Codeforces Round #282 (Div. 1)

A. Treasure

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

Malek has recently found a treasure map. While he was looking for a treasure he found a locked door. There was a string s written on the door consisting of characters '(', ')' and '#'. Below there was a manual on how to open the door. After spending a long time Malek managed to decode the manual and found out that the goal is to replace each '#' with one or more ')' characters so that the final string becomes *beautiful*.

Below there was also written that a string is called *beautiful* if for each i $(1 \leq i \leq |s|)$ there are no more ')' characters than '(' characters among the first i characters of s and also the total number of '(' characters is equal to the total number of ')' characters.

Help Malek open the door by telling him for each '#' character how many ')' characters he must replace it with.

Input

The first line of the input contains a string s $(1 \leq |s| \leq 10^5)$. Each character of this string is one of the characters '(', ')' or '#'. It is guaranteed that s contains at least one '#' character.

Output

If there is no way of replacing '#' characters which leads to a beautiful string print -1. Otherwise for each character '#' print a separate line containing a positive integer, the number of ')' characters this character must be replaced with.

If there are several possible answers, you may output any of them.

Sample test(s)

input
(((#)((#)
output
1 2

input
()((#((#(#()
output
2 2 1

input
#
output
-1

input
(#)
output
-1

Note

$|s|$ denotes the length of the string s.

B. Obsessive String

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

Hamed has recently found a string t and suddenly became quite fond of it. He spent several days trying to find all occurrences of t in other strings he had. Finally he became tired and started thinking about the following problem. Given a string s how many ways are there to extract $k \geq 1$ non-overlapping substrings from it such that each of them contains string t as a substring? More formally, you need to calculate the number of ways to choose two sequences $a_1, a_2, ..., a_k$ and $b_1, b_2, ..., b_k$ satisfying the following requirements:

- $k \geq 1$
- $\forall i\ (1 \leq i \leq k)\ 1 \leq a_i, b_i \leq |s|$
- $\forall i\ (1 \leq i \leq k)\ b_i \geq a_i$
- $\forall i\ (2 \leq i \leq k)\ a_i > b_{i-1}$
- $\forall i\ (1 \leq i \leq k)$ t is a substring of string $s_{a_i} s_{a_i+1} ... s_{b_i}$ (string s is considered as 1-indexed).

As the number of ways can be rather large print it modulo $10^9 + 7$.

Input

Input consists of two lines containing strings s and t ($1 \leq |s|, |t| \leq 10^5$). Each string consists of lowercase Latin letters.

Output

Print the answer in a single line.

Sample test(s)

input
ababa aba
output
5

input
welcometoroundtwohundredandeightytwo d
output
274201

input
ddd d
output
12

C. Helping People

time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

Malek is a rich man. He also is very generous. That's why he decided to split his money between poor people. A charity institute knows n poor people numbered from 1 to n. The institute gave Malek q recommendations. A recommendation is a segment of people like $[l, r]$ which means the institute recommended that Malek gives one dollar to every person whose number is in this segment.

However this charity has very odd rules about the recommendations. Because of those rules the recommendations are given in such a way that for every two recommendation $[a, b]$ and $[c, d]$ one of the following conditions holds:

- The two segments are completely disjoint. More formally either $a \le b < c \le d$ or $c \le d < a \le b$
- One of the two segments are inside another. More formally either $a \le c \le d \le b$ or $c \le a \le b \le d$.

The *goodness* of a charity is the value of maximum money a person has after Malek finishes giving his money. The institute knows for each recommendation what is the probability that Malek will accept it. They want to know the expected value of *goodness* of this charity. So they asked you for help.

You have been given the list of recommendations and for each recommendation the probability of it being accepted by Malek. You have also been given how much money each person initially has. You must find the expected value of *goodness*.

Input

In the first line two space-separated integers n, q ($1 \le n \le 10^5$, $1 \le q \le 5000$) are given.

In the second line n space-separated integers $a_1, a_2, ..., a_n$ ($0 \le a_i \le 10^9$) are given meaning that person number i initially has a_i dollars.

Each of the next q lines contains three space-separated numbers l_i, r_i, p_i ($1 \le l_i \le r_i \le n$, $0 \le p \le 1$) where l_i and r_i are two integers describing the segment of recommendation and p_i is a real number given with exactly three digits after decimal point which is equal to probability of Malek accepting this recommendation.

Note that a segment may appear several times in recommendations.

Output

Output the sought value. Your answer will be considered correct if its absolute or relative error is less than 10^{-6}.

