Problem A. Union of Intervals

Time limit: Please refer to DOM Judge
Memory limit: Please refer to DOM Judge

You are given an initially empty set S of intervals. Your task is to perform a sequence of operations on S and, after each operation, compute the total length of the union of all intervals in S.

The operations are defined as follows:

1. **Insert operation**: Given integers l and r, insert the interval $[l, r]$ into S.
2. **Remove operation**: Given integers l and r, remove the interval $[l, r]$ from S. It is guaranteed that the interval $[l, r]$ exists in S at the time of removal.

After each operation, you must output the length of the union of all intervals currently in S.

Input

The input consists of:

- The first line contains an integer n, the number of operations to be performed ($1 \leq n \leq 2 \times 10^5$).
- Each of the next n lines contains three integers l, r, and t:
  - If $t = 1$, it represents an *insert operation*, where the interval $[l, r]$ is added to S.
  - If $t = -1$, it represents a *remove operation*, where the interval $[l, r]$ is removed from S.

  Here, $-10^6 \leq l < r \leq 10^6$.

Output

After each operation, output a single integer —the length of the union of all intervals currently in S.

Examples

Standard Input	Standard Output
4 1 5 1 3 6 1 1 5 -1 3 6 -1	4 5 3 0

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Problem B. Tree Diameter

Time limit: Please refer to DOM Judge
Memory limit: Please refer to DOM Judge

You are given a tree T with n nodes and weighted edges. Your task is to compute the largest distance (also known as the diameter) between any two nodes in T.

Input

The input consists of:

- The first line contains an integer n, the number of nodes in T ($1 \leq n \leq 10^5$).
- Each of the next $n-1$ lines contains three integers a, b, and w, representing an edge between nodes a and b with weight w ($1 \leq a, b \leq n$, $-1000 \leq w \leq 1000$).

Output

Output a single integer, the largest distance between any two nodes in T.

Examples

Standard Input	Standard Output
4 1 2 3 2 3 -1 3 4 5	7
5 1 2 3 2 3 -4 3 4 1 3 5 3	4

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Problem C. How Yuan De Road

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

You are given n cities. There are m highways and n^2 roads connecting the cities. Both highways and roads are bidirectional. The length of the i-th highway is w_i. For each pair of (i, j), $1 \leq i, j \leq n$, there is a road from city i to city j with length $A_i + A_j$.

Frank is located at city 1, and he wants to meet his girlfriend at city n. He can travel on both highways and roads at a speed of 1 length unit per second. Please determine the shortest time Frank can meet his girlfriend.

Input

The first line of the input contains two integers n and m, representing the number of cities and the number of bidirectional highways, respectively.

The second line of the input contains n integers A_i.

Each of the next m lines contains three integers u_i, v_i, and w_i, indicating that the i-th highway connects city u_i and city v_i with a length of w_i.

- $1 \leq n \leq 3 \cdot 10^5$
- $0 \leq m \leq 3 \cdot 10^5$
- $1 \leq A_i, w_i \leq 10^9$
- $1 \leq u_i \leq v_i \leq n$
- $u_i \neq v_i, 1 \leq i \leq m$

Output

Output a single integer representing the shortest time Frank can meet his girlfriend.

Examples

Standard Input	Standard Output
5 2 1 3 5 7 9 1 5 11 3 5 3	9
7 5 566 138 713 761 77 649 755 5 6 746 2 7 234 3 5 766 4 5 486 1 5 214	663

Note

In first sample test case, Frank can travel through $1 \xrightarrow{\text{road}} 3 \xrightarrow{\text{highway}} 5$ with a total length of $(1+5)+3 = 9$.

Note that "How Yuan De Road" means "What a distant road" in Chinese.

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Problem D. Distinct Colors

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

You are given a graph with n vertices and m edges. Each vertex has a color represented by a integer.

You are asked to perform q operations. Each operation is one of two types:

1. Remove the edge between vertices u and v from the graph. It is guaranteed that the edge exists and has not been removed previously.
2. Report three numbers:
   (a) The number of connected components in the graph.
   (b) The number of vertices in the connected component containing vertex u.
   (c) The number of distinct colors in the connected component containing vertex u.

