Problem A. Distinct Numbers

Time Limit   1000 ms

Mem Limit   524288 kB

You are given a list of n integers, and your task is to calculate the number of *distinct* values in the list.

Input

The first input line has an integer n: the number of values.

The second line has n integers $x_1, x_2, \ldots, x_n$.

Output

Print one integers: the number of distinct values.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le x_i \le 10^9$

Example

Input	Output
5 2 3 2 2 3	2

Problem B. Apartments

Time Limit   1000 ms

Mem Limit   524288 kB

There are n applicants and m free apartments. Your task is to distribute the apartments so that as many applicants as possible will get an apartment.

Each applicant has a desired apartment size, and they will accept any apartment whose size is close enough to the desired size.

Input

The first input line has three integers n, m, and k: the number of applicants, the number of apartments, and the maximum allowed difference.

The next line contains n integers $a_1, a_2, \ldots, a_n$: the desired apartment size of each applicant. If the desired size of an applicant is x, they will accept any apartment whose size is between $x - k$ and $x + k$.

The last line contains m integers $b_1, b_2, \ldots, b_m$: the size of each apartment.

Output

Print one integer: the number of applicants who will get an apartment.

Constraints

- $1 \leq n, m \leq 2 \cdot 10^5$
- $0 \leq k \leq 10^9$
- $1 \leq a_i, b_i \leq 10^9$

Example

Input	Output
4 3 5 60 45 80 60 30 60 75	2

Problem C. Ferris Wheel

Time Limit 1000 ms

Mem Limit 524288 kB

There are n children who want to go to a Ferris wheel, and your task is to find a gondola for each child.

Each gondola may have one or two children in it, and in addition, the total weight in a gondola may not exceed x. You know the weight of every child.

What is the minimum number of gondolas needed for the children?

Input

The first input line contains two integers n and x: the number of children and the maximum allowed weight.

The next line contains n integers $p_1, p_2, \ldots, p_n$: the weight of each child.

Output

Print one integer: the minimum number of gondolas.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le x \le 10^9$
- $1 \le p_i \le x$

Example

Input	Output
4 10 7 2 3 9	3

Problem D. Concert Tickets

Time Limit 1000 ms

Mem Limit 524288 kB

There are n concert tickets available, each with a certain price. Then, m customers arrive, one after another.

Each customer announces the maximum price they are willing to pay for a ticket, and after this, they will get a ticket with the nearest possible price such that it does not exceed the maximum price.

Input

The first input line contains integers n and m: the number of tickets and the number of customers.

The next line contains n integers $h_1, h_2, \ldots, h_n$: the price of each ticket.

The last line contains m integers $t_1, t_2, \ldots, t_m$: the maximum price for each customer in the order they arrive.

Output

Print, for each customer, the price that they will pay for their ticket. After this, the ticket cannot be purchased again.

If a customer cannot get any ticket, print -1.

Constraints

- $1 \le n, m \le 2 \cdot 10^5$
- $1 \le h_i, t_i \le 10^9$

Example

Input	Output
5 3 5 3 7 8 5 4 8 3	3 8 -1

Problem E. Restaurant Customers

Time Limit   1000 ms

Mem Limit   524288 kB

You are given the arrival and leaving times of n customers in a restaurant.

What was the maximum number of customers in the restaurant at any time?

Input

The first input line has an integer n: the number of customers.

After this, there are n lines that describe the customers. Each line has two integers a and b : the arrival and leaving times of a customer.

You may assume that all arrival and leaving times are distinct.

Output

Print one integer: the maximum number of customers.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le a < b \le 10^9$

Example

Input	Output
3 5 8 2 4 3 9	2

Problem F. Movie Festival

Time Limit 1000 ms

Mem Limit 524288 kB

In a movie festival n movies will be shown. You know the starting and ending time of each movie. What is the maximum number of movies you can watch entirely?

Input

The first input line has an integer n: the number of movies.

After this, there are n lines that describe the movies. Each line has two integers a and b: the starting and ending times of a movie.

Output

Print one integer: the maximum number of movies.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le a < b \le 10^9$

Example

Input	Output
3 3 5 4 9 5 8	2

Problem G. Sum of Two Values

Time Limit   1000 ms

Mem Limit   524288 kB

You are given an array of n integers, and your task is to find two values (at distinct positions) whose sum is x.

Input

The first input line has two integers n and x: the array size and the target sum.

