

Codeforces Round #423 (Div. 2, rated, based on VK Cup Finals)

A. Restaurant Tables

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

In a small restaurant there are a tables for one person and b tables for two persons.

It is known that n groups of people come today, each consisting of one or two people.

If a group consists of one person, it is seated at a vacant one-seater table. If there are none of them, it is seated at a vacant two-seater table. If there are none of them, it is seated at a two-seater table occupied by a single person. If there are still none of them, the restaurant denies service to this group.

If a group consists of two people, it is seated at a vacant two-seater table. If there are none of them, the restaurant denies service to this group.

You are given a chronological order of groups coming. You are to determine the total number of people the restaurant denies service to.

Input

The first line contains three integers n , a and b ($1 \leq n \leq 2 \cdot 10^5$, $1 \leq a, b \leq 2 \cdot 10^5$) — the number of groups coming to the restaurant, the number of one-seater and the number of two-seater tables.

The second line contains a sequence of integers t_1, t_2, \dots, t_n ($1 \leq t_i \leq 2$) — the description of clients in chronological order. If t_i is equal to one, then the i -th group consists of one person, otherwise the i -th group consists of two people.

Output

Print the total number of people the restaurant denies service to.

Examples

input
4 1 2 1 2 1 1
output
0

input
4 1 1 1 1 2 1
output
2

Note

In the first example the first group consists of one person, it is seated at a vacant one-seater table. The next group occupies a whole two-seater table. The third group consists of one person, it occupies one place at the remaining two-seater table. The fourth group consists of one person, he is seated at the remaining seat at the two-seater table. Thus, all clients are served.

In the second example the first group consists of one person, it is seated at the vacant one-seater table. The next group consists of one person, it occupies one place at the two-seater table. It's impossible to seat the next group of two people, so the restaurant denies service to them. The fourth group consists of one person, he is seated at the remaining seat at the two-seater table. Thus, the restaurant denies service to 2 clients.

B. Black Square

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

Polycarp has a checkered sheet of paper of size $n \times m$. Polycarp painted some of cells with black, the others remained white. Inspired by Malevich's "Black Square", Polycarp wants to paint minimum possible number of white cells with black so that all black cells form a square.

You are to determine the minimum possible number of cells needed to be painted black so that the black cells form a black square with sides parallel to the painting's sides. All the cells that do not belong to the square should be white. The square's side should have positive length.

Input

The first line contains two integers n and m ($1 \leq n, m \leq 100$) — the sizes of the sheet.

The next n lines contain m letters 'B' or 'W' each — the description of initial cells' colors. If a letter is 'B', then the corresponding cell is painted black, otherwise it is painted white.

Output

Print the minimum number of cells needed to be painted black so that the black cells form a black square with sides parallel to the painting's sides. All the cells that do not belong to the square should be white. If it is impossible, print -1 .

Examples

input
5 4 WWWW WWWB WWWB WWBB WWWW
output
5
input
1 2 BB
output
-1
input
3 3 WWW WWW WWW
output
1

Note

In the first example it is needed to paint 5 cells — $(2, 2)$, $(2, 3)$, $(3, 2)$, $(3, 3)$ and $(4, 2)$. Then there will be a square with side equal to three, and the upper left corner in $(2, 2)$.

In the second example all the cells are painted black and form a rectangle, so it's impossible to get a square.

In the third example all cells are colored white, so it's sufficient to color any cell black.

C. String Reconstruction

time limit per test: 2 seconds

memory limit per test: 256 megabytes

input: standard input

output: standard output

Ivan had string s consisting of small English letters. However, his friend Julia decided to make fun of him and hid the string s . Ivan preferred making a new string to finding the old one.

Ivan knows some information about the string s . Namely, he remembers, that string t_i occurs in string s at least k_i times or more, he also remembers exactly k_i positions where the string t_i occurs in string s : these positions are $x_{i,1}, x_{i,2}, \dots, x_{i,k_i}$. He remembers n such strings t_i .

You are to reconstruct **lexicographically minimal** string s such that it fits all the information Ivan remembers. Strings t_i and string s consist of small English letters only.

Input

The first line contains single integer n ($1 \leq n \leq 10^5$) — the number of strings Ivan remembers.

The next n lines contain information about the strings. The i -th of these lines contains non-empty string t_i , then positive integer k_i , which equal to the number of times the string t_i occurs in string s , and then k_i distinct positive integers $x_{i,1}, x_{i,2}, \dots, x_{i,k_i}$ in increasing order — positions, in which occurrences of the string t_i in the string s start. It is guaranteed that the sum of lengths of strings t_i doesn't exceed 10^6 , $1 \leq x_{i,j} \leq 10^6$, $1 \leq k_i \leq 10^6$, and the sum of all k_i doesn't exceed 10^6 . The strings t_i can coincide.

It is guaranteed that the input data is not self-contradictory, and thus at least one answer **always** exists.

Output

Print lexicographically minimal string that fits all the information Ivan remembers.

Examples

input
3 a 4 1 3 5 7 ab 2 1 5 ca 1 4
output
abacaba
input
1 a 1 3
output
aaa
input
3 ab 1 1 aba 1 3 ab 2 3 5
output
ababab

D. High Load

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

Arkady needs your help again! This time he decided to build his own high-speed Internet exchange point. It should consist of n nodes connected with minimum possible number of wires into one network (a wire directly connects two nodes). Exactly k of the nodes should be exit-nodes, that means that each of them should be connected to exactly one other node of the network, while all other nodes should be connected to at least two nodes in order to increase the system stability.

