Fortress

Input file:	`standard input`
Output file:	`standard output`
Time limit:	6 seconds
Memory limit:	1024 megabytes

In a distant land, there is a fortress. If we represent the orientation using a Cartesian coordinate system, the territory of the fortress can be viewed as a circle centered at the origin with radius R. The boundary of the fortress territory is surrounded by high walls, and it is impossible to see the outside from within the fortress.

Inside the fortress, there are some buildings. For convenience, the boundaries of the buildings are represented by n **possibly overlapping** rectangles whose edges are parallel to the coordinate axes. A point inside the fortress is considered blocked if it strictly lies within any of the rectangles (points on the boundary of the rectangles are not considered to be inside).

Little S is a guard of this fortress. He stands at some unblocked point (x, y) inside the fortress. Little S can guard another point (x', y') inside the fortress if and only if every point on the line segment $(x, y) - (x', y')$ (including the two endpoints) is not blocked. The task is to calculate the area of the set of points that Little S can guard, which represents the area of the fortress land that Little S can oversee.

Input

This problem contains multiple test cases. The first line of 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 two integers R, n ($0 < R \le 10^6, 0 \le n \le 10^5$), representing the radius of the fortress and the number of rectangles.

The next n lines each contain four integers x_1, y_1, x_2, y_2 ($|x_1|, |x_2|, |y_1|, |y_2| \le 10^6, x_1 < x_2, y_1 < y_2$), describing a rectangle, where (x_1, y_1) represents the coordinates of the bottom-left corner and (x_2, y_2) represents the coordinates of the top-right corner. It is guaranteed that all rectangles are strictly within the fortress territory and do not touch the boundary of the territory.

The last line contains two integers x, y ($|x|, |y| \le 10^6, x^2 + y^2 < R^2$), representing the coordinates of Little S. It is guaranteed that the point (x, y) is not blocked.

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

Output

For each test case, output a single line with a real number representing the area of the set of points that Little S can guard within the fortress.

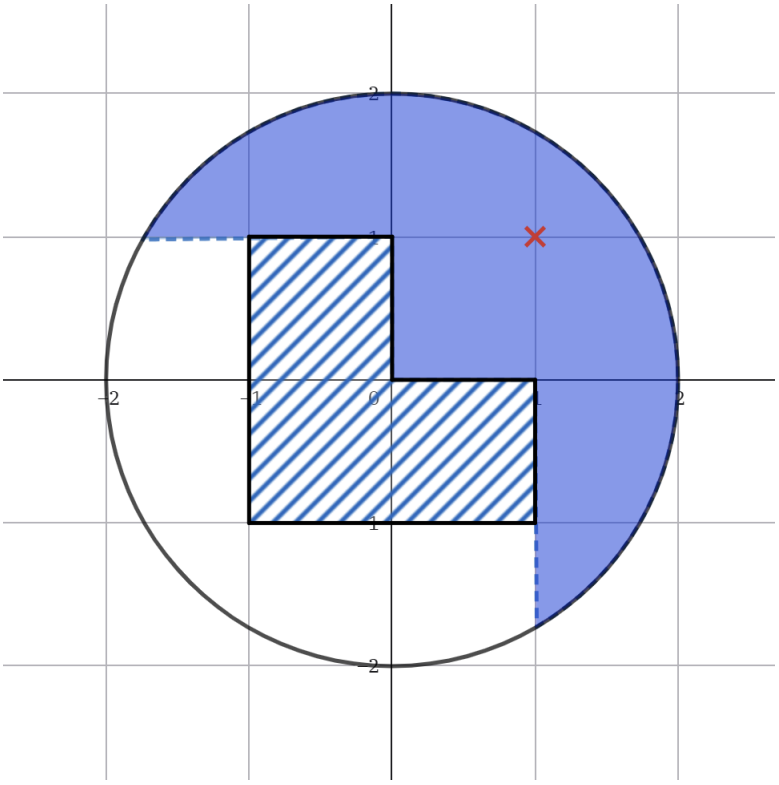
The answer will be considered correct if the relative or absolute error compared to the standard answer is less than 10^{-6}. In other words, if your output is a and the standard answer is b, your output is considered correct if and only if $\frac{|a-b|}{\max(1,b)} \le 10^{-6}$.

