Problem A. Outlier

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Zenyk and Marichka play a game with a set of stones. In this game, Marichka arranges the set of stones on a flat surface.

She designates one of the stones as the secret *outlier* stone without telling Zenyk about it and makes the arrangement accordingly. That outlier stone has the property that when you remove it from the arrangement, the *width* of the remaining stones will be the smallest, i.e. if you leave this secret stone in the arrangement and remove any other stone the width of the stone set will be larger. Geometrically, the width of a set of stones is defined as the smallest distance between two parallel lines that enclose all the stones on or in between them. Can you help Zenyk to find the secret outlier stone?

Specifically, in this problem you will be given a set S of n distinct two-dimensional points indicating the positions of the stones in Marichka's arrangement. Your goal is to find the outlier stone in set S. You have to report the width of the stone set when this outlier is removed.

Formally, given a set $S = \{p_i\}$ of two-dimensional points, for each point p_i $(1 \le i \le n)$, compute the width of the point set $S - \{p_i\}$ as w_i. The outlier is the point for which w_i is minimum. Report the minimum width w_i as a real number.

Input

The first line of the input contains a single integer n $(5 \le n \le 100\,000)$ — the number of stones.

Each of the following n lines contains two integers which are the x and y coordinates of stone p_i $(1 \le i \le n)$.

Line $i + 1$ contains the coordinates of point p_i with the integer identifier i $(1 \le i \le n)$.

The coordinates of the stones are distinct, i.e. for any two stones p_i and p_j, $(i \ne j)$, $x_i \ne x_j$ or $y_i \ne y_j$.

The coordinate values are integers between -10^7 and 10^7. All stone coordinates are distinct.

Output

A single line containing the width w of the stone set without the outlier as a real number with as high precision as possible. Your answer will be judged as correct if it has an absolute or relative error less than 10^{-9}.

Example

standard input	standard output
12 -4 -8 -9 9 -8 1 2 1 1 -3 -8 -9 -1 -3 1 9 4 4 -10 -1 -1 -9 4 2	11.50372185157

Problem B. A Math Problem

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Zenyk is given a sequence of n integers $a_1, \ldots, a_n$ and a sequence of m integers $b_1, \ldots, b_m$. Both sequences contain only positive integers. You built a matrix of size $n \times m$ such that an element at the i-th row and the j-th column has value of LCM (least common multiple) of values a_i and b_j.

Now he wants to know how many pairs of sequences c and d are there that produce the same matrix.

Input

The first line contains two integers n and m ($1 \le n, m \le 10^5$). The second line contains n integers $a_1, \ldots, a_n$. The third line contains m integers $b_1, \ldots, b_m$ ($1 \le a_i, b_j \le 10^9$).

Output

The number of pairs modulo $1\,000\,000\,007$ ($10^9 + 7$).

Example

standard input	standard output
2 3 2 10 28 3 4	5

Problem C. A Permutation Problem

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	256 mebibytes

Zenyk has a permutation of n integers from 1 to n, inclusive. His task is to sort the permutation, and he has to swap each pair of integers exactly once.

Can you help him to do that?

Input

The first line contains a single integer n ($2 \le n \le 1000$). The second line contains the permutation P of integers between 1 and n.

Output

Print "no" if it's impossible to sort the permutation. Otherwise, print $\frac{n(n-1)}{2}$ lines that describe the pairs of values (not indices) to swap on the corresponding turn.

Examples

standard input	standard output
4 3 2 4 1	1 2 4 1 1 3 2 3 2 4 3 4
3 1 3 2	1 3 3 2 1 2
2 1 2	no

Problem D. Split in Sets

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Zenyk is given n balls with integers $a_1, \ldots, a_n$ on them, and also k boxes. You have to put each ball in a box, and each box must have at least one ball in it. The value of a box is the bitwise AND of all integers on the balls in it.

Find the maximum total sum (regular) of all boxes and the number of ways to put balls in boxes that achieve the maximum sum. Note that the order of balls in a particular box is not important. However, all boxes are different, and all balls are also different, even if some balls have the same integer on them.

Input

The first line contains two integers n and k ($1 \le k \le n \le 10^5$). The next line contains n integers $a_1, \ldots, a_n$ ($0 \le a_j \le 10^9$).

