Codeforces Round #425 (Div. 2)

A. Sasha and Sticks

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

It's one more school day now. Sasha doesn't like classes and is always bored at them. So, each day he invents some game and plays in it alone or with friends.

Today he invented one simple game to play with Lena, with whom he shares a desk. The rules are simple. Sasha draws n sticks in a row. After that the players take turns crossing out exactly k sticks from left or right in each turn. Sasha moves first, because he is the inventor of the game. If there are less than k sticks on the paper before some turn, the game ends. Sasha wins if he makes strictly more moves than Lena. Sasha wants to know the result of the game before playing, you are to help him.

Input

The first line contains two integers n and k ($1 \le n, k \le 10^{18}, k \le n$) — the number of sticks drawn by Sasha and the number k — the number of sticks to be crossed out on each turn.

Output

If Sasha wins, print "YES" (without quotes), otherwise print "NO" (without quotes).

You can print each letter in arbitrary case (upper of lower).

Examples

input
1 1
output
YES

input
10 4
output
NO

Note

In the first example Sasha crosses out 1 stick, and then there are no sticks. So Lena can't make a move, and Sasha wins.

In the second example Sasha crosses out 4 sticks, then Lena crosses out 4 sticks, and after that there are only 2 sticks left. Sasha can't make a move. The players make equal number of moves, so Sasha doesn't win.

B. Petya and Exam

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

It's hard times now. Today Petya needs to score 100 points on Informatics exam. The tasks seem easy to Petya, but he thinks he lacks time to finish them all, so he asks you to help with one..

There is a glob pattern in the statements (a string consisting of lowercase English letters, characters "?" and "*"). It is known that character "*" occurs **no more than once** in the pattern.

Also, n query strings are given, it is required to determine for each of them if the pattern matches it or not.

Everything seemed easy to Petya, but then he discovered that **the special pattern characters differ from their usual meaning**.

A pattern matches a string if it is possible to replace each character "?" with one *good* lowercase English letter, and the character "*" (if there is one) with any, including empty, string of *bad* lowercase English letters, so that the resulting string is the same as the given string.

The good letters are given to Petya. All the others are bad.

Input

The first line contains a string with length from 1 to 26 consisting of distinct lowercase English letters. These letters are good letters, all the others are bad.

The second line contains the pattern — a string s of lowercase English letters, characters "?" and "*" ($1 \le |s| \le 10^5$). It is guaranteed that character "*" occurs in s no more than once.

The third line contains integer n ($1 \le n \le 10^5$) — the number of query strings.

n lines follow, each of them contains single non-empty string consisting of lowercase English letters — a query string.

It is guaranteed that the total length of all query strings is not greater than 10^5.

Output

Print n lines: in the i-th of them print "YES" if the pattern matches the i-th query string, and "NO" otherwise.

You can choose the case (lower or upper) for each letter arbitrary.

Examples

input
ab a?a 2 aaa aab
output
YES NO

input
abc a?a?a* 4 abacaba abaca apapa aaaaax
output
NO YES NO YES

Note

In the first example we can replace "?" with good letters "a" and "b", so we can see that the answer for the first query is "YES", and the answer for the second query is "NO", because we can't match the third letter.

Explanation of the second example.

- The first query: "NO", because character "*" can be replaced with a string of bad letters only, but the only way to match the query string is to replace it with the string "ba", in which both letters are good.
- The second query: "YES", because characters "?" can be replaced with corresponding good letters, and character "*" can be replaced with empty string, and the strings will coincide.
- The third query: "NO", because characters "?" can't be replaced with bad letters.

- The fourth query: "YES", because characters "?" can be replaced with good letters "a", and character "*" can be replaced with a string of bad letters "x".

C. Strange Radiation

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

n people are standing on a coordinate axis in points with positive integer coordinates strictly less than 10^6. For each person we know in which direction (left or right) he is facing, and his maximum speed.

You can put a bomb in some point with non-negative integer coordinate, and blow it up. At this moment all people will start running with their maximum speed in the direction they are facing. Also, two strange rays will start propagating from the bomb with speed s: one to the right, and one to the left. Of course, the speed s is strictly greater than people's maximum speed.

The rays are strange because if at any moment the position and the direction of movement of some ray and some person coincide, then the speed of the person immediately increases by the speed of the ray.

You need to place the bomb is such a point that the minimum time moment in which there is a person that has run through point 0, and there is a person that has run through point 10^6, is as small as possible. In other words, find the minimum time moment t such that there is a point you can place the bomb to so that at time moment t some person has run through 0, and some person has run through point 10^6.

Input

The first line contains two integers n and s ($2 \le n \le 10^5$, $2 \le s \le 10^6$) — the number of people and the rays' speed.

The next n lines contain the description of people. The i-th of these lines contains three integers x_i, v_i and t_i ($0 < x_i < 10^6$, $1 \le v_i < s$, $1 \le t_i \le 2$) — the coordinate of the i-th person on the line, his maximum speed and the direction he will run to (1 is to the left, i.e. in the direction of coordinate decrease, 2 is to the right, i.e. in the direction of coordinate increase), respectively.

It is guaranteed that the points 0 and 10^6 will be reached independently of the bomb's position.

Output

Print the minimum time needed for both points 0 and 10^6 to be reached.

Your answer is considered correct if its absolute or relative error doesn't exceed 10^{-6}. Namely, if your answer is a, and the jury's answer is b, then your answer is accepted, if $\frac{|a-b|}{\max(1,|b|)} \le 10^{-6}$.

