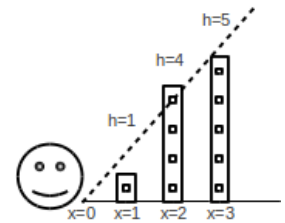


Problem A. Construction

Input file: standard input
Output file: standard output
Time limit: 2 seconds
Memory limit: 64 megabytes

Every day, while coming to the lyceum, Vasya looks at the construction area nearby. Out of curiosity he always counts how many buildings are there in his vision. Vasya cannot see all the buildings, because some of them are covered by the others. He also noticed that the number of visible buildings changes with time. This is due to the fact that each day exactly one of the buildings is changed in height (it's not necessarily the same building every day). The builders did not always care about precise execution of their order, hence the height might both increase and decrease. Your problem is to simulate the described process.



For simplicity let us consider that all the events take place on the two-dimensional plane. Vasya is at the origin point $(0,0)$, and the buildings are represented as segments joining the points $(i, 0)$ and (i, h_i) for each i from 1 to n . The building is considered to be visible, if any positive-length part of the building is visible. At a day #0, all the buildings have the height 0. Vasya counts the buildings at the day #1 for the first time.

Input

First line of an input contains two numbers separated by spaces: n — number of buildings, and d — the number of days, where $1 \leq n \leq 100\,000$, $1 \leq d \leq 100\,000$. Next d lines describe which buildings were changing in height. j -th of these lines contains the numbers: i — number of building that was changed in the height at the j -th day, and h_i — the new height of this building, where $1 \leq j \leq d$, $1 \leq i \leq n$, $1 \leq h_i \leq 1\,000\,000\,000$.

Output

Output d lines in the output file. In the j -th line, please output, how many buildings Vasya will see at the j -th day.

Example

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

Problem B. Sequence-2

Input file: standard input
Output file: standard output
Time limit: 2 seconds
Memory limit: 64 megabytes

Alex likes number sequences. Once he took one of his favorite sequences, and decided to create another one out of it. To do this, he calculated for each element of the given sequence a length of the longest non-decreasing subsequence that ends in this element. These lengths formed a new sequence. After that he told his friend Sasha a new sequence. Of course, he did not describe Sasha his favorite sequence.

Help Sasha to regenerate Alex's favorite sequence.

Input

The first line of the input file contains n ($1 \leq n \leq 100\,000$) — the length of new sequence. The new sequence is given in the second line as numbers a_i , $1 \leq i \leq n$, $1 \leq a_i \leq 10^9$, separated by spaces.

Output

Output Alex's favorite sequence as a single line of numbers, separated by spaces. If several solutions exist, output any of them. It is guaranteed that solution always exists. We also know that all Alex's favorite sequences consist only of positive integers not greater than 10^9 .

Example

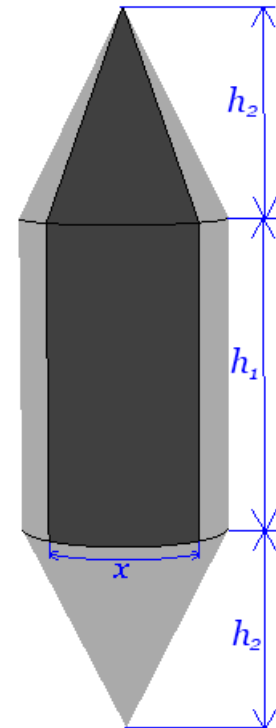
standard input	standard output
1 1	1
2 1 1	2 1

Problem C. Banana

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 64 megabytes

Peter likes bananas. One morning, while peeling a banana for breakfast, Peter suddenly thought about a way in which he was doing it. Usually, Peter peels bananas in *petals*, starting from one end, but not taking a petal completely down to the lower end. When Peter peeled a first petal down, he was interested what percentage of banana skin area he had just peeled with this movement. Determine this percentage for Peter.

Let us imagine a banana as a right cylinder of height h_1 and radius R , with two identical right cones of height h_2 each, built on the bases of the cylinder. Locate a banana in such a way that a common axis of the cylinder and the cones is the axis OZ . Then one petal is a part of the surface, separated by two parallel vertical lines on the cylinder surface, which extend on the surface of the upper cone to its apex, and end at the lower edge of the cylinder (see the figure). The petal area is the area of the cylinder and upper cone lateral surface part, which was cut off by these lines. Peter has measured the length x of the petal lower edge arc in order to help you with a solution.



