DAA LAB 10

K S PRABHATH

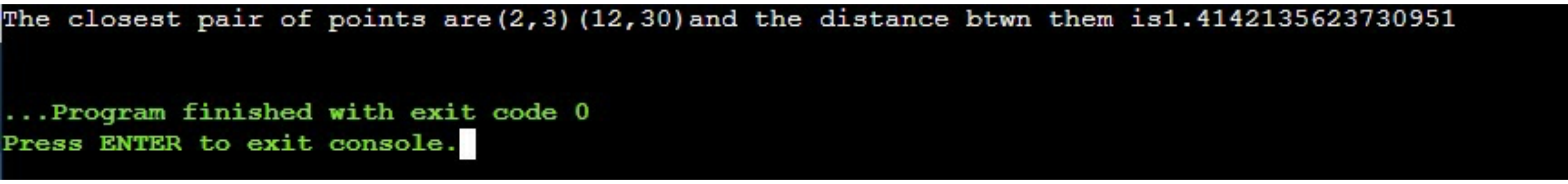
19BCE7564

Nearset Neighbour:

```
import java.util.*; class Main {        static
double min = Integer.MAX_VALUE;
static Point p1 =null ,p2 = null;
public static class Point {           private
int x;           private int y;           public
Point(int x, int y) {               this.x = x;
this.y = y;
          }
      }
   private static double getMin(){
return min;
   }
      public static void mindistance(List<Point> list) throws IllegalArgumentException{
if(list==null || list.size()<2) throw new IllegalArgumentException("We need atleast 2
points");           for(int i=0;i<list.size();i++) {               if(list.get(i)==null)
throw new IllegalArgumentException("Point is not initialised");
          }
          int n = list.size();
          Point[] pointsbyX = new
Point[n];           for(int i=0;i<n;i++){
pointsbyX[i] = list.get(i);
```

```
            }
            Arrays.sort(pointsbyX, new Comparator<Point>() {
                @Override
                public int compare(Point o1,
Point o2) {                    if(o1.x!=o2.x)
return o1.x-o2.x;                    else
return o1.y-o2.y;
                }
            });
            for(int i=0;i<n-1;i++){
if(pointsbyX[i]==pointsbyX[i+1]){
min = 0;                    p1 = pointsbyX[i];
p2 = pointsbyX[i+1];                    break;
                }
            }
            Point[] pointsbyY = new Point[n];
for (int i = 0; i < n; i++)
pointsbyY[i] = pointsbyX[i];            Point[]
aux = new Point[n];
closest(pointsbyX, pointsbyY, aux, 0, n-1);
        }
    private static double closest(Point[] pointsByX, Point[] pointsByY, Point[] aux,
int lo, int hi) {        if (hi <= lo) return Double.POSITIVE_INFINITY;        int mid = lo
+ (hi - lo) / 2;
        Point median = pointsByX[mid];

        double delta1 = closest(pointsByX, pointsByY, aux, lo,

mid);        double delta2 = closest(pointsByX, pointsByY,
aux, mid+1, hi);        double delta = Math.min(delta1,

delta2);        merge(pointsByY, aux, lo, mid, hi);

        int m = 0;        for (int i
= lo; i <= hi; i++) {            if
(Math.abs(pointsByY[i].x -
median.x) < delta)
aux[m++] = pointsByY[i];
        }        for (int i = 0; i < m; i++) {            for (int j = i+1; (j
< m) && (aux[j].y - aux[i].y < delta); j++) {                double
distance = getDistance(aux[i], aux[j]);                if (distance
< delta) {                    delta = distance;                    if
(distance < min) {                        min = delta;
p1 = aux[i];                        p2 = aux[j];
                    }
                }
            }        }
return delta;
    }    private static void merge(Point[] a, Point[] aux, int lo,
int mid, int hi) {        for (int k = lo; k <= hi; k++) {            aux[k]
= a[k];
        }

        int i = lo, j = mid+1;        for (int k = lo;
k <= hi; k++) {            if      (i > mid)
a[k] = aux[j++];            else if (j > hi)
a[k] = aux[i++];            else if (less(aux[j],
aux[i])) a[k] = aux[j++];            else
a[k] = aux[i++];
        }
    }

    private static boolean less(Point v, Point w) {
        return v.x<w.x;
    }

    public static double getDistance(Point a,
Point b){            int x = a.x-b.x;            int y =
a.y-b.y;        return Math.sqrt(x*x+y*y);
    }
    public static void main(String[] args) {
        Point p1 = new Point(2,3);
        Point p2 = new Point(12,30);
        Point p3 = new Point(40,50);
        Point p4 = new Point(5,1);
        Point p5 = new Point(12,10);
        Point p6 = new Point(3,4);
        List<Point> list = new ArrayList<>();        list.add(p1);
list.add(p2); list.add(p3); list.add(p4); list.add(p5); list.add(p6);
mindistance(list);
        System.out.println("The closest pair of points are ("+p1.x+","+p1.y+")
("+p2.x+","+p2.y+") and the distance between them is "+ min);
    }
}
```

OUTPUT:



```
The closest pair of points are(2,3)(12,30)and the distance btwn them is1.4142135623730951


...Program finished with exit code 0
Press ENTER to exit console.
```