Codeforces Round #553 (Div. 2)

A. Maxim and Biology

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

Today in the scientific lyceum of the Kingdom of Kremland, there was a biology lesson. The topic of the lesson was the *genomes*. Let's call the *genome* the string "ACTG".

Maxim was very boring to sit in class, so the teacher came up with a task for him: on a given string s consisting of uppercase letters and length of at least 4, you need to find the minimum number of *operations* that you need to apply, so that the *genome* appears in it as a substring. For one *operation*, you can replace any letter in the string s with the next or previous in the alphabet. For example, for the letter "D" the previous one will be "C", and the next — "E". In this problem, we assume that for the letter "A", the previous one will be the letter "Z", and the next one will be "B", and for the letter "Z", the previous one is the letter "Y", and the next one is the letter "A".

Help Maxim solve the problem that the teacher gave him.

A string a is a substring of a string b if a can be obtained from b by deletion of several (possibly, zero or all) characters from the beginning and several (possibly, zero or all) characters from the end.

Input
The first line contains a single integer n ($4 \le n \le 50$) — the length of the string s.

The second line contains the string s, consisting of exactly n uppercase letters of the Latin alphabet.

Output
Output the minimum number of *operations* that need to be applied to the string s so that the *genome* appears as a substring in it.

Examples

input
4 ZCTH
output
2

input
5 ZDATG
output
5

input
6 AFBAKC
output
16

Note
In the first example, you should replace the letter "Z" with "A" for one *operation*, the letter "H" — with the letter "G" for one *operation*. You will get the string "ACTG", in which the *genome* is present as a substring.

In the second example, we replace the letter "A" with "C" for two *operations*, the letter "D" — with the letter "A" for three *operations*. You will get the string "ZACTG", in which there is a *genome*.

B. Dima and a Bad XOR

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

Student Dima from Kremland has a matrix a of size $n \times m$ filled with non-negative integers.

He wants to select exactly one integer from each row of the matrix so that the `bitwise exclusive OR` of the selected integers is strictly greater than zero. Help him!

Formally, he wants to choose an integers sequence $c_1, c_2, \ldots, c_n$ ($1 \le c_j \le m$) so that the inequality $a_{1,c_1} \oplus a_{2,c_2} \oplus \ldots \oplus a_{n,c_n} > 0$ holds, where $a_{i,j}$ is the matrix element from the i-th row and the j-th column.

Here $x \oplus y$ denotes the bitwise XOR operation of integers x and y.

Input
The first line contains two integers n and m ($1 \le n, m \le 500$) — the number of rows and the number of columns in the matrix a.

Each of the next n lines contains m integers: the j-th integer in the i-th line is the j-th element of the i-th row of the matrix a, i.e. $a_{i,j}$ ($0 \le a_{i,j} \le 1023$).

Output
If there is no way to choose one integer from each row so that their bitwise exclusive OR is strictly greater than zero, print "`NIE`".

Otherwise print "TAK" in the first line, in the next line print n integers $c_1, c_2, \ldots c_n$ ($1 \le c_j \le m$), so that the inequality $a_{1,c_1} \oplus a_{2,c_2} \oplus \ldots \oplus a_{n,c_n} > 0$ holds.

If there is more than one possible answer, you may output any.

Examples

input
3 2 0 0 0 0 0 0
output
NIE

input
2 3 7 7 7 7 7 10
output
TAK 1 3

Note
In the first example, all the numbers in the matrix are 0, so it is impossible to select one number in each row of the table so that their bitwise exclusive OR is strictly greater than zero.

In the second example, the selected numbers are 7 (the first number in the first line) and 10 (the third number in the second line), $7 \oplus 10 = 13$, 13 is more than 0, so the answer is found.

C. Problem for Nazar

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

Nazar, a student of the scientific lyceum of the Kingdom of Kremland, is known for his outstanding mathematical abilities. Today a math teacher gave him a `very difficult task`.

Consider two infinite sets of numbers. The first set consists of odd positive numbers ($1, 3, 5, 7, \ldots$), and the second set consists of even positive numbers ($2, 4, 6, 8, \ldots$). At the first stage, the teacher writes the first number on the endless blackboard from the first set, in the second stage — the first two numbers from the second set, on the third stage — the next four numbers from the first set, on the fourth — the next eight numbers from the second set and so on. In other words, at each stage, starting from the second, he writes out **two times more** numbers than at the previous one, and also **changes the set** from which these numbers are written out **to another**.

The ten first written numbers: $1, 2, 4, 3, 5, 7, 9, 6, 8, 10$. Let's number the numbers written, starting **with one**.

The task is to find the sum of numbers with numbers from l to r for given integers l and r. The answer may be big, so you need to find the remainder of the division by 1000000007 ($10^9 + 7$).

Nazar thought about this problem for a long time, but didn't come up with a solution. Help him solve this problem.

Input
The first line contains two integers l and r ($1 \le l \le r \le 10^{18}$) — the range in which you need to find the sum.

Output
Print a single integer — the answer modulo 1000000007 ($10^9 + 7$).

Examples

input
1 3
output
7

input
5 14
output
105

input
88005553535 99999999999
output
761141116

Note

In the first example, the answer is the sum of the first three numbers written out ($1 + 2 + 4 = 7$).

In the second example, the numbers with numbers from 5 to 14: $5, 7, 9, 6, 8, 10, 12, 14, 16, 18$. Their sum is 105.

