Problem G. Closest Pair of Segments

Input file:	*standard input*
Output file:	*standard output*
Time limit:	12 seconds
Memory limit:	512 mebibytes

The closest pair of points problem is a well-known problem in computational geometry. In this problem, you are given n points on the Euclidean plane, and you need to find a pair of points with the smallest distance between them.

Now, Claris, the brilliant one who has participated in programming contests for several years, is trying to solve a harder problem named the closest pair of segments problem, which also has a quite simple description as above.

However, the problem seems too hard, even for Claris, and she is asking you for help.

Now n segments are lying on the Euclidean plane. You have to pick two different segments, and then pick a point on each of them. Do it in such a way that the distance between these two points is the minimum possible.

For simplicity, no two given segments share a common point. Also, you don't need to show her the two points: just find the minimum possible distance between them instead.

Input

The input contains several test cases, and the first line contains a single integer T ($1 \le T \le 100$): the number of test cases.

For each test case, the first line contains one integer n ($2 \le n \le 100\,000$), which is the number of segments on the Euclidean plane.

The following n lines describe all the segments lying on the Euclidean plane. The i-th of these lines contains four integers, x_1, y_1, x_2, and y_2, describing a segment that connects (x_1, y_1) and (x_2, y_2), where $-10^9 \le x_1, y_1, x_2, y_2 \le 10^9$.

It is guaranteed that, in each test case, the two endpoints of each segment do not coincide, and no two segments share a common point. It is also guaranteed that the sum of n in all test cases does not exceed 100 000.

Output

For each test case, output a line containing a single real number: the answer to the closest pair of segments problem with an absolute or relative error of at most 10^{-6}.

Precisely speaking, assume that your answer is a and and the jury's answer is b. Your answer will be considered correct if and only if $\frac{|a-b|}{\max\{1,|b|\}} \le 10^{-6}$.

Example

standard input	standard output
2 2 0 1 1 2 1 1 2 0 2 0 1 1 2 2 2 3 1	0.707106781185 1.000000000001