ECE30017, Fall 2021
Problem Solving through Computational Thinking

Week 13

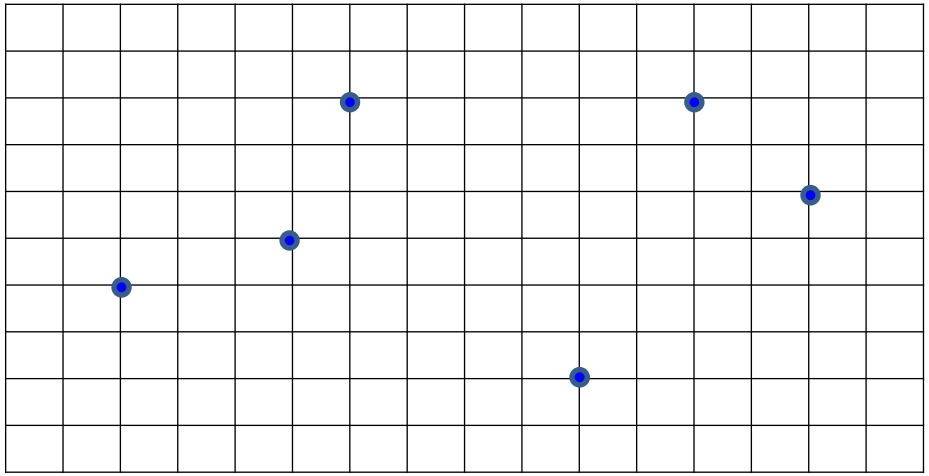
- **C10. Chinese or Pizza**
  Deadline: 11:59 PM, 26 November (Fri)
- **P10. Shiritori**
  Deadline: 11:59 PM, 30 November (Tue)

C10. Chinese or Pizza

You are franchisor of two restaurant brands, one for Pizza house and the other for Chinese restaurant. You also owns *N* bulidings in a city of course.

You want to open a restaurant with one of your brands on every building of your own. To maximize benefit, you do not open a restaurant of a brand if another restaurant of the same brand exists within 5 miles in Euclidean distance. Given *N* positions of buildings on a 2-D plane, there may exist various possible combinations of restaurants and buildings.

Write a program that receives the positions of *N* buildings and find out the minimum number of restaurants that a brand can open in all possible combinations.



```
A: (2, 4)
B: (5, 5)
C: (6, 8)
D: (10, 2)
E: (12, 8)
F: (14, 6)
```

Suppose that there are six buildings placed as above.

There are eight possible combinations of brands and buildings:

(Chinese: {A, C, E}, Pizza: {B, D, F}), (Chinese: {B, D, F}, Pizza: {A, C, E}),
(Chinese: {A, C, F}, Pizza: {B, D, E}), (Chinese: {B, D, E}, Pizza: {A, C, F}),
(Chinese: {A, C, D, F}, Pizza: {B, E}), (Chinese: {B, E}, Pizza: {A, C, D, F}),
(Chinese: {A, C, D, E}, Pizza: {B, F}), (Chinese: {B, F}, Pizza: {A, C, D, E})

Among these combinations, at least two buildings are chosen for a brand.

Input

- Input is given as text via the standard input
- The first line has one integers N for $1 \leq N \leq 50000$.
- From the second to the (N+1)-th lines, each line has two integers x_i and y_i for $1 \leq x_i \leq 500000$ and $1 \leq y_i \leq 500000$ that represents the position of the i-th building in mile.

Output

- Print the minimum number of restaurants that a brand can open. Your program should return the answer within 1.0 second.

Test case example

Input 1

```
6
2 4
5 5
6 8
10 2
12 8
14 6
```

Output 1

```
2
```

Input 2

```
2
20 20
60 40
```

Output 2

```
0
```

C10 Teams

1001	이인석	이수아
1002	정성목	최시령
1003	박건희	강석운
1004	이혜림	김해린
1005	박은찬	김영표
1006	전영우	홍순규
1007	차경민	이찬효
1008	남진우	권혁찬
1009	강동인	

P10. Shiritori

Shiritori is a game to enumerate words such that the last letter of a proceeding word appears at the beginning of the succeeding word.

For a given set of words, you want to find a scenario of Shiritori where every word appears exactly once, and the resulting word sequence is least among all feasible Shiritori scenarios in lexicographical order.

Write a program that finds such a solution for a given set of words.

Input

- The input is given via standard input.
- The first line has an integer N for $3 \leq N \leq 1000$ representing the number of words.
- From the second to the (N+1)-th line, a word is given. Each word consists of only lowercase alphabet letters. The length of a word does not exceed 20.

Output

- The output must be printed via standard output.
- Print a word in a line in the solution sequence. If there is no possible solution, print one line containg a zero.

Test cases

Input 1

```
6
alabama
around
trigger
drawing
gambler
rocket
```

Output 1

```
alabama
around
drawing
gambler
rocket
trigger
```

Input 2

```
3
playlist
fever
radio
```

Output 2

```
0
```