

Problem A. Static Range Sum Queries

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to process q queries of the form: what is the sum of values in range $[a, b]$?

Input

The first input line has two integers n and q : the number of values and queries.

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

Finally, there are q lines describing the queries. Each line has two integers a and b : what is the sum of values in range $[a, b]$?

Output

Print the result of each query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

Input	Output
8 4 3 2 4 5 1 1 5 3 2 4 5 6 1 8 3 3	11 2 24 4

Problem B. Static Range Minimum Queries

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to process q queries of the form: what is the minimum value in range $[a, b]$?

Input

The first input line has two integers n and q : the number of values and queries.

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

Finally, there are q lines describing the queries. Each line has two integers a and b : what is the minimum value in range $[a, b]$?

Output

Print the result of each query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

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

Problem C. Dynamic Range Sum Queries

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to process q queries of the following types:

1. update the value at position k to u
2. what is the sum of values in range $[a, b]$?

Input

The first input line has two integers n and q : the number of values and queries.

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

Finally, there are q lines describing the queries. Each line has three integers: either " $1\ k\ u$ " or " $2\ a\ b$ ".

Output

Print the result of each query of type 2.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i, u \leq 10^9$
- $1 \leq k \leq n$
- $1 \leq a \leq b \leq n$

Example

Input	Output
8 4	14
3 2 4 5 1 1 5 3	2
2 1 4	11
2 5 6	
1 3 1	
2 1 4	

Problem D. Dynamic Range Minimum Queries

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to process q queries of the following types:

1. update the value at position k to u
2. what is the minimum value in range $[a, b]$?

Input

The first input line has two integers n and q : the number of values and queries.

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

Finally, there are q lines describing the queries. Each line has three integers: either " $1\ k\ u$ " or " $2\ a\ b$ ".

Output

Print the result of each query of type 2.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i, u \leq 10^9$
- $1 \leq k \leq n$
- $1 \leq a \leq b \leq n$

Example

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

Problem E. Range Xor Queries

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to process q queries of the form: what is the xor sum of values in range $[a, b]$?

Input

The first input line has two integers n and q : the number of values and queries.

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

Finally, there are q lines describing the queries. Each line has two integers a and b : what is the xor sum of values in range $[a, b]$?

Output

Print the result of each query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

Input	Output
8 4 3 2 4 5 1 1 5 3 2 4 5 6 1 8 3 3	3 0 6 4

Problem F. Range Update Queries

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to process q queries of the following types:

1. increase each value in range $[a, b]$ by u
2. what is the value at position k ?

Input

The first input line has two integers n and q : the number of values and queries.

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

Finally, there are q lines describing the queries. Each line has three integers: either "1 a b u " or "2 k ".

Output

Print the result of each query of type 2.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i, u \leq 10^9$
- $1 \leq k \leq n$
- $1 \leq a \leq b \leq n$

Example

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

Problem G. Forest Queries

Time Limit 1000 ms

Mem Limit 524288 kB

You are given an $n \times n$ grid representing the map of a forest. Each square is either empty or contains a tree. The upper-left square has coordinates $(1, 1)$, and the lower-right square has coordinates (n, n) .

Your task is to process q queries of the form: how many trees are inside a given rectangle in the forest?

Input

The first input line has two integers n and q : the size of the forest and the number of queries.

Then, there are n lines describing the forest. Each line has n characters: `.` is an empty square and `*` is a tree.

Finally, there are q lines describing the queries. Each line has four integers y_1, x_1, y_2, x_2 corresponding to the corners of a rectangle.

Output

Print the number of trees inside each rectangle.

Constraints

- $1 \leq n \leq 1000$
- $1 \leq q \leq 2 \cdot 10^5$
- $1 \leq y_1 \leq y_2 \leq n$
- $1 \leq x_1 \leq x_2 \leq n$

Example

Input	Output
<pre> 4 3 .*.. *.* **.. **** 2 2 3 4 3 1 3 1 1 1 2 2 </pre>	<pre> 3 1 2 </pre>

Problem H. Hotel Queries

Time Limit 1000 ms

Mem Limit 524288 kB

There are n hotels on a street. For each hotel you know the number of free rooms. Your task is to assign hotel rooms for groups of tourists. All members of a group want to stay in the same hotel.

The groups will come to you one after another, and you know for each group the number of rooms it requires. You always assign a group to the first hotel having enough rooms. After this, the number of free rooms in the hotel decreases.

Input

The first input line contains two integers n and m : the number of hotels and the number of groups. The hotels are numbered $1, 2, \dots, n$.

