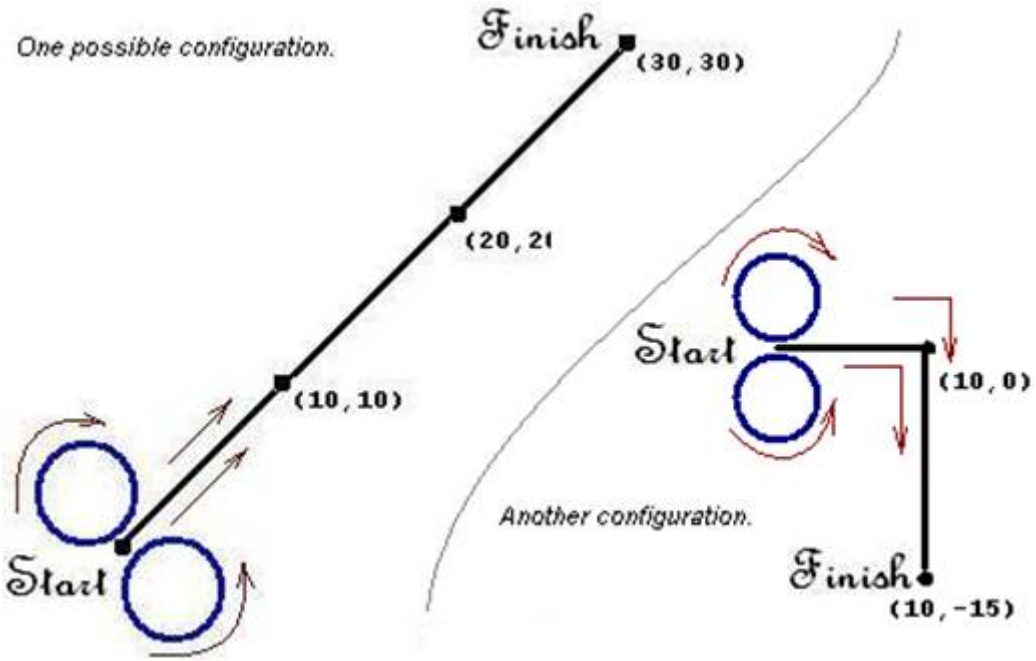
4113 Race in Flatland

In Edwin A Abbott's 'Flatland,' the 3rd spatial dimension of height (or, depth) is completely missing. Thus, there, you have lines, you have polygons, and you have circles but never any cylinders, prisms, pyramids, or spheres. Social classification is guided purely by the number of sides: the more the sides one has, the higher one's hierarchical position and respect in the society. Thus, triangles exist below squares in the social status, and squares below octagons. Circles, by virtue of their having infinite number of sides, are considered to be the most evolved of all beings in flatland. [No matter where or how one touches these circles, one cannot find any 'rough edges' or 'sharp corners' in their personalities! They are sort of the 'perfect angels' of the flatland.]

Now, a unique race is once organized by these flatlanders. Two of the most socially reclusive circles of the time have been requested to contend in the race for the delight and entertainment of all. The race is to consist of a velcro wall, constructed using a series of contiguous, straight-line segments. Draped in their velcro costume especially designed for the race, the two contending circles are to stand on either side of this wall and are to race from one end of the wall to the other, as fast as they can, by spinning themselves against their side of the wall. Slipping and coming off the wall at any time is disallowed!



On D-day, as all are eagerly waiting for the race to start, a programmer flatlander suddenly jumps up∗ from his seat and calls on everyone to halt the race! There is a possible flaw in the rules and structure of this race, he yells out. Depending upon the construction of the wall, one of the circles may unfairly be covering a longer distance, he points out to everyone's shock and awe.

Your task is to team up with this programmer and devise a program that, given the specification of the wall and that of the contenders, calculates the unfair distance advantage one contender possibly has over the other.

You may assume the following:

1. The contenders are identical in size.

2. The wall is built out of one or more contiguous line segments without forming any loops.
3. Each wall segment is longer than the diameter of the contender.
4. The wall is such that at any given time, a contender touches either only one wall segment, or a wall segment and either of its contiguous neighbors.
5. Contenders start the race at their first tangential point of contact with the first wall segment. To finish the race, they must both reach the last tangential point of contact with the last segment of the wall.
6. The wall is such that neither contender can escape touching every wall segment in his race to the finish.
7. Any change in the direction of forward motion happens instantaneously.
8. The wall has zero thickness.

Consequently, topologies such as the ones illustrated in figures 2 to 7 may be safely ruled out from consideration.

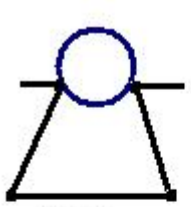


Figure 2

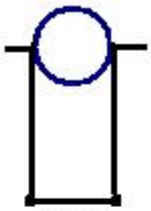


Figure 3


Figure 4

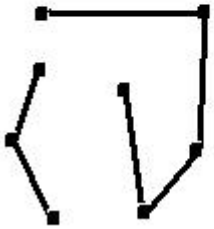


Figure 5

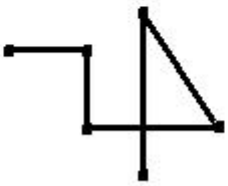


Figure 6

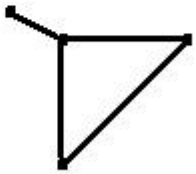


Figure 7

With the exception of the final result, use 8-byte floating point arithmetic in all your intermediate calculations. The final result must be rounded off and output as a non-negative integer.

Input

There may be multiple specification sets in the input. Each specification set is followed by a blank line.

Within each specification set...

The first line holds the radius, R ($0 < R < 501$), of each of the contending circles.

The second line holds the count, N ($1 < N < 101$), of 2D-coordinates that are to follow this line.

The next N lines carry the coordinates; each 2D-coordinate is on a line by itself. The velcro wall is constructed by connecting the 2D-coordinates with straight-lines such that coordinate i is connected with coordinate $i + 1$, coordinate $i + 1$ with $i + 2$ ... and finally, coordinate $N - 1$ with coordinate N.

Each 2D-coordinate is a pair of numbers denoting the x and the y values, respectively, of a position in the XY plane. ($|x|$ and $|y| < 100001$)

The radius and the coordinate values are rational numbers, with up to 4 decimal digits.

Output

For every specification set in the input, your program must output the distance advantage one contender has over the other. Each such result must be a non-negative integer arrived at by a rounding-off process such that it renders 1.1 and 1.99 as 1 and 2 respectively. Each result must be on a line by itself. A blank line must follow each result line.

Note: ∗ The programmer flatlander does the equivalent of 'jumping up' in his seat, as no one can really jump 'up' or 'down' in Flatland.

Sample Input

```
3.7600
3
10 10
20 20
30 30

4.4950
4
10.1 0
0 10.1
10.1 20.2
0 30.3

2
3
0 0
10 0
10 -15

241
4
0 0.0
1000.0 0
2000.0 1000.0
1000 2000
```

Sample Output

```
0

0

4

682
```