Arkady wants to make the system as fast as possible, so he wants to minimize the maximum distance between two exit-nodes. The distance between two nodes is the number of wires a package needs to go through between those two nodes.

Help Arkady to find such a way to build the network that the distance between the two most distant exit-nodes is as small as possible.

Input

The first line contains two integers n and k ($3 \leq n \leq 2 \cdot 10^5$, $2 \leq k \leq n - 1$) — the total number of nodes and the number of exit-nodes.

Note that it is always possible to build at least one network with n nodes and k exit-nodes within the given constraints.

Output

In the first line print the minimum possible distance between the two most distant exit-nodes. In each of the next $n - 1$ lines print two integers: the ids of the nodes connected by a wire. The description of each wire should be printed exactly once. You can print wires and wires' ends in arbitrary order. The nodes should be numbered from 1 to n . Exit-nodes can have any ids.

If there are multiple answers, print any of them.

Examples

input
3 2
output
2 1 2 2 3

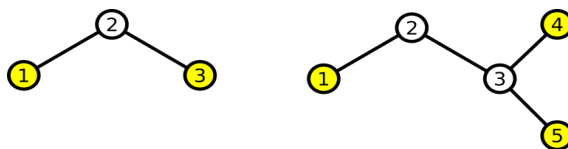
input
5 3
output
3 1 2 2 3 3 4 3 5

Note

In the first example the only network is shown on the left picture.

In the second example one of optimal networks is shown on the right picture.

Exit-nodes are highlighted.



E. DNA Evolution

time limit per test: 2 seconds

memory limit per test: 512 megabytes

input: standard input

output: standard output

Everyone knows that DNA strands consist of nucleotides. There are four types of nucleotides: "A", "T", "G", "C". A DNA strand is a sequence of nucleotides. Scientists decided to track evolution of a rare species, which DNA strand was string s initially.

Evolution of the species is described as a sequence of changes in the DNA. Every change is a change of some nucleotide, for example, the following change can happen in DNA strand "AAGC": the second nucleotide can change to "T" so that the resulting DNA strand is "ATGC".

Scientists know that some segments of the DNA strand can be affected by some unknown infections. They can represent an infection as a sequence of nucleotides. Scientists are interested if there are any changes caused by some infections. Thus they sometimes want to know the value of impact of some infection to some segment of the DNA. This value is computed as follows:

- Let the infection be represented as a string e , and let scientists be interested in DNA strand segment starting from position l to position r , inclusive.
- Prefix of the string $eee\dots$ (i.e. the string that consists of infinitely many repeats of string e) is written under the string s from position l to position r , inclusive.
- The value of impact is the number of positions where letter of string s coincided with the letter written under it.

Being a developer, Innokenty is interested in bioinformatics also, so the scientists asked him for help. Innokenty is busy preparing VK Cup, so he decided to delegate the problem to the competitors. Help the scientists!

Input

The first line contains the string s ($1 \leq |s| \leq 10^5$) that describes the initial DNA strand. It consists only of capital English letters "A", "T", "G" and "C".

The next line contains single integer q ($1 \leq q \leq 10^5$) — the number of events.

After that, q lines follow, each describes one event. Each of the lines has one of two formats:

- $1 \ x \ c$, where x is an integer ($1 \leq x \leq |s|$), and c is a letter "A", "T", "G" or "C", which means that there is a change in the DNA: the nucleotide at position x is now c .
- $2 \ l \ r \ e$, where l, r are integers ($1 \leq l \leq r \leq |s|$), and e is a string of letters "A", "T", "G" and "C" ($1 \leq |e| \leq 10$), which means that scientists are interested in the value of impact of infection e to the segment of DNA strand from position l to position r , inclusive.

Output

For each scientists' query (second type query) print a single integer in a new line — the value of impact of the infection on the DNA.

Examples

input
ATGCATGC 4 2 1 8 ATGC 2 2 6 TTT 1 4 T 2 2 6 TA
output
8 2 4

input
GAGTTGTAA 6 2 3 4 TATGGTG 1 1 T 1 6 G 2 5 9 AGTAATA 1 10 G 2 2 6 TTGT
output
0 3 1

Note

Consider the first example. In the first query of second type all characters coincide, so the answer is 8. In the second query we compare string "TTTTT..." and the substring "TGCAT". There are two matches. In the third query, after the DNA change, we compare string "TATAT..." with substring "TGTAT". There are 4 matches.

F. Best Edge Weight

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

You are given a connected weighted graph with n vertices and m edges. The graph doesn't contain loops nor multiple edges. Consider some edge with id i . Let's determine for this edge the maximum integer weight we can give to it so that it is contained in all minimum spanning trees of the graph if we don't change the other weights.

You are to determine this maximum weight described above for each edge. You should calculate the answer for each edge independently, it means there can't be two edges with changed weights at the same time.

Input

The first line contains two integers n and m ($2 \leq n \leq 2 \cdot 10^5$, $n - 1 \leq m \leq 2 \cdot 10^5$), where n and m are the number of vertices and the number of edges in the graph, respectively.

Each of the next m lines contains three integers u , v and c ($1 \leq v, u \leq n$, $v \neq u$, $1 \leq c \leq 10^9$) meaning that there is an edge between vertices u and v with weight c .

Output

Print the answer for each edge in the order the edges are given in the input. If an edge is contained in every minimum spanning tree with any weight, print -1 as the answer.

Examples

input
4 4 1 2 2 2 3 2 3 4 2 4 1 3
output
2 2 2 1

input
4 3 1 2 2 2 3 2 3 4 2
output
-1 -1 -1