The second line has n integers $a_1, a_2, \ldots, a_n$: the array values.

Output

Print two integers: the positions of the values. If there are several solutions, you may print any of them. If there are no solutions, print `IMPOSSIBLE`.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le x, a_i \le 10^9$

Example

Input	Output
4 8 2 7 5 1	2 4

Problem H. Maximum Subarray Sum

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to find the maximum sum of values in a contiguous, nonempty subarray.

Input

The first input line has an integer n: the size of the array.

The second line has n integers $x_1, x_2, \ldots, x_n$: the array values.

Output

Print one integer: the maximum subarray sum.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $-10^9 \leq x_i \leq 10^9$

Example

Input	Output
8 -1 3 -2 5 3 -5 2 2	9

Problem I. Stick Lengths

Time Limit   1000 ms

Mem Limit   524288 kB

There are n sticks with some lengths. Your task is to modify the sticks so that each stick has the same length.

You can either lengthen and shorten each stick. Both operations cost x where x is the difference between the new and original length.

What is the minimum total cost?

Input

The first input line contains an integer n: the number of sticks.

Then there are n integers: $p_1, p_2, \ldots, p_n$: the lengths of the sticks.

Output

Print one integer: the minimum total cost.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le p_i \le 10^9$

Example

Input	Output
5 2 3 1 5 2	5

Problem J. Missing Coin Sum

Time Limit   1000 ms

Mem Limit   524288 kB

You have n coins with positive integer values. What is the smallest sum you cannot create using a subset of the coins?

Input

The first line has an integer n: the number of coins.

The second line has n integers $x_1, x_2, \ldots, x_n$: the value of each coin.

Output

Print one integer: the smallest coin sum.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le x_i \le 10^9$

Example

Input	Output
5 2 9 1 2 7	6

Problem K. Collecting Numbers

Time Limit   1000 ms

Mem Limit   524288 kB

You are given an array that contains each number between $1 \ldots n$ exactly once. Your task is to collect the numbers from 1 to n in increasing order.

On each round, you go through the array from left to right and collect as many numbers as possible. What will be the total number of rounds?

Input

The first line has an integer n: the array size.

The next line has n integers $x_1, x_2, \ldots, x_n$: the numbers in the array.

Output

Print one integer: the number of rounds.

Constraints

- $1 \le n \le 2 \cdot 10^5$

Example

Input	Output
5 4 2 1 5 3	3

Problem L. Collecting Numbers II

Time Limit   1000 ms

Mem Limit   524288 kB

You are given an array that contains each number between $1 \ldots n$ exactly once. Your task is to collect the numbers from 1 to n in increasing order.

On each round, you go through the array from left to right and collect as many numbers as possible.

Given m operations that swap two numbers in the array, your task is to report the number of rounds after each operation.

Input

The first line has two integers n and m: the array size and the number of operations.

The next line has n integers $x_1, x_2, \ldots, x_n$: the numbers in the array.

Finally, there are m lines that describe the operations. Each line has two integers a and b: the numbers at positions a and b are swapped.

Output

Print m integers: the number of rounds after each swap.

Constraints

- $1 \leq n, m \leq 2 \cdot 10^5$
- $1 \leq a, b \leq n$

Example

Input	Output
5 3 4 2 1 5 3 2 3 1 5 2 3	2 3 4

Problem M. Playlist

Time Limit   1000 ms

Mem Limit   524288 kB

You are given a playlist of a radio station since its establishment. The playlist has a total of n songs.

What is the longest sequence of successive songs where each song is unique?

Input

The first input line contains an integer n: the number of songs.

The next line has n integers $k_1, k_2, \ldots, k_n$: the id number of each song.

Output

Print the length of the longest sequence of unique songs.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le k_i \le 10^9$

Example

Input	Output
8 1 2 1 3 2 7 4 2	5

Problem N. Towers

Time Limit 1000 ms

Mem Limit 524288 kB

You are given n cubes in a certain order, and your task is to build towers using them. Whenever two cubes are one on top of the other, the upper cube must be smaller than the lower cube.

You must process the cubes in the given order. You can always either place the cube on top of an existing tower, or begin a new tower. What is the minimum possible number of towers?

Input

The first input line contains an integer n: the number of cubes.

The next line contains n integers $k_1, k_2, \ldots, k_n$: the sizes of the cubes.

