Capture The Criminal

Task:

After getting Kory's location, there's only one thing left to do. Capture him and bring him back to the headquarter. You positioned n agents $(x_1, y_1), (x_2, y_2), \cdots, (x_n, y_n)$. The agents at (x_i, y_i) and (x_{i+1}, y_{i+1}) are adjacents to each other as well as the agents at (x_1, y_1) and (x_n, y_n) which then makes a polygon of n vertices.

Kory can be at m locations and you need to determine for each location if it is inside, outside or on the boundary of the polygon.

Input:

The first input line has two integers n and m : the number of agents and the amount of locations.
After this, there are n lines that describe the agents locations. The i-th such line has two integers (x_i, y_i).
You may assume that the polygon is simple, i.e., it does not intersect itself.
Finally, there are m lines that describe the points. Each line has two integers x and y .

Output:

For each point, print "INSIDE", "OUTSIDE" or "BOUNDARY".

Sample

Input	Output
4 3 1 1 4 2 3 5 1 4 2 3 3 1 1 3	INSIDE OUTSIDE BOUNDARY