D. Stas and the Queue at the Buffet

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

During a break in the buffet of the scientific lyceum of the Kingdom of Kremland, there was formed a queue of n high school students numbered from 1 to n. Initially, each student i is on position i. Each student i is characterized by two numbers — a_i and b_i. *Dissatisfaction* of the person i equals the product of a_i by the number of people standing to the left of his position, add the product b_i by the number of people standing to the right of his position. Formally, the *dissatisfaction* of the student i, which is on the position j, equals $a_i \cdot (j - 1) + b_i \cdot (n - j)$.

The director entrusted Stas with the task: rearrange the people in the queue so that **minimize the total** *dissatisfaction*.

Although Stas is able to solve such problems, this was not given to him. He turned for help to you.

Input

The first line contains a single integer n ($1 \le n \le 10^5$) — the number of people in the queue.

Each of the following n lines contains two integers a_i and b_i ($1 \le a_i, b_i \le 10^8$) — the characteristic of the student i, initially on the position i.

Output

Output one integer — **minimum total** *dissatisfaction* which can be achieved by rearranging people in the queue.

Examples

input
3 4 2 2 3 6 1
output
12

input
4 2 4 3 3 7 1 2 3
output
25

input
10 5 10 12 4 31 45

20 55 30 17 29 30 41 32 7 1 5 5 3 15
output
1423

Note
In the first example it is optimal to put people in this order: $(3, 1, 2)$. The first person is in the position of 2, then his *dissatisfaction* will be equal to $4 \cdot 1 + 2 \cdot 1 = 6$. The second person is in the position of 3, his *dissatisfaction* will be equal to $2 \cdot 2 + 3 \cdot 0 = 4$. The third person is in the position of 1, his *dissatisfaction* will be equal to $6 \cdot 0 + 1 \cdot 2 = 2$. The total *dissatisfaction* will be 12.

In the second example, you need to put people in this order: $(3, 2, 4, 1)$. The total *dissatisfaction* will be 25.

E. Number of Components

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

The Kingdom of Kremland is a tree (a connected undirected graph without cycles) consisting of n vertices. Each vertex i has its own value a_i. All vertices are connected in series by edges. Formally, for every $1 \leq i < n$ there is an edge between the vertices of i and $i + 1$.

Denote the function $f(l, r)$, which takes two integers l and r ($l \leq r$):

- We leave in the tree only vertices whose values range from l to r.
- The value of the function will be the number of connected components in the new graph.

Your task is to calculate the following sum:

$$\sum_{l=1}^{n} \sum_{r=l}^{n} f(l, r)$$

Input
The first line contains a single integer n ($1 \leq n \leq 10^5$) — the number of vertices in the tree.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \leq a_i \leq n$) — the values of the vertices.

Output
Print one number — the answer to the problem.

Examples

input
3 2 1 3
output
7

input
4 2 1 1 3
output
11

input
10 1 5 2 5 5 3 10 6 5 1
output
104

Note
In the first example, the function values will be as follows:

- $f(1, 1) = 1$ (there is only a vertex with the number 2, which forms one component)
- $f(1, 2) = 1$ (there are vertices 1 and 2 that form one component)
- $f(1, 3) = 1$ (all vertices remain, one component is obtained)

- $f(2,2) = 1$ (only vertex number 1)
- $f(2,3) = 2$ (there are vertices 1 and 3 that form two components)
- $f(3,3) = 1$ (only vertex 3)

Totally out 7.
In the second example, the function values will be as follows:

- $f(1,1) = 1$
- $f(1,2) = 1$
- $f(1,3) = 1$
- $f(1,4) = 1$
- $f(2,2) = 1$
- $f(2,3) = 2$
- $f(2,4) = 2$
- $f(3,3) = 1$
- $f(3,4) = 1$
- $f(4,4) = 0$ (there is no vertex left, so the number of components is 0)

Totally out 11.

F. Sonya and Informatics

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

A girl named Sonya is studying in the scientific lyceum of the Kingdom of Kremland. The teacher of computer science (Sonya's favorite subject!) invented a task for her.

Given an array a of length n, **consisting only of the numbers 0 and 1**, and the number k. **Exactly k times** the following happens:

- Two numbers i and j are chosen equiprobable such that ($1 \le i < j \le n$).
- The numbers in the i and j positions are swapped.

Sonya's task is to find the probability that after all the operations are completed, the a array will be **sorted in non-decreasing order**. She turned to you for help. Help Sonya solve this problem.

It can be shown that the desired probability is either 0 or it can be represented as $\frac{P}{Q}$, where P and Q are coprime integers and $Q \not\equiv 0 \pmod{10^9+7}$.

Input

The first line contains two integers n and k ($2 \le n \le 100, 1 \le k \le 10^9$) — the length of the array a and the number of operations.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($0 \le a_i \le 1$) — the description of the array a.

Output

If the desired probability is 0, print 0, otherwise print the value $P \cdot Q^{-1} \pmod{10^9+7}$, where P and Q are defined above.

Examples

input
3 2 0 1 0
output
333333336

input
5 1 1 1 1 0 0
output
0

input
6 4 1 0 0 1 1 0
output
968493834

Note

In the first example, all possible variants of the final array a, after applying exactly two operations: $(0, 1, 0)$, $(0, 0, 1)$, $(1, 0, 0)$, $(1, 0, 0)$, $(0, 1, 0)$, $(0, 0, 1)$, $(0, 0, 1)$, $(1, 0, 0)$, $(0, 1, 0)$. Therefore, the answer is $\frac{3}{9} = \frac{1}{3}$.

In the second example, the array will not be sorted in non-decreasing order after one operation, therefore the answer is 0.
