



## 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  $\ell$  if and only if there exists  $s' \in S$  satisfying that s' and s are symmetric about the line  $\ell$  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  $\ell_1, \ell_2, \ldots, \ell_n$  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  $\ell_i$  for all  $i = 1, 2, \ldots, n$ .

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  $(1 \le T \le 10^5)$ , the number of test cases. For each test case:

The first line contains an integer n and q  $(1 \le n, q \le 10^5)$ : 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  $\ell_i$  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  $10^{-9}$ .





## Examples

standard input	standard output
4	3.162277660168
1 1	1.414213562373
0 0 1 0	0.0000000000
-1 -2 2 1	0.0000000000
2 1	
0 0 1 0	
0 0 0 1	
-1 -2 2 1	
3 1	
0 0 1 0	
0 0 0 1	
0 0 1 1	
-1 -2 2 1	
3 1	
0 0 1 0	
0 0 0 1	
0 0 1 2	
-1 -2 2 1	
5	3.162277660168
1 1	7.810249675907
-8 1 -8 10	7.071067811865
-7 -5 -4 -6	7.211102550928
2 2	0.0000000000
-1 -10 -1 -8	0.0000000000
10 9 9 10	0.0000000000
2 10 -10 5	13.00000000000
-4 4 -3 -3	9.899494936612
3 1	2.236067977500
-5 -10 -5 6	
6 10 8 8	
7 -2 4 -5	
0 -9 -6 -3	
3 3	
9 8 10 7	
1 5 -9 5	
4 -2 -3 -9	
6 6 -6 -8	
2 -7 10 -3	
3 -8 8 -9	
-2 -7 -2 6	
-6 -7 -7 -9	