Problem J. 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 ($1 \le T \le 10^5$) 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 ($-10^3 \le x_1, y_1, x_2, y_2 \le 10^3$) 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 ($-10^3 \le x_3, y_3, x_4, y_4 \le 10^3$) 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 $\frac{|a-b|}{\max(1,|b|)} \le 10^{-9}$.

Example

standard input	standard output
3 0 0 1 0 0 0 1 0 0 0 1 0 0 0 0 1 0 0 1 0 0 1 1 1	0.333333333333333333 0.765195716464212691 1.076635732895178009

Note

Thanks to "Computational Intelligence", we can know that:

For the first sample case, the expected distance is

$$\int_0^1 \int_0^1 |x_0 - x_1| \, \mathrm{d}x_0 \, \mathrm{d}x_1 = \frac{1}{3} \approx 0.333333333333333333;$$

For the second sample case, the expected distance is

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

For the third sample case, the expected distance is

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