Codeforces Round #204 (Div. 1)

A. Jeff and Rounding

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

Jeff got $2n$ real numbers $a_1, a_2, \ldots, a_{2n}$ as a birthday present. The boy hates non-integer numbers, so he decided to slightly "adjust" the numbers he's got. Namely, Jeff consecutively executes n operations, each of them goes as follows:

- choose indexes i and j ($i \neq j$) that haven't been chosen yet;
- round element a_i to the nearest integer that isn't more than a_i (assign to a_i: $\lfloor a_i \rfloor$);
- round element a_j to the nearest integer that isn't less than a_j (assign to a_j: $\lceil a_j \rceil$).

Nevertheless, Jeff doesn't want to hurt the feelings of the person who gave him the sequence. That's why the boy wants to perform the operations so as to make the absolute value of the difference between the sum of elements before performing the operations and the sum of elements after performing the operations as small as possible. Help Jeff find the minimum absolute value of the difference.

Input

The first line contains integer n ($1 \leq n \leq 2000$). The next line contains $2n$ real numbers $a_1, a_2, \ldots, a_{2n}$ ($0 \leq a_i \leq 10000$), given with exactly three digits after the decimal point. The numbers are separated by spaces.

Output

In a single line print a single real number — the required difference with **exactly three digits** after the decimal point.

Examples

input
3 0.000 0.500 0.750 1.000 2.000 3.000
output
0.250

input
3 4469.000 6526.000 4864.000 9356.383 7490.000 995.896
output
0.279

Note

In the first test case you need to perform the operations as follows: $(i = 1, j = 4)$, $(i = 2, j = 3)$, $(i = 5, j = 6)$. In this case, the difference will equal $|(0 + 0.5 + 0.75 + 1 + 2 + 3) - (0 + 0 + 1 + 1 + 2 + 3)| = 0.25$.

B. Jeff and Furik

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

Jeff has become friends with Furik. Now these two are going to play one quite amusing game.

At the beginning of the game Jeff takes a piece of paper and writes down a permutation consisting of n numbers: $p_1, p_2, \ldots, p_n$. Then the guys take turns to make moves, Jeff moves first. During his move, Jeff chooses two adjacent permutation elements and then the boy swaps them. During his move, Furic tosses a coin and if the coin shows "heads" he chooses a random pair of adjacent elements with indexes i and $i + 1$, for which an inequality $p_i > p_{i+1}$ holds, and swaps them. But if the coin shows "tails", Furik chooses a random pair of adjacent elements with indexes i and $i + 1$, for which the inequality $p_i < p_{i+1}$ holds, and swaps them. If the coin shows "heads" or "tails" and Furik has multiple ways of adjacent pairs to take, then he uniformly takes one of the pairs. If Furik doesn't have any pair to take, he tosses a coin one more time. The game ends when the permutation is sorted in the increasing order.

Jeff wants the game to finish as quickly as possible (that is, he wants both players to make as few moves as possible). Help Jeff find the minimum mathematical expectation of the number of moves in the game if he moves optimally well.

You can consider that the coin shows the heads (or tails) with the probability of 50 percent.

Input

The first line contains integer n $(1 \le n \le 3000)$. The next line contains n distinct integers $p_1, p_2, \ldots, p_n$ $(1 \le p_i \le n)$ — the permutation p. The numbers are separated by spaces.

Output

In a single line print a single real value — the answer to the problem. The answer will be considered correct if the absolute or relative error doesn't exceed 10^{-6}.

Examples

input
2 1 2
output
0.000000

input
5 3 5 2 4 1
output
13.000000

Note

In the first test the sequence is already sorted, so the answer is 0.

C. Jeff and Brackets

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

Jeff loves regular bracket sequences.

Today Jeff is going to take a piece of paper and write out the regular bracket sequence, consisting of nm brackets. Let's number all brackets of this sequence from 0 to $nm - 1$ from left to right. Jeff knows that he is going to spend $a_{i \bmod n}$ liters of ink on the i-th bracket of the sequence if he paints it opened and $b_{i \bmod n}$ liters if he paints it closed.

