15-295 Fall 2018 #5
Selection Round 2

Keeping Cool A.

Time limit: 2 seconds
Memory limit: 256 megabytes

Kevin has just gotten back to his car after a morning at the beach and is about to drive away when he realises that he has left his ball somewhere. Thankfully, he remembers exactly where it is! Unfortunately for Kevin, it is extremely hot outside and any sand that is exposed to direct sunlight is very hot. Kevin's pain tolerance allows him to only run for at most k seconds in the hot sand at one time. Kevin runs at exactly 1 meter per second on hot sand.

Scattered around the beach are umbrellas. Each umbrella is a perfect circle and keeps the sand underneath it cool. Each time Kevin reaches an umbrella, he will wait there until his feet cool down enough to run for another k seconds on the hot sand. Note that Kevin will not run more than k seconds in the hot sand at one time, so if two umbrellas are more than k meters apart, Kevin will not run between them.

Determine the minimum amount of time that Kevin must be in the sun in order to retrieve his ball and return back to the car.

Input

The first line of input contains four integers n ($0 \leq n \leq 100$), which is the number of umbrellas, k ($1 \leq k \leq 100$), which is the number of meters that Kevin can run on the hot sand, x ($-100 \leq x \leq 100$) and y ($-100 \leq y \leq 100$), which are the coordinates of the beach ball. Kevin starts at his car at $(0, 0)$. You may treat Kevin and the ball as single points.

The next n lines describe the umbrellas. Each of these lines contains three integers x ($-100 \leq x \leq 100$), y ($-100 \leq y \leq 100$) and r ($1 \leq r \leq 100$). The umbrella is a circle centered at (x, y) with radius r.

There may be multiple items (ball, umbrella(s) or Kevin) at a single location. All measurements are in meters.

Output

Display the minimum amount of time (in seconds) that Kevin must be in the sun. If it is impossible for Kevin to get to the ball and return back to the car, display `-1` instead. Your answer should have an absolute or relative error of less than 10^{-6}.

Examples

test	answer
0 1 0 0	0.0000000000
0 20 1 2	4.4721359550
0 10 20 20	-1
2 2 7 4 6 2 2 2 2 1	6.1289902045
1 2 3 3 0 3 2	4.0000000000

B — Casting Spells

Casting spells is the least understood technique of dealing with real life. Actually, people find it quite hard to distinguish between a real spells like "abrahellehhelleh" (used in the battles and taught at the mage universities) and screams like "rachelhellabracadabra" (used by uneducated witches for shouting at cats).

Finally, the research conducted at the Unheard University showed how one can measure the power of a word (be it a real spell or a scream). It appeared that it is connected with the mages' ability to pronounce words backwards. (Actually, some singers were burned at the stake for exactly the same ability, as it was perceived as demonic possession.) Namely, the power of a word is the length of the maximum subword of the form ww^Rww^R (where w is an arbitrary sequence of characters and w^R is w written backwards). If no such subword exists, then the power of the word is 0. For example, the power of `abrahellehhelleh` is 12 as it contains `hellehhelleh` and the power of `rachelhellabracadabra` is 0. Note that the power of a word is always a multiple of 4.

Multiple Test Cases

The input contains several test cases. The first line of the input contains a positive integer $Z \leq 40$, denoting the number of test cases. Then Z test cases follow, each conforming to the format described in section *Single Instance Input*. For each test case, your program has to write an output conforming to the format described in section *Single Instance Output*.

Single Instance Input

The input is one line containing a word of length at most $3 \cdot 10^5$, consisting of (large or small) letters of the English alphabet.

Single Instance Output

You should output one integer k being the power of the word.

Example

Input	Output
2 abrahellehhelleh rachelhellabracadabra	12 0

C. Hoarse Horses

Farmer Bob's horses all are hoarse and may have a cold - even the pony is a little hoarse! Because of that, all the farm animals need to be individually quarantined. To separate the animals, Farmer Bob has a set of n fences that cannot be crossed. Unfortunately, Farmer Alice has taken all of Farmer Bob's fences and placed them arbitrarily in the plane! Farmer Bob has no time to rearrange these fences - he must leave them as is.

