Programming Exercises AA

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1 Problem 1

Telecom towers are an integral part of the telecom network infrastructure. In fact they are the most expensive to build and the valuations are heavy. The newly started mobile company in Hacker Land built towers to enhance the connectivity of their users. You can assume that the Cartesian coordinate system is used in Hacker Land and the location of tower is given as (x_i, y_i).

After the construction of the towers, the company realized that there are many call drops happening with the users. One identified reason for the frequent call drop was that the pair of towers which are at Euclidean distance were causing destructive interference. To resolve the issue the company decided to destroy some towers such that no two towers are at distance. You have to tell the minimum number of towers that the company need to destroy such that no two towers are at distance d.

Note: The Euclidean distance between points (x_1, y_1) and (x_2, y_2) is the length of the line segment connecting them, which is same as

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Constraints:

- $2 \leq n \leq 10^4$
- $1 \leq d \leq 200$
- $1 \leq x_i, y_i \leq 200$
- There are no two towers with the same location.

Input Format:

The first line contains two space-separated integers n and d denoting the number of telecom towers constructed initially and the distance which causes destructive interference respectively.

Next n lines contains two-space separated integers denoting the (x_i and y_i location of the towers.

Output Format:

Print a single line denoting the minimum number of towers that should be destroyed such that no two towers are separated by distance Example:

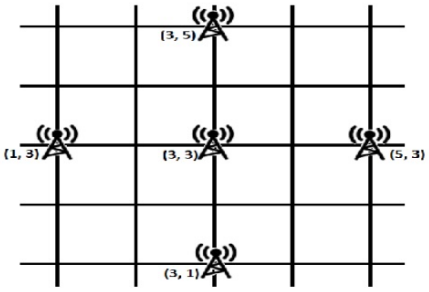

Figure 1: Towers

```
Sample input:
5 2
1 3
3 1
3 3
3 5
5 3

Sample output:
1
```

The Figure 1 shows the location of the towers, We can destroy the tower at $(3, 3)$

2 Problem 2

At the beginning of spring all the sheep move to the higher pastures in the mountains. If there are thousands of them, it is well worthwhile gathering them together in one place. But sheep don't like to leave their grass-lands. Help the shepherd and build him a fence which would surround all the sheep. The fence should have the smallest possible length! Assume that sheep are negligibly small and that they are not moving. Sometimes a few sheep are standing in the same place. If there is only one sheep, it is probably dying, so no fence is needed at all...

Input
t [the number of tests ≤ 100]
[empty line]
n [the number of sheep ≤ 100000]
$x_1 y_1$ [coordinates of the first sheep]
...
$x_n y_n$
[integer coordinates from -10000 to 10000]

[empty line]
[other lists of sheep]

Text grouped in [ ] does not appear in the input file. Assume that sheep are numbered in the input order.

Output

o [length of circumference, rounded to 2 decimal places]

$p_1 p_2 \ldots p_k$

[the sheep that are standing in the corners of the fence; the first one should be positioned bottommost and as far to the left as possible, the others ought to be written in anticlockwise order; ignore all sheep standing in the same place but the first to appear in the input file; the number of sheep should be the smallest possible]

[empty line]

[next solutions]

Example

```
Sample input:
8

5
0 0
0 5
10 5
3 3
10 0

1
0 0

3
0 0
1 0
2 0

4
0 0
0 0
0 1
1 0

3
0 0
0 1
1 0

6
```

```
0 0
-1 -1
1 1
2 2
3 3
4 4

2
10 0
0 0

7
-3 -4
2 -3
4 3
-4 2
0 5
2 -3
-1 4
```

Sample output:

```
30.00
1 5 3 2

0.00
1

4.00
1 3

3.41
1 4 3

3.41
1 3 2

14.14
2 6

20.00
2 1

26.98
1 2 3 5 4
```