

Problem L. Symmetry: Closure

Input file: *standard input*
Output file: *standard output*
Time limit: 2 seconds
Memory limit: 256 mebibytes

A point set S is symmetric about a line ℓ if and only if there exists $s' \in S$ satisfying that s' and s are symmetric about the line ℓ for all $s \in S$.

Let us denote the distance between two points a and b as $d(a, b)$. The distance between two non-empty point sets A and B is $\inf \{d(a, b) : a \in A, b \in B\}$. The infimum of a non-empty real number set S is the maximum value of x which satisfies $x \leq s$ for all $s \in S$.

Lines $\ell_1, \ell_2, \dots, \ell_n$ are given, where two or more lines may coincide. For a point s , define $C(s)$ as the intersection of all sets S satisfying $s \in S$ such that S is symmetric about ℓ_i for all $i = 1, 2, \dots, n$.

There are q queries. For each query, given two points A and B , find the distance between $C(A)$ and $C(B)$.

Input

There are multiple test cases. The first line of input contains an integer T ($1 \leq T \leq 10^5$), the number of test cases. For each test case:

The first line contains an integer n and q ($1 \leq n, q \leq 10^5$): the number of lines and the number of points.

The i -th of the following n lines contains four integers x_{P_i} , y_{P_i} , x_{Q_i} , and y_{Q_i} : the coordinates of P_i and Q_i such that ℓ_i passes through P_i and Q_i . It is guaranteed that $x_{P_i} \neq x_{Q_i}$ or $y_{P_i} \neq y_{Q_i}$. Any two lines may coincide.

The i -th of the following q lines contains four integers x_{A_i} , y_{A_i} , x_{B_i} , and y_{B_i} : the coordinates of A_i and B_i .

It is guaranteed that the absolute value of all coordinates in the input does not exceed 10^9 .

It is guaranteed that both the sum of n and the sum of q over all test cases do not exceed 10^5 .

Output

For each test case:

For each query, output the distance between $C(A)$ and $C(B)$.

The distance you output will be considered correct if the relative error or absolute error to the jury does not exceed 10^{-9} .

