

4651 Border Conflict

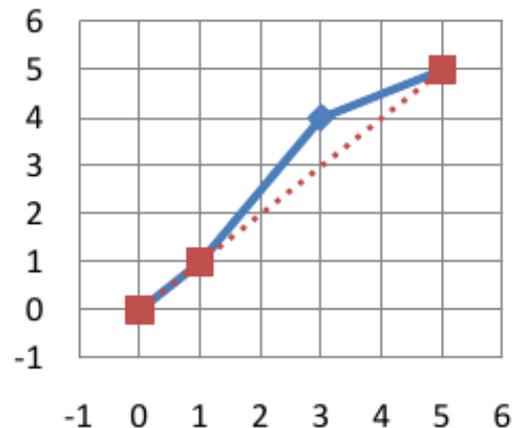
Irvanistan and Jikjikestan are two neighboring countries that have fought several wars with many casualties over their border dispute. Despite the loss of lives in the scale of tens of thousands, none of their border claims have been accepted by the other party.

Recently, the logical leaders who have gained control of both countries have accepted the United Nations proposal to resolve their border dispute. The proposal is to come up with a shorter and simplified version of the border that is calculated by a fair computer program.

To describe the problem accurately, let the current border P be a set of non-crossing line segments each connecting two border points. Let p_0, p_1, \dots, p_N be these border points; i.e., P is exactly composed of the line segments connecting p_i and p_{i+1} , for $0 \leq i < N$.

The UN suggests to create a new border C with points c_0, c_1, \dots, c_K , in such a way that $c_0 = p_0$ and $c_K = p_N$ and the following constraints are satisfied.

1. Each point c_i should be one of the points p_0, \dots, p_N . Obviously, if $c_t = p_r$ and $c_{i+1} = p_s$, then $s > r$.
2. Each point p_i should have a distance of at most some given number D from C . The distance of p_i from C is defined as the distance from p_i to the closest point on C . Note that, the line segment drawn from p_i to the closest point on C , is always perpendicular to C .



Your task is to find a new border C with the shortest possible length, while adhering to the above constraints.

Input

There are multiple test cases in the input. The first line of each test case contains N ($2 \leq N \leq 100$), the number of points followed by D ($0 \leq D \leq 500$). Each of the next N lines contains two integers x_i, y_i ($-10000 \leq x_i, y_i \leq 10000$) which are the coordinates of the point p_i . Note that the point coordinates are increasing; i.e. $x_i < x_{i+1}$ and $y_i < y_{i+1}$. The input terminates with a line containing '0'.

Output

For each test case write a single line containing the shortest possible length of the new border with exactly two digits after the decimal point.

Sample Input

```
4 3
1 1
2 2
4 5
6 6
3 0
```

1 1
5 4
8 8
0 0

Sample Output

7.07
10.00