The next line contains n integers h_1, h_2, \dots, h_n : the number of free rooms in each hotel.

The last line contains m integers r_1, r_2, \dots, r_m : the number of rooms each group requires.

Output

Print the assigned hotel for each group. If a group cannot be assigned a hotel, print 0 instead.

Constraints

- $1 \leq n, m \leq 2 \cdot 10^5$
- $1 \leq h_i \leq 10^9$
- $1 \leq r_i \leq 10^9$

Example

Input	Output
8 5 3 2 4 1 5 5 2 6 4 4 7 1 1	3 5 0 1 1

Problem I. List Removals

Time Limit 1000 ms

Mem Limit 524288 kB

You are given a list consisting of n integers. Your task is to remove elements from the list at given positions, and report the removed elements.

Input

The first input line has an integer n : the initial size of the list. During the process, the elements are numbered $1, 2, \dots, k$ where k is the current size of the list.

The second line has n integers x_1, x_2, \dots, x_n : the contents of the list.

The last line has n integers p_1, p_2, \dots, p_n : the positions of the elements to be removed.

Output

Print the elements in the order they are removed.

Constraints

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

Example

Input	Output
5 2 6 1 4 2 3 1 3 1 1	1 2 2 6 4

Explanation: The contents of the list are $[2, 6, 1, 4, 2]$, $[2, 6, 4, 2]$, $[6, 4, 2]$, $[6, 4]$, $[4]$ and $[]$.

Problem J. Salary Queries

Time Limit 1000 ms

Mem Limit 524288 kB

A company has n employees with certain salaries. Your task is to keep track of the salaries and process queries.

Input

The first input line contains two integers n and q : the number of employees and queries.

The employees are numbered $1, 2, \dots, n$.

The next line has n integers p_1, p_2, \dots, p_n : each employee's salary.

After this, there are q lines describing the queries. Each line has one of the following forms:

- **!** $k\ x$: change the salary of employee k to x
- **?** $a\ b$: count the number of employees whose salary is between $a \dots b$

Output

Print the answer to each **?** query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq p_i \leq 10^9$
- $1 \leq k \leq n$
- $1 \leq x \leq 10^9$
- $1 \leq a \leq b \leq 10^9$

Example

Input	Output
5 3 3 7 2 2 5 ? 2 3 ! 3 6 ? 2 3	3 2

Problem K. Prefix Sum Queries

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to process q queries of the following types:

1. update the value at position k to u
2. what is the maximum prefix sum in range $[a, b]$?

Input

The first input line has two integers n and q : the number of values and queries.

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

Finally, there are q lines describing the queries. Each line has three integers: either " $1\ k\ u$ " or " $2\ a\ b$ ".

Output

Print the result of each query of type 2.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $-10^9 \leq x_i, u \leq 10^9$
- $1 \leq k \leq n$
- $1 \leq a \leq b \leq n$

Example

Input	Output
8 4 1 2 -1 3 1 -5 1 4 2 2 6 1 4 -2 2 2 6 2 3 4	5 2 0

Problem L. Pizzeria Queries

Time Limit 1000 ms

Mem Limit 524288 kB

There are n buildings on a street, numbered $1, 2, \dots, n$. Each building has a pizzeria and an apartment.

The pizza price in building k is p_k . If you order a pizza from building a to building b , its price (with delivery) is $p_a + |a - b|$.

Your task is to process two types of queries:

1. The pizza price p_k in building k becomes x .
2. You are in building k and want to order a pizza. What is the minimum price?

Input

The first input line has two integers n and q : the number of buildings and queries.

The second line has n integers p_1, p_2, \dots, p_n : the initial pizza price in each building.

Finally, there are q lines that describe the queries. Each line is either "1 k x " or "2 k ".

Output

Print the answer for each query of type 2.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq p_i, x \leq 10^9$
- $1 \leq k \leq n$

Example

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

Problem M. Visible Buildings Queries

Time Limit 1000 ms

Mem Limit 524288 kB

There are n buildings in a row numbered $1, 2, \dots, n$ from left to right. You are standing to the left of the first building. You can see a building if it is taller than any building to its left.

Your task is to process q queries: If only buildings in range $[a, b]$ existed, how many buildings would you see?

Input

The first line has two integers n and q : the number of buildings and queries.

The second line has n integers h_1, h_2, \dots, h_n : the heights of the buildings.

Finally, there are q lines describing the queries. Each line has two integers a and b .

