1. Which InputFormat did you use in the MapReduce program?

   The TextInputFormat has been used as the input format class. Input Format for the Map program is the <key, Value> pairs coming from the inputSplit which reads the input file from the path and then sends each line as the String in value.

2. What is the input and output format of the map function?

   The input is fed to mapper in terms of <key, value>, where Key is the Object of the class and Value is the String with Text as the data type.
   The Output of mapper is again a new set of <key, value> pairs.
   Key is DoubleWritable type (floating numbers) and value is Text type (fString). Where the key is the distance between the current point and the given point, So i have kept the format of the key as DoubleWritable type as the key will be floating numbers. The value is of Text type as the value consist of a string which includes X and Y coordinates of the point, with which the distance has been calculated.

3. What is the logic of the map function?
   Map function inputs the content of the points.txt file as key and value, the value string is then splitted to fetch the x and y coordinate. After the fetch of (x,y) point, the distance from the given point to this point is calculated using pythagoras theorem. Then the function writes the output in the context, again in terms of <key, value> pair. Where key is the distance between the two points and value is the string consisting coordination of that point. So key is of type DoubleWritable and value is of type Text (ie String) type. This new set of data sets is then read by reducer.

4. If a combiner function is used, what is the signature of the combiner function (input and output) and what is its logic?
   Not Used, but if it was used it will have similar signature as Reducer. Similar set of inputs. outputs will have the same format as input.

5. If a reduce function is used, what is the signature of the reduce function (input and output) and what is its logic?
   Reduce function is used to filter out the top k neighbours which are closest to the given point. The input of the reducer is a list of <key, value> pairs which are sorted on key. Here the key is the distance between the point and value is a iterable<Text>, which includes all the query points which have the same distance from the given point. In the Reducer implementation, i have initialized a counter which counts the number of times the reducer is called with every key and terminates the loop as soon as the counter equals to k.

6. How many mappers and reducers are needed for your program?
   Mapper - 14, Reducer -1

7. How many records are shuffled between the mappers and reducers?
   350907441 bytes