Output

Print one integer: the minimum number of towers.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le k_i \le 10^9$

Example

Input	Output
5 3 8 2 1 5	2

Problem O. Traffic Lights

Time Limit   1000 ms

Mem Limit   524288 kB

There is a street of length x whose positions are numbered $0, 1, \ldots, x$. Initially there are no traffic lights, but n sets of traffic lights are added to the street one after another.

Your task is to calculate the length of the longest passage without traffic lights after each addition.

Input

The first input line contains two integers x and n: the length of the street and the number of sets of traffic lights.

Then, the next line contains n integers $p_1, p_2, \ldots, p_n$: the position of each set of traffic lights. Each position is distinct.

Output

Print the length of the longest passage without traffic lights after each addition.

Constraints

- $1 \le x \le 10^9$
- $1 \le n \le 2 \cdot 10^5$
- $0 < p_i < x$

Example

Input	Output
8 3 3 6 2	5 3 3

Problem P. Distinct Values Subarrays

Time Limit   1000 ms

Mem Limit   524288 kB

Given an array of n integers, count the number of subarrays where each element is dictinct.

Input

The first line has an integer n: the array size.

The second line has n integers $x_1, x_2, \ldots, x_n$: the array contents.

Output

Print the number of subarrays with distinct elements.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$

Example

Input	Output
4 1 2 1 3	8

Explanation: The subarrays are $[1]$ (two times), $[2]$, $[3]$, $[1, 2]$, $[1, 3]$, $[2, 1]$ and $[2, 1, 3]$.

Problem Q. Distinct Values Subsequences

Time Limit   1000 ms

Mem Limit   524288 kB

Given an array of n integers, count the number of subsequences where each element is dictinct.

A subsequence is a sequence of array elements from left to right that may have gaps.

Input

The first line has an integer n: the array size.

The second line has n integers $x_1, x_2, \ldots, x_n$: the array contents.

Output

Print the number of subsequences with distinct elements. The answer can be large, so print it modulo $10^9 + 7$.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$

Example

Input	Output
4 1 2 1 3	11

Explanation: The subsequences are $[1]$ (two times), $[2]$, $[3]$, $[1, 2]$, $[1, 3]$ (two times), $[2, 1]$, $[2, 3]$, $[1, 2, 3]$ and $[2, 1, 3]$.

Problem R. Josephus Problem I

Time Limit 1000 ms

Mem Limit 524288 kB

Consider a game where there are n children (numbered $1, 2, \ldots, n$) in a circle. During the game, every other child is removed from the circle until there are no children left. In which order will the children be removed?

Input

The only input line has an integer n.

Output

Print n integers: the removal order.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$

Example

Input	Output
7	2 4 6 1 5 3 7

Problem S. Josephus Problem II

Time Limit   1000 ms

Mem Limit   524288 kB

Consider a game where there are n children (numbered $1, 2, \ldots, n$) in a circle. During the game, repeatedly k children are skipped and one child is removed from the circle. In which order will the children be removed?

Input

The only input line has two integers n and k.

Output

Print n integers: the removal order.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $0 \le k \le 10^9$

Example

Input	Output
7 2	3 6 2 7 5 1 4

Problem T. Nested Ranges Check

Time Limit   1000 ms

Mem Limit   524288 kB

Given n ranges, your task is to determine for each range if it contains some other range and if some other range contains it.

Range $[a, b]$ contains range $[c, d]$ if $a \le c$ and $d \le b$.

Input

The first input line has an integer n: the number of ranges.

After this, there are n lines that describe the ranges. Each line has two integers x and y: the range is $[x, y]$.

You may assume that no range appears more than once in the input.

Output

First print a line that describes for each range (in the input order) if it contains some other range (1) or not (0).

Then print a line that describes for each range (in the input order) if some other range contains it (1) or not (0).

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le x < y \le 10^9$

Example

Input	Output
4 1 6 2 4 4 8 3 6	1 0 0 0 0 1 0 1

Problem U. Nested Ranges Count

Time Limit   1000 ms

Mem Limit   524288 kB

Given n ranges, your task is to count for each range how many other ranges it contains and how many other ranges contain it.

Range $[a, b]$ contains range $[c, d]$ if $a \le c$ and $d \le b$.

Input

The first input line has an integer n: the number of ranges.

After this, there are n lines that describe the ranges. Each line has two integers x and y: the range is $[x, y]$.

