

# Computational Intelligence

Input file:            **standard input**  
Output file:         **standard output**  
Time limit:          1.5 seconds  
Memory limit:       1024 megabytes

Given two straight line segments on a two-dimensional Cartesian plane, you need to pick a point uniformly at random on each of them and calculate the expected Euclidean distance between the two picked points.

## Input

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

The first line contains four integers  $x_1, y_1, x_2$  and  $y_2$  ( $-10^3 \leq x_1, y_1, x_2, y_2 \leq 10^3$ ) indicating that the two endpoints of the first segment are  $(x_1, y_1)$  and  $(x_2, y_2)$ .

The second line contains four integers  $x_3, y_3, x_4$  and  $y_4$  ( $-10^3 \leq x_3, y_3, x_4, y_4 \leq 10^3$ ) indicating that the two endpoints of the second segment are  $(x_3, y_3)$  and  $(x_4, y_4)$ .

It is guaranteed that the two segments both have positive lengths.

## Output

For each test case, output one line containing one number indicating the expected distance between the two randomly picked points.

Your answer will be considered correct if its absolute or relative error does not exceed  $10^{-9}$ . Formally speaking, suppose that your output is  $a$  and the jury's answer is  $b$ , your output is accepted if and only if  $\frac{|a-b|}{\max(1, |b|)} \leq 10^{-9}$ .

## Example

standard input	standard output
3	0.3333333333333333
0 0 1 0	0.765195716464212691
0 0 1 0	1.076635732895178009
0 0 1 0	
0 0 0 1	
0 0 1 0	
0 1 1 1	

## Note

Thanks to “Computational Intelligence”, we can know that:

For the first sample case, the expected distance is

$$\int_0^1 \int_0^1 |x_0 - x_1| dx_0 dx_1 = \frac{1}{3} \approx 0.3333333333333333;$$

For the second sample case, the expected distance is

$$\int_0^1 \int_0^1 \sqrt{x^2 + y^2} dx dy = \frac{\sqrt{2} + \ln(1 + \sqrt{2})}{3} \approx 0.765195716464212691;$$

For the third sample case, the expected distance is

$$\int_0^1 \int_0^1 \sqrt{(x_0 - x_1)^2 + 1} dx_0 dx_1 = \frac{2 - \sqrt{2} + 3 \ln(1 + \sqrt{2})}{3} \approx 1.076635732895178009.$$