Codeforces Beta Round #79 (Div. 1 Only)

A. Homework

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

Once when Gerald studied in the first year at school, his teacher gave the class the following homework. She offered the students a string consisting of n small Latin letters; the task was to learn the way the letters that the string contains are written. However, as Gerald is too lazy, he has no desire whatsoever to learn those letters. That's why he decided to lose some part of the string (not necessarily a connected part). The lost part can consist of any number of segments of any length, at any distance from each other. However, Gerald knows that if he loses more than k characters, it will be very suspicious.

Find the least number of distinct characters that can remain in the string after no more than k characters are deleted. You also have to find any possible way to delete the characters.

Input

The first input data line contains a string whose length is equal to n ($1 \le n \le 10^5$). The string consists of lowercase Latin letters. The second line contains the number k ($0 \le k \le 10^5$).

Output

Print on the first line the only number m — the least possible number of different characters that could remain in the given string after it loses no more than k characters.

Print on the second line the string that Gerald can get after some characters are lost. The string should have exactly m distinct characters. The final string should be the subsequence of the initial string. If Gerald can get several different strings with exactly m distinct characters, print any of them.

Examples

input
aaaaa 4
output
1 aaaaa

input
abacaba 4
output
1 aaaa

input
abcdefgh 10
output
0

Note

In the first sample the string consists of five identical letters but you are only allowed to delete 4 of them so that there was at least one letter left. Thus, the right answer is 1 and any string consisting of characters "a" from 1 to 5 in length.

In the second sample you are allowed to delete 4 characters. You cannot delete all the characters, because the string has length equal to 7. However, you can delete all characters apart from "a" (as they are no more than four), which will result in the "aaaa" string.

In the third sample you are given a line whose length is equal to 8, and $k = 10$, so that the whole line can be deleted. The correct answer is 0 and an empty string.

B. Buses

time limit per test: 2 seconds
memory limit per test: 265 megabytes
input: standard input
output: standard output

Little boy Gerald studies at school which is quite far from his house. That's why he has to go there by bus every day. The way from home to school is represented by a segment of a straight line; the segment contains exactly $n + 1$ bus stops. All of them are numbered with integers from 0 to n in the order in which they follow from Gerald's home. The bus stop by Gerald's home has number 0 and the bus stop by the school has number n.

There are m buses running between the house and the school: the i-th bus goes from stop s_i to t_i ($s_i < t_i$), visiting all the intermediate stops in the order in which they follow on the segment. Besides, Gerald's no idiot and he wouldn't get off the bus until it is still possible to ride on it closer to the school (obviously, getting off would be completely pointless). In other words, Gerald can get on the i-th bus on any stop numbered from s_i to $t_i - 1$ inclusive, but he can get off the i-th bus only on the bus stop t_i.

Gerald can't walk between the bus stops and he also can't move in the direction from the school to the house.

Gerald wants to know how many ways he has to get from home to school. Tell him this number. Two ways are considered different if Gerald crosses some segment between the stops on different buses. As the number of ways can be too much, find the remainder of a division of this number by 1000000007 ($10^9 + 7$).

Input

The first line contains two space-separated integers: n and m ($1 \le n \le 10^9, 0 \le m \le 10^5$). Then follow m lines each containing two integers s_i, t_i. They are the numbers of starting stops and end stops of the buses ($0 \le s_i < t_i \le n$).

Output

Print the only number — the number of ways to get to the school modulo 1000000007 ($10^9 + 7$).

Examples

input
2 2 0 1 1 2
output
1

input
3 2 0 1 1 2
output
0

input
5 5 0 1 0 2 0 3 0 4 0 5
output
16

Note

The first test has the only variant to get to school: first on bus number one to the bus stop number one; then on bus number two to the bus stop number two.

In the second test no bus goes to the third bus stop, where the school is positioned. Thus, the correct answer is 0.

In the third test Gerald can either get or not on any of the first four buses to get closer to the school. Thus, the correct answer is $2^4 = 16$.

C. Vectors

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

At a geometry lesson Gerald was given a task: to get vector B out of vector A. Besides, the teacher permitted him to perform the following operations with vector A:

- Turn the vector by 90 degrees clockwise.
- Add to the vector a certain vector C.

Operations could be performed in any order any number of times.

Can Gerald cope with the task?

Input

The first line contains integers x_1 и y_1 — the coordinates of the vector A ($-10^8 \le x_1, y_1 \le 10^8$). The second and the third line contain in the similar manner vectors B and C (their coordinates are integers; their absolute value does not exceed 10^8).

Output

Print "YES" (without the quotes) if it is possible to get vector B using the given operations. Otherwise print "NO" (without the quotes).

Examples

input
0 0 1 1 0 1
output
YES

input
0 0 1 1 1 1
output
YES

input
0 0 1 1 2 2
output
NO

D. Castle

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

Gerald is positioned in an old castle which consists of n halls connected with $n - 1$ corridors. It is exactly one way to go from any hall to any other one. Thus, the graph is a tree. Initially, at the moment of time 0, Gerald is positioned in hall 1. Besides, some other hall of the castle contains the treasure Gerald is looking for. The treasure's position is not known; it can equiprobably be in any of other $n - 1$ halls. Gerald can only find out where the treasure is when he enters the hall with the treasure. That very moment Gerald sees the treasure and the moment is regarded is the moment of achieving his goal.

