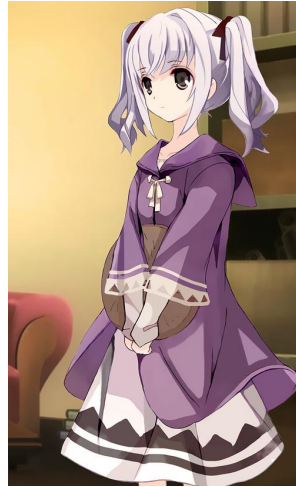


Problem A. Nephren and a game with tempting prizes

What do you do at the end of the world? Are you busy? Will you save us?



Nephren is preparing an interesting game for her friends, here is the rule:

n friends sit in a circle, they are numbered from 1 to n . There are m stones. All of her friends take turns, with number 1 moves first. Each time the player can take 1, 2, ..., k stones, the player who takes the last stone wins the game.

Nephren also prepares tempting prizes for her friends, there are three kinds of prize.

1. Basic prize. If the player with number i wins the game, everyone will get i coins.
2. Friendship prize. There are 10^{18} coins in total. At the beginning of the game, every player can claim some players to be his partner, but the i -th player can only claim the players numbered from $i + 1$ to n . Then everyone's choices will be shown before the game starts. If player i wins the game, all the players he claims will get $10^{18}/(n - i + 1)$ coins, other coins will belong to player i . (The relation of partner is unidirectional, if i claims j to be his partner and j wins the game, i can't get friendship prize)
3. Final prize. The player who wins the game will win the biggest prize – Nephren's love.

Everyone wants to win the final prize, but if they can't, they want to get more coins. If there are multiple choices that one player can get the most coins, he wants the winner to get less coins. Now Nephren wants to know if everyone is smart enough, who will win the game?

Input

The first line contains an integer T ($1 \leq T \leq 1000$), the number of testcases.

Then T lines are followed, each line contains three numbers n, m, k ($1 \leq n \leq 10^6, 1 \leq m \leq 10^9, 1 \leq k \leq 10^6$).

Output

T lines, each line contains the answer of one testcase, the number of the player wins this game.

Example

standard input	standard output
1 3 3 2	2

Problem B. Garden

*For shame deny that thou bear'st love to any,
Who for thy self art so unprovident.
Grant, if thou wilt, thou art beloved of many,
But that thou none lov'st is most evident:
For thou art so possessed with murderous hate,
That 'gainst thy self thou stick'st not to conspire,
Seeking that beauteous roof to ruinate
Which to repair should be thy chief desire.
O! change thy thought, that I may change my mind:
Shall hate be fairer lodged than gentle love?
Be, as thy presence is, gracious and kind,
Or to thyself at least kind-hearted prove:
Make thee another self for love of me,
That beauty still may live in thine or thee.*

You are given a 0-1 matrix with height n and width m . Every time you can select an unselected rectangle that contains only number 1, and get points equal to the square of its size. Your task is to calculate the total points you can get, modulo 998244353.

Input

The first line of the input contains two integers n and m ($1 \leq n, m \leq 1000$), the height and width of the matrix.

Next n lines, every line contains a 0-1 string with length m , denoting the matrix.

Output

Output one line with one integer, the total points you can get, modulo 998244353.

Example

standard input	standard output
5 5 01001 11000 00010 00000 10001	15

Note

In the sample, you choose 1×1 rectangle 7 times, 1×2 rectangle once and 2×1 rectangle once, and get 15 points.

Problem C. Binary and GCD

Izayoi Sakuya is going to participate in tonight's Mathforces Round 664 (Div 1).

She decides to prepare for this round by solving problems given by her fan **Cirno**.

One of them is : Calculate the number of pairs (a, b) which satisfies $1 \leq a, b \leq n$ and $\gcd(a, b) = a \text{ xor } b$.



The problem is too easy so she decided to give you a try.

Please notice the **time limit** of this problem.

Input

The only line contains an integer n ($1 \leq n \leq 10^8$).

Output

Print a single line containing one integer — The answer to the task.

Examples

standard input	standard output
10	12
623532	2174704
7175	24186

Note

623532 623532 623532 7175 (Eiyashou – Eastern Night)

Problem D. Back to Reality

Sdchr has been trapped into an endless looped dream with sadness for almost one thousand years, until the day he discovered the secret to go back to the reality obviously.

In the core area of the dream, exactly one kind of material will appear per second. There are n kinds of material in total, and the i -th material will appear with the probability $\frac{p_i}{m}$. Sdchr could finally escape the virtual world, when he collects k kinds of materials.

Sdchr wants to know the expected time when he could return to reality.



Input

The first line contains three integers n, k, m .

The second line contains n integer p_1, p_2, \dots, p_n .

Output

The first line contains a integer, representing the answer modulo 998244353.

Example

standard input	standard output
3 3 3 1 1 1	499122182

Note

$$1 \leq n \leq 1000$$

$$1 \leq k \leq n, n - k \leq 10$$

$$0 \leq p_i \leq m, p_1 + p_2 + \dots + p_n = m$$

$$1 \leq m \leq 10000$$

It's guranteed that Sdchr can escape from the dream one time.

Problem E. Bye

Nassi is a smart girl.

She does not like redundance.

Given an array a_n , let $b_i = a_i - 1$, let $f_k = \sum_{i=1}^n (b_i (\sum_{j=0}^{k-1} (b_i + 1)^j) + 1)$, she wants to know $\oplus_{i=1}^n f_i$.

Since she does not like big numbers, every step needs to module 998244353 except for the *xor* steps.

Note that \oplus means *xor*.

Now it is time to say goodbye to Nassi.

Suddenly you wake up.

Input

The first line contains an integer n .

The second line contains n integers a_i .

$(1 \leq n \leq 200000)$

$(0 \leq a_i \leq 10^9)$

Output

One line contains a integer representing the answer.

Examples

standard input	standard output
3 2 1 1	8
4 1 1 1 1	0
5 1 1 1 1 1	5

Note

Notice the time limitation.

Problem F. Fate Sky

Fate Sky is a popular board in CC98 for seeking new friends and blind dating.

Now Fate Sky has n topics denoted as $1, 2, \dots, n$. Each writer of the topics has a integer matching value a_i . The matching level of two persons is defined as the bitwise *xor* of their matching values.

Usually, if a seeker with matching value x opens the board, he will do one of the two operations:

- 1 Write a topic. His topic with his matching value will be automatically added to the tail of the topic list. And n increase by 1.
- 2 Browse the topics. Seems browsing all topics is so tired, he will browse a consecutive interval of topics from l to r . Then he will choose the one that makes the highest matching level.

Now there are m queries, please help the seekers find their sweethearts.

It's obvious that the writers won't delete the topics, because they also want to make the highest matching level.

Input

The first line of input contains two integers n and m ($1 \leq n, m \leq 10^5$), the number of initial topics and the number of queries.

The second line contains n integers a_1, a_2, \dots, a_n ($0 \leq a_i \leq 2^{31} - 1$), the matching value of the initial topics.

Next m lines, each line describes a query in the following form:

- 1 x denoting the first operation ($0 \leq x \leq 2^{31} - 1$).
- 2 l r x denoting the second operation ($1 \leq l \leq r \leq n, 0 \leq x \leq 2^{31} - 1$).

Output

For each query 2, output one integer in one line, the highest matching level.

Example

standard input	standard output
5 5	3
1 2 3 4 5	7
1 3	5
2 2 3 1	
1 4	
2 1 5 2	
2 4 7 1	