Sample test(s)

input

```
5 2
1 7 2 4 3
1 3 0.500
2 2 0.500
```

output

```
8.000000000
```

input

```
5 2
281 280 279 278 282
1 4 1.000
1 4 0.000
```

output

```
282.000000000
```

input

```
3 5
1 2 3
1 3 0.500
2 2 0.250
1 2 0.800
1 1 0.120
2 2 0.900
```

output

```
4.465000000
```

D. Birthday

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

Ali is Hamed's little brother and tomorrow is his birthday. Hamed wants his brother to earn his gift so he gave him a hard programming problem and told him if he can successfully solve it, he'll get him a brand new laptop. Ali is not yet a very talented programmer like Hamed and although he usually doesn't cheat but this time is an exception. It's about a brand new laptop. So he decided to secretly seek help from you. Please solve this problem for Ali.

An n-vertex weighted rooted tree is given. Vertex number 1 is a root of the tree. We define $d(u, v)$ as the sum of edges weights on the shortest path between vertices u and v. Specifically we define $d(u, u) = 0$. Also let's define $S(v)$ for each vertex v as a set containing all vertices u such that $d(1, u) = d(1, v) + d(v, u)$. Function $f(u, v)$ is then defined using the following formula:

$$f(u, v) = \sum_{x \in S(v)} d(u, x)^2 - \sum_{x \notin S(v)} d(u, x)^2$$

The goal is to calculate $f(u, v)$ for each of the q given pair of vertices. As the answer can be rather large it's enough to print it modulo $10^9 + 7$.

Input

In the first line of input an integer n ($1 \le n \le 10^5$), number of vertices of the tree is given.

In each of the next n - 1 lines three space-separated integers a_i, b_i, c_i ($1 \le a_i, b_i \le n, 1 \le c_i \le 10^9$) are given indicating an edge between a_i and b_i with weight equal to c_i.

In the next line an integer q ($1 \le q \le 10^5$), number of vertex pairs, is given.

In each of the next q lines two space-separated integers u_i, v_i ($1 \le u_i, v_i \le n$) are given meaning that you must calculate $f(u_i, v_i)$.

It is guaranteed that the given edges form a tree.

Output

Output q lines. In the i-th line print the value of $f(u_i, v_i)$ modulo $10^9 + 7$.

Sample test(s)

input

```
5
1 2 1
4 3 1
3 5 1
1 3 1
5
1 1
1 5
2 4
2 1
3 5
```

output

```
10
1000000005
1000000002
23
1000000002
```

input

```
8
1 2 100
1 3 20
2 4 2
2 5 1
3 6 1
3 7 2
6 8 5
6
1 8
2 3
5 8
2 6
4 7
6 1
```

output

```
999968753
49796
999961271
999991235
999958569
45130
```

E. Sharti

time limit per test: 5 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

During the last 24 hours Hamed and Malek spent all their time playing "Sharti". Now they are too exhausted to finish the last round. So they asked you for help to determine the winner of this round.

"Sharti" is played on a $n \times n$ board with some of cells colored white and others colored black. The rows of the board are numbered from top to bottom using number 1 to n. Also the columns of the board are numbered from left to right using numbers 1 to n. The cell located at the intersection of i-th row and j-th column is denoted by (i, j).

The players alternatively take turns. In each turn the player must choose a square with side-length at most k with its lower-right cell painted white. Then the colors of all the cells in this square are inversed (white cells become black and vice-versa). The player who cannot perform a move in his turn loses.

You know Hamed and Malek are very clever and they would have played their best moves at each turn. Knowing this and the fact that Hamed takes the first turn, given the initial board as described in the input, you must determine which one of them will be the winner.

Input

In this problem the initial board is specified as a set of m rectangles. All cells that lie inside at least one of these rectangles are colored white and the rest are colored black.

In the first line of input three space-spereated integers n, m, k ($1 \le k \le n \le 10^9$, $1 \le m \le 5 \cdot 10^4$) follow, denoting size of the board, number of rectangles and maximum size of the turn square during the game, respectively.

In i-th line of the next m lines four space-seperated integers a_i, b_i, c_i, d_i ($1 \le a_i \le c_i \le n$, $1 \le b_i \le d_i \le n$) are given meaning that i-th rectangle determining the initial board is a rectangle with upper-left cell at (a_i, b_i) and lower-right cell at (c_i, d_i).

Output

If Hamed wins, print "Hamed", otherwise print "Malek" (without the quotes).

Sample test(s)

input
5 2 1 1 1 3 3 2 2 4 4
output
Malek

input
12 5 7 3 4 5 6 1 2 1 2 4 5 9 9 8 6 12 10 12 4 12 4
output
Hamed