

北京理工大学第十六届“连山科技”程序设计大赛

The 16-th BIT Campus Programming Contest

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连山科技
LSSEC TECH

网络选拔赛
Online Round



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请勿在比赛开始前翻阅试题！

Do not open before the contest has started.

2022 年 10 月 30 日

Problem A. Saki

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

Friedchicken likes playing Majsouul and has strong luck. So it is easy for him to get **Yakuman** which is a difficult thing in Majsouul. He wants more friends to play Majsouul with him, so he try to teach you.

First, you need to know the Tile's types.

Manzu									
	Ii man	Ryan man	San man	Suu man	Uu man	Rou man	Chii man	Paa man	Kyuu man
	1m	2m	3m	4m	5m	6m	7m	8m	9m
Pinzu									
	Ii pin	Ryan pin	San pin	Suu pin	Uu pin	Rou pin	Chii pin	Paa pin	Kyuu pin
	1p	2p	3p	4p	5p	6p	7p	8p	9p
Souzu									
	Ii sou	Ryan sou	San sou	Suu sou	Uu sou	Rou sou	Chii sou	Paa sou	Kyuu sou
	1s	2s	3s	4s	5s	6s	7s	8s	9s
Jihai									
		Ton	Nan	Shaa	Pei		Haku	Hatsu	Chun
		1z	2z	3z	4z		5z	6z	7z

For example 1m means Ii man, 1z means Ton.

There some special tiles hands called **Yakuman**, such as:

Blessing of Heaven Dealer Only

Win a hand by Tsumo as a dealer in the first turn with the first draw

Blessing of Earth Non-Dealer Only

Win a hand by Tsumo as a non-dealer in the first turn before any tiles are called

Big Three Dragons

Win a hand with three Triplets or Quads of all the three Dragon Tiles

Four Concealed Triplets Menzenchin Only

Win a hand with four closed Triplets

All Honors

Win a hand with four Triplets and a Pair of the Honor Tiles (Wind Tiles and Dragon Tiles)

All Green Green is not Necessary

Win a hand with only green-colored tiles: 2-Sou/3-Sou/4-Sou/6-Sou/8-Sou and/or Green (F)

All Terminals

Win a hand with four Triplets and a Pair of 1 and 9 out of the Number Tiles (1-Man/9-Man, 1-Pin/9-Pin, 1-Sou/9-Sou)

Thirteen Orphans Menzenchin Only

Win a hand with one of each 13 Terminal Tiles, plus any tile matches one of them

Four Little Winds

Win a hand with three Triplets or Quads of the Wind Tiles, plus a pair of the fourth wind

Four Quads

Win a hand with four Quads

Nine Gates Menzenchin Only

Win a hand with tiles from only one of the three Number Tiles in the order of "1112345678999", plus any tile matches one of them

Now, Friedchicken wants to test your Majsouls level. He will give you some **Yakuman's** name, you should print out the tiles **from left to right** according to **the image above**.

Input

A string indicates Yakuman's name.

Output

Output one line indicating the tiles, and each tile is separated by a space.

Examples

standard input	standard output
Blessing of Heaven	1m 2m 3m 4p 4p 4p 5s 6s 7s 1z 1z 1z 2z 2z
Blessing of Earth	1m 2m 3m 4p 4p 4p 5s 6s 7s 1z 1z 1z 2z 2z

Note

Each tile is separated by a space. The examples have line feed only because of a typographical problem.

Problem B. ZYW with his score

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

As we all know, ZYW is a master of roll. Now, at the end of this term, everyone wants to know how many points ZYW has scored. But ZYW believes that only people who are intelligent enough can know his score. So he told you his encrypted score.

There are only two courses in this semester. Let's assume that ZYW's scores are a and b , respectively. He will tell you $a + b$ and $a \wedge b$. Can you tell the value of $a \oplus b$?

“ $\wedge$ ” and “ $\oplus$ ” represents bitwise AND and XOR operation, respectively.

Input

The input consists of two integers $a + b$ and $a \wedge b$ ($0 \leq a, b \leq 10^9$).

Output

Output an integer indicating $a \oplus b$.

Example

standard input	standard output
5 2	1

Problem C. Array Brush

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

Given an array, it's easy to calculate its maximum value A and minimum value B . We then define variation range V of an array as $V = A - B$. Now ZYW has an integer array $a_1, a_2, \dots, a_n$ and an array brush with length k . The array brush can convert exact k consecutive numbers in the array into their average. ZYW only has one chance to use the array brush and he wants to minimize the variation range of the array. Can you tell him the minimum variation range?

Input

There are two lines in the input.

The first line contains two integers n, k ($1 \leq n \leq 10^5, 1 \leq k \leq n$), indicating the length of the array and the array brush.

The second line contains n integers $a_1, a_2, \dots, a_n$ ($-10^5 \leq a_i \leq 10^5$), indicating the original array.