Example

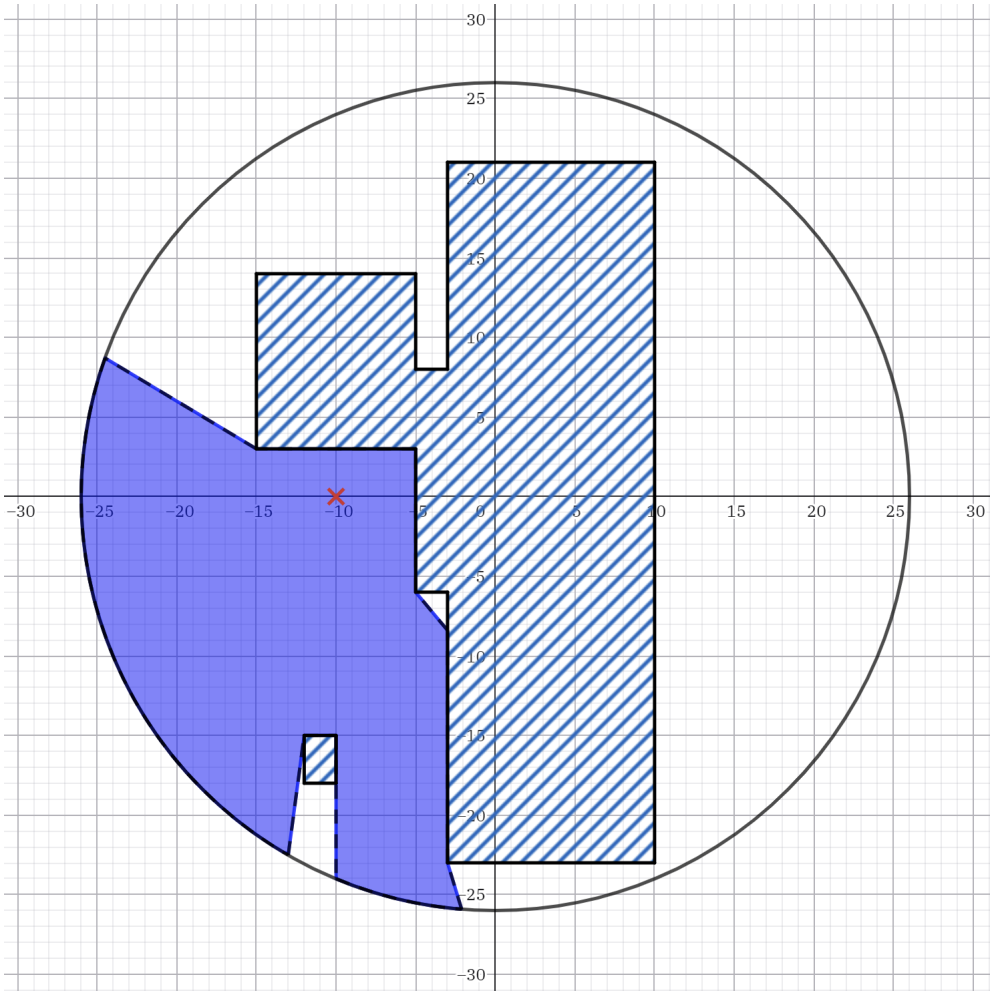
standard input	standard output
2 2 3 -1 -1 0 0 -1 -1 0 1 0 -1 1 0 1 1 26 5 -3 -23 10 21 -15 3 -5 14 -12 -18 -10 -15 -5 -6 -2 8 7 -23 10 -19 -10 0	5.598332050807308 513.142778328943998

Note

For the first test case, the corresponding image is as follows:



For the second test case, the corresponding image is as follows:


30
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