A My Cousin Obama

Problem

When Barack Obama was elected president of the United States of America, the city of Leiden was proud to announce that his ancestors Thomas Blossom and Anne Eldson had lived in Leiden between 1609 and 1629. They were members of over 125 protestants which had fled from England to Holland, seeking religious freedom, and which later became known as the 'Pilgrim Fathers'. Father and son Bush (earlier presidents of the USA) were descendants from the same Leiden couple.

Of course, we wish Leiden joy of having a relation with Barack Obama, but Leiden is probably not the only city in the world with such a relation. Given that every person has two (biological) parents, and that you get a new generation every, say, thirty years, Barack Obama probably has several thousands of ancestors from the early seventeenth century.

It would be more interesting if the relation of Obama with Leiden would be entirely along the male line of ancestry.[1] This is not the case: Obama's father is from Kenia, and in fact, the line towards Thomas Blossom and Anne Eldson started from Obama's mother.

In general, when some person A_0 descends from some person B_0 living centuries ago, there is not necessarily a unique line of ancestry. Far relatives may get married without even knowing that they are relatives. In such a case, it would be interesting to find the line of ancestry from A_0 to B_0 containing as few women as possible.

You are asked to find this line of ancestry, from a database with ancestor information. In particular, you are asked for the smallest *number* of women on a line of ancestry from A_0 to B_0. For the sake of simplicity, the database does not contain real names, but numbers between 1 and a certain maximum N to identify individuals.

Input

The input consists of a single test case, satisfying the following format:

- One line with one integer N, satisfying $2 \leq N \leq 100,000$: the number of persons in the database.
- One line with two different integers A_0 and B_0, satisfying $1 \leq A_0, B_0 \leq N$: the ID numbers of the two persons we are interested in.
- N lines, each with two integers f and m, satisfying $0 \leq f, m \leq N$. The integers on line i are the ID numbers of the father (f) and the mother (m) of the person with ID number i. An ID number $f = 0$ (or $m = 0$) indicates that the father (or mother) of person i is not known.

Integers on the same line are separated by single spaces.

The integers f and m on the N lines are gender-consistent: no person is registered both as father and as mother (of the same or different persons).[2] We do not assume age limits; for example, a man and a woman who are ten generations apart, may have a child together. Of course, the ancestor information in the input does not describe cycles.

Output

The output should contain a single line containing a single integer: the smallest number of women on a line of ancestry from A_0 to B_0 (not counting A_0 and B_0 if either of them is a woman) if B_0 is an ancestor of A_0 according to the database, or containing the string `"no ancestor"` otherwise.

[1] We apologize, if people feel offended by this traditional view on the role of men and women in a line of ancestry.
[2] We apologize if people feel offended by this traditional view on the sex of a person.

Sample Input 1

```
23
1 8
2 0
3 15
9 4
5 10
11 6
0 7
8 0
0 0
0 0
0 0
12 14
13 0
0 0
0 0
16 23
17 20
0 18
19 0
12 7
21 0
22 0
8 0
0 0
```

Sample Output 1

```
2
```

Sample Input 2

```
9
2 9
5 2
3 4
0 0
0 0
6 7
0 0
8 9
0 0
0 0
```

Sample Output 2

```
no ancestor
```

B Digital Friends

Problem

Two positive integers are called *friends* if they consist of the same decimal digits. So 123 and 32331313323213 are friends, but 123 and 22121221 are not.

Two positive integers (that are not friends) are called *almost friends* if a single neighbour exchange in one of them results in a pair of friends. A *neighbour exchange* changes two neighbouring digits a and b into $a-1$ and $b+1$, or into $a+1$ and $b-1$, provided that these new digits are still in the range $0 \ldots 9$, and that no leading zero is generated. So 123 and 2223042 are almost friends (let $04 \to 13$), and 137 and 470 are neither friends nor almost friends (note that $13 \to 04$ is not allowed).

The problem is to determine if two given integers are friends or almost friends.

Input

The input consists of a single test case, satisfying the following format:

- One line with two integers x and y, separated by a single space, with $0 < x, y < 10^{100}$. Both integers start with a non-zero digit.

Output

The output should contain a single line containing the string `"friends"` or `"almost friends"` or `"nothing"`, reflecting the property of the two given integers.