Output

Print two integers. The first integer should be the maximum total sum of all boxes. The second integer should be the number of ways to put balls in boxes modulo $10^9 + 7$.

Examples

standard input	standard output
3 2 4 7 5	11 2
4 1 44 47 74 77	8 1
4 4 44 47 74 77	242 24

Problem E. The Destruction of the Crystals

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Once upon a time, Zenyk came up with a new magical game for his friends. He brought a $n \times m$ board and placed k crystals on it. After that, he also placed b bombs on the board.

Upon explosion each bomb destroys all the crystals either in its row or in its column. It also detonates all the bombs in the chosen direction. The direction of the explosion (row/column) for each bomb is chosen by friends. Different bombs may have different directions.

The objective of the game is to choose the first bomb and the directions to detonate in such a way that the number of destroyed crystals is the largest possible.

Input

In the first line there are four integers: n, m, k, b ($1 \le n, m \le 3000$, $0 \le k + b \le n \cdot m$). They are the dimensions of the board, the number of the crystals on it and the number of bombs.

In the next n rows the board is described by m characters per row:

- "`.`" — an empty cell,
- "`k`" — a crystal,
- "`b`" — a bomb.

Output

A single integer: the maximum possible amount of destroyed crystals.

Examples

standard input	standard output
7 3 4 5 bbb ..b ..b k.. k.. k.. k..	4
3 3 4 2 k.. kk. bbk	3

Problem F. Balls

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Zenyk placed n balls in a row on a table, and the i-th ball is colored in color c_i. Now Marichka is going to play with Zenyk's balls.

In a single turn, she can pick a sequence of consecutive balls which has a dominant color. After that, all selected balls that are colored in a different color than the dominant will be removed.

Marichka wants to make some number of turns (possibly zero) after which all remaining balls will be colored in the same color. Find out how many different colors could be left at the end.

Color is considered dominant if more than half of the selected balls are colored in it.

Input

The first line contains a single integer n ($1 \le n \le 10^5$) — the number of balls. The second line contains a list of n space-separated integers c_i ($1 \le c_i \le 10^9$) — the initial colors of the balls in the order they are placed on the table.

Output

In the only line print a single integer — the answer to the problem.

Example

standard input	standard output
7 3 1 3 2 1 2 3	2

Problem G. Football Match

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Zenyk wants to play football, and $n - 1$ friends join him. All players have skill level — an integer between 1 and 10 000.

Players want to choose a referee and then divide into two teams such that each player is either the referee or a member of one of the teams, and the sums of skills of players in both teams are the same. So that will be a fair game.

Unfortunately all of them forgot their own skill levels. But each player remembers if it's possible to divide into teams when he is a referee.

Find such skill values that satisfy all conditions. If several possible answers exist print any of them.

Input

The first line contains one integer n ($3 \le n \le 50$).

The second line contains a string of length n. The i-th character of this string equals "Y" if it's possible to divide players into teams if i-th player is a referee, and "N" otherwise.

Output

In the first line, print "YES" if at least one possible set of values exists, and "NO" otherwise. If the answer is "YES", print n integers — the corresponding values. These values should be between 1 and 10 000. If several possible answers exist, print any of them.

Example

standard input	standard output
4 YNNY	YES 3 1 2 3

Problem H. Hill

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Having stocked up with snowballs, Zenyk and Marichka already wanted to start a game.

But suddenly, Zenyk thought that throwing snowballs on a flat surface is boring. He wanted to build as high as possible hill for himself to climb at it and throw snowballs at Marichka.

Building of a hill isn't easy. Zenyk treated it seriously, took a sheet of paper with coordinate axes, where y-axis is directed upwards, and began to draw the cross section of a hill (a front view).

Marichka doesn't want the hill to be too high, so she imposed some constraints at its section.

1. Section must be a polygonal chain.
2. The chain must start at point (x_0, y_0) and end at point (x_n, y_n).
3. The chain must contain n segments.
4. The length of the i-th segment should be l_i.

Zenyk wants to know the maximum height he of a hill he can make under these constraints, and asks you the maximal y-coordinate of the hill's section. Help him find it.

Input

The first line contains four integers x_0, y_0, x_n, y_n ($|x_0|, |y_0|, |x_n|, |y_n| \le 10^6$) – coordinates of start and end of the chain.

The second line contains an integer n ($1 \le n \le 10^5$) — number of segments in the chain.

