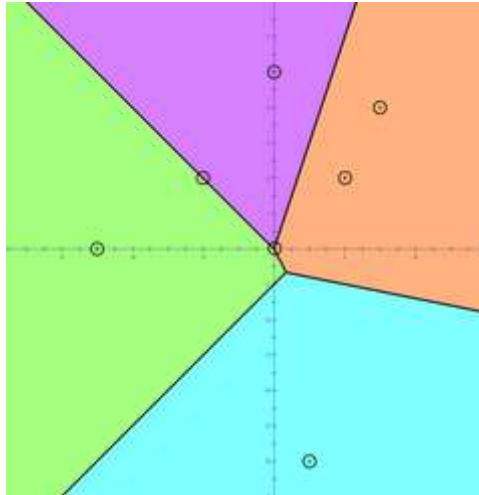# K. Voronoi Diagram Returns

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 $\{P_1, P_2, \cdots, P_n\}$ 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 $\{P_1, P_2, \cdots, P_n\}$, 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 ith 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. ($|x|, |y| \le 10^4$)

In the jth 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. ($|x|, |y| \le 10^4$)

Output

Output consists of q lines. In the jth 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

input   Copy

```
4 3
-5 0
0 5
3 4
1 -6
-2 2
0 0
2 2
```

output   Copy

```
LINE 1 2
POINT
REGION 3
```

Note

Example is illustrated as diagram above.