Codeforces Round #443 (Div. 2)

A. Borya's Diagnosis

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

It seems that Borya is seriously sick. He is going visit n doctors to find out the exact diagnosis. Each of the doctors needs the information about all previous visits, so Borya has to visit them in the prescribed order (i.e. Borya should first visit doctor 1, then doctor 2, then doctor 3 and so on). Borya will get the information about his health from the last doctor.

Doctors have a strange working schedule. The doctor i goes to work on the s_i-th day and works every d_i day. So, he works on days $s_i, s_i + d_i, s_i + 2d_i, \ldots$.

The doctor's appointment takes quite a long time, so Borya can not see more than one doctor per day. What is the minimum time he needs to visit all doctors?

Input

First line contains an integer n — number of doctors ($1 \le n \le 1000$).

Next n lines contain two numbers s_i and d_i ($1 \le s_i, d_i \le 1000$).

Output

Output a single integer — the minimum day at which Borya can visit the last doctor.

Examples

input
3 2 2 1 2 2 2
output
4

input
2 10 1 6 5
output
11

Note

In the first sample case, Borya can visit all doctors on days 2, 3 and 4.

In the second sample case, Borya can visit all doctors on days 10 and 11.

B. Table Tennis

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

n people are standing in a line to play table tennis. At first, the first two players in the line play a game. Then the loser goes to the end of the line, and the winner plays with the next person from the line, and so on. They play until someone wins k games in a row. This player becomes the winner.

For each of the participants, you know the power to play table tennis, and for all players these values are different. In a game the player with greater power always wins. Determine who will be the winner.

Input

The first line contains two integers: n and k ($2 \le n \le 500$, $2 \le k \le 10^{12}$) — the number of people and the number of wins.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le n$) — powers of the player. It's guaranteed that this line contains a valid permutation, i.e. all a_i are distinct.

Output

Output a single integer — **power** of the winner.

Examples

input
2 2 1 2
output
2

input
4 2 3 1 2 4
output
3

input
6 2 6 5 3 1 2 4
output
6

input
2 10000000000 2 1
output
2

Note

Games in the second sample:

3 plays with 1. 3 wins. 1 goes to the end of the line.

3 plays with 2. 3 wins. He wins twice in a row. He becomes the winner.

C. Short Program

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

Petya learned a new programming language CALPAS. A program in this language always takes one non-negative integer and returns one non-negative integer as well.

In the language, there are only three commands: apply a bitwise operation AND, OR or XOR with a given constant to the current integer. A program can contain an arbitrary sequence of these operations with arbitrary constants from 0 to 1023. When the program is run, all operations are applied (in the given order) to the argument and in the end the result integer is returned.

Petya wrote a program in this language, but it turned out to be too long. Write a program in CALPAS that does the same thing as the Petya's program, and consists of no more than 5 lines. Your program should return the same integer as Petya's program for all arguments from 0 to 1023.

Input

The first line contains an integer n ($1 \le n \le 5 \cdot 10^5$) — the number of lines.

Next n lines contain commands. A command consists of a character that represents the operation ("&", "|" or "^" for AND, OR or XOR respectively), and the constant x_i $0 \le x_i \le 1023$.

Output

Output an integer k ($0 \le k \le 5$) — the length of your program.

Next k lines must contain commands in the same format as in the input.

Examples

input
3 | 3 ^ 2 | 1
output
2 | 3 ^ 2

input
3 & 1 & 3 & 5
output
1 & 1

input
3 ^ 1 ^ 2 ^ 3
output
0

Note

You can read about bitwise operations in https://en.wikipedia.org/wiki/Bitwise_operation.

Second sample:

Let x be an input of the Petya's program. It's output is $((x\&1)\&3)\&5 = x\&(1\&3\&5) = x\&1$. So these two programs always give the same outputs.

D. Teams Formation

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

This time the Berland Team Olympiad in Informatics is held in a remote city that can only be reached by one small bus. Bus has n passenger seats, seat i can be occupied only by a participant from the city a_i.

Today the bus has completed m trips, each time bringing n participants. The participants were then aligned in one line in the order they arrived, with people from the same bus standing in the order of their seats (i. e. if we write down the cities where the participants came from, we get the sequence a_1, a_2, ..., a_n repeated m times).

After that some teams were formed, each consisting of k participants form the same city standing next to each other in the line. Once formed, teams left the line. The teams were formed until there were no k neighboring participants from the same city.

Help the organizers determine how many participants have left in the line after that process ended. We can prove that answer doesn't depend on the order in which teams were selected.

Input

The first line contains three integers n, k and m ($1 \le n \le 10^5$, $2 \le k \le 10^9$, $1 \le m \le 10^9$).

The second line contains n integers a_1, a_2, ..., a_n ($1 \le a_i \le 10^5$), where a_i is the number of city, person from which must take seat i in the bus.

Output

Output the number of remaining participants in the line.

Examples

input
4 2 5 1 2 3 1
output
12

input
1 9 10 1
output
1

input
3 2 10 1 2 1
output
0

Note

In the second example, the line consists of ten participants from the same city. Nine of them will form a team. At the end, only one participant will stay in the line.

E. Tournament

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

Recently a tournament in k kinds of sports has begun in Berland. Vasya wants to make money on the bets.

The scheme of the tournament is very mysterious and not fully disclosed. Competitions are held back to back, each of them involves two sportsmen who have not left the tournament yet. Each match can be held in any of the k kinds of sport. Loser leaves the tournament. The last remaining sportsman becomes the winner. Apart of this, the scheme can be arbitrary, it is not disclosed in advance.

Vasya knows powers of sportsmen in each kind of sport. He believes that the sportsmen with higher power always wins.

The tournament is held every year, and each year one new participant joins it. In the first tournament, only one sportsman has participated, in the second there were two sportsmen, and so on. Vasya has been watching the tournament for the last n years. Help him to find the number of possible winners for each of the n tournaments.

Input

The first line contains two integers n and k ($1 \le n \le 5 \cdot 10^4$, $1 \le k \le 10$) — the number of tournaments and the number of kinds of sport, respectively.

Each of the next n lines contains k integers $s_{i1}, s_{i2}, \ldots, s_{ik}$ ($1 \le s_{ij} \le 10^9$), where s_{ij} is the power of the i-th sportsman in the j-th kind of sport. The sportsman with higher powers always wins. It's guaranteed that for any kind of sport all of these powers are distinct.

Output

For each of the n tournaments output the number of contenders who can win.

Examples

input
3 2 1 5 5 1 10 10
output
1 2 1

input
3 2 2 2 3 3 1 10
output
1 1 3

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

Note

In the first sample:

In the first tournament there is only one sportsman, and he is the winner.

In the second tournament, there are two sportsmen, and everyone can defeat another, depending on kind of sports.

In the third tournament, the third sportsman in the strongest in both kinds of sports, so he is the winner regardless of the scheme.