Output

Output one real number V , indicating the minimum variation range ZYW can get.

If the standard answer is a , and your answer is b , your answer will be considered correct if $|\frac{a-b}{\max(a,1)}| < 10^{-4}$

Examples

standard input	standard output
5 3 2 3 1 4 5	1.333333
5 2 2 3 1 4 5	3.000000

Note

In the first sample, ZYW performs array brush on $[1, 4, 5]$ and the array becomes $[2, 3, 3.3333, 3.3333, 3.3333]$, the variation range is 1.3333.

Problem D. Bookworm

Input file: `standard input`
Output file: `standard output`
Time limit: 1 second
Memory limit: 256 megabytes

As a total bookworm, doing a lot of reading every day is an integral part of Waff's life. After reading all the books several times over, Waff found the old way of reading too boring.

Now, Waff plans to pick a book from his shelf first, and when he finishes it, the title of the next book must be the result of adding an arbitrary letter in any one place (at the beginning, between two letters, or at the end) to the title of this book. Waff then repeats this process until there are no more books to read that satisfy the condition. For example, if the book Waff is reading is called *tom*, the title of the next book that satisfies the condition can be *atom*, *toom*, or *tomb*, but can't be *to* and *tomm*.

Waff has N books on his bookshelf, and the titles of all the books are strings of lowercase letters only. Now that Waff has selected the book he wants to read, then he wants to know what the longest title he can read is.

The input is guaranteed to have a unique solution.

Input

Line 1: An integer N ($1 \leq N \leq 1000$) followed by a legal word, indicating the first book he will read.

Line 2 to $N + 1$: Each line contains a legal word less than 80 letters long, consisting only of lowercase letters.

Output

A single line contains a word, indicating the longest title Waff can read.

Example

standard input	standard output
7 tom to tom atom atoma tomb tomba tombau	tombau

Note

The reading sequence in testcase: *tom*, *tomb*, *tomba*, *tombau*.

Problem E. Diameter

Input file: standard input
Output file: standard output
Time limit: 1.5 seconds
Memory limit: 256 megabytes

Aqua and Hiyori love the longest diameter.

Aqua has a sequence a of length n , and Hiyori want to construct a complete undirected graph which has n vertices based on the sequence a , which means that the length of edge between u and v is $\min_{i=\min(u,v)}^{\max(u,v)} a_i$. In Aqua's mind, $d(u, v)$ is described as the longest simple path from u to v and she want to know $\max_{1 \leq u < v \leq n} d(u, v)$. But she is stupid, could you help her?

Input

There are two lines in the input.

The first line contains a integer n ($1 \leq n \leq 10^6$), indicating the number of the piles.

The second line contains n integers $a_1, a_2, \dots, a_n$ ($1 \leq a_i \leq 10^9$), indicating the sequence a .

Output

Output a single integer — $\max_{1 \leq u < v \leq n} d(u, v)$.

Example

standard input	standard output
3 1 1 1	2

Problem F. Subsequence

Input file: standard input
 Output file: standard output
 Time limit: 5 seconds
 Memory limit: 512 megabytes

Aqua and Hiyori love subsequences.

Today, Aqua finds a cute tree. A tree is an undirected acyclic graph and this cute tree's root is vertex 1. Now, Aqua colors the vertices in the tree and the color of vertex i is a_i . In order to examine Aqua, Hiyori sets a problem.

A subsequence A is defined as some sequences like $\{u_1, u_2, \dots, u_k\} (k \geq 1)$, and it satisfies that u_i is u_{i+1} 's ancestor for every $i = 1, 2, \dots, k-1$. Meanwhile, the color of the subsequence A is $\{a_{u_1}, a_{u_2}, \dots, a_{u_k}\}$.

Define T as the multiset of all subsequences' color in the tree, and $P(T)$ as the set of all subsequences' color in the tree. Let v_x be the number of the subsequence x 's color appearing in T .

Now, Aqua should get $\sum_{x \in P(T)} v_x^2$. But she is stupid, could you help her?

Input

There are three lines in the input.

The first line contains a integer n ($1 \leq n \leq 5 \cdot 10^3$), indicating the size of tree.

The second line contains n integers $a_1, a_2, \dots, a_n$ ($0 \leq a_i \leq 10^9$), indicating the color of vertex i .

The third line contains $n-1$ integer $p_2, p_3, \dots, p_n$ ($1 \leq p_i \leq i-1$), indicating the father of vertex i .

Output

Print one line. The only line should contain the answer modulo 998244353.

Examples

standard input	standard output
3 1 2 3 1 1	5
3 1 1 1 1 1	13

Note

In the second sample, $T = \{\{1\}, \{1\}, \{1\}, \{1, 1\}, \{1, 1\}\}$, $P(T) = \{\{1\}, \{1, 1\}\}$, so the answer is $3^2 + 2^2 = 13$.