

Problem J. Master of Polygon

Input file: standard input
Output file: standard output
Time limit: 4 seconds
Memory limit: 1024 megabytes

Prof.Chen is the master of computational geometry. Now he has a simple polygon with n vertices lying on the Euclidean plane, he would like to give you q queries. In each query, you will be given two points P and Q , you need to check whether the segment PQ intersects with the boundary of the given polygon. Note that even when the segment touches a point of the polygon, you should also answer “YES”.

Input

The first line of the input contains two integers n and q ($3 \leq n \leq 200\,000$, $1 \leq q \leq 200\,000$), denoting the number of vertices and the number of queries.

The next n lines, each line contains two integers x and y ($0 \leq x, y \leq 30\,000$) that give the coordinates (x, y) of the vertices of the polygon in either clockwise order or counter-clockwise order. The polygon is simple, i.e., its vertices are distinct and no two edges of the polygon intersect or touch, except that consecutive edges touch at their common vertex. In addition, no two consecutive edges are collinear.

Each of the next q lines contains four integers x_1, y_1, x_2 and y_2 ($0 \leq x_1, y_1, x_2, y_2 \leq 30\,000$), denoting a query segment with endpoint $P(x_1, y_1)$ and $Q(x_2, y_2)$. It's guaranteed that the two endpoints of each segment do not coincide.

Output

For each query, print “YES” or “NO” in a single line.

Example

standard input	standard output
4 6	YES
1 1	YES
4 1	YES
4 4	YES
1 4	NO
0 2 2 0	YES
0 1 1 1	
0 0 5 5	
2 2 4 2	
2 2 3 2	
5 1 0 2	