You may assume that no range appears more than once in the input.

Output

First print a line that describes for each range (in the input order) how many other ranges it contains.

Then print a line that describes for each range (in the input order) how many other ranges contain it.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le x < y \le 10^9$

Example

Input	Output
4 1 6 2 4 4 8 3 6	2 0 0 0 0 1 0 1

Problem V. Room Allocation

Time Limit   1000 ms

Mem Limit   524288 kB

There is a large hotel, and n customers will arrive soon. Each customer wants to have a single room.

You know each customer's arrival and departure day. Two customers can stay in the same room if the departure day of the first customer is earlier than the arrival day of the second customer.

What is the minimum number of rooms that are needed to accommodate all customers? And how can the rooms be allocated?

Input

The first input line contains an integer n: the number of customers.

Then there are n lines, each of which describes one customer. Each line has two integers a and b: the arrival and departure day.

Output

Print first an integer k: the minimum number of rooms required.

After that, print a line that contains the room number of each customer in the same order as in the input. The rooms are numbered $1, 2, \ldots, k$. You can print any valid solution.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le a \le b \le 10^9$

Example

Input	Output
3 1 2 2 4 4 4	2 1 2 1

Problem W. Factory Machines

Time Limit   1000 ms

Mem Limit   524288 kB

A factory has n machines which can be used to make products. Your goal is to make a total of t products.

For each machine, you know the number of seconds it needs to make a single product. The machines can work simultaneously, and you can freely decide their schedule.

What is the shortest time needed to make t products?

Input

The first input line has two integers n and t: the number of machines and products.

The next line has n integers $k_1, k_2, \ldots, k_n$: the time needed to make a product using each machine.

Output

Print one integer: the minimum time needed to make t products.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le t \le 10^9$
- $1 \le k_i \le 10^9$

Example

Input	Output
3 7 3 2 5	8

Explanation: Machine 1 makes two products, machine 2 makes four products and machine 3 makes one product.

Problem X. Tasks and Deadlines

Time Limit   1000 ms

Mem Limit   524288 kB

You have to process n tasks. Each task has a duration and a deadline, and you will process the tasks in some order one after another. Your reward for a task is $d - f$ where d is its deadline and f is your finishing time. (The starting time is 0, and you have to process all tasks even if a task would yield negative reward.)

What is your maximum reward if you act optimally?

Input

The first input line has an integer n: the number of tasks.

After this, there are n lines that describe the tasks. Each line has two integers a and d: the duration and deadline of the task.

Output

Print one integer: the maximum reward.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq a, d \leq 10^6$

Example

Input	Output
3 6 10 8 15 5 12	2

Problem Y. Reading Books

Time Limit   1000 ms

Mem Limit   524288 kB

There are n books, and Kotivalo and Justiina are going to read them all. For each book, you know the time it takes to read it.

They both read each book from beginning to end, and they cannot read a book at the same time. What is the minimum total time required?

Input

The first input line has an integer n: the number of books.

The second line has n integers $t_1, t_2, \ldots, t_n$: the time required to read each book.

Output

Print one integer: the minimum total time.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le t_i \le 10^9$

Example

Input	Output
3 2 8 3	16

Problem Z. Sum of Three Values

Time Limit   1000 ms

Mem Limit   524288 kB

You are given an array of n integers, and your task is to find three values (at distinct positions) whose sum is x.

Input

The first input line has two integers n and x: the array size and the target sum.

The second line has n integers $a_1, a_2, \ldots, a_n$: the array values.

Output

Print three integers: the positions of the values. If there are several solutions, you may print any of them. If there are no solutions, print `IMPOSSIBLE`.

Constraints

- $1 \leq n \leq 5000$
- $1 \leq x, a_i \leq 10^9$

Example

Input	Output
4 8 2 7 5 1	1 3 4

Problem AA. Sum of Four Values

Time Limit 1000 ms

Mem Limit 524288 kB

You are given an array of n integers, and your task is to find four values (at distinct positions) whose sum is x.

Input

The first input line has two integers n and x: the array size and the target sum.

The second line has n integers $a_1, a_2, \ldots, a_n$: the array values.

Output

Print four integers: the positions of the values. If there are several solutions, you may print any of them. If there are no solutions, print `IMPOSSIBLE`.