Examples

input
2 999 400000 1 2 500000 1 1
output
500000.000000000000000000000000000000

input
2 1000 400000 500 1 600000 500 2
output
400.000000000000000000000000000000

Note

In the first example, it is optimal to place the bomb at a point with a coordinate of 400000. Then at time 0, the speed of the first person becomes 1000 and he reaches the point 10^6 at the time 600. The bomb will not affect on the second person, and he will reach the 0 point at the time 500000.

In the second example, it is optimal to place the bomb at the point 500000. The rays will catch up with both people at the time 200. At this time moment, the first is at the point with a coordinate of 300000, and the second is at the point with a coordinate of 700000. Their speed will become 1500 and at the time 400 they will simultaneously run through points 0 and 10^6.

D. Misha, Grisha and Underground

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Misha and Grisha are funny boys, so they like to use new underground. The underground has n stations connected with $n - 1$ routes so that each route connects two stations, and it is possible to reach every station from any other.

The boys decided to have fun and came up with a plan. Namely, in some day in the morning Misha will ride the underground from station s to station f by the shortest path, and will draw with aerosol an ugly text "Misha was here" on every station he will pass through (including s and f). After that on the same day at evening Grisha will ride from station t to station f by the shortest path and will count stations with Misha's text. After that at night the underground workers will wash the texts out, because the underground should be clean.

The boys have already chosen three stations a, b and c for each of several following days, one of them should be station s on that day, another should be station f, and the remaining should be station t. They became interested how they should choose these stations s, f, t so that the number Grisha will count is as large as possible. They asked you for help.

Input

The first line contains two integers n and q ($2 \le n \le 10^5$, $1 \le q \le 10^5$) — the number of stations and the number of days.

The second line contains $n - 1$ integers $p_2, p_3, \ldots, p_n$ ($1 \le p_i \le n$). The integer p_i means that there is a route between stations p_i and i. It is guaranteed that it's possible to reach every station from any other.

The next q lines contains three integers a, b and c each ($1 \le a, b, c \le n$) — the ids of stations chosen by boys for some day. Note that some of these ids could be same.

Output

Print q lines. In the i-th of these lines print the maximum possible number Grisha can get counting when the stations s, t and f are chosen optimally from the three stations on the i-th day.

Examples

input
3 2 1 1 1 2 3 2 3 3

output
2 3

input
4 1 1 2 3 1 2 3

output
2

Note

In the first example on the first day if $s = 1, f = 2, t = 3$, Misha would go on the route $1 \longrightarrow 2$, and Grisha would go on the route $3 \longrightarrow 1 \longrightarrow 2$. He would see the text at the stations 1 and 2. On the second day, if $s = 3, f = 2, t = 3$, both boys would go on the route $3 \longrightarrow 1 \longrightarrow 2$. Grisha would see the text at 3 stations.

In the second examle if $s = 1, f = 3, t = 2$, Misha would go on the route $1 \longrightarrow 2 \longrightarrow 3$, and Grisha would go on the route $2 \longrightarrow 3$ and would see the text at both stations.

E. Vasya and Shifts

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Vasya has a set of $4n$ strings of equal length, consisting of lowercase English letters "a", "b", "c", "d" and "e". Moreover, the set is split into n groups of 4 equal strings each. Vasya also has one special string a of the same length, consisting of letters "a" only.

Vasya wants to obtain from string a some fixed string b, in order to do this, he can use the strings from his set in any order. When he uses some string x, each of the letters in string a replaces with the next letter in alphabet as many times as the alphabet position, counting from zero, of the corresponding letter in string x. Within this process the next letter in alphabet after "e" is "a".

For example, if some letter in a equals "b", and the letter on the same position in x equals "c", then the letter in a becomes equal "d", because "c" is the second alphabet letter, counting from zero. If some letter in a equals "e", and on the same position in x is "d", then the letter in a becomes "c". For example, if the string a equals "abcde", and string x equals "baddc", then a becomes "bbabb".

A used string disappears, but Vasya can use equal strings several times.

Vasya wants to know for q given strings b, how many ways there are to obtain from the string a string b using the given set of $4n$ strings? Two ways are different if the number of strings used from some group of 4 strings is different. Help Vasya compute the answers for these questions modulo $10^9 + 7$.

Input

The first line contains two integers n and m ($1 \le n, m \le 500$) — the number of groups of four strings in the set, and the length of all strings.

Each of the next n lines contains a string s of length m, consisting of lowercase English letters "a", "b", "c", "d" and "e". This means that there is a group of four strings equal to s.

The next line contains single integer q ($1 \le q \le 300$) — the number of strings b Vasya is interested in.

Each of the next q strings contains a string b of length m, consisting of lowercase English letters "a", "b", "c", "d" and "e" — a string Vasya is interested in.

Output

For each string Vasya is interested in print the number of ways to obtain it from string a, modulo $10^9 + 7$.

Examples

input
1 1 b 2 a e

output
1 1

input
2 4 aaaa bbbb 1 cccc

output
5

Note

In the first example, we have 4 strings "b". Then we have the only way for each string b: select 0 strings "b" to get "a" and select 4 strings "b" to get "e", respectively. So, we have 1 way for each request.

In the second example, note that the choice of the string "aaaa" does not change anything, that is we can choose any amount of it (from 0 to 4, it's 5 different ways) and we have to select the line "bbbb" 2 times, since other variants do not fit. We get that we have 5 ways for the request.

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