You've got sequences a, b and numbers n, m. What minimum amount of ink will Jeff need to paint a regular bracket sequence of length nm?

Operation $x \bmod y$ means taking the remainder after dividing number x by number y.

Input

The first line contains two integers n and m ($1 \le n \le 20$; $1 \le m \le 10^7$; m is even). The next line contains n integers: a_0, a_1, ..., a_{n-1} ($1 \le a_i \le 10$). The next line contains n integers: b_0, b_1, ..., b_{n-1} ($1 \le b_i \le 10$). The numbers are separated by spaces.

Output

In a single line print the answer to the problem — the minimum required amount of ink in liters.

Examples

input
2 6 1 2 2 1
output
12

input
1 10000000 2 3
output
25000000

Note

In the first test the optimal sequence is: ()()()()()(), the required number of ink liters is 12.

D. Jeff and Removing Periods

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Cosider a sequence, consisting of n integers: $a_1, a_2, \ldots, a_n$. Jeff can perform the following operation on sequence a:

- take three integers v, t, k $(1 \le v, t \le n;\ 0 \le k;\ v + tk \le n)$, such that $a_v = a_{v+t}, a_{v+t} = a_{v+2t}, \ldots, a_{v+t(k-1)} = a_{v+tk}$;
- remove elements $a_v, a_{v+t}, \ldots, a_{v+t \cdot k}$ from the sequence a, the remaining elements should be reindexed $a_1, a_2, \ldots, a_{n-k-1}$.
- permute in some order the remaining elements of sequence a.

A beauty of a sequence a is the minimum number of operations that is needed to delete all elements from sequence a.

Jeff's written down a sequence of m integers $b_1, b_2, \ldots, b_m$. Now he wants to ask q questions. Each question can be described with two integers l_i, r_i. The answer to the question is the beauty of sequence $b_{l_i}, b_{l_i+1}, \ldots, b_{r_i}$. You are given the sequence b and all questions. Help Jeff, answer all his questions.

Input

The first line contains integer m $(1 \le m \le 10^5)$. The next line contains m integers $b_1, b_2, \ldots, b_m$ $(1 \le b_i \le 10^5)$.

The third line contains integer q $(1 \le q \le 10^5)$ — the number of questions. The next q lines contain pairs of integers, i-th of them contains a pair of integers l_i, r_i $(1 \le l_i \le r_i \le m)$ — the description of i-th question.

Output

In q lines print the answers to Jeff's queries. Print the answers according to the order of questions in input.

Examples

input
5 2 2 1 1 2 5 1 5 1 1 2 2 1 3 2 3
output
2 1 1 2 2

input
10 2 1 3 3 3 3 1 3 1 1 10 4 8 2 10 1 10 4 4 1 3 2 4 6 7 1 9 2 5 1 1
output
2 3 3 1 3 2 2 3 2 1

E. Jeff and Permutation

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

Jeff's friends know full well that the boy likes to get sequences and arrays for his birthday. Thus, Jeff got sequence $p_1, p_2, \ldots, p_n$ for his birthday.

Jeff hates inversions in sequences. An inversion in sequence $a_1, a_2, \ldots, a_n$ is a pair of indexes i, j $(1 \le i < j \le n)$, such that an inequality $a_i > a_j$ holds.

Jeff can multiply some numbers of the sequence p by -1. At that, he wants the number of inversions in the sequence to be minimum. Help Jeff and find the minimum number of inversions he manages to get.

Input

The first line contains integer n $(1 \le n \le 2000)$. The next line contains n integers — sequence $p_1, p_2, \ldots, p_n$ $(|p_i| \le 10^5)$. The numbers are separated by spaces.

Output

In a single line print the answer to the problem — the minimum number of inversions Jeff can get.

Examples

input
2 2 1
output
0

input
9 -2 0 -1 0 -1 2 1 0 -1
output
6