CSCI 58000
Program 2.2

Due 10/11/23

(8 pts) Write a program to solve the Closest Points problem for an input file that contains duplicate x-coordinate values. As an extreme case, the data file could look like this:

5 6.7
5 7.1
5 4.2
5 5.7
5 4.9

Again, you can assume that the maximum number of data points is 16. As before, submit your .cpp and .h files via Canvas.

(6 pts) In addition (on paper for the TA)

a. Carefully explain any difficulties your previous (Program 2.1) program would have if the assumption about distinct x-coordinates is dropped.

b. Carefully explain what changes you made in your Program 2.1 to overcome such difficulties.

c. In the previous version of this problem (with no duplicate x-values), the algorithm used had the following recurrence relation: $T(n) = 2T(n/2) + \Theta(n)$ plus the time to presort, $\Theta(n \lg n)$.

this term includes $\Theta(n)$ to divide + $\Theta(n)$ to find Y' + $\Theta(n)$ to search Y' for points + $\Theta(1)$ for final comparison

So $T(n) = \Theta(n \lg n)$ (recurrence relation we have seen before) + $\Theta(n \lg n)$ (presort), therefore overall $T(n) = \Theta(n \lg n)$.

How do the changes in part (b) affect the overall order-of-magnitude of the algorithm? (Just explain what the order-of-magnitude of your algorithm is, it need not be $T(n) = \Theta(n \lg n)$, although that would be good!)