Input

A single input line contains four real numbers R, h_1, h_2, x , separated by spaces and given to the second decimal place ($1 \leq R, h_1, h_2 \leq 1000$, $0 \leq x \leq \pi R$).

Output

Output a single real number — the percentage of total banana surface area peeled with a single petal. Your answer's absolute or relative error should not exceed 10^{-6} .

Example

standard input	standard output
2.00 3.00 1.00 1.52	9.5130192282

Problem D. Cottage demolition

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 64 megabytes

Oligarch Vasily Petrovich wants to have a beautiful cottage. In his opinion, a beautiful cottage of a modern oligarch should consist of several buildings lined up along the road in a non-decreasing height order. Vasily Petrovich ordered the construction of his cottage to Construction Company "Horns and Hooves". The employees of this company were former programmers: the project was built during the last night and out of accordance with the specifications. At the acceptance day Vasily Petrovich found out in horror that his cottage consisted of n buildings with randomly ordered heights $h_1, h_2, \dots, h_n$.

In order to beautify the cottage, some of the buildings had to be removed, and some had to be demolished completely. The same construction company requires \$1 for demolishing 1 meter off top of any building. Vasily Petrovich can shorten any of n buildings to any level. Reluctantly Vasily Petrovich is even ready to demolish some of the buildings completely. A demolished building is considered to be disappeared, and the total cottage beauty is determined based on the remaining buildings. However, as any respectable oligarch, Vasily Petrovich would not mind some saving. What is the minimum sum of money that Vasily Petrovich requires to put his cottage in order?

Input

The first line contains a single number n ($1 \leq n \leq 10^4$) — the number of buildings. The second line contains n numbers $h_1, h_2, \dots, h_n$ ($1 \leq h_i \leq 10^5$), separated by spaces — the heights of the constructed buildings.

Output

Output a single number — the minimum amount to be spent on the demolition.

Example

standard input	standard output
5 2 7 5 6 2	4

Explanation

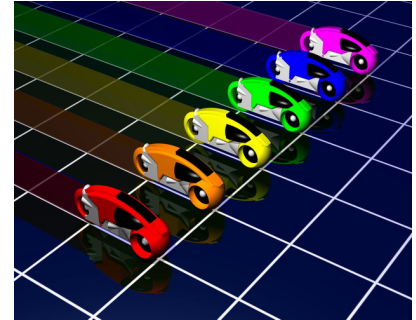
In the example the best way is to shorten the building #2 from 7 meters to 5 meters (for \$2), and to demolish the building #5 completely (for \$2). If Vasily Petrovich spends \$4, he will get 4 buildings with the following heights: "2 5 5 6".

Problem E. Tron

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 64 megabytes

Vasya's favorite movie is "Tron". Vasya has recently started creating a network game where players will ride light motorcycles, as in the movie. A light motorcycle differs from the ordinary one in the following way: its ridden trajectory turns into a wall of light. Any player is out of the game if he passes through any wall of light. After a player quits the game, his light motorcycle disappears, but his wall of light still remains. If two or more players collide, they just safely ride through each other.

Let us imagine this game on a plane with introduced coordinates (x, y) . All players start their movement at the OX axis. All players have the same speed. Motorcycles are very small, so they can be considered as points. Vasya has implemented an artificial intelligence to play with. But so far his AI is pretty simple and moves motorcycles only in straight lines.



Vasya wants to test the game automatically. When the game starts, n artificial intelligences will compete. Tester counts a number of players who quit during the game, denoted as k . The game runs for a long time, until it is clear that nobody else quits the game in the future. The same number k is calculated with a second program, and these two results are compared. Please help Vasya to write the second program.

Input

The first line contains an integer n . $1 \leq n \leq 100\,000$. The second line contains n integers, separated by spaces: $x_1, x_2, \dots, x_n$ — the initial coordinates of the players $-1\,000\,000 \leq x_i \leq 1\,000\,000$. The third line contains n reals: $\alpha_1, \alpha_2, \dots, \alpha_n$ — the starting angles of motorcycles, measured in degrees counter-clockwise from the positive direction of OX axis. Angles are specified up to the third decimal place, $0 < \alpha_i < 180$.

Output

Output a single number k — the number of players who will quit the game.

Example

standard input	standard output
2 3 1 135 45	0
5 1 2 7 8 10 179.999 90 45 160 120	3

Problem F. Problems

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 64 megabytes

Once, while Vasya was dealing with his homework assignment, an interesting idea dawned upon him. He realized that the assignment could be reduced to the simple calculations and consisted of n separate problems. First, problem #1 is solved, then its answer is substituted into the problem #2, it is solved, then problem #2's answer is substituted into the problem #3, it is solved, and so on. . . That is, each next answer depends on the previous one.