Picture by Alistair Hamilton via Flickr.

Help Farmer Bob calculate how many of his prized barnyard animals he can quarantine. That is, Farmer Bob wants to place as many animals inside non-empty regions enclosed by the fences, such that no animal can reach another animal, and no animal can escape to infinity.

Each fence is given by a line segment between two points. It is given that no three fences go through the same point. Fences are allowed to cross each other.

Input

- A single integer $1 \leq n \leq 1000$, the number of fences.
- Then n lines follow, each with four integers $-10^9 \leq x_1, y_1, x_2, y_2 \leq 10^9$. These are the endpoints of the fences, each fence is given by a straight line segment between two endpoints.

Output

Output a single line containing a single integer c, the maximum number of animals Farmer Bob can quarantine.

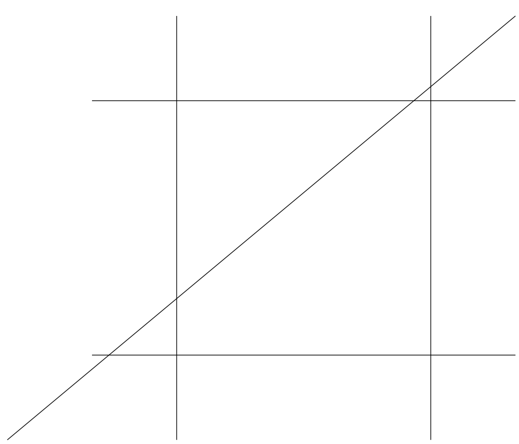


Figure 4: Illustration of the third example input.

Sample Input 1

```
1
1 1 1 2
```

Sample Output 1

```
0
```

Sample Input 2

```
4
1 0 1 5
4 0 4 5
0 1 5 1
0 4 5 4
```

Sample Output 2

```
1
```

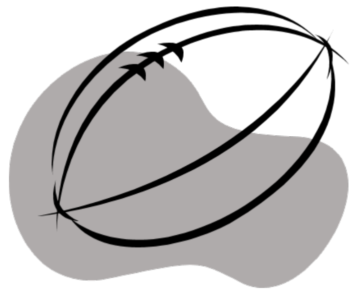
Sample Input 3

```
5
1 0 1 5
4 0 4 5
0 1 5 1
0 4 5 4
-1 0 5 5
```

Sample Output 3

```
4
```

D. Top 25



In college football, many different sources create a list of the Top 25 teams in the country. Since it's subjective, these lists often differ, but they're usually very similar. Your job is to compare two of these lists, and determine where they are similar. In particular, you are to partition them into sets, where each set represents the same consecutive range of positions in both lists, and has the same teams, and is as small as possible. If the lists agree completely, you'll have 25 lists (or n, where n is an input). For these lists:

K&R Poll	Lovelace Ranking
A	A
B	C
C	D
D	B
E	E

You'll have 3 sets:

A

B C D

E

Input

The input will start with a single integer on one line giving the number of test cases. There will be at least one but not more than 100 test cases. Each test case will begin with an integer N, $1 \leq N \leq 1{,}000{,}000$, indicating the number of teams ranked. The next N lines will hold the first list, in order. The team names will appear one per line, consist of at most 8 capital letters only. After this will be N lines, in the same format, indicating the second list. Both lists will contain the same team names, and all N team names will be unique.

Output

For each test case, simply output the size of each set, in order, on one line, with the numbers separated by a single space. Do not output any extra spaces, and do not output blank lines between numbers.