Constraints

- $1 \leq n \leq 1000$
- $1 \leq x, a_i \leq 10^9$

Example

Input	Output
8 15 3 2 5 8 1 3 2 3	2 4 6 7

Problem AB. Nearest Smaller Values

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to find for each array position the nearest position to its left having a smaller value.

Input

The first input line has an integer n: the size of the array.

The second line has n integers $x_1, x_2, \ldots, x_n$: the array values.

Output

Print n integers: for each array position the nearest position with a smaller value. If there is no such position, print 0.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$

Example

Input	Output
8 2 5 1 4 8 3 2 5	0 1 0 3 4 3 3 7

Problem AC. Subarray Sums I

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n positive integers, your task is to count the number of subarrays having sum x.

Input

The first input line has two integers n and x: the size of the array and the target sum x.

The next line has n integers $a_1, a_2, \ldots, a_n$: the contents of the array.

Output

Print one integer: the required number of subarrays.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq x, a_i \leq 10^9$

Example

Input	Output
5 7 2 4 1 2 7	3

Problem AD. Subarray Sums II

Time Limit   1000 ms

Mem Limit   524288 kB

Given an array of n integers, your task is to count the number of subarrays having sum x.

Input

The first input line has two integers n and x: the size of the array and the target sum x.

The next line has n integers $a_1, a_2, \ldots, a_n$: the contents of the array.

Output

Print one integer: the required number of subarrays.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $-10^9 \leq x, a_i \leq 10^9$

Example

Input	Output
5 7 2 -1 3 5 -2	2

Problem AE. Subarray Divisibility

Time Limit   1000 ms

Mem Limit   524288 kB

Given an array of n integers, your task is to count the number of subarrays where the sum of values is divisible by n.

Input

The first input line has an integer n: the size of the array.

The next line has n integers $a_1, a_2, \ldots, a_n$: the contents of the array.

Output

Print one integer: the required number of subarrays.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $-10^9 \leq a_i \leq 10^9$

Example

Input	Output
5 3 1 2 7 4	1

Problem AF. Subarray Distinct Values

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to calculate the number of subarrays that have at most k distinct values.

Input

The first input line has two integers n and k.

The next line has n integers $x_1, x_2, \ldots, x_n$: the contents of the array.

Output

Print one integer: the number of subarrays.

Constraints

- $1 \leq k \leq n \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$

Example

Input	Output
5 2 1 2 3 1 1	10

Problem AG. Array Division

Time Limit   1000 ms

Mem Limit   524288 kB

You are given an array containing n positive integers.

Your task is to divide the array into k subarrays so that the maximum sum in a subarray is as small as possible.

Input

The first input line contains two integers n and k: the size of the array and the number of subarrays in the division.

The next line contains n integers $x_1, x_2, \ldots, x_n$: the contents of the array.

Output

Print one integer: the maximum sum in a subarray in the optimal division.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le k \le n$
- $1 \le x_i \le 10^9$

Example

Input	Output
5 3 2 4 7 3 5	8

Explanation: An optimal division is $[2, 4], [7], [3, 5]$ where the sums of the subarrays are $6, 7, 8$. The largest sum is the last sum 8.

Problem AH. Movie Festival II

Time Limit   1000 ms

Mem Limit   524288 kB

In a movie festival, n movies will be shown. Syrjälä's movie club consists of k members, who will be all attending the festival.

You know the starting and ending time of each movie. What is the maximum total number of movies the club members can watch entirely if they act optimally?

Input

The first input line has two integers n and k: the number of movies and club members.

After this, there are n lines that describe the movies. Each line has two integers a and b: the starting and ending time of a movie.

Output

Print one integer: the maximum total number of movies.

Constraints

- $1 \le k \le n \le 2 \cdot 10^5$
- $1 \le a < b \le 10^9$

Example

Input	Output
5 2 1 5 8 10 3 6 2 5 6 9	4

Problem AI. Maximum Subarray Sum II

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to find the maximum sum of values in a contiguous subarray with length between a and b.

Input

The first input line has three integers n, a and b: the size of the array and the minimum and maximum subarray length.

The second line has n integers $x_1, x_2, \ldots, x_n$: the array values.

Output

Print one integer: the maximum subarray sum.

Constraints

- $1 \le n \le 2 \cdot 10^5$
- $1 \le a \le b \le n$
- $-10^9 \le x_i \le 10^9$

Example

Input	Output
8 1 2 -1 3 -2 5 3 -5 2 2	8