

## Marsh Causeway

The International Marshland Society is very interested in unique marsh habitats in tropical parts of Central America which had only recently formed due to the quickly rising sea levels. Biologists working in one such marsh had discovered and described some endemic plants with special biochemistry properties which may stimulate fruitful genetic research in the future.

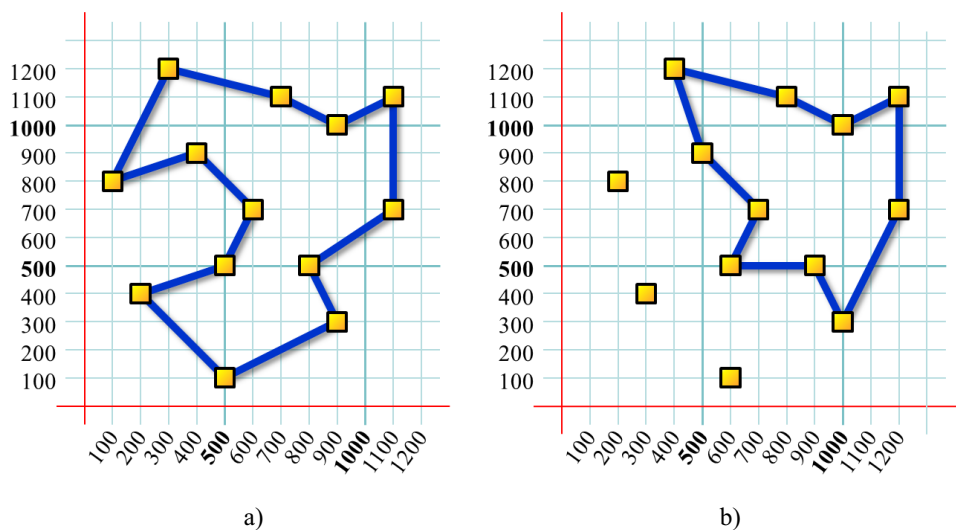
The plants tend to concentrate in small isolated areas or patches which typically measure few decimeters across and which scientists call sites. To be able to monitor closely the development of the sites the Society proposed to build a modern circular wooden causeway connecting some of the sites, maybe all of them.

The causeway will consist of straight segments, each segment will connect two sites. Each site connected by the causeway will be at the end of exactly two segments. The causeway should not intersect itself, neither at a site nor at any other point.

For various environmental reasons, the length of the entire causeway should not exceed a given length limit  $D$ . On the other hand, the causeway should connect as many sites as possible.

Among all possible causeways which length is less or equal to  $D$  and which connect maximum number of sites, only those of minimum length should be considered and those are called **optimal causeways**.

The sites are of roughly equal importance, therefore there is no priority regarding which sites should be connected if the length limit  $D$  prevents construction of a causeway connecting all sites.



**Image 1.** Schemes of sites connected by the causeway projected on the rectangular grid.

Scheme a) corresponds to Example 1, scheme b) corresponds to Example 2.

In both cases the site locations are the same, the causeway length limit  $D$  is 4400 in case a) and 3400 in case b). The causeways depicted here are optimal in the sense described in the text.

### The task

You are given the coordinates of the botanical sites and the causeway length limit  $D$ . An optimal causeway  $C$  satisfies conditions:

1.  $C$  connects maximum possible number of sites, it does not intersect itself and its length does not exceed  $D$ .
2. Length of  $C$  is minimal among all causeways which satisfy condition 1.

Find the length of an optimal connected causeway.

### Input

The input contains several text lines. The first line contains two integer values  $N$ ,  $D$  separated by space. Value  $N$  is the total number of botanical sites in the marsh,  $D$  is the causeway length limit expressed in meters.

Next, there are  $N$  lines, each line specifies one site. The line contains two integers, separated by space, which represent the  $x$  and  $y$  coordinates (in this order) of a site expressed in meters. The order of sites in the input is arbitrary.

The value of  $N$  does not exceed 15, the value of  $D$  does not exceed 50000. All site coordinates are positive and less than 20000.

### Output

The output contains single text line with one value representing the length in meters of the optimal causeway rounded to the nearest bigger integer.

You may assume that the solution exists in all given problem instances.

### Example 1

#### Input

```
13 4400
100 800
200 400
300 1200
```

```
400 900
500 100
500 500
600 700
700 1100
800 500
900 300
900 1000
1100 700
1100 1100
```

### Output

```
4302
```

The site locations and the causeway corresponding to Example 1 and its solution are depicted in the Image 1 a).

## Example 2

### Input

```
13 3400
200 800
300 400
400 1200
500 900
600 100
600 500
700 700
800 1100
900 500
1000 300
1000 1000
1200 700
1200 1100
```

### Output

```
3054
```

The site locations and the causeway corresponding to Example 2 and its solution are depicted in the Image 1 b).

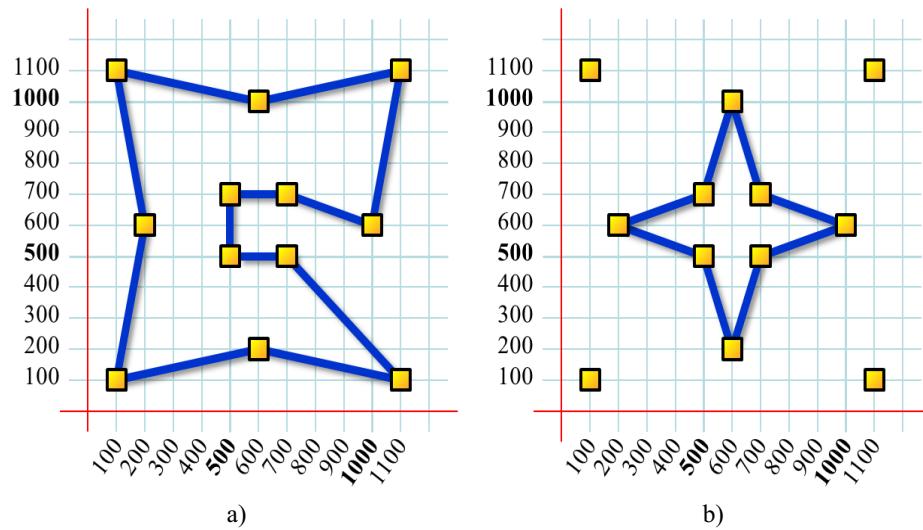
## Example 3

### Input

```
12 6000
100 100
1100 100
1100 1100
100 1100
600 200
700 500
1000 600
700 700
600 1000
500 700
200 600
500 500
```

### Output

```
5052
```



**Image 2.** Schemes of sites corresponding to a) Example 3 and b) Example 4. In both cases the site locations are the same, the causeway length limit  $D$  is 6000 in case a) and 3000 in case b). The causeways depicted here are optimal in the sense described in the text.

## Example 4

### Input

```
12 3000
100 100
1100 100
1100 1100
100 1100
600 200
700 500
1000 600
700 700
600 1000
500 700
200 600
500 500
```

### Output

```
2530
```

## Public data

The public data set is intended for easier debugging and approximate program correctness checking. The public data set is stored also in the upload system and each time a student submits a solution it is run on the public dataset and the program output to stdout and stderr is available to him/her.

[Link to public data set](#)