Sample Input 1

```
123 32331313323213
```

Sample Output 1

```
friends
```

Sample Input 2

```
123 22121221
```

Sample Output 2

```
almost friends
```

Sample Input 3

```
123 2223042
```

Sample Output 3

```
almost friends
```

Sample Input 4

```
137 470
```

Sample Output 4

```
nothing
```

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C Evacuation

Problem

Fires can be disastrous, especially when a fire breaks out in a room that is completely filled with people. Rooms usually have a couple of exits and emergency exits, but with everyone rushing out at the same time, it may take a while for everyone to escape.
You are given the floorplan of a room and must find out how much time it will take for everyone to get out. Rooms consist of obstacles and walls, which are represented on the map by an `'X'`, empty squares, represented by a `'.'` and exit doors, which are represented by a `'D'`. The boundary of the room consists only of doors and walls, and there are no doors inside the room. The interior of the room contains at least one empty square.
Initially, there is one person on every empty square in the room and these persons should move to a door to exit. They can move one square per second to the North, South, East or West. While evacuating, multiple persons can be on a single square. The doors are narrow, however, and only one person can leave through a door per second.
What is the minimal time necessary to evacuate everybody? A person is evacuated at the moment he or she enters a door square.

Input

The input consists of a single test case, satisfying the following format:

- One line with two integers Y and X, separated by a single space, satisfying $3 \leq Y, X \leq 12$: the size of the room.
- Y lines with X characters, each character being either `'X'`, `'.'` or `'D'`: a valid description of a room.

Output

The output should contain a single line containing: either a single integer: the minimal evacuation time in seconds, if evacuation is possible, or `"impossible"`, if it is not.

Sample Input 1

```
5 5
XXDXX
X...X
D...X
X...D
XXXXX
```

Sample Output 1

```
3
```

Sample Input 2

```
5 12
XXXXXXXXXXXX
X..........D
X.XXXXXXXXX
X..........X
XXXXXXXXXXXX
```

Sample Output 2

```
21
```

Sample Input 3

```
5 5
XDXXX
X.X.D
XX.XX
D.X.X
XXXDX
```

Sample Output 3

```
impossible
```

D Farmer John

Problem

Farmer John owns a lot of cows that graze in the fields and walk around happily. However, cow Bessie is very lazy and always takes the shortest route to the barn to get food. Farmer John wants to give Bessie some more walking exercises, so he placed some extra fences to make sure that Bessie cannot always take the shortest route and has to walk around the fences.
Given the current location of Bessie, the location of the barn with the food, and all locations of the fences (modelled as line segments), farmer John wants you to compute the minimum distance that Bessie has to walk. Bessie is not allowed to cross any fence on her route, but she is allowed to touch the fences.

Input

The input consists of a single test case, satisfying the following format:

- One line with four integers B_x, B_y, F_x and F_y satisfying $-10,000 \leq B_x, B_y, F_x, F_y \leq 10,000$: the location of Bessie and the location of the food.
- One line with one integer N satisfying $0 \leq N \leq 100$: the number of fences.
- N lines, one for each fence, with four integers x_1, y_1, x_2 and y_2 satisfying $-10,000 \leq x_1, y_1, x_2, y_2 \leq 10,000$ and $x_1 \neq x_2$ or $y_1 \neq y_2$: the x- and y-coordinates of the begin and end points of this fence.

Integers on the same line are separated by single spaces. The current location of Bessie and the location of the food will not lie on a fence, and fences will not touch or overlap.

Output

The output should contain a single line containing a single real number, rounded and displayed to six digits after the decimal point: the minimum walking distance.

Sample Input 1

```
0 0 10 0
1
-1 -100 -1 100
```

Sample Output 1

```
10.000000
```

Sample Input 2

```
0 0 10 0
2
-1 -100 -1 100
5 4 5 -6
```

Sample Output 2

```
12.806248
```

Sample Input 3

```
0 0 2 1
1
1 1 1 -1
```

Sample Output 3

```
2.414214
```

E Keylogger

Problem

As a malicious hacker you are trying to steal your mother's password, and therefore you have installed a keylogger on her PC (or Mac, so you like). You have a log from your mother typing the password, but unfortunately the password is not directly visible because she used the left and right arrows to change the position of the cursor, and the backspace to delete some characters. Write a program that can decode the password from the given keylog.

Input

The input consists of a single test case, satisfying the following format:

- One line with a string L, satisfying $1 \leq \mathit{Length}(L) \leq 1,000,000$, consisting of:
  - `'-'` representing backspace: the character directly before the cursor position is deleted, if there is any.
  - `'<'` (and `'>'`) representing the left (right) arrow: the cursor is moved 1 character to the left (right), if possible.
  - alphanumeric characters, which are part of the password, unless deleted later. We assume 'insert mode': if the cursor is not at the end of the line, and you type an alphanumeric character, then all characters after the cursor move one position to the right.

Every decoded password will be of length > 0.

Output

The output should contain a single line containing a single string: the decoded password.

Sample Input 1

```
<<BP<A>>Cd-
```

Sample Output 1

```
BAPC
```

Sample Input 2

```
ThIsIsS3Cr3t
```

Sample Output 2

```
ThIsIsS3Cr3t
```