CS 361 – Lab #9 – Divide and Conquer

In today's lab, you will implement the "closest pair" algorithm we discussed in class. Here is the pseudocode:

```
closestPair(list of points P):
   px and py are P sorted by x and y respectively
   if |px| <= 3,
      return the simple base case solution
   Create Q and R:  the left & right halves of P.
   closestQ = closestPair(Q)
   closestR = closestPair(R)
   delta = min(dist(closestQ), dist(closestR))
   S = points in P within delta of rightmost Q
   sy = S sorted by y
   for each s in sy:
      find dist from s to each of next 15 in sy
   let [s,s'] be this shortest pair in sy
   return closest of:  closestQ, closestR, or [s,s']
```

Create a new directory called lab09. Copy the files from my lab09 folder on the class Web site. Driver.java is the only source file you need to modify. Feel free to organize your solution any way you wish (such as adding additional classes), but one possible structure for your solution is suggested in the comments in Driver.java. I have already implemented classes Point, XComparator and YComparator that you may find useful. You need to make a minor modification to the main() function so that it invokes the appropriate function to begin solving the problem, and it needs to print out the solution.

Most of your work will be working out the recursive closestPair() function. One early decision you need to make is when to sort the list of points P. You could sort them at the beginning of the function, or you could make this sorting the responsibility of the caller, in which case both the x- and y-sortings need to be passed.

The magic number 15 is probably larger than it needs to be. There are other formulations of the algorithm that show that somewhat smaller numbers suffice. Nevertheless, O(15n) is still O(n) for this step.

Finally, for testing your program you should run your program on input.txt and million.txt which I have provided. If you would like to create additional input files, you can use the program GeneratePoints, and redirect its output to another text file.