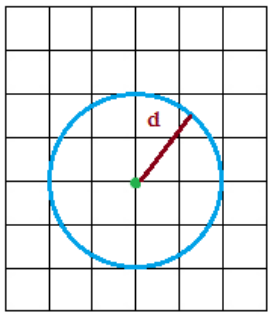
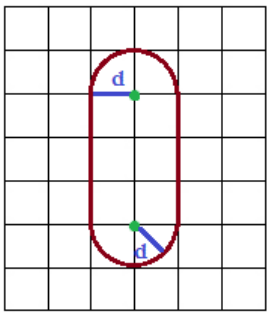
1239 – Convex Fence

I have a land consisting of **n** trees. Since the trees are favorites to cows, I have a big problem saving them. So, I have planned to make a fence around the trees. I want the fence to be convex (curves are allowed) and the minimum distance from any tree to the fence is at least **d** units. And definitely I want a single big fence that covers all trees.

You are given all the information of the trees, to be specific, the land is shown as a 2D plane and the trees are plotted as 2D points. You have to find the perimeter of the fence that I need to create as described above. And you have to minimize the perimeter.



Only one tree, so a circular fence is needed



Two trees, the fence is shown

Input

Input starts with an integer **T (≤ 10)**, denoting the number of test cases.

Each case starts with a line containing two integers **n (1 ≤ n ≤ 50000), d (1 ≤ d ≤ 1000)**. Each of the next lines contains two integers x_i y_i **($-10^8 \le x_i, y_i \le 10^8$)** denoting a position of a tree. You can assume that all the positions are distinct.

Output

For each case, print the case number and the minimum possible perimeter of the fence. Errors less than 10^{-3} will be ignored.

Sample Input	Output for Sample Input
3 1 2 0 0 2 1 0 -1 0 2 3 5 0 0 5 0 0 5	Case 1: 12.566370614 Case 2: 12.2831853 Case 3: 48.4869943478

Note

Dataset is huge, use faster i/o methods.