
Problem A. Voronoi Diagram Returns

Input file: **standard input**
Output file: **standard output**
Time limit: 10 seconds
Memory limit: 1024 megabytes

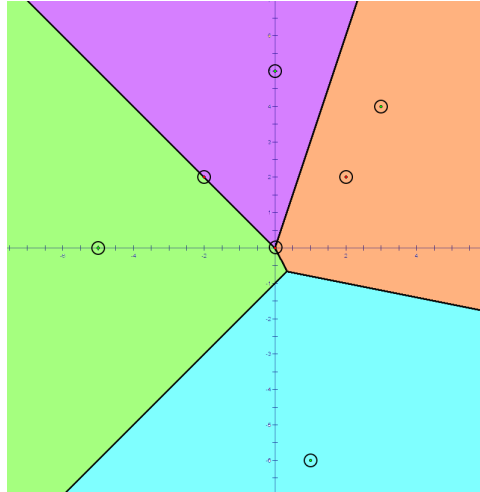


Figure: Voronoi Diagram of size 4.

In the 2-dimensional Cartesian coordinate system, we define the **Voronoi Diagram** of a non-empty set of points S , as a diagram that divides the plane by the criteria “which point in the set S is closest in this location?”. More precisely, the Voronoi diagram of a given non-empty point set $\{P_1, P_2, \dots, P_n\}$ is a collection of **regions**: A point K is included in region i if and only if $d(P_i, K) \leq d(P_j, K)$ holds for all $1 \leq j \leq n$, where $d(X, Y)$ denotes the Euclidean distance between point X and Y .

For example, in the picture above, every location over the plane is colored by the closest point with such location. The points which belongs to a single region is colored by a light color indicating a region, and the points which belongs to more than one region forms lines and points colored black.

There is an algorithm which computes the Voronoi Diagram in $O(n \log(n))$, but it is infamous to be very complicated and hard. In fact, we are lenient problem setters, so we set $n \leq 2000$, which means you can solve this task with slower Voronoi Diagram algorithms!

In this task, you should solve the **point query problem** in Voronoi diagram: in the Voronoi diagram constructed with the set of points $\{P_1, P_2, \dots, P_n\}$, you should determine which region(s) the point belongs in. More precisely, you will be given q queries of points. For each query point, you should determine the following:

- If it's not included in any region, output **NONE**.
- If it's included in exactly one region, output **REGION X**, where **X** is the index of such region.
- If it's included in exactly two regions, output **LINE X Y**, where **X** and **Y** ($X < Y$) are the indices of such two regions.
- If it's included in three or more regions, output **POINT**.

Input

In the first line, the number of points consisting Voronoi diagram n , and the number of queries q are given. ($3 \leq n \leq 2\,000, 1 \leq q \leq 250\,000$)

In the i th line of next n lines, two integers indicating x and y co-ordinate of P_i are given. These are the points consisting the Voronoi diagram. All n points are distinct. ($|x|, |y| \leq 10^4$)

In the j th line of next q lines, two integers indicating x and y co-ordinate of Q_j are given. For each point Q_j , you should determine in which region(s) the given point belongs to. ($|x|, |y| \leq 10^4$)

Output

Output consists of q lines. In the j th line, you should print one of following:

- If Q_j is not included in any region, output NONE.
- If Q_j is included in exactly one region, output REGION X, where X is the index of such region.
- If Q_j is included in exactly two regions, output LINE X Y, where X and Y ($X < Y$) are the indices of such two regions.
- If Q_j is included in three or more regions, output POINT.

Example

standard input	standard output
4 3	LINE 1 2
-5 0	POINT
0 5	REGION 3
3 4	
1 -6	
-2 2	
0 0	
2 2	

Note

Example is illustrated as diagram above.