



Downsizing

Renowned biologist Nathaniel Zacharias Patrice Chalmers has found a solution to pest control in Kapiti island. Instead of trying to keep predators outside of the island, he is going to relocate all predators into Kapiti island! More precisely, he has found a way to teleport regions of land (both bounded and unbounded) to a bounded set of points inside a finite circular cell. He explains his process as follows.

Assume a circular cell of radius r is centred at a point O . Let P be any point not in the interior of the cell, and suppose the line $\overline{OP}$ intersects the cell's boundary at the point B . Then point P is teleported to a point P' lying on this line, where $\text{length}(\overline{OP}) \cdot \text{length}(\overline{OP'}) = r^2$. (Points along the cell boundary are teleported to themselves.) Figure 1 shows how a pentagonal enclosure is teleported to the shaded area within the circle; sample points O , P , P' , and B are identified in the figure to illustrate the teleportation rule.

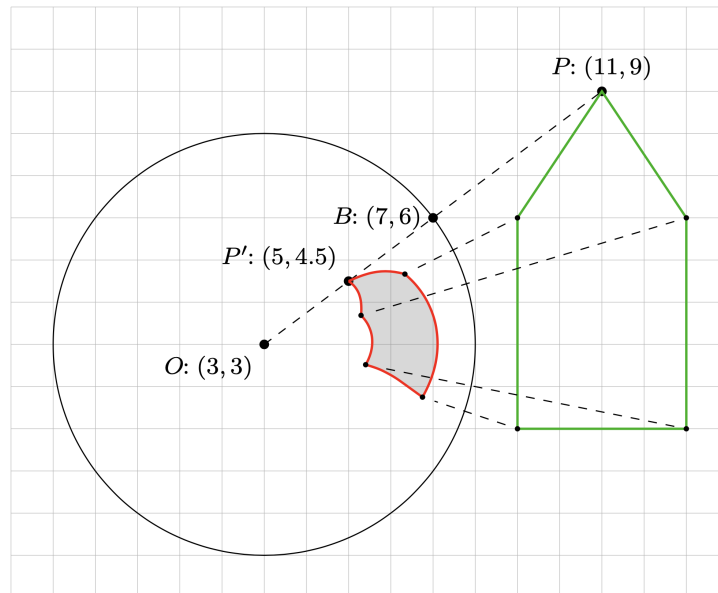


Figure 1: Sample input 1, illustrating the downsizing process

Given a convex polygonal shape not containing any interior point of the cell, Nathaniel would like to know the area of the corresponding teleported shape. Can you help?

Input

The first line contains three integers x_0 , y_0 , and r ($-10^4 \leq x_0, y_0 \leq 10^4$, $1 \leq r \leq 10^4$), specifying the centre of the circular cell and its radius. (The entire circular cell lies within the specified bounds.)

The second line contains a positive integer n , $3 \leq n \leq 100$, followed by n pairs of integers $x_1, y_1, x_2, y_2, \dots, x_n, y_n$, $-10^4 \leq x_i, y_i \leq 10^4$, giving the vertices of a convex polygon with n vertices in counterclockwise order.



New Zealand Programming Contest

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Output

Output the area of the region of the cell corresponding to the polygonal region in the input. Your answer should be correct to a relative or absolute error of 10^{-6} . Refer to the contest instructions if you do not know what this means.

Sample Input 1

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3 3 5
5 11 9 9 6 9 1 13 1 13 6
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Sample Output 1

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4.112904
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