The third line contains n integers $l_1, \ldots, l_n$ ($1 \le l_i \le 10^6$) — lengths of the segments.

Output

If there is no hill that satisfies these constraints, output "`IMPOSSIBLE`".

Otherwise, output one real number — the maximum y-coordinate of the highest point. The answer will be considered correct if its absolute or relative error doesn't exceed 10^{-7}.

Examples

standard input	standard output
2 3 8 3 2 5 5	7.0000000000
4 7 44 77 4 4 7 7 4	IMPOSSIBLE

Problem I. Special Game

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Dmytryk and Petro are playing the following game. They have $2n$ cards with integer values 1 to $2n$, all values are different. At the beginning of the game, each player has exactly n cards.

A total of n rounds occur, and Dmytryk makes the first turn in the first round. In each round, the player that makes the first turn takes out one of his cards. Then the other player (seeing the first player's card) takes out one of his cards. The player that has the largest card value wins the round and takes the first turn in the next round. Both cards are then removed from the game.

There is an additional rule: in each round, if the player making the second turn has a card with bigger value than the other player's card he sees, he is obliged to take out one of such cards.

The objective of each player is to maximize the number of rounds he wins. Find the maximum number of turns Dmytryk can win, if both players play optimally.

Input

The first line contains a single integer n ($1 \le n \le 1000$). The second line contains n integers — Dmytryk's cards. The third line contains Petro's cards.

Output

The answer to the problem.

Examples

standard input	standard output
3 1 2 5 3 4 6	1
2 4 3 1 2	2

Problem J. Even More Exciting Game

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Petro decided to play new game with Oleg-Andriy. They have a string that consists of lowercase English letters and they alternatively make turns: one can choose an arbitrary letter and delete it, or replace with the next letter in the alphabetical order (if it exists). In this strange game a player who can't move loses.

Petro was almost sure in his victory, but suddenly realized, that this game is unequal, because Oleg-Andriy always will make moves two times in a row (first for Oleg, then for Andriy). So, he is interested whether he can win this game.

You are given the initial string and the information about the player who starts. Your task is to determine whether Petro can win game if his opponent will play optimally.

Input

The first line contains a positive integer n ($1 \le n \le 10^5$) — the number of characters in the string, followed by the name of the player which goes first ("`Petro`" or "`Oleg-Andriy`"). In the second line you are given the game string itself.

All characters in the given string are lowercase English letters.

Output

Print one word — "`Win`" in case of Petro's win, or "`Lose`" otherwise.

Examples

standard input	standard output
1 Petro a	Win
17 Oleg-Andriy olegandriywillwin	Lose

Problem K. Potato Shuffle

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Marichka has a lot of potato in her basement. There are n bags with potato in a line. The i-th of them contains a_i potatoes.

Zenyk loves to shuffle those bags. During one shuffle operation he can grab two adjacent bags and swap their positions if the total number of potatoes in this two bags does not exceed number k. Zenyk can perform as many shuffle operations as he wishes.

Once Zenyk and Marichka wondered, what is the total number of bag permutations Zenyk can achieve. Two bag permutations are considered different if there is a position where two bags have different number of potatoes.

Input

The first line contains two integers n ($1 \le n \le 10^5$) and k ($0 \le k \le 2 \cdot 10^9$). The second line contains n integers a_i ($1 \le a_i \le 10^9$).

Output

Single integer — the number of different permutations modulo $10^9 + 7$.

Examples

standard input	standard output
3 7 5 2 4	3
5 4 1 2 3 2 1	10

Problem L. Palindrome

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	256 mebibytes

Zenyk bought a string of length n, which contains only `0` and `1` characters. He wants to present it to Marichka, however he knows that she likes only palindromes (strings which read the same backward as forward) and she will be satisfied with just such a gift.

In one hour, Zenyk can change the string by moving any one of its characters to the end of the string. What is the minimum number of hours needed for Zenyk to prepare a gift for Marichka?

Input

The first line contains one integer n ($1 \le n \le 300$). The second line contains a string of length n containing only `0` and `1` characters.

Output

If Zenyk succeeds in preparing a gift then print one integer — the minimum number of hours.

If he can't do that print "`-1`" (without quotes).

Examples

standard input	standard output
7 1101001	1
4 1001	0
12 110100010011	3