Vasya knows from his experience that his probability to solve the problem # i correctly is p_i . Fortunately, Vasya can check the correctness of each task's solution. Vasya knows that for an incorrectly solved problem the test will show its incorrectness with probability q_i . In this case, the problem should be solved again from scratch. If the problem is solved correctly, then the test will always show that the problem has been solved correctly. The same problem can be checked several times. All the events "correctness of problem solution" and "error detection if there is one" are mutually independent.

However, life would be too easy without time limits. Vasya has only t minutes before the lecture. Each problem is doable in exactly 1 minutes because all of the are typical. Each correctness test also takes 1 minute. Vasya wants to know the maximum probability of getting a final correct answer, if he chooses the optimal strategy for problem solving and testing.

There are lots of possible problem answers, so Vasya cannot guess an answer. For the same reason, if, for example, the answer to problem #5 is incorrect, and the problem #6 was solved correctly, the answer to the problem #6 would still be wrong.

Input

The first line of an input contains integers n and t , separated by a space. $1 \leq n \leq 500$, $0 \leq t \leq 500$. The second line contains n numbers, separated by spaces: $p_1, p_2, p_3, \dots, p_n$. The third line contains n numbers, separated by spaces: $q_1, q_2, q_3, \dots, q_n$. The numbers p_i and q_i are specified up to the third decimal place. $0 \leq p_i \leq 1$, $0 \leq q_i \leq 1$.

Output

Output the maximum desired probability on a single line. Your answer will be accepted if its absolute error does not exceed 10^{-6} .

Example

standard input	standard output
1 3 0.5 0.2	0.55
2 4 0.3 0.6 0.2 0.1	0.2052

Problem G. Totient function

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 64 megabytes

In number theory there is a well-known *totient function* $\varphi(n)$ — how many numbers are there which are less than n and coprime with n . Recall that two numbers are coprime if they have no common divisors except 1.

We extend the definition of totient function to the string domain. Let s be a non-empty string over the alphabet $\{a..z\}$, and k be a positive integer. Then $s \cdot k$ by definition is a string $t = \underbrace{s \circ s \circ \dots \circ s}_k$

(concatenation of s with itself k times). In this case we will call a string s to be a *divisor* of string t . For example, "ab" is a divisor of string "ababab".

We define two non-empty strings s and t to be *coprime*, if there exists no such string u , that is a divisor both to s and to t . Then the totient function $\varphi(s)$ of the string s by definition is the number of non-empty strings over the same alphabet $\{a..z\}$, strictly shorter than s , and coprime to it.

Input

A single line contains a string s of length from 1 to 10^5 symbols inclusive, which consists of small English characters.

Output

Output a single number — the value of $\varphi(s)$ modulo 1000000007 ($10^9 + 7$).

Example

standard input	standard output
aa	25
abab	18277

Problem H. Fibonacci

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 64 megabytes

Once Vasya was given a task at the olympiad: calculate a sum of the numbers in a square $n \times n$, filled with Fibonacci numbers such that $a_{i,j} = F_{i+j-1}$.

$$\begin{array}{cccc} F_1 & F_2 & \dots & F_n \\ F_2 & F_3 & \dots & F_{n+1} \\ \vdots & \vdots & \ddots & \vdots \\ F_n & F_{n+1} & \dots & F_{2n-1} \end{array}$$

After Vasya solved the problem, he came up with a brilliant idea. He decided to generalize a problem to the k -dimensional case. Namely, the problem is to find a sum of k -dimensional hypercube of size $\underbrace{n \times n \times \dots \times n}_k$, where the element $a_{i_1, i_2, \dots, i_k} = F_{i_1 + i_2 + \dots + i_k}$. Since the answer may be very large, calculate it modulo 1 000 000 007.

In this problem the Fibonacci number is defined as an element of the following sequence: $F_1 = 1$, $F_2 = 1$, $F_i = F_{i-1} + F_{i-2}$.

Input

The only line of input contains two integers: n — the size of hypercube, and k — dimension. $1 \leq n \leq 1\,000\,000\,007$, $1 \leq k \leq 1\,000\,000\,007$.

Output

Output a single number — the sum of the numbers in the hypercube modulo 1 000 000 007.

Example

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