Minimum Euclidean Distance

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	128 megabytes

One day you are surviving in the wild. After a period of exploration, you determine a safe area, which is a convex hull with n vertices $P_1, P_2, \ldots, P_n$ in counter-clockwise order and any three of them are not collinear.

Now you are notified that there will be q airdrop supplies, and for the i-th supply, its delivery range is described by a circle C_i , which means the supply will landed with uniformly probability among all the points with a real number coordinate inside C_i.

You need supplies so much that you decide to predetermine a starting point for **each** supply, and the starting point of two different supplies can be different. Every starting point should be inside the safe area and have the smallest expected value of **the square** of the Euclidean distance to the corresponding supply landing point.

Recall that On a two-dimensional plane, the Euclidean distance between two points (x_1, y_1) and (x_2, y_2) is $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$. If both coordinates of a point are all integers, then we call this point an integer point.

Input

The first line contains two integers n, q $(3 \le n, q \le 5000)$, representing the number of vertices of the safe area and the number of airdrop supplies.

The following n lines, each line contains two integers x_i, y_i , representing the coordinates of the i-th vertex of the safe area.

It's garanteed that the vertices are given in counter-clockwise order and any three of them are not collinear.

Then the following q lines, each line contains 4 integers $x_{i,1}, y_{i,1}, x_{i,2}, y_{i,2}$, representing the segment connecting $(x_{i,1}, y_{i,1})$ and $(x_{i,2}, y_{i,2})$ is a diameter of the circle C_i.

All the coordinates input are integers in the range $[-10^9, 10^9]$.

Output

For each airdrop supply, output a single line with a real number - the minimum expected value of **the square** of the Euclidean distance. Your answer will be considered correct if its absolute or relative error does not exceed 10^{-4}. That is, if your answer is a, and the jury's answer is b, then the solution will be accepted if $\frac{|a-b|}{\max(1,|b|)} \le 10^{-4}$.

Example

standard input	standard output
4 3 0 0 1 0 1 1 0 1 0 0 1 1 1 1 2 2 1 1 2 3	0.2500000000 0.7500000000 1.8750000000