Codeforces Round #307 (Div. 2)

A. GukiZ and Contest

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

Professor GukiZ likes programming contests. He especially likes to rate his students on the contests he prepares. Now, he has decided to prepare a new contest.

In total, n students will attend, and before the start, every one of them has some positive integer rating. Students are indexed from 1 to n. Let's denote the rating of i-th student as a_i. After the contest ends, every student will end up with some positive integer position. GukiZ expects that his students will take places according to their ratings.

He thinks that each student will take place equal to $1 + (\text{number of students with strictly higher rating than his or her})$. In particular, if student A has rating strictly lower then student B, A will get the strictly better position than B, and if two students have equal ratings, they will share the same position.

GukiZ would like you to reconstruct the results by following his expectations. Help him and determine the position after the end of the contest for each of his students if everything goes as expected.

Input

The first line contains integer n ($1 \le n \le 2000$), number of GukiZ's students.

The second line contains n numbers $a_1, a_2, \ldots a_n$ ($1 \le a_i \le 2000$) where a_i is the rating of i-th student ($1 \le i \le n$).

Output

In a single line, print the position after the end of the contest for each of n students in the same order as they appear in the input.

Examples

input
3 1 3 3
output
3 1 1

input
1 1
output
1

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

Note

In the first sample, students 2 and 3 are positioned first (there is no other student with higher rating), and student 1 is positioned third since there are two students with higher rating.

In the second sample, first student is the only one on the contest.

In the third sample, students 2 and 5 share the first position with highest rating, student 4 is next with third position, and students 1 and 3 are the last sharing fourth position.

B. ZgukistringZ

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

Professor GukiZ doesn't accept string as they are. He likes to swap some letters in string to obtain a new one.

GukiZ has strings a, b, and c. He wants to obtain string k by swapping some letters in a, so that k should contain as many non-overlapping substrings equal either to b or c as possible. Substring of string x is a string formed by consecutive segment of characters from x. Two substrings of string x overlap if there is position i in string x occupied by both of them.

GukiZ was disappointed because none of his students managed to solve the problem. Can you help them and find one of possible strings k?

Input

The first line contains string a, the second line contains string b, and the third line contains string c ($1 \le |a|, |b|, |c| \le 10^5$, where $|s|$ denotes the length of string s).

All three strings consist only of lowercase English letters.

It is possible that b and c coincide.

Output

Find one of possible strings k, as described in the problem statement. If there are multiple possible answers, print any of them.

Examples

input
aaa a b
output
aaa

input
pozdravstaklenidodiri niste dobri
output
nisteaadddiiklooprrvz

input
abbbaaccca ab aca
output
ababacabcc

Note

In the third sample, this optimal solutions has three non-overlaping substrings equal to either b or c on positions $1 – 2$ (ab), $3 – 4$ (ab), $5 – 7$ (aca). In this sample, there exist many other optimal solutions, one of them would be $acaababbcc$.

C. GukiZ hates Boxes

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

Professor GukiZ is concerned about making his way to school, because massive piles of boxes are blocking his way.

In total there are n piles of boxes, arranged in a line, from left to right, i-th pile ($1 \le i \le n$) containing a_i boxes. Luckily, m students are willing to help GukiZ by removing all the boxes from his way. Students are working simultaneously. At time 0, all students are located left of the first pile. It takes one second for every student to move from this position to the first pile, and after that, every student must start performing sequence of two possible operations, each taking one second to complete. Possible operations are:

1. If $i \neq n$, move from pile i to pile $i + 1$;
2. If pile located at the position of student is not empty, remove one box from it.

GukiZ's students aren't smart at all, so they need you to tell them how to remove boxes before professor comes (he is very impatient man, and doesn't want to wait). They ask you to calculate minumum time t in seconds for which they can remove all the boxes from GukiZ's way. Note that students can be positioned in any manner after t seconds, but all the boxes must be removed.

Input

The first line contains two integers n and m ($1 \le n, m \le 10^5$), the number of piles of boxes and the number of GukiZ's students.

The second line contains n integers $a_1, a_2, \ldots a_n$ ($0 \le a_i \le 10^9$) where a_i represents the number of boxes on i-th pile. It's guaranteed that at least one pile of is non-empty.

