

CSE 2320 Lab Assignment 1

Due June 27, 2011

Goals:

1. Understanding of mergesort.
2. Understanding of binary search.

Requirements:

1. Design, code, and test a Java program that 1) mergesorts a set of 2-D points based on their angles around the origin and 2) uses binary search to determine the number of points at the same angle (e.g. ray) as a given point. Your program may reuse Sedgewick's code or code from Notes 1. The first line of the input will be n , the number of target 2-D points on the next n input lines. The line after the last input point will contain m , the number of 2-D query points on the next m input lines. Each coordinate should be read as an `int`. The input should be read from standard input using `java.util.Scanner` (especially `nextInt()`, see `LIS.java` on the course webpage). The output is one line per query point that echoes the coordinates of the query point and the number of target points on the ray of the query point.
2. Email your program to `hafizfahad.sheikh@mavs.uta.edu` by 12:45 p.m. on June 27.

Getting Started:

1. The input will not include the origin as a point.
2. One way to implement the sort is to convert cartesian (x, y) coordinates to polar coordinates (r, θ) where r is positive and $0 \leq \theta < 2\pi$. Since this is inherently slow (e.g. computing the arctangent), and possibly inaccurate, you **must** do all computations on integers without using division. It is still useful, however, to think in terms of slopes.
3. If a duplicate target point is discovered while sorting, keep only one of them. (So n may be decreased.)

If two points on the same ray are discovered while sorting, the one **closer** to the origin will appear earlier in the output array than the other point.

4. Your program **should not** prompt for an input file name. Instead, a **shell redirect** (`java mergesort < file1.dat`), typing the input, or cut-and-paste should be used when testing your program. The mechanism for input redirection makes the referenced file appear to the executing program as though its contents are being typed manually at the keyboard.
5. Arrays should be allocated dynamically.