Output

For each query, print one integer: the number of visible buildings.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq q \leq 2 \cdot 10^5$
- $1 \leq h_i \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

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

Problem N. Range Interval Queries

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array x of n integers, your task is to process q queries of the form: how many integers i satisfy $a \leq i \leq b$ and $c \leq x_i \leq d$?

Input

The first line has two integers n and q : the number of values and queries.

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

Finally, there are q lines describing the queries. Each line has four integers a, b, c and d : how many integers i satisfy $a \leq i \leq b$ and $c \leq x_i \leq d$?

Output

Print the result of each query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- $1 \leq a \leq b \leq n$
- $1 \leq c \leq d \leq 10^9$

Example

Input	Output
8 4 3 2 4 5 1 1 5 3 2 4 2 4 5 6 2 9 1 8 1 5 3 3 4 4	2 0 8 1

Problem O. Subarray Sum Queries

Time Limit 1000 ms

Mem Limit 524288 kB

There is an array consisting of n integers. Some values of the array will be updated, and after each update, your task is to report the maximum subarray sum in the array.

Input

The first input line contains integers n and m : the size of the array and the number of updates. The array is indexed $1, 2, \dots, n$.

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

Then there are m lines describing the changes. Each line has two integers k and x : the value at position k becomes x .

Output

After each update, print the maximum subarray sum. Empty subarrays (with sum 0) are allowed.

Constraints

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

Example

Input	Output
5 3 1 2 -3 5 -1 2 6 3 1 2 -2	9 13 6

Problem P. Subarray Sum Queries II

Time Limit 1000 ms

Mem Limit 524288 kB

You are given an array of n integers and q queries. In each query, your task is to calculate the maximum subarray sum in the range $[a, b]$.

Empty subarrays (with sum 0) are allowed.

Input

The first line contains two integers n and q : the number of elements and the number of queries.

Then there are n integers x_1, x_2, \dots, x_n : the contents of the array.

Finally there are q lines that describe the queries. Each line has two integers a and b .

Output

Print the answer for each query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $-10^9 \leq x_i \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

Input	Output
8 4	6
2 5 1 -2 3 -1 -7 1	7
2 4	0
2 5	3
6 7	
4 8	

Problem Q. Distinct Values Queries

Time Limit 1000 ms

Mem Limit 524288 kB

You are given an array of n integers and q queries of the form: how many distinct values are there in a range $[a, b]$?

Input

The first input line has two integers n and q : the array size and number of queries.

The next line has n integers x_1, x_2, \dots, x_n : the array values.

Finally, there are q lines describing the queries. Each line has two integers a and b .

Output

For each query, print the number of distinct values in the range.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

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

Problem R. Distinct Values Queries II

Time Limit 1000 ms

Mem Limit 524288 kB

Given an array of n integers, your task is to process q queries of the following types:

1. update the value at position k to u
2. check if every value in range $[a, b]$ is distinct

Input

The first line has two integers n and q : the number of values and queries.

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

Finally, there are q lines describing the queries. Each line has three integers: either "1 k u " or "2 a b ".

Output

For each query of type 2, print **YES** if every value in the range is distinct and **NO** otherwise.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i, u \leq 10^9$
- $1 \leq k \leq n$
- $1 \leq a \leq b \leq n$

Example

Input	Output
5 4 3 2 7 2 8 2 3 5 2 2 5 1 2 9 2 2 5	YES NO YES

Problem S. Increasing Array Queries

Time Limit 1000 ms

Mem Limit 524288 kB

You are given an array that consists of n integers. The array elements are indexed $1, 2, \dots, n$.

You can modify the array using the following operation: choose an array element and increase its value by one.

Your task is to process q queries of the form: when we consider a subarray from position a to position b , what is the minimum number of operations after which the subarray is increasing?

An array is increasing if each element is greater than or equal with the previous element.

Input

The first input line has two integers n and q : the size of the array and the number of queries.

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

Finally, there are q lines that describe the queries. Each line has two integers a and b : the starting and ending position of a subarray.

Output

For each query, print the minimum number of operations.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

Input	Output
5 3 2 10 4 2 5 3 5 2 2 1 4	2 0 14

Problem T. Movie Festival Queries

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.

Your task is to process q queries of the form: if you arrive and leave the festival at specific times, what is the maximum number of movies you can watch?

You can watch two movies if the first movie ends before or exactly when the second movie starts. You can start the first movie exactly when you arrive and leave exactly when the last movie ends.

Input

The first input line has two integers n and q : the number of movies and queries.

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

Finally, there are q lines describing the queries. Each line has two integers a and b : your arrival and leaving time.

