

Because points on the plane are defined by doubles, and not integers, we must use a comparison sorting algorithm, instead of something potentially more efficient, like count sort.

We’re going to have to deal with negative numbers in this problem.