Output

In a single line, print one number, minimum time needed to remove all the boxes in seconds.

Examples

input
2 1 1 1
output
4

input
3 2 1 0 2
output
5

input
4 100 3 4 5 4
output
5

Note

First sample: Student will first move to the first pile (1 second), then remove box from first pile (1 second), then move to the second pile (1 second) and finally remove the box from second pile (1 second).

Second sample: One of optimal solutions is to send one student to remove a box from the first pile and a box from the third pile, and send another student to remove a box from the third pile. Overall, 5 seconds.

Third sample: With a lot of available students, send three of them to remove boxes from the first pile, four of them to remove boxes from the second pile, five of them to remove boxes from the third pile, and four of them to remove boxes from the fourth pile. Process will be over in 5 seconds, when removing the boxes from the last pile is finished.

D. GukiZ and Binary Operations

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

We all know that GukiZ often plays with arrays.

Now he is thinking about this problem: how many arrays a, of length n, with non-negative elements **strictly less** then 2^l meet the following condition: $(a_1 \text{ and } a_2) \text{ or } (a_2 \text{ and } a_3) \text{ or } \ldots \text{ or } (a_{n-1} \text{ and } a_n) = k$? Here operation and means bitwise AND (in `Pascal` it is equivalent to and, in `C/C++/Java/Python` it is equivalent to &), operation or means bitwise OR (in `Pascal` it is equivalent to or, in `C/C++/Java/Python` it is equivalent to |).

Because the answer can be quite large, calculate it modulo m. This time GukiZ hasn't come up with solution, and needs you to help him!

Input

First and the only line of input contains four integers n, k, l, m ($2 \le n \le 10^{18}$, $0 \le k \le 10^{18}$, $0 \le l \le 64$, $1 \le m \le 10^9 + 7$).

Output

In the single line print the number of arrays satisfying the condition above modulo m.

Examples

input
2 1 2 10
output
3

input
2 1 1 3
output
1

input
3 3 2 10
output
9

Note

In the first sample, satisfying arrays are $\{1, 1\}, \{3, 1\}, \{1, 3\}$.

In the second sample, only satisfying array is $\{1, 1\}$.

In the third sample, satisfying arrays are
$\{0, 3, 3\}, \{1, 3, 2\}, \{1, 3, 3\}, \{2, 3, 1\}, \{2, 3, 3\}, \{3, 3, 0\}, \{3, 3, 1\}, \{3, 3, 2\}, \{3, 3, 3\}$.

E. GukiZ and GukiZiana

time limit per test: 10 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Professor GukiZ was playing with arrays again and accidentally discovered new function, which he called $GukiZiana$. For given array a, indexed with integers from 1 to n, and number y, $GukiZiana(a, y)$ represents maximum value of $j - i$, such that $a_j = a_i = y$. If there is no y as an element in a, then $GukiZiana(a, y)$ is equal to -1. GukiZ also prepared a problem for you. This time, you have two types of queries:

1. First type has form $1\ l\ r\ x$ and asks you to increase values of all a_i such that $l \le i \le r$ by the non-negative integer x.
2. Second type has form $2\ y$ and asks you to find value of $GukiZiana(a, y)$.

For each query of type 2, print the answer and make GukiZ happy!

Input

The first line contains two integers n, q ($1 \le n \le 5 * 10^5, 1 \le q \le 5 * 10^4$), size of array a, and the number of queries.

The second line contains n integers $a_1, a_2, \ldots a_n$ ($1 \le a_i \le 10^9$), forming an array a.

Each of next q lines contain either four or two numbers, as described in statement:

If line starts with 1, then the query looks like $1\ l\ r\ x$ ($1 \le l \le r \le n$, $0 \le x \le 10^9$), first type query.

If line starts with 2, then th query looks like $2\ y$ ($1 \le y \le 10^9$), second type query.

Output

For each query of type 2, print the value of $GukiZiana(a, y)$, for y value for that query.

Examples

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

input
2 3 1 2 1 2 2 1 2 3 2 4
output
0 -1