Output

Print the maximum number of movies for each query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq a < b \leq 10^6$

Example

Input	Output
4 3 2 5 6 10 4 7 9 10 5 9 2 10 7 10	0 2 1

Problem U. Forest Queries II

Time Limit 1000 ms



Mem Limit 524288 kB

You are given an $n \times n$ grid representing the map of a forest. Each square is either empty or has a tree. Your task is to process q queries of the following types:

1. Change the state (empty/tree) of a square.
2. How many trees are inside a rectangle in the forest?

Input

The first input line has two integers n and q : the size of the forest and the number of queries.

Then, there are n lines describing the forest. Each line has n characters:  is an empty square and  is a tree.

Finally, there are q lines describing the queries. The format of each line is either "1 y x " or "2 y_1 x_1 y_2 x_2 ".

Output

Print the answer to each query of the second type.

Constraints

- $1 \leq n \leq 1000$
- $1 \leq q \leq 2 \cdot 10^5$
- $1 \leq y, x \leq n$
- $1 \leq y_1 \leq y_2 \leq n$
- $1 \leq x_1 \leq x_2 \leq n$

Example

Input	Output
<pre> 4 3 .*.. *.* **.. **** 2 2 2 3 4 1 3 3 2 2 2 3 4 </pre>	<pre> 3 4 </pre>

Problem V. Range Updates and Sums

Time Limit 1000 ms

Mem Limit 524288 kB

Your task is to maintain an array of n values and efficiently process the following types of queries:

1. Increase each value in range $[a, b]$ by x .
2. Set each value in range $[a, b]$ to x .
3. Calculate the sum of values in range $[a, b]$.

Input

The first input line has two integers n and q : the array size and the number of queries.

The next line has n values t_1, t_2, \dots, t_n : the initial contents of the array.

Finally, there are q lines describing the queries. The format of each line is one of the following: "1 a b x ", "2 a b x ", or "3 a b ".

Output

Print the answer to each sum query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq t_i, x \leq 10^6$
- $1 \leq a \leq b \leq n$

Example

Input	Output
6 5 2 3 1 1 5 3 3 3 5 1 2 4 2 3 3 5 2 2 4 5 3 3 5	7 11 15

Problem W. Polynomial Queries

Time Limit 1000 ms

Mem Limit 524288 kB

Your task is to maintain an array of n values and efficiently process the following types of queries:

1. Increase the first value in range $[a, b]$ by 1, the second value by 2, the third value by 3, and so on.
2. Calculate the sum of values in range $[a, b]$.

Input

The first input line has two integers n and q : the size of the array and the number of queries.

The next line has n values t_1, t_2, \dots, t_n : the initial contents of the array.

Finally, there are q lines describing the queries. The format of each line is either "1 a b " or "2 a b ".

Output

Print the answer to each sum query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq t_i \leq 10^6$
- $1 \leq a \leq b \leq n$

Example

Input	Output
5 3 4 2 3 1 7 2 1 5 1 1 5 2 1 5	17 32

Problem X. Range Queries and Copies

Time Limit 1000 ms

Mem Limit 524288 kB

Your task is to maintain a list of arrays which initially has a single array. You have to process the following types of queries:

1. Set the value a in array k to x .
2. Calculate the sum of values in range $[a, b]$ in array k .
3. Create a copy of array k and add it to the end of the list.

Input

The first input line has two integers n and q : the array size and the number of queries.

The next line has n integers t_1, t_2, \dots, t_n : the initial contents of the array.

Finally, there are q lines describing the queries. The format of each line is one of the following: " $1\ k\ a\ x$ ", " $2\ k\ a\ b$ " or " $3\ k$ ".

Output

Print the answer to each sum query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq t_i, x \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

Input	Output
5 6	13
2 3 1 2 5	13
3 1	13
2 1 1 5	15
2 2 1 5	
1 2 2 5	
2 1 1 5	
2 2 1 5	

Problem Y. Missing Coin Sum Queries

Time Limit 1000 ms

Mem Limit 524288 kB

You have n coins with positive integer values. The coins are numbered $1, 2, \dots, n$.

Your task is to process q queries of the form: "if you can use coins $a \dots b$, what is the smallest sum you cannot produce?"

Input

The first input line has two integers n and q : the number of coins and queries.

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

Finally, there are q lines that describe the queries. Each line has two values a and b : you can use coins $a \dots b$.

Output

Print the answer for each query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

Input	Output
5 3 2 9 1 2 7 2 4 4 4 1 5	4 1 6

Explanation: First you can use coins $[9, 1, 2]$, then coins $[2]$ and finally coins $[2, 9, 1, 2, 7]$.