

# Problem

## Emergency Pipeline Repair

Time limit: 5 seconds

A severe water leak has been detected in the city's underground utility network! Little Cyan Fish has retrieved the layout of the main water pipelines, which reveals that there are  $n$  aging primary water pipes running beneath the city. In the 2D schematic map, each pipe is modeled as an infinite straight line in the plane.

To quickly seal the leaks and restore the water supply, the city has deployed a new emergency repair system: a retractable robotic repair arm that can be inserted from the surface and extended underground as a straight line segment.

The arm is equipped with smart connectors and can automatically dock and perform on-site sealing and repair, as long as the segment intersects a water pipe, i.e., shares at least one common point with it. However, the cost and mechanical complexity of the repair arm are directly proportional to its length. Moreover, geological constraints limit how far the arm can extend laterally underground.

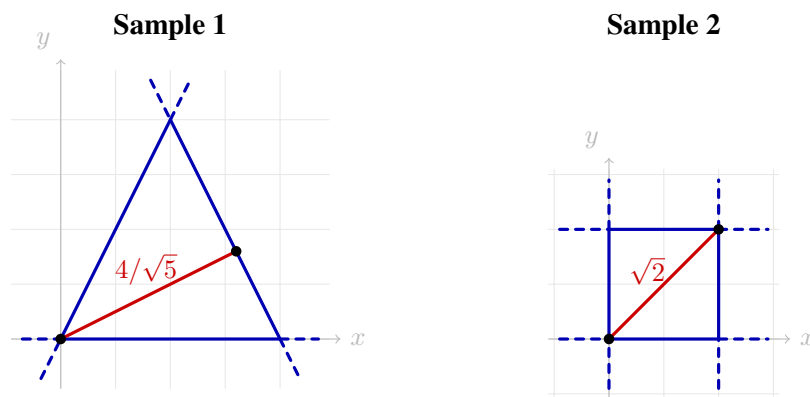


Illustration of the two sample answers.

Therefore, Little Cyan Fish must determine the shortest possible length of such a segment that intersects all  $n$  water pipes. As the lead algorithm engineer of the city's smart infrastructure division, Little Cyan Fish is urgently tasked with solving this critical geometric optimization problem.

### Input

There are multiple test cases. The first line of the input contains a single integer  $T$  ( $1 \leq T$ ), indicating the number of test cases.

For each test case, the first line contains an integer  $n$  ( $1 \leq n \leq 10^5$ ), indicating the number of pipes. Each of the following  $n$  lines contains four integers  $x_1, y_1, x_2, y_2$  ( $-10^3 \leq x_1, y_1, x_2, y_2 \leq 10^3, (x_1, y_1) \neq (x_2, y_2)$ ), indicating a pipe passing through the points  $(x_1, y_1)$  and  $(x_2, y_2)$ .

It is guaranteed that the sum of  $n$  over all test cases does not exceed  $10^5$ .

### Output

For each test case, output a line containing a real number, indicating the shortest length of such a segment that intersects all  $n$  water pipes.

Your answer is acceptable if its absolute or relative error does not exceed  $10^{-6}$ . Formally speaking, suppose that your output is  $a$  and the jury's answer is  $b$ , and your output is accepted if and only if  $\frac{|a-b|}{\max(1,|b|)} \leq 10^{-6}$ .

**Sample Input 1****Sample Output 1**

3	1.788854381948
3	1.414213562373
0 0 2 0	0
2 0 1 2	
1 2 0 0	
4	
0 0 1 0	
1 0 1 1	
1 1 0 1	
0 1 0 0	
1	
0 0 1 1	