The corridors have different lengths. At that, the corridors are considered long and the halls are considered small and well lit. Thus, it is possible not to take the time Gerald spends in the halls into consideration. **The castle is very old, that's why a corridor collapses at the moment when somebody visits it two times, no matter in which direction.**

Gerald can move around the castle using the corridors; he will go until he finds the treasure. Naturally, Gerald wants to find it as quickly as possible. In other words, he wants to act in a manner that would make the average time of finding the treasure as small as possible. **Each corridor can be used no more than two times. That's why Gerald chooses the strategy in such a way, so he can visit every hall for sure.**

More formally, if the treasure is located in the second hall, then Gerald will find it the moment he enters the second hall for the first time — let it be moment t_2. If the treasure is in the third hall, then Gerald will find it the moment he enters the third hall for the first time. Let it be the moment of time t_3. And so on. Thus, the average time of finding the treasure will be equal to $\frac{t_2+t_3+\cdots+t_n}{n-1}$.

Input

The first line contains the only integer n ($2 \le n \le 10^5$) — the number of halls in the castle. Next $n - 1$ lines each contain three integers. The i-th line contains numbers a_i, b_i and t_i ($1 \le a_i, b_i \le n$, $a_i \ne b_i$, $1 \le t_i \le 1000$) — the numbers of halls connected with the i-th corridor and the time needed to go along the corridor. Initially Gerald is in the hall number 1. It is guaranteed that one can get from any hall to any other one using corridors.

Output

Print the only real number: the sought expectation of time needed to find the treasure. The answer should differ from the right one in no less than 10^{-6}.

Examples

input
2 1 2 1

output
1.0

input
4 1 3 2 4 2 1 3 2 3

output
4.333333333333334

input
5 1 2 1 1 3 1 1 4 1 1 5 1

output
4.0

Note

In the first test the castle only has two halls which means that the treasure is located in the second hall. Gerald will only need one minute to go to the second hall from the first one.

In the second test Gerald can only go from the first hall to the third one. He can get from the third room to the first one or to the second one, but he has already visited the first hall and can get nowhere from there. Thus, he needs to go to the second hall. He should go to hall 4 from there, because all other halls have already been visited. If the treasure is located in the third hall, Gerald will find it in a minute, if the treasure is located in the second hall, Gerald finds it in two minutes, if the treasure is in the fourth hall, Gerald will find it in three minutes. The average time makes 2 minutes.

In the third test Gerald needs to visit 4 halls: the second, third, fourth and fifth ones. All of them are only reachable from the first hall. Thus, he needs to go to those 4 halls one by one and return. Gerald will enter the first of those halls in a minute, in the second one — in three minutes, in the third one - in 5 minutes, in the fourth one - in 7 minutes. The average time is 4 minutes.

E. Candies and Stones

time limit per test: 7.5 seconds
memory limit per test: 45 megabytes
input: standard input
output: standard output

Little Gerald and his coach Mike play an interesting game. At the beginning of the game there is a pile consisting of n candies and a pile consisting of m stones. Gerald and Mike move in turns, Mike goes first. During his move Mike checks how many candies and stones Gerald has eaten. Let Gerald eat a candies and b stones. Then Mike awards Gerald $f(a, b)$ prize points. Gerald during his move either eats a candy from the pile of candies or a stone from the pile of stones. As Mike sees that Gerald has eaten everything apart one candy and one stone, he awards points for the last time and the game ends. Gerald is not allowed to eat all the candies, and he is not allowed to eat all the stones too. Tell Gerald how to play to get the largest possible number of points: it is required to find one of the possible optimal playing strategies for Gerald.

Input

The first line contains three integers n, m, p ($1 \le n, m \le 20000$, $1 \le p \le 10^9$). The second line contains n integers $x_0, x_1, ..., x_{n-1}$ ($0 \le x_i \le 20000$). The third line contains m integers $y_0, y_1, ..., y_{m-1}$ ($0 \le y_i \le 20000$). The value of $f(a, b)$ is calculated as a remainder of the division of the sum $x_a + y_b$ by number p.

Output

Print on the first line the only number: the maximal number of points Gerald can earn. Print on the second line a sting consisting of $n + m - 2$ characters, each of which is either a "C" or "S", the i-th character should be "C" if Gerald's i-th move should be eating a candy and "S" if he should eat a stone.

Examples

input
2 2 10 0 0 0 1
output
2 SC

input
3 3 10 0 2 0 0 0 2
output
10 CSSC

input
3 3 2 0 1 1 1 1 0
output
4 SCSC

Note

In the first test if Gerald's first move is eating a stone, he will receive a point for it and if he eats a candy, he will get zero pints. In any way Gerald will get 0 points before his first move, and 1 after his second one. This, the maximum number of points Gerald can get equals to 2, and for that he should first eat a stone, then a candy.