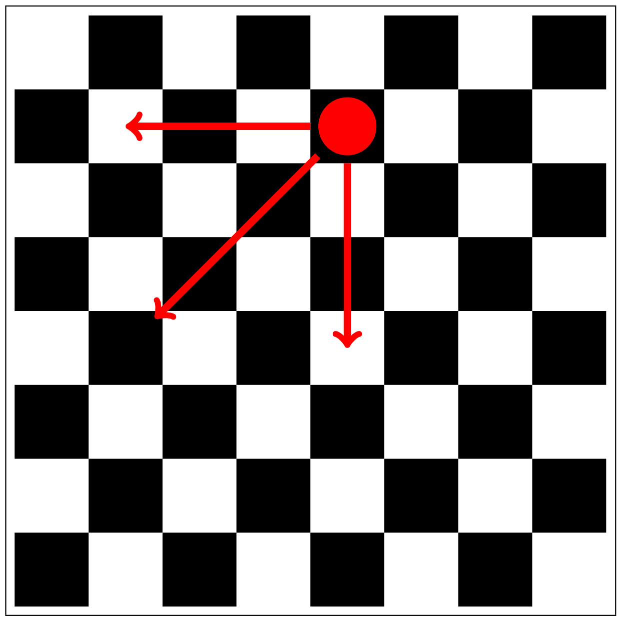
Sample Input	Sample Output

<pre>3
5
A
B
C
D
E
A
C
D
B
E
3
RED
BLUE
ORANGE
RED
BLUE
ORANGE
3
MOE
LARRY
CURLY
CURLY
MOE
LARRY</pre>
	<pre>1 3 1
	1 1 1
	3</pre>

Chessboard Chaos E.

Time limit: 1 second
Memory limit: 64 megabytes

Alice and Britney have acquired a huge chessboard and are playing a new game. To start the game, one token is placed somewhere on the board. Then, Alice and Britney take turns moving the token. On each player's turn, they may move the token some positive number of spots to the left, down or diagonal (left and down).



The winner of the game is the player that moves the token to the bottom-left corner of the board on their turn. Assuming Alice moves first and both players play optimally, who wins?

Input

The input consists of a single line containing two integers r ($1 \leq r \leq 10^6$), which is the row where the token is originally placed, and c ($1 \leq c \leq 10^6$), which is the column where the token is originally placed. The rows are numbered in increasing order from bottom-to-top and the columns are numbered in increasing order from left-to-right, so the bottom-left corner of the board is position $(1, 1)$. The token will never start on position $(1, 1)$.

Output

Display the winner of the game.

Examples

test	answer
2 2	Alice
3 2	Britney

Extending Rock-Paper-Scissors F.

Time limit: 2 seconds
Memory limit: 1024 megabytes

Rock-paper-scissors is a game played between two players, where each player chooses one of three elements: rock, paper or scissors. The rules are simple: rock-beats-scissors, scissors-beats-paper and paper-beats-rock. If the players choose the same element, then they tie. On the television show *The Big Bang Theory*, Sheldon extended rock-paper-scissors to include two extra elements: Lizard and Spock.

The rules are scissors-cuts-paper, paper-covers-rock, rock-crushes-lizard, lizard-poisons-Spock, Spock-smashes-scissors, scissors-decapitates-lizard, lizard-eats-paper, paper-disproves-Spock, Spock-vaporizes-rock and rock-crushes-scissors.

Sheldon's setup is valid since each element beats exactly half of the other elements and loses to the remaining half. Whenever the number of elements is odd, it is possible to find a game that satisfies these criteria. Extend the game to n elements.

Input

The input consists of a single line with one integer n ($3 \le n \le 99$), which is the number of elements. It is guaranteed that n is odd.

Output

Display one valid extension of rock-paper-scissors to n elements. Display exactly $\binom{n}{2} = \frac{n(n-1)}{2}$ lines containing two integers each, b and c ($b \neq c$), indicating that element b beats element c. The elements are numbered $1, 2, \ldots, n$.

For each pair of distinct elements, x and y, exactly one of 'x y' or 'y x' should be displayed. The lines may be displayed in any order. If there are multiple solutions, any one will be accepted.

Examples

test	answer
5	1 2 1 3 2 3 2 4 3 4 3 5 4 5 4 1 5 1 5 2
3	1 2 2 3 3 1