Input

The first line of the input contains two integers n and m, representing the number of vertices and the number of edges, respectively.

The second line of the input contains n integers A_i, where A_i is the color of the i-th vertex.

Each of the next m lines contains two integers u_i and v_i, indicating that there is an edge between vertices u_i and v_i.

The following line contains one integer q, the number of operations.

Each of the next q lines contains either '1 u v' or '2 u', representing an operation of type 1 or type 2, respectively.

- $1 \leq n, A_i \leq 10^5$
- $1 \leq m \leq 2 \cdot 10^5$
- $1 \leq q \leq 3 \cdot 10^5$
- $1 \leq u_i, v_i \leq n, u_i \neq v_i, 1 \leq i \leq m$
- $1 \leq u, v \leq n$ for type 1 operations. It is guaranteed that the edge exists.
- $1 \leq u \leq n$ for type 2 operations.

Output

For each operation of type 2, print three numbers on a single line: the number of connected components, the number of vertices in the connected component containing vertex u, and the number of distinct colors in the connected component containing vertex u.

Examples

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

Note

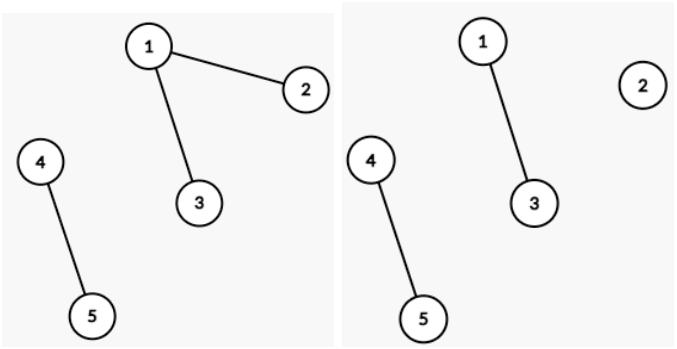

Figure 1: Before and after type 1 operation in sample test case

Problem E. How da de number

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

Given an array a with length n and q following events. Each event is in one of the two following type:

1. Update $a[k]$ with $a[k] + v$, for all $i = l, \ldots, r$
2. For the range $a[l], \ldots a[r]$, answer the maximum value and the number of element who has the maximum value.

Note that "How da de number" means such a big number.

This is the problem on last year's final exam. The actual statement of this problem is states as follows:

Given three positive integers a, b, p, calculate

$$a^b \mod p$$

Input

The first line contains an integer t, representing the number of test cases. Each of the next t lines contains three integers a, b, and p, representing the given number for a single test case.

- $1 \leq t \leq 10$
- $1 \leq a, b \leq 10^{10^5}$
- $1 \leq p \leq 10^9$
- p is a prime

Output

For each test case, output the answer in a single line.

Examples

Standard Input	Standard Output
3 5 3 41 2 4 17 10039309830423098 2329384623849723 59	2 16 52

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Problem F. Simple Add and Delete Problem

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

You are given an initially empty box. We will perform Q operations of the following two types:

1. $+ x$: Add a ball with the integer x written on it into the box.
2. $- x$: Remove a ball with the integer x written on it from the box. It is guaranteed that the box contains a ball with the integer x before this operation.

After each operation, answer the following question:

Find the number of ways to select some number of balls from the box such that the sum of the integers written on the selected balls equals k, modulo 998244353. Note that all balls in the box are distinguishable.

Input

The first line contains two integers Q, k. The next Q lines, each describes an operation either in the form $+ x$ or $- x$, representing adding or deleting a ball with integer x written on it.

- $1 \leq Q, k \leq 5000$
- $1 \leq x \leq 5000$

Output

Print Q lines, where the i-th line contains the answer to the question after the i-th operation, modulo 998244353.

Examples

Standard Input	Standard Output
15 10 + 5 + 2 + 3 - 2 + 5 + 10 - 3 + 1 + 3 + 3 - 5 + 1 + 7 + 4 - 3	0 0 1 0 1 2 2